

Solutions Companion

PHP AND ALGORITHMIC THINKING FOR THE COMPLETE BEGINNER

3rd Revised Edition

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Warning and Disclaimer

This book is designed to provide the answers to all of the review questions, as well as the solutions to all review exercises of the book “PHP AND ALGORITHMIC THINKING FOR THE COMPLETE BEGINNER – Third Edition”. Every effort has been taken to make this book compatible with all releases of PHP, and it is almost certain to be compatible with any future releases of it.

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How to Report Errata

Although I have taken great care to ensure the accuracy of the content in this book, mistakes can still occur. If you come across any errors, either in the text or the code, I highly encourage you to report them to me. By doing so, you'll not only assist in saving other readers from potential confusion and frustration but also contribute to enhancing the quality of the next release. If you discover any errors, please report them by visiting one of the following addresses:

- <https://tinyurl.com/28nwh2nf>
- <https://www.bouraspape.com/report-errata>



Once I verify your reported error(s), your submission will be accepted. The errata will then be uploaded to my website and added to any existing list of corrections.

If you Like the Book

If you find the book valuable, please consider visiting the web store where you purchased it, as well as goodreads.com, to show your appreciation by writing a positive review and awarding as many stars as you think appropriate. By doing so, you will motivate me to keep writing and, of course, you'll be assisting other readers in discovering my work.

Chapter 1

1.7 Review Questions: True/False

1. true
2. false
3. true
4. false
5. false
6. true
7. true
8. false
9. false
10. false
11. true
12. true
13. false
14. false
15. false
16. true
17. true
18. false
19. false
20. true
21. false
22. false
23. true

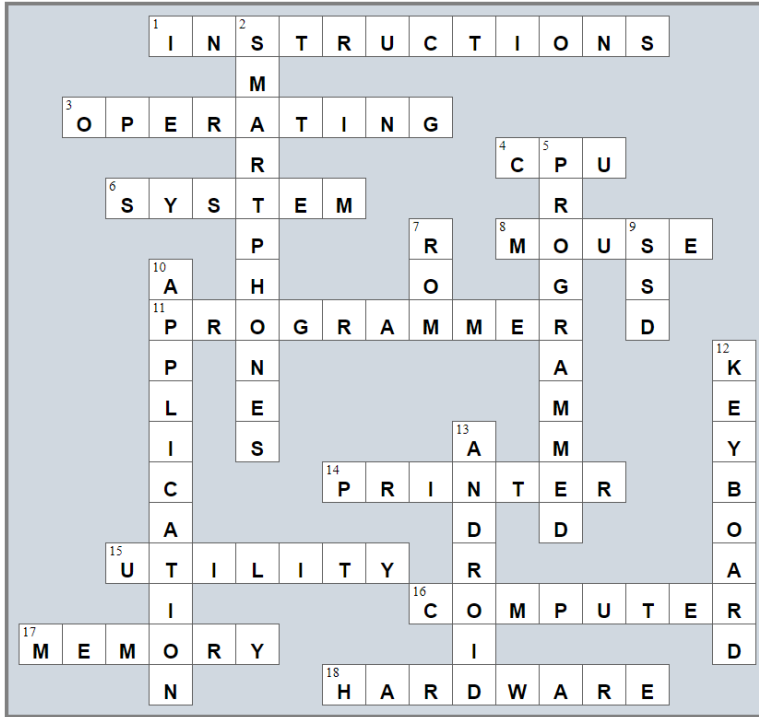
1.8 Review Questions: Multiple Choice

1. b
2. d
3. d
4. c
5. f
6. d
7. c
8. b
9. c
10. b
11. a

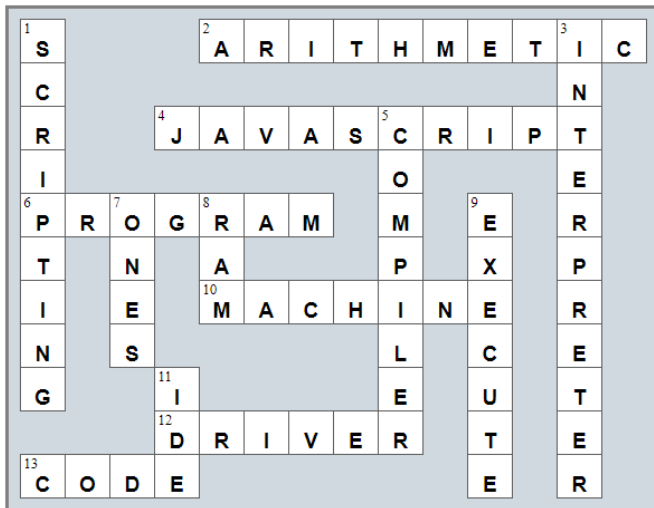
Review in "Introductory Knowledge"

Review Crossword Puzzles

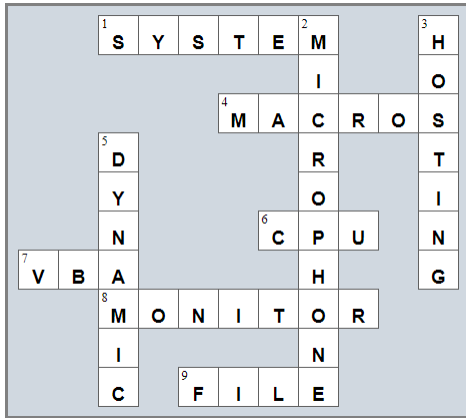
1.



2.



3.



Chapter 4

4.17 Review Questions: True/False

1. true
2. false
3. false
4. false
5. false
6. true
7. false
8. true
9. true
10. true
11. false
12. false
13. true
14. true
15. false
16. true
17. false
18. false
19. false
20. true
21. true
22. true
23. false
24. false
25. false
26. false
27. true
28. true
29. false
30. false
31. false
32. false
33. false
34. true
35. false
36. false
37. false
38. false
39. true
40. true
41. false

4.18 Review Questions: Multiple Choice

1. c
2. b
3. c
4. a
5. a
6. a
7. b
8. d
9. a
10. d

Chapter 5

5.8 Review Questions: True/False

- | | |
|----------|-----------|
| 1. false | 10. false |
| 2. false | 11. true |
| 3. true | 12. false |
| 4. false | 13. true |
| 5. false | 14. true |
| 6. true | 15. true |
| 7. false | 16. true |
| 8. false | 17. false |
| 9. true | |

5.9 Review Questions: Multiple Choice

- | | |
|------|------|
| 1. e | 5. c |
| 2. a | 6. c |
| 3. d | 7. d |
| 4. b | 8. a |

5.10 Review Exercises

- 1 - c, 2 - d, 3 - a, 4 - b
- 1 - d, 2 - c, 3 - b, 4 - a
-

Value	Data Type	Declaration and Initialization
The name of my friend	String	<code>\$name = "Mark";</code>
My address	String	<code>\$address = "254 Lookout Rd. Wilson, NY 27893";</code>
The average daily temperature	Float	<code>\$average = 70.3;</code>
A telephone number	String	<code>\$phoneNumber = "1-891-764-2410";</code>
My Social Security Number (SSN)	String	<code>\$ssn = "123-45-6789";</code>
The speed of a car	Float	<code>\$speed = 90.5;</code>
The number of children in a family	Integer	<code>\$children = 3;</code>

Chapter 6

6.4 Review Questions: True/False

1. true
2. true
3. true
4. false
5. false

6.5 Review Questions: Multiple Choice

1. c
2. a
3. b
4. b

Chapter 7

7.7 Review Questions: True/False

- | | |
|-----------|-----------|
| 1. false | 15. false |
| 2. true | 16. false |
| 3. false | 17. false |
| 4. false | 18. true |
| 5. false | 19. false |
| 6. false | 20. true |
| 7. false | 21. false |
| 8. false | 22. false |
| 9. true | 23. false |
| 10. false | 24. true |
| 11. false | 25. false |
| 12. true | 26. false |
| 13. false | |
| 14. false | |

7.8 Review Questions: Multiple Choice

- | | | |
|------|------|------|
| 1. c | 4. b | 7. d |
| 2. c | 5. d | 8. d |
| 3. d | 6. b | 9. c |

7.9 Review Exercises

- ii, iv, v, ix, x
- i. String, ii. Boolean, iii. String, iv. String, v. Float, vi. Integer
- i. d, ii. f, iii. c, iv. e
- i. 26, ii. 28
- i. 5, ii. 6
- i. 1, ii. 0, iii. 1, iv. 1, v. 0, vi. 1
- i. $2 * 3$, ii. 4
- i. 2, ii. 0, iii. 1, iv. 0, v. 0, vi. 0
- i. 2, ii. 5
- My name is George Malkovich
- i. (-3), ii. 1
- California California California

Chapter 8

8.2 Review Questions: True/False

1. false
2. true
3. false
4. false

8.3 Review Exercises

1. Solution

Step	Statement	Notes	\$a	\$b	\$c	\$d
1	<code>\$a = (float)readline()</code>	User enters value 3	3	?	?	?
2	<code>\$b = \$a + 10</code>		3	13	?	?
3	<code>\$a = \$b * (\$a - 3)</code>		0	13	?	?
4	<code>\$c = 3 * \$b / 6</code>		0	13	6.5	?
5	<code>\$d = \$c * \$c</code>		0	13	6.5	42.25
6	<code>\$d--</code>		0	13	6.5	41.25
7	<code>echo \$d</code>	It displays: 41.25				

2. Solution

For the input value of 3

Step	Statement	\$a	\$b	\$c	\$d	
1	<code>\$a = (int)readline()</code>	3	?	?	?	
2	<code>\$a = (\$a + 1) * (\$a + 1) + 6 / 3 * 2 + 20</code>	40	?	?	?	
3	<code>\$b = \$a % 13</code>	40	1	?	?	
4	<code>\$c = \$b % 7</code>	40	1	1	?	
5	<code>\$d = \$a * \$b * \$c</code>	40	1	1	40	
6	<code>echo \$a, ", ", \$b, ", ", \$c, ", ", \$d</code>	It displays: 40, 1, 1, 40				

For the input value of 4

Step	Statement	\$a	\$b	\$c	\$d	
1	<code>\$a = (int)readline()</code>	4	?	?	?	
2	<code>\$a = (\$a + 1) * (\$a + 1) + 6 / 3 * 2 + 20</code>	49	?	?	?	
3	<code>\$b = \$a % 13</code>	49	10	?	?	
4	<code>\$c = \$b % 7</code>	49	10	3	?	
5	<code>\$d = \$a * \$b * \$c</code>	49	10	3	1470	
6	<code>echo \$a, ", ", \$b, ", ", \$c, ", ", \$d</code>	It displays: 49, 10, 3, 1470				

For the input value of 1

Step	Statement	\$a	\$b	\$c	\$d
1	<code>\$a = (int)readline()</code>	1	?	?	?

2	$\$a = (\$a + 1) * (\$a + 1) + 6 / 3 * 2 + 20$	28	?	?	?
3	$\$b = \$a \% 13$	28	2	?	?
4	$\$c = \$b \% 7$	28	2	2	?
5	$\$d = \$a * \$b * \c	28	2	2	112
6	echo \$a, ", ", \$b, ", ", \$c, ", ", \$d	It displays: 28, 2, 2, 112			

3. Solution

For the input values of 8, 4

Step	Statement	\$a	\$b	\$c	\$d	\$e
1	$\$a = (\text{int})\text{readline}()$	8	?	?	?	?
2	$\$b = (\text{int})\text{readline}()$	8	4	?	?	?
3	$\$c = \$a + \$b$	8	4	12	?	?
4	$\$d = 1 + \$a / \$b * \$c + 2$	8	4	12	27	?
5	$\$e = \$c + \$d$	8	4	12	27	39
6	$\$c += \$d + \$e$	8	4	78	27	39
7	$\$e--$	8	4	78	27	38
8	$\$d -= \$c + \$d \% \c	8	4	78	-78	38
9	echo \$c, ", ", \$d, ", ", \$e	It displays: 78, -78, 38				

For the input values of 4, 4

Step	Statement	\$a	\$b	\$c	\$d	\$e
1	$\$a = (\text{int})\text{readline}()$	4	?	?	?	?
2	$\$b = (\text{int})\text{readline}()$	4	4	?	?	?
3	$\$c = \$a + \$b$	4	4	8	?	?
4	$\$d = 1 + \$a / \$b * \$c + 2$	4	4	8	11	?
5	$\$e = \$c + \$d$	4	4	8	11	19
6	$\$c += \$d + \$e$	4	4	38	11	19
7	$\$e--$	4	4	38	11	18
8	$\$d -= \$c + \$d \% \c	4	4	38	-38	18
9	echo \$c, ", ", \$d, ", ", \$e	It displays: 38, -38, 18				

Chapter 9

9.3 Review Exercises

1. Solution

The statement `$$ = $$1 + $$3 + $$$` is wrong. It must be `$$ = $$1 + $$3 + $$5`

2. Solution

For the input values of 5, 5

Step	Statement	\$a	\$b	\$c	\$d	\$e
1	<code>\$a = (int)readline()</code>	5	?	?	?	?
2	<code>\$b = (int)readline()</code>	5	5	?	?	?
3	<code>\$c = \$a + \$b</code>	5	5	10	?	?
4	<code>\$d = 5 + \$a / \$b * \$c + 2</code>	5	5	10	17	?
5	<code>\$e = \$c - \$d</code>	5	5	10	17	-7
6	<code>\$c += \$d + \$c</code>	5	5	37	17	-7
7	<code>\$e--</code>	5	5	37	17	-8
8	<code>\$d += \$e + \$c % \$b</code>	5	5	37	11	-8
9	<code>echo \$c, ", ", \$d, ", ", \$e</code>	It displays: 37, 11, -8				

For the input values of 4, 2

Step	Statement	\$a	\$b	\$c	\$d	\$e
1	<code>\$a = (int)readline()</code>	4	?	?	?	?
2	<code>\$b = (int)readline()</code>	4	2	?	?	?
3	<code>\$c = \$a + \$b</code>	4	2	6	?	?
4	<code>\$d = 5 + \$a / \$b * \$c + 2</code>	4	2	6	19	?
5	<code>\$e = \$c - \$d</code>	4	2	6	19	-13
6	<code>\$c += \$d + \$c</code>	4	2	31	19	-13
7	<code>\$e--</code>	4	2	31	19	-14
8	<code>\$d += \$e + \$c % \$b</code>	4	2	31	6	-14
9	<code>echo \$c, ", ", \$d, ", ", \$e</code>	It displays: 31, 6, -14				

3. Solution

For the input value of 5

Step	Statement	\$a	\$b	\$c
1	<code>\$b = (int)readline()</code>	?	5	?
2	<code>\$c = 5</code>	?	5	5
3	<code>\$c = \$c * \$b</code>	?	5	25
4	<code>\$a = 3 * \$c % 10</code>	5	5	25

5	echo \$a	It displays: 5
----------	----------	----------------

For the input value of 4

Step	Statement	\$a	\$b	\$c
1	\$b = (int)readline()	?	4	?
2	\$c = 5	?	4	5
3	\$c = \$c * \$b	?	4	20
4	\$a = 3 * \$c % 10	0	4	20
5	echo \$a	It displays: 0		

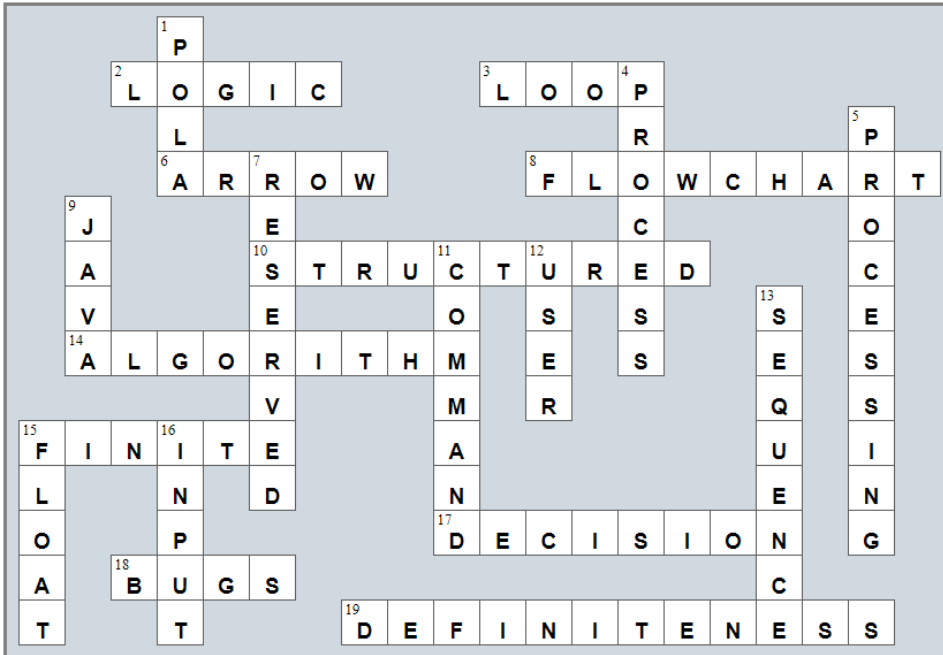
For the input value of 15

Step	Statement	\$a	\$b	\$c
1	\$b = (int)readline()	?	15	?
2	\$c = 5	?	15	5
3	\$c = \$c * \$b	?	15	75
4	\$a = 3 * \$c % 10	5	15	75
5	echo \$a	It displays: 5		

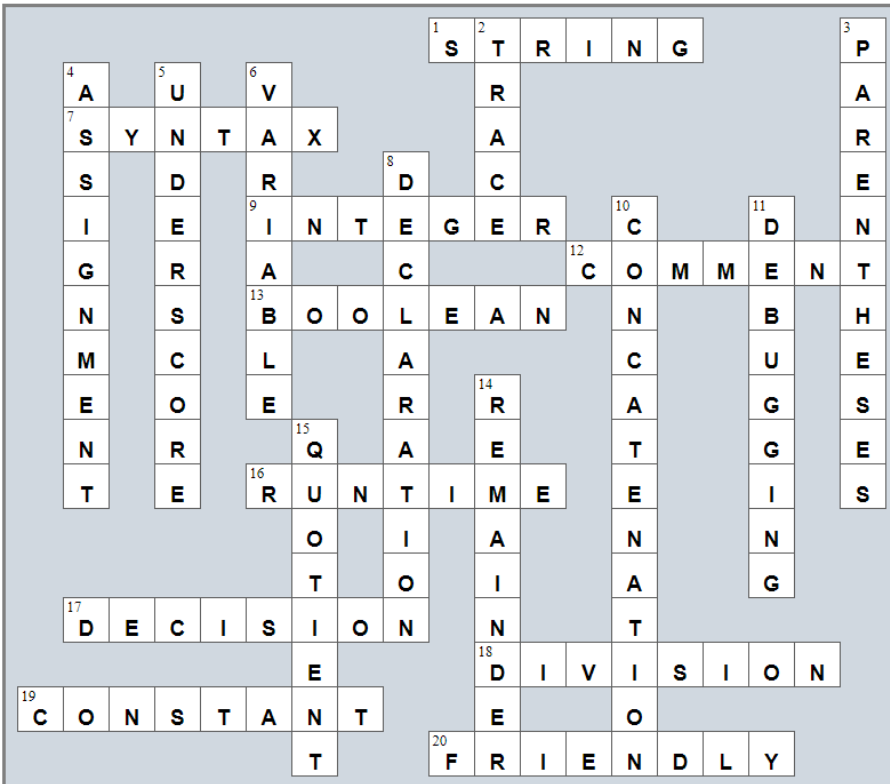
Review in "Getting Started with PHP"

Review Crossword Puzzles

1.



2.



Chapter 10

10.2 Review Exercises

1. Solution

```
<?php
$milesDriven = (float)readline("Enter miles driven: ");
$gallons = (float)readline("Enter gallons of gas used: ");

$mpg = $milesDriven / $gallons;

echo "Your car's MPG is: ", $mpg, "\n";
?>
```

2. Solution

```
<?php
$b = (float)readline("Enter base: ");
$h = (float)readline("Enter height: ");

$area = 0.5 * $b * $h;

echo $area, "\n";
?>
```

3. Solution

```
<?php
$angle1 = (float)readline("Enter 1st angle: ");
$angle2 = (float)readline("Enter 2nd angle: ");

$angle3 = 180 - $angle1 - $angle2;

echo $angle3, "\n";
?>
```

4. Solution

```
<?php
$g1 = (int)readline("Enter 1st grade: ");
$g2 = (int)readline("Enter 2nd grade: ");
$g3 = (int)readline("Enter 3rd grade: ");
$g4 = (int)readline("Enter 4th grade: ");

$average = ($g1 + $g2 + $g3 + $g4) / 4.0;

echo $average, "\n";
?>
```

5. Solution

```
<?php
```

```

    $r = (float)readline("Enter radius: ");

    $perimeter = 2 * pi() * $r;

    echo $perimeter, "\n";
?>

```

6. Solution

```

<?php
    $d = (float)readline("Enter diameter (in meters): ");

    $radius = $d / 2;
    $volume = 4 / 3 * pi() * $radius ** 3;

    echo $volume, "\n";
?>

```

7. Solution

Only a), e) and g) are syntactically correct. The latter is more user friendly.

8. Solution

```

<?php
    $firstName = readline("First name: ");
    $middleName = readline("Middle name: ");
    $lastName = readline("Last name: ");
    $title = readline("Title: ");

    echo $title, " ", $firstName, " ", $middleName, " ", $lastName, "\n";
    echo $firstName, " ", $middleName, " ", $lastName, "\n";
    echo $lastName, " ", $firstName, "\n";
    echo $lastName, " ", $firstName, " ", $middleName, "\n";
    echo $lastName, " ", $firstName, " ", $middleName, " ", $title, "\n";
    echo $firstName, " ", $lastName, "\n";
?>

```

9. Solution

```

<?php
    $d = (float)readline("Enter diameter: ");

    $radius = $d / 2;
    $perimeter = 2 * pi() * $radius;
    $area = PI * $radius ** 2;
    $volume = 4 / 3 * pi() * $radius ** 3;

    echo $radius, " ", $perimeter, " ", $area, " ", $volume, "\n";
?>

```

10. Solution

```

<?php

```

```
$charge = (float)readline("Enter charge for a meal: ");

$tip = $charge * 10 / 100;
$tax = $charge * 7 / 100;

$total = $charge + $tip + $tax;

echo $total, "\n";
?>
```

11. Solution

```
<?php
echo "Enter the distance traveled (in meters): ";
$s = (float)readline();
echo "Enter the minutes traveled: ";
$minutes = (int)readline();
echo "Enter the seconds traveled: ";
$seconds = (int)readline();

$totalSeconds = $minutes * 60 + $seconds;

$a = 2 * $s / $totalSeconds ** 2;

echo $a, "\n";
?>
```

12. Solution

```
<?php
$f = (float)readline("Enter temperature in Fahrenheit: ");

$c = 5 / 9 * ($f - 32);

echo $c, "\n";
?>
```

13. Solution

```
<?php
$w = (int)readline("Enter weight in pounds: ");
$h = (int)readline("Enter height in inches: ");

$bmi = $w * 703.0 / $h ** 2;

echo $bmi, "\n";
?>
```

14. Solution

```
<?php
$sTotal = (float)readline("Enter subtotal: ");
$gRate = (int)readline("Enter gratuity rate (0 - 100): ");

$tip = $sTotal * $gRate / 100;
```

```

$total = $sTotal + $tip;

echo "Tip is $", $tip, " and total is $", $total, "\n";
?>

```

15. Solution

```

<?php
define("VAT", 0.20);

$btaxPrice1 = (float)readline("Enter before-tax price 1: ");
$btaxPrice2 = (float)readline("Enter before-tax price 2: ");
$btaxPrice3 = (float)readline("Enter before-tax price 3: ");

$ataxPrice1 = $btaxPrice1 + $btaxPrice1 * VAT;
$ataxPrice2 = $btaxPrice2 + $btaxPrice2 * VAT;
$ataxPrice3 = $btaxPrice3 + $btaxPrice3 * VAT;

$avg = ($ataxPrice1 + $ataxPrice2 + $ataxPrice3) / 3;

echo $avg, "\n";
?>

```

16. Solution

```

<?php
define("VAT", 0.20);

$ataxPrice = (float)readline("Enter after-tax price: ");

$btaxPrice = $ataxPrice / (1 + VAT);

echo $btaxPrice, "\n";
?>

```

17. Solution

```

<?php
$iPrice = (float)readline("Enter price: ");
$dDiscount = (int)readline("Enter discount (0 - 100): ");

$fPrice = $iPrice - $iPrice * $dDiscount / 100;
$sSaved = $iPrice - $fPrice;

echo $fPrice, " ", $sSaved, "\n";
?>

```

18. Solution

```

<?php
define("VAT", 0.20);

$iKWh = (int)readline("Enter kWh at the beginning of the month: ");
$fKWh = (int)readline("Enter kWh at the end of the month: ");

```



```
$kWhConsumed = $fKWh - $iKWh;

$cost = $kWhConsumed * 0.06;
$cost += $cost * VAT;

echo $kWhConsumed, " ", $cost, "\n";
?>
```

19. Solution

```
<?php
echo "Enter number of yachts sold: ";
$soldYachts = (int)readline();

$yachtsCost = $soldYachts * 1000000;
$insuranceCost = 250000 * 12;
$totalCost = $yachtsCost + $insuranceCost;
$totalEarnings = $soldYachts * 1500000;

echo $totalEarnings - $totalCost, "\n";
?>
```

20. Solution

```
<?php
$month = (int)readline("Enter current month: ");
$day = (int)readline("Enter current day: ");

$daysPassed = ($month - 1) * 30 + $day;

echo $daysPassed, "\n";
?>
```

21. Solution

```
<?php
$month = (int)readline("Enter current month: ");
$day = (int)readline("Enter current day: ");

$daysPassed = ($month - 1) * 30 + $day;
$daysLeft = 360 - $daysPassed;

echo $daysLeft, "\n";
?>
```

Chapter 11

11.3 Review Questions: True/False

- | | | |
|----------|-----------|-----------|
| 1. true | 7. false | 13. true |
| 2. false | 8. true | 14. true |
| 3. false | 9. false | 15. false |
| 4. false | 10. false | 16. false |
| 5. false | 11. true | |
| 6. true | 12. true | |

11.4 Review Questions: Multiple Choice

1. d
2. b
3. c
4. a
5. b

11.5 Review Exercises

1. Solution

For the input value of 9

Step	Statement	\$a	\$b	\$c
1	<code>\$a = (float)readline()</code>	9	?	?
2	<code>\$a += 6 / sqrt(\$a) * 2 + 20.4</code>	33.4	?	?
3	<code>\$b = round(\$a) % 4</code>	33.4	1	?
4	<code>\$c = \$b % 3</code>	33.4	1	1
5	<code>echo \$a, ", ", \$b, ", ", \$c</code>	It displays: 33.4, 1, 1		

For the input value of 4

Step	Statement	\$a	\$b	\$c
1	<code>\$a = (float)readline()</code>	4	?	?
2	<code>\$a += 6 / sqrt(\$a) * 2 + 20.4</code>	30.4	?	?
3	<code>\$b = round(\$a) % 4</code>	30.4	2	?
4	<code>\$c = \$b % 3</code>	30.4	2	2
5	<code>echo \$a, ", ", \$b, ", ", \$c</code>	It displays: 30.4, 2, 2		

2. Solution

For the input value of -2

Step	Statement	\$a	\$b	\$c
1	<code>\$a = (int)readline()</code>	-2	?	?
2	<code>\$b = abs(\$a) % 4 + (int)(\$a ** 4)</code>	-2	18	?
3	<code>\$c = \$b % 5</code>	-2	18	3
4	<code>echo \$b, ", ", \$c</code>	It displays: 18, 3		

For the input value of -3

Step	Statement	\$a	\$b	\$c
1	<code>\$a = (int)readline()</code>	-3	?	?
2	<code>\$b = abs(\$a) % 4 + (int)(\$a ** 4)</code>	-3	84	?
3	<code>\$c = \$b % 5</code>	-3	84	4
4	<code>echo \$b, ", ", \$c</code>	It displays: 84, 4		

3. Solution

```
<?php
    $radians = (float)readline("Enter angle in radians: ");

    $degrees = $radians * 180 / pi();

    echo $degrees, "\n";
?>
```

4. Solution

```
<?php
    $a = (float)readline("Enter right angle side A of a right-angled triangle: ");
    $b = (float)readline("Enter right angle side B of a right-angled triangle: ");

    $hypotenuse = sqrt($a ** 2 + $b ** 2);

    echo $hypotenuse, "\n";
?>
```

5. Solution

```
<?php
    $th = (float)readline("Enter angle  $\theta$  (in degrees) of a right-angled triangle: ");
    $adjacent = (float)readline("Enter length of adjacent side: ");

    $opposite = tan($th * pi() / 180) * $adjacent;

    echo $opposite, "\n";
?>
```

Chapter 12

12.2 Review Exercises

1. Solution

- i. a, e, g, h
- ii. c, f

2. Solution

- i. $\$y = (\$x + 3) ** (5 * \$w) / (7 * (\$x - 4))$
- ii. $\$y = (3 * \$x ** 2 - \$x ** 3 / 4) ** (1 / 5)$
- iii. $\$y = \text{sqrt}(\$x ** 4 - 2 * \$x ** 3 - 7 * \$x ** 2 + \$x) / (4 * (7 * \$x ** 4 - 3 / 4 * \$x ** 3) * (7 * \$x ** 2 + \$x)) ** (1 / 3)$
- iv. $\$y = \$x / (\$x - 3 * (\$x - 1)) + \$x * (\$x - 1) ** (1 / 5) / ((\$x ** 3 - 2) * (\$x - 1) ** 3)$
- v. $\$y = (\sin(\text{pi}() / 3) - \cos(\text{pi}() / 2 * \$w)) ** 2$
- vi. $\$y = (\sin(\text{pi}() / 2 * \$x) + \cos(3 * \text{pi}() / 2 * \$w)) ** 3 / (\tan(2 * \text{pi}() / 3 * \$w) - \sin(\text{pi}() / 2 * \$x)) ** 0.5 + 6$

3. Solution

```
<?php
    $x = (float)readline("Enter value for x: ");

    $y = sqrt($x ** 2 + 1) * ($x ** 3 + $x ** 2);

    echo $y, "\n";
?>
```

4. Solution

```
<?php
    $x = (float)readline("Enter value for x: ");

    $y = 7 * $x / (2 * $x + 4 * ($x * $x + 4));

    echo $y, "\n";
?>
```

5. Solution

```
<?php
    $x = (float)readline("Enter value for x: ");
    $w = (float)readline("Enter value for w: ");

    $y = $x ** ($x + 1) / (tan(2 * $w / 3 + 5) + tan($x / 2 + 1)) ** 3;

    echo $y, "\n";
?>
```

6. Solution

```
<?php
    $x = (float)readline("Enter value for x: ");
    $w = (float)readline("Enter value for w: ");

    $y = (3 + $w) / (6 * $x + 7 * ($x + 4)) + $x * (3 * $w + 1) ** (1 / 5) * (5 * $x + 4) / (($x ** 3 +
3) * ($x - 1) ** 6);

    echo $y, "\n";
?>
```

7. Solution

```
<?php
    $x = (float)readline("Enter value for x: ");
    $w = (float)readline("Enter value for w: ");

    $y = $x ** $x / (sin(2 * $w / 3 + 5) - $x) ** 2 + (sin(3 * $x) + $w) ** ($x + 1) / sqrt(7 * $w) ** (3
/ 2);

    echo $y, "\n";
?>
```

8. Solution

```
<?php
    $a = (float)readline("Enter length A: ");
    $b = (float)readline("Enter length B: ");
    $c = (float)readline("Enter length C: ");

    $semi = ($a + $b + $c) / 2;
    $area = sqrt($semi * ($semi - $a) * ($semi - $b) * ($semi - $c));

    echo $area, "\n";
?>
```

Chapter 13

13.2 Review Exercises

1. Solution

```
<?php
    $n = (int)readline("Enter an integer: ");

    $lastDigit = $n % 10;
    $result = $lastDigit * 8;

    echo $result, "\n";
?>
```

2. Solution

```
<?php
    $number = (int)readline("Enter a five-digit integer: ");

    $digit5 = $number % 10;
    $r = (int)($number / 10);

    $digit4 = $r % 10;
    $r = (int)($r / 10);

    $digit3 = $r % 10;
    $r = (int)($r / 10);

    $digit2 = $r % 10;
    $digit1 = (int)($r / 10);

    $reversedNumber = $digit5 * 10000 + $digit4 * 1000 + $digit3 * 100 + $digit2 * 10 + $digit1;
    echo $number, " + ", $reversedNumber, " = ", $number + $reversedNumber, "\n";
?>
```

3. Solution

```
<?php
    $n = (int)readline("Enter an integer: ");

    $result = $n % 2;

    echo $result, "\n";
?>
```

4. Solution

```
<?php
    $n = (int)readline("Enter an integer: ");

    $result = 1 - $n % 2;

    echo $result, "\n";
```

| ?>

5. Solution

```

<?php
    $number = (int)readline("Enter an elapsed time in seconds: ");

    $weeks = (int)($number / 604800); // 60 * 60 * 24 * 7 = 604800
    $r = $number % 604800;

    $days = (int)($r / 86400); // 60 * 60 * 24 = 86400
    $r = $r % 86400;

    $hours = (int)($r / 3600);
    $r = $r % 3600;

    $minutes = (int)($r / 60);
    $seconds = $r % 60;

    echo $weeks, " week(s) ", $days, " day(s) ", $hours, " hour(s) ";
    echo $minutes, " minute(s) and ", $seconds, " second(s)\n";
?>

```

6. Solution

```

<?php
    $amount = (int)readline("Enter amount of money to withdraw: ");

    $usd20 = (int)($amount / 20);
    $r = $amount % 20;

    $usd10 = (int)($r / 10);
    $r = $r % 10;

    $usd5 = (int)($r / 5);
    $usd1 = $r % 5;

    echo $usd20, " note(s) of $20 ", $usd10, " note(s) of $10 ";
    echo $usd5, " note(s) of $5 and ", $usd1, " note(s) of $1\n";
?>

```

7. Solution

```

<?php
    $steps = (int)readline("Enter number of steps: ");

    $distance = $steps * 25;

    $miles = (int)($distance / 63360);
    $r = $distance % 63360;

    $yards = (int)($r / 36);
    $r = $r % 36;

    $feet = (int)($r / 12);

```



```
$inches = $r % 12;  
  
echo $miles, " mile(s) ", $yards, " yard(s) ";  
echo $feet, " foot/feet and ", $inches, " inch(es)\n";  
?>
```

Chapter 14

14.4 Review Questions: True/False

- | | | |
|----------|-----------|-----------|
| 1. true | 7. true | 13. false |
| 2. false | 8. false | 14. true |
| 3. false | 9. true | 15. true |
| 4. true | 10. false | 16. true |
| 5. true | 11. false | 17. true |
| 6. false | 12. true | |

14.5 Review Questions: Multiple Choice

- | | | |
|------|------|-------|
| 1. d | 5. b | 9. c |
| 2. b | 6. b | 10. a |
| 3. b | 7. c | |
| 4. d | 8. a | |

14.6 Review Exercises

1. Solution

```
<?php
$alphabet = "abcdefghijklmnopqrstuvwxyz";

$randomWord = strtoupper($alphabet[rand(0, 25)]) .
    $alphabet[rand(0, 25)] .
    $alphabet[rand(0, 25)] .
    $alphabet[rand(0, 25)] .
    $alphabet[rand(0, 25)];

echo $randomWord, "\n";
?>
```

2. Solution

```
<?php
$name = readline("Enter name: ");

$x = str_replace(" ", "", strtolower($name));

$secretPassword = $x[rand(0, strlen($x) - 1)] .
    $x[rand(0, strlen($x) - 1)] .
    $x[rand(0, strlen($x) - 1)] .
    rand(1000, 9999);

echo $secretPassword, "\n";
?>
```

3. Solution

First approach

```
<?php
```

```

$number = (int)readline("Enter a three-digit integer: ");

$sNumber = (string)$number;

$digit1 = $sNumber[0];
$digit2 = $sNumber[1];
$digit3 = $sNumber[2];

$reversedNumber = 100 * (int)$digit3 + 10 * (int)$digit2 + (int)$digit1;

echo $reversedNumber, "\n";
?>

```

Second approach

```

<?php
$number = (int)readline("Enter a three-digit integer: ");

$sNumber = (string)$number;
$reversedNumber = (int)($sNumber[2] . $sNumber[1] . $sNumber[0]);

echo $reversedNumber, "\n";
?>

```

4. Solution

```

<?php
$firstName = readline("First name: ");
$middleName = readline("Middle name: ");
$lastName = readline("Last name: ");

$firstName = strtoupper($firstName[0]) . strtolower(substr($firstName, 1));
$middleName = strtoupper($middleName[0]) . strtolower(substr($middleName, 1));
$lastName = strtoupper($lastName[0]) . strtolower(substr($lastName, 1));

echo $firstName, " ", $middleName, " ", $lastName, "\n";
echo $firstName, " ", $middleName[0], ". ", $lastName, "\n";
echo $lastName, " ", $firstName[0], ".\n";
?>

```

5. Solution

```

<?php
echo "Enter a long word: ";
$word = readline();

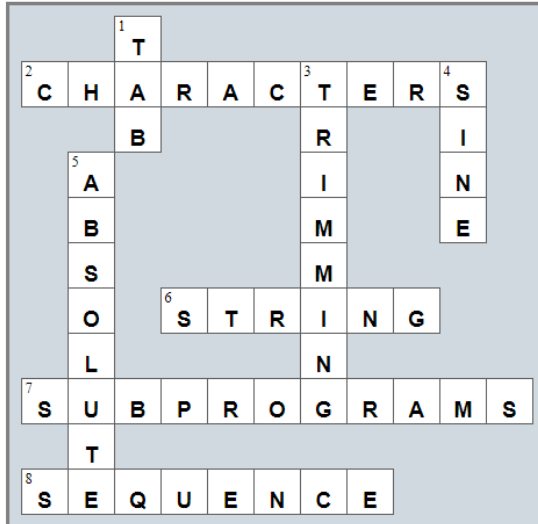
$abbreviation = $word[0] . strlen($word) . $word[-1];
echo $abbreviation, "\n";
?>

```

Review in "Sequence Control Structures"

Review Crossword Puzzle

1.



Chapter 15

15.9 Review Questions: True/False

- | | | |
|----------|-----------|-----------|
| 1. true | 9. true | 17. false |
| 2. false | 10. true | 18. true |
| 3. false | 11. true | 19. true |
| 4. false | 12. true | 20. false |
| 5. false | 13. true | 21. true |
| 6. false | 14. true | 22. true |
| 7. false | 15. false | 23. true |
| 8. true | 16. false | |

15.10 Review Questions: Multiple Choice

- | | | |
|------|------|------|
| 1. b | 3. a | 5. c |
| 2. a | 4. a | 6. d |

15.11 Review Exercises

1. Solution

- i. c, e, g
- ii. a, j
- iii. d, f
- iv. b, h, i

2. Solution

\$a	\$b	\$c	\$a != 1	\$b > \$a	\$c / 2 > 2 * \$a
3	-5	8	true	false	false
1	10	20	false	true	true
-4	-2	-9	true	true	true

3. Solution

BE1 (Boolean Expression 1)	BE2 (Boolean Expression 2)	BE1 BE2	BE1 && BE2	!(BE2)
false	false	false	false	true
false	true	true	false	false
true	false	true	false	true
true	true	true	true	false

4. Solution

\$a	\$b	\$c	\$a > 3 \$c > \$b && \$c > 1	\$a > 3 && \$c > \$b \$c > 1
4	-6	2	true	true

-3	2	-4	false	false
2	5	5	false	true

5. Solution

Expression	Value
$(\$x + \$y) ** 3$	8
$(\$x + \$y) / (\$x ** 2 - 14)$	1
$\$x - 1 == \$y + 5$	true
$\$x > 2 \ \&\& \ \$y == 1$	false
$\$x == 1 \ \ \$y == -2 \ \&\& \ !(\$flag == false)$	true
$!(\$x >= 3) \ \&\& \ (\$x \% 2 > 1)$	false

6. Solution

- i. false
- ii. true

7. Solution

- i. $\$age < 12 \ \&\& \ \$age != 8$
- ii. $\$age >= 6 \ \&\& \ \$age <= 9 \ || \ \$age == 11$
- iii. $\$age > 7 \ \&\& \ \$age != 10 \ \&\& \ \$age != 12$
- iv. $\$age == 6 \ || \ \$age == 9 \ || \ \$age == 11$
- v. $\$age >= 6 \ \&\& \ \$age <= 12 \ \&\& \ \$age != 8$
- vi. $\$age != 7 \ \&\& \ \$age != 10$

8. Solution

- i. $\$x != 4 \ || \ \$y == 3$
- ii. $\$x + 4 > 0$
- iii. $!(\$x <= 5) \ \&\& \ \$y != 4$
- iv. $\$x == false$
- v. $!(\$x < 4 \ \&\& \ \$z <= 4)$
- vi. $\$x == 2 \ || \ \$x < -5$

9. Solution

- i. $!(\$x < 4 \ || \ \$y == 10)$
- ii. $!(\$x - 2 < 9)$
- iii. $!(!(\$x < 2) \ \&\& \ \$y == 4)$
- iv. $!(\$x == false \ \&\& \ \$y != 3)$
- v. **First approach:** $!(!(\$x < 2 \ || \ \$y < 2))$
Second approach: $\$x < 2 \ || \ \$y < 2$
- vi. $!(\$x == -2 \ || \ \$x > 2)$

Chapter 16

16.2 Review Questions: True/False

- | | |
|----------|----------|
| 1. false | 5. false |
| 2. false | 6. false |
| 3. true | 7. true |
| 4. false | 8. false |

16.3 Review Questions: Multiple Choice

- | | |
|------|------|
| 1. b | 4. d |
| 2. c | 5. c |
| 3. d | |

16.4 Review Exercises

1. Solution

The corrections/additions are in red

```
<?php
$x = (float)readline();
$y = -5;
if ($x * $y / 2 > 20) {
    $y *= 2;
    $x += 4 * $x ** 2;
}

echo $x, $y;
?>
```

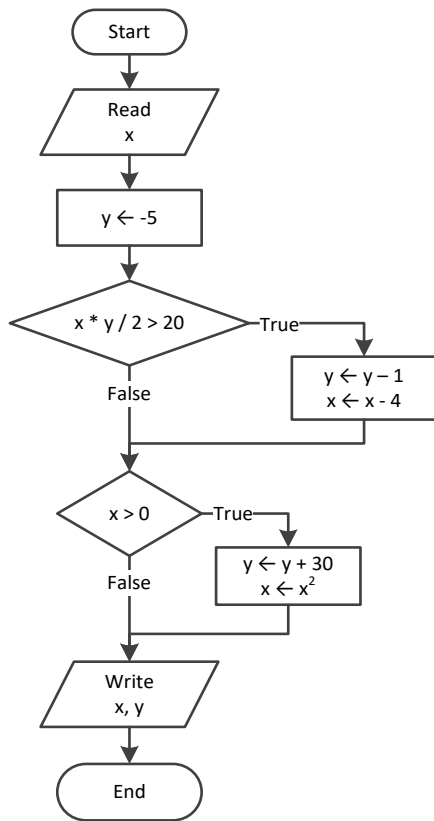
2. Solution

For the input value of 10

Step	Statement	\$x	\$y
1	<code>\$x = (float)readline();</code>	10	?
2	<code>\$y = -5;</code>	10	-5
3	<code>if (\$x * \$y / 2 > 20)</code>	false	
4	<code>if (\$x > 0)</code>	true	
5	<code>\$y += 30</code>	10	25
6	<code>\$x = \$x ** 2</code>	100	25
7	<code>echo \$x, ", ", \$y</code>	It displays: 100, 25	

For the input value of -10

Step	Statement	\$x	\$y
1	<code>\$x = (float)readline()</code>	-10	?
2	<code>\$y = -5</code>	-10	-5
3	<code>if (\$x * \$y / 2 > 20)</code>	true	
4	<code>\$y--</code>	-10	-6
5	<code>\$x -= 4</code>	-14	-6
6	<code>if (\$x > 0)</code>	false	
7	<code>echo \$x, ", ", \$y</code>	It displays: -14, -6	



3. Solution

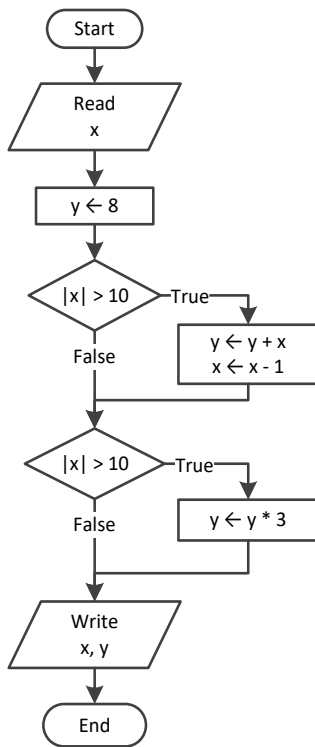
For the input value of -11

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	-11	?
2	<code>\$y = 8</code>	-11	8
3	<code>if (abs(\$x) > 10)</code>	true	
4	<code>\$y += \$x</code>	-11	-3
5	<code>\$x--</code>	-12	-3
6	<code>if (abs(\$x) > 10)</code>	true	
7	<code>\$y *= 3</code>	-12	-9

8	echo \$x, ", ", \$y	It displays: -12, -9
----------	---------------------	----------------------

For the input value of 11

Step	Statement	\$x	\$y
1	\$x = (int)readline()	11	?
2	\$y = 8	11	8
3	if (abs(\$x) > 10)	true	
4	\$y += \$x	11	19
5	\$x--	10	19
6	if (abs(\$x) > 10)	false	
7	echo \$x, ", ", \$y	It displays: 10, 19	



4. Solution

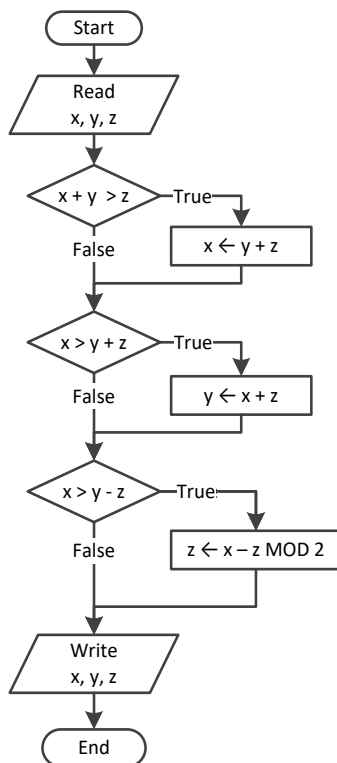
For input values of 1, 2 and 3

Step	Statement	\$x	\$y	\$z
1	\$x = (int)readline()	1	?	?
2	\$y = (int)readline()	1	2	?
3	\$z = (int)readline()	1	2	3
4	if (\$x + \$y > \$z)	false		
5	if (\$x > \$y + \$z)	false		
6	if (\$x > \$y - \$z)	true		
7	\$z = \$x - \$z % 2	1	2	0

8	echo \$x, " ", " ", \$y, " ", " ", \$z	It displays: 1, 2, 0
----------	--	----------------------

For input values of 4, 2 and 1

Step	Statement	\$x	\$y	\$z
1	<code>\$x = (int)readline()</code>	4	?	?
2	<code>\$y = (int)readline()</code>	4	2	?
3	<code>\$z = (int)readline()</code>	4	2	1
4	<code>if (\$x + \$y > \$z)</code>			true
5	<code>\$x = \$y + \$z</code>	3	2	1
6	<code>if (\$x > \$y + \$z)</code>			false
7	<code>if (\$x > \$y - \$z)</code>			true
8	<code>\$z = \$x - \$z % 2</code>	3	2	2
9	<code>echo \$x, " ", " ", \$y, " ", " ", \$z</code>			It displays: 3, 2, 2



5. Solution

```

<?php
  $x = (float)readline("Enter a number: ");

  if ($x > 0) {
    echo "Positive\n";
  }
?>

```

6. Solution

```
<?php
    $x = (float)readline("Enter a number: ");
    $y = (float)readline("Enter a second number");

    if ($x > 0 && $y > 0) {
        echo "Both Positives\n";
    }
?>
```

7. Solution

```
<?php
    $x = (int)readline("Enter your age: ");

    if ($x > 14) {
        echo "You can drive a car in Kansas (USA)\n";
    }
?>
```

8. Solution

```
<?php
    $str = readline("Enter a string: ");

    if ($str == strtoupper($str)) {
        echo "Uppercase\n";
    }
?>
```

9. Solution

```
<?php
    $str = readline("Enter a string: ");

    if (strlen($str) > 20) {
        echo "Many characters\n";
    }
?>
```

10. Solution

```
<?php
    $n1 = (float)readline("Enter 1st number: ");
    $n2 = (float)readline("Enter 2nd number: ");
    $n3 = (float)readline("Enter 3rd number: ");
    $n4 = (float)readline("Enter 4th number: ");

    if ($n1 < 0 || $n2 < 0 || $n3 < 0 || $n4 < 0) {
        echo "Among the provided numbers, there is a negative one!\n";
    }
?>
```

11. Solution

```
<?php
    $a = (float)readline("Enter 1st number: ");
    $b = (float)readline("Enter 2nd number: ");

    if ($a > $b) {
        $c = $a;
        $a = $b;
        $b = $c;
    }

    echo $a, ", ", $b, "\n";
?>
```

12. Solution

```
<?php
    $t1 = (float)readline("Enter 1st temperature: ");
    $t2 = (float)readline("Enter 2nd temperature: ");
    $t3 = (float)readline("Enter 3rd temperature: ");

    $average = ($t1 + $t2 + $t3) / 3;

    if ($average > 60) {
        echo "Heat Wave\n";
    }
?>
```

Chapter 17

17.2 Review Questions: True/False

1. false
2. true
3. true
4. false
5. false
6. false

17.3 Review Questions: Multiple Choice

1. b
2. c
3. c

17.4 Review Exercises

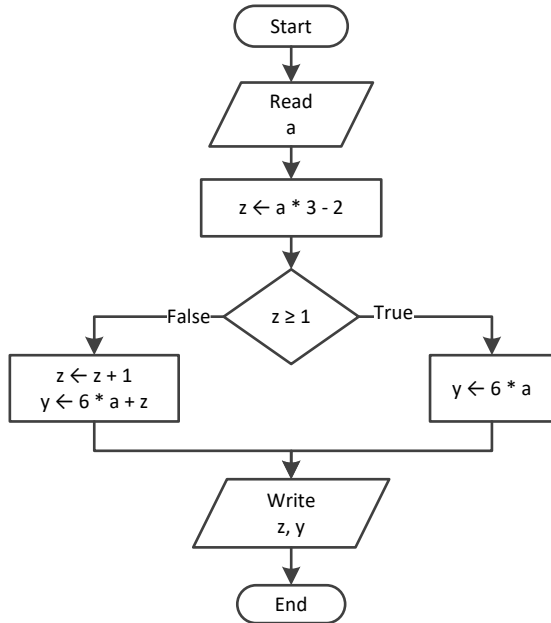
1. Solution

For input value of 3

Step	Statement	\$a	\$y	\$z
1	<code>\$a = (float)readline()</code>	3	?	?
2	<code>\$z = \$a * 3 - 2</code>	3	?	7
3	<code>if (\$z >= 1)</code>	true		
4	<code>\$y = 6 * \$a</code>	3	18	7
5	<code>echo \$z, ", ", \$y</code>	It displays: 7 18		

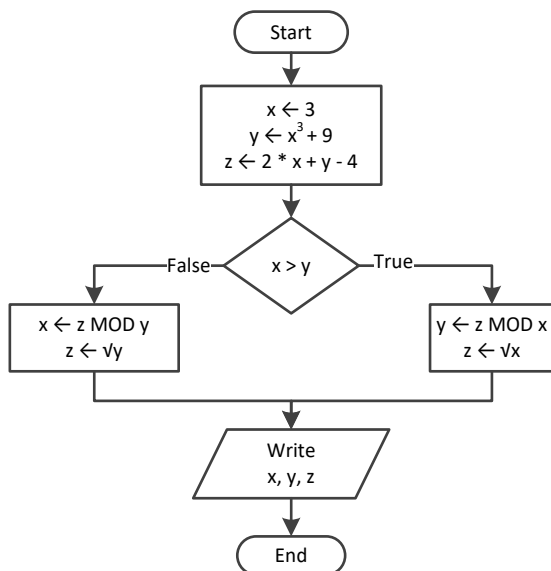
For input value of 0.5

Step	Statement	\$a	\$y	\$z
1	<code>\$a = (float)readline()</code>	0.5	?	?
2	<code>\$z = \$a * 3 - 2</code>	0.5	?	-0.5
3	<code>if (\$z >= 1)</code>	false		
4	<code>\$z++</code>	0.5	?	0.5
5	<code>\$y = 6 * \$a + \$z</code>	0.5	3.5	0.5
6	<code>echo \$z, ", ", \$y</code>	It displays: 0.5, 3.5		



2. Solution

Step	Statement	\$x	\$y	\$z
1	$\$x = 3$	3	?	?
2	$\$y = \$x ** 3 + 9$	3	36	?
3	$\$z = 2 * \$x + \$y - 4$	3	36	38
4	if ($\$x > \y)	false		
5	$\$x = \$z \% \$y$	2	36	38
6	$\$z = \text{sqrt}(\$y)$	2	36	6
7	echo \$x, ", ", \$y, ", ", \$z	It displays: 2, 36, 6		



3. Solution

```
<?php
  $x = (float)readline();
  $w = $x * 3 - 15;
  $z = ($w + 7) * ($x + 4) - 10;
  if ($w > $x && $z > $x) {
    $x++;
    $y = $x / 2 + 4;
  }
  else {
    $y = $x / 4 + 2;
  }
  echo $y;
?>
```

For input value of 10

Step	Statement	\$x	\$y	\$w	\$z
1	<code>\$x = (float)readline()</code>	10	?	?	?
2	<code>\$w = \$x * 3 - 15</code>	10	?	15	?
3	<code>\$z = (\$w + 7) * (\$x + 4) - 10</code>	10	?	15	298
4	<code>if (\$w > \$x && \$z > \$x)</code>	true			
5	<code>\$x++</code>	11	?	15	298
6	<code>\$y = \$x / 2 + 4</code>	11	9.5	15	298
7	<code>echo \$y</code>	It displays: 9.5			

For input value of 2

Step	Statement	\$x	\$y	\$w	\$z
1	<code>\$x = (float)readline()</code>	2	?	?	?
2	<code>\$w = \$x * 3 - 15</code>	2	?	-9	?
3	<code>\$z = (\$w + 7) * (\$x + 4) - 10</code>	2	?	-9	-22
4	<code>if (\$w > \$x && \$z > \$x)</code>	false			
5	<code>\$y = \$x / 4 + 2</code>	2	2.5	-9	-22
6	<code>echo \$y</code>	It displays: 2.5			

4. Solution

```
<?php
  $num = (float)readline("Enter a number: ");

  if ($num > 100) {
    echo "Provided number is greater than 100\n";
  }
  else {
    echo "Provided number is less than or equal to 100\n";
  }
?>
```

5. Solution

```
<?php
$num = (float)readline("Enter a number: ");

if ($num >= 0 && $num <= 100) {
    echo "Provided number is between 0 and 100\n";
}
else {
    echo "Provided number is not between 0 and 100\n";
}
?>
```

6. Solution

```
<?php
$name1 = readline("Enter team name 1: ");
$name2 = readline("Enter team name 2: ");

$goals1 = (int)readline("Enter goals " . $name1 . " scored: ");
$goals2 = (int)readline("Enter goals " . $name2 . " scored: ");

if ($goals1 > $goals2) {
    echo "Winner: ", $name1, "\n";
}
else {
    echo "Winner: ", $name2, "\n";
}
?>
```

7. Solution

```
<?php
$x = (int)readline();
if ($x % 6 == 0) {
    echo $x, " is a multiple of 6\n";
}
else {
    echo $x, " is not a multiple of 6\n";
}
?>
```

8. Solution

```
<?php
$x = (int)readline();
if ($x % 6 == 0 || $x % 7 == 0) {
    echo $x, " is a multiple of 6 or a multiple of 7\n";
}
else {
    echo $x, " is neither a multiple of 6 nor a multiple of 7\n";
}
?>
```


| ?>

9. Solution

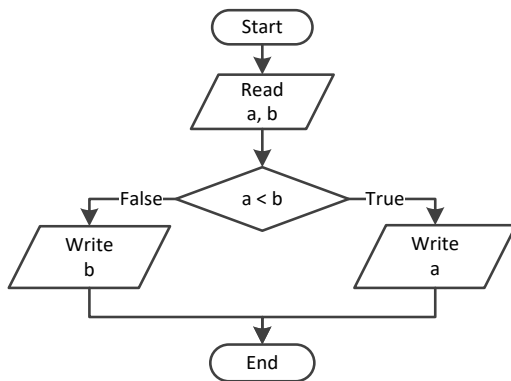
```

<?php
    $x = (int)readline();

    $y = $x % 4;
    if ($y == 0) {
        echo $x, " is a multiple of 4\n";
    }
    else {
        echo $x, " is not a multiple of 4\n";
    }

    echo "The structure is: ", $x, " = ", (int)($x / 4), " x 4 + ", $y, "\n";
?>

```

10. Solution

```

<?php
    $a = (float)readline();
    $b = (float)readline();

    if ($a < $b) {
        echo $a, "\n";
    }
    else {
        echo $b, "\n";
    }
?>

```

11. Solution

```

<?php
    $a = (float)readline();
    $b = (float)readline();
    $c = (float)readline();

    if ($a < $b + $c && $b < $a + $c && $c < $a + $b) {
        echo "Provided numbers can be lengths of the three sides of a triangle\n";
    }

```

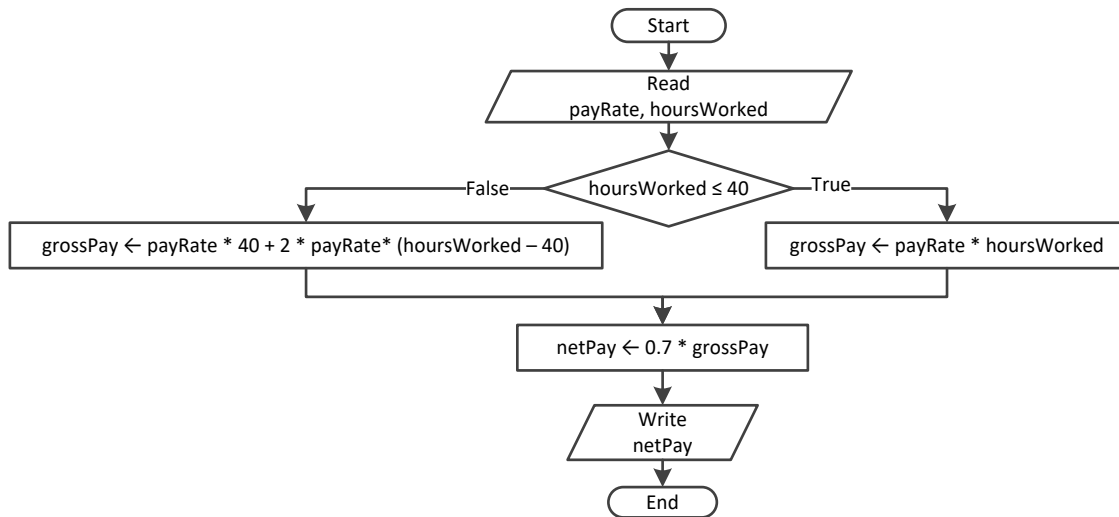
```
    else {  
        echo "Provided numbers cannot be lengths of the three sides of a triangle\n";  
    }  
?>
```

12. Solution

```
<?php  
$a = (float)readline();  
$b = (float)readline();  
$c = (float)readline();  
  
if ($a ** 2 == $b ** 2 + $c ** 2 || $b ** 2 == $a ** 2 + $c ** 2 || $c ** 2 == $a ** 2 + $b ** 2) {  
    echo "Provided numbers can be lengths of the three sides of a right triangle\n";  
}  
else {  
    echo "Provided numbers cannot be lengths of the three sides of a right triangle\n";  
}  
?>
```

13. Solution

```
<?php  
$a = (float)readline("Enter 1st jump in meters: ");  
$b = (float)readline("Enter 2nd jump in meters: ");  
$c = (float)readline("Enter 3rd jump in meters: ");  
  
$average = ($a + $b + $c) / 3;  
  
if ($average >= 8) {  
    echo "Qualified\n";  
}  
else {  
    echo "Disqualified\n";  
}  
?>
```

14. Solution

```

<?php
    $payRate = (float)readline();
    $hoursWorked = (int)readline();

    if ($hoursWorked <= 40) {
        $grossPay = $payRate * $hoursWorked;
    }
    else {
        $grossPay = $payRate * 40 + 2 * $payRate * ($hoursWorked - 40);
    }

    $netPay = 0.7 * $grossPay;
    echo $netPay, "\n";
?>
  
```

15. Solution

```

<?php
    $miles = (int)readline("Enter miles traveled: ");

    $r = $miles % 12000;

    if ($r > 6000) {
        $milesLeft = 12000 - $r;
        echo "Your car needs a major service in ", $milesLeft, " miles\n";
    }
    else {
        $milesLeft = 6000 - $r;
        echo "Your car needs a minor service in ", $milesLeft, " miles\n";
    }
?>
  
```

16. Solution

```

<?php
  
```

```
$t = (float)readline("Enter the time the two cars traveled: ");
$a1 = (float)readline("Enter the acceleration for car A: ");
$a2 = (float)readline("Enter the acceleration for car B: ");

$s1 = 0.5 * $a1 * $t ** 2;
$s2 = 0.5 * $a2 * $t ** 2;

echo "Distance between them: ", abs($s1 - $s2), " meters";

if ($s1 > $s2) {
    echo "Car A is first\n";
}
else {
    echo "Car B is first\n";
}
?>
```

Chapter 18

18.2 Review Questions: True/False

- | | |
|----------|----------|
| 1. true | 5. false |
| 2. false | 6. true |
| 3. false | 7. false |
| 4. false | 8. true |

18.3 Review Exercises

1. Solution

For input value of 5

Step	Statement	\$q	\$b
1	<code>\$q = (int)readline()</code>	5	?
2	<code>if (\$q > 0 && \$q <= 50)</code>	true	
3	<code>\$b = 1</code>	5	1
4	<code>echo \$b</code>	It displays: 1	

For input value of 150

Step	Statement	\$q	\$b
1	<code>\$q = (int)readline()</code>	150	?
2	<code>if (\$q > 0 && \$q <= 50)</code>	false	
3	<code>elseif (\$q > 50 && \$q <= 100)</code>	false	
4	<code>elseif (\$q > 100 && \$q <= 200)</code>	true	
5	<code>\$b = 3</code>	150	3
6	<code>echo \$b</code>	It displays: 3	

For input value of 250

Step	Statement	\$q	\$b
1	<code>\$q = (int)readline()</code>	250	?
2	<code>if (\$q > 0 && \$q <= 50)</code>	false	
3	<code>elseif (\$q > 50 && \$q <= 100)</code>	false	
4	<code>elseif (\$q > 100 && \$q <= 200)</code>	false	
5	<code>\$b = 4</code>	250	4
6	<code>echo \$b</code>	It displays: 4	

For input value of -1

Step	Statement	\$q	\$b
1	<code>\$q = (int)readline()</code>	-1	?
2	<code>if (\$q > 0 && \$q <= 50)</code>	false	
3	<code>elseif (\$q > 50 && \$q <= 100)</code>	false	
4	<code>elseif (\$q > 100 && \$q <= 200)</code>	false	

5	<code>\$b = 4</code>	-1	4
6	<code>echo \$b</code>	It displays: 4	

2. Solution

For input value of 5

Step	Statement	\$amount	\$discount	\$payment
1	<code>\$amount = (float)readline()</code>	5	?	?
2	<code>if (\$amount < 20)</code>	true		
3	<code>\$discount = 0</code>	5	0	?
4	<code>\$payment = \$amount - \$amount * \$discount / 100</code>	5	0	5
5	<code>echo \$discount, ", ", \$payment</code>	It displays: 0, 5		

For input value of 150

Step	Statement	\$amount	\$discount	\$payment
1	<code>\$amount = (float)readline()</code>	150	?	?
2	<code>if (\$amount < 20)</code>	false		
3	<code>elseif (\$amount >=20 && \$amount < 60)</code>	false		
4	<code>elseif (\$amount >= 60 && \$amount < 100)</code>	false		
5	<code>elseif (\$amount >= 100)</code>	true		
6	<code>\$discount = 15</code>	150	15	?
7	<code>\$payment = \$amount - \$amount * \$discount / 100</code>	150	15	127.5
8	<code>echo \$discount, ", ", \$payment</code>	It displays: 15, 127.5		

For input value of -1

Step	Statement	\$amount	\$discount	\$payment
1	<code>\$amount = (float)readline()</code>	-1	?	?
2	<code>if (\$amount < 20)</code>	true		
3	<code>\$discount = 0</code>	-1	0	?
4	<code>\$payment = \$amount - \$amount * \$discount / 100</code>	-1	0	-1
5	<code>echo \$discount, ", ", \$payment</code>	It displays: 0, -1		

3. Solution

```
<?php
$a = (float)readline();

if ($a < 1) {
    $y = 5 + $a;
    echo $y;
}
elseif ($a < 5) {
    $y = 23 / $a;
    echo $y;
```

```
}
elseif ($a < 10) {
    $y = 5 * $a;
    echo $y;
}
else {
    echo "Error! ";
}
?>
```

4. Solution

```
<?php
    $n1 = (int)readline("Enter an integer: ");
    $n2 = (int)readline("Enter a second integer: ");

    if ($n1 % 2 == 0 && $n2 % 2 == 0) {
        echo "Both numbers are evens\n";
    }
    elseif ($n1 % 2 != 0 && $n2 % 2 != 0) {
        echo "Both numbers are odds\n";
    }
    else {
        echo "Nothing special!\n";
    }
?>
```

5. Solution

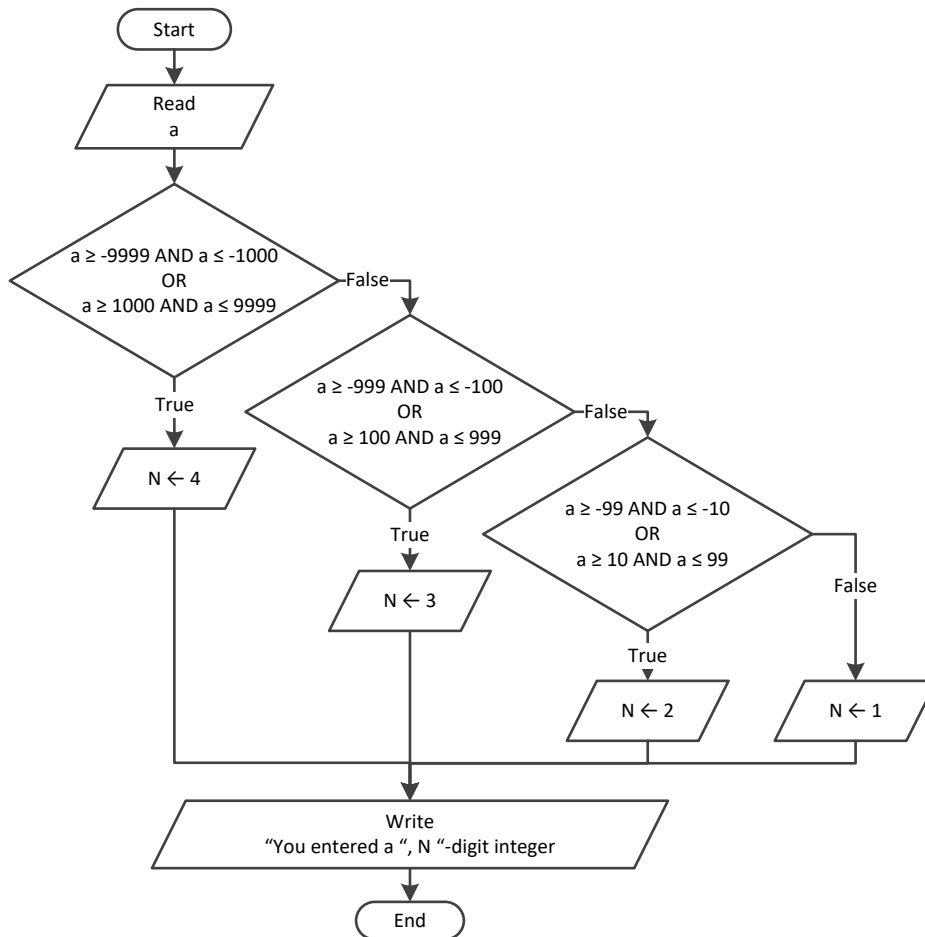
```
<?php
    $name1 = readline("Enter team name 1: ");
    $name2 = readline("Enter team name 2: ");

    $goals1 = (int)readline("Enter goals " . $name1 . " scored: ");
    $goals2 = (float)readline("Enter goals " . $name2 . " scored: ");

    if ($goals1 > $goals2) {
        echo "Winner: ", $name1, "\n";
    }
    elseif ($goals2 > $goals1) {
        echo "Winner: ", $name2, "\n";
    }
    else {
        echo "It's a tie!\n";
    }
?>
```

6. Solution

First approach



```

<?php
$a = (int)readline();

if ($a >= -9999 && $a <= -1000 || $a >= 1000 && $a <= 9999) {
    $n = 4;
}
elseif ($a >= -999 && $a <= -100 || $a >= 100 && $a <= 999) {
    $n = 3;
}
elseif ($a >= -99 && $a <= -10 || $a >= 10 && $a <= 99) {
    $n = 2;
}
else {
    $n = 1;
}

echo "You entered a ", $n, "-digit integer\n";
?>
  
```

Second approach

```

<?php
  
```



```

$a = abs((int)readline());

if ($a >= 1000 && $a <= 9999) {
    $n = 4;
}
elseif ($a >= 100 && $a <= 999) {
    $n = 3;
}
elseif ($a >= 10 && $a <= 99) {
    $n = 2;
}
else {
    $n = 1;
}

echo "You entered a ", $n, "-digit integer\n";
?>

```

Third approach

```

<?php
$a = (int)readline();

$aString = (string)abs($a);
echo "You entered a ", strlen($aString), "-digit integer\n";
?>

```

7. Solution

First approach

```

<?php
$a = (int)readline();

if ($a >= -9999 && $a <= -1000 || $a >= 1000 && $a <= 9999) {
    echo "You entered a 4-digit integer\n";
}
elseif ($a >= -999 && $a <= -100 || $a >= 100 && $a <= 999) {
    echo "You entered a 3-digit integer\n";
}
elseif ($a >= -99 && $a <= -10 || $a >= 10 && $a <= 99) {
    echo "You entered a 2-digit integer\n";
}
elseif ($a >= -9 && $a <= 9) { //Include the value of zero
    echo "You entered a 1-digit integer\n";
}
else {
    echo "Error: Invalid value!\n";
}
?>

```

Second approach

```

<?php
$a = abs((int)readline());

if ($a >= 1000 && $a <= 9999) {

```

```

    echo "You entered a 4-digit integer\n";
}
elseif ($a >= 100 && $a <= 999) {
    echo "You entered a 3-digit integer\n";
}
elseif ($a >= 10 && $a <= 99) {
    echo "You entered a 2-digit integer\n";
}
elseif ($a >= 0 && $a <= 9) {
    echo "You entered a 1-digit integer\n";
}
else {
    echo "Error: Invalid value!\n";
}
?>

```

Third approach

```

<?php
$a = (int)readline();

if ($a >= -9999 && $a <= 9999) {
    $aString = (string)abs($a);
    echo "You entered a ", strlen($aString), "-digit integer\n";
}
else {
    echo "Error: Invalid value!\n";
}
?>

```

8. Solution

```

<?php
echo "1. Convert USD to Euro (EUR)\n";
echo "2. Convert USD to British Pound Sterling (GBP)\n";
echo "3. Convert USD to Japanese Yen (JPY)\n";
echo "4. Convert USD to Canadian Dollar (CAD)\n";
$ch = (int)readline("Enter a choice: ");

$usd = (float)readline("Enter an amount in US dollars: ");

if ($ch == 1) {
    $eur = $usd * 0.94;
    echo "$", $usd, " = ", $eur, " EUR\n";
}
elseif ($ch == 2) {
    $gbp = $usd * 0.81;
    echo "$", $usd, " = ", $gbp, " GBP\n";
}
elseif ($ch == 3) {
    $jpy = $usd * 149.11;
    echo "$", $usd, " = ", $jpy, " JPY\n";
}
else {

```

```
    $cad = $usd * 1.36;
    echo "$", $usd, " = ", $cad, " CAD\n";
}
?>
```

9. Solution

```
<?php
    $m = (int)readline("Enter the number of a month between 1 and 12: ");

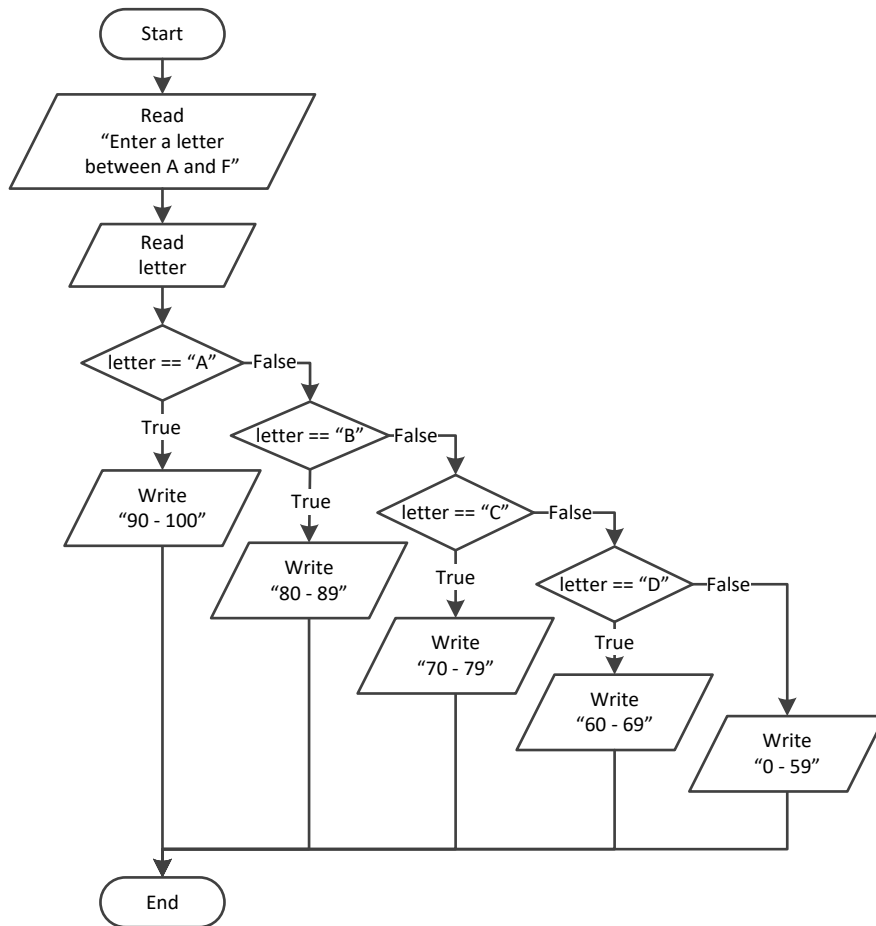
    if ($m <= 2 || $m == 12) {
        echo "Winter\n";
    }
    elseif ($m <= 5) {
        echo "Spring\n";
    }
    elseif ($m <= 8) {
        echo "Summer\n";
    }
    else {
        echo "Fall (Autumn)\n";
    }
?>
```

10. Solution

```
<?php
    $m = (int)readline("Enter the number of a month between 1 and 12: ");

    if ($m < 1 || $m > 12) {
        echo "Error: Invalid value!\n";
    }
    elseif ($m <= 2 || $m == 12) {
        echo "Winter\n";
    }
    elseif ($m <= 5) {
        echo "Spring\n";
    }
    elseif ($m <= 8) {
        echo "Summer\n";
    }
    else {
        echo "Fall (Autumn)\n";
    }
?>
```

11. Solution



```

<?php
    $letter = readline("Enter a letter between A and F: ");

    if ($letter == "A") {
        echo "90 - 100\n";
    }
    elseif ($letter == "B") {
        echo "80 - 89\n";
    }
    elseif ($letter == "C") {
        echo "70 - 79\n";
    }
    elseif ($letter == "D") {
        echo "60 - 69\n";
    }
    else {
        echo "0 - 59\n";
    }
?>

```

12. Solution

```
<?php
    $n = (float)readline("Enter a number between 0.0 and 9.9: ");

    $x = (int)($n);
    $y = (int)($n * 10) % 10;

    $number = "";

    if ($x == 1) {
        $number .= "One";
    }
    elseif ($x == 2) {
        $number .= "Two";
    }
    elseif ($x == 3) {
        $number .= "Three";
    }
    elseif ($x == 4) {
        $number .= "Four";
    }
    elseif ($x == 5) {
        $number .= "five";
    }
    elseif ($x == 6) {
        $number .= "six";
    }
    elseif ($x == 7) {
        $number .= "seven";
    }
    elseif ($x == 8) {
        $number .= "eight";
    }
    elseif ($x == 9) {
        $number .= "nine";
    }
    elseif ($x == 0) {
        $number .= "zero";
    }

    $number .= " point ";

    if ($y == 1) {
        $number .= "one";
    }
    elseif ($y == 2) {
        $number .= "two";
    }
    elseif ($y == 3) {
        $number .= "three";
    }
}
```

```
elseif ($y == 4) {
    $number .= "four";
}
elseif ($y == 5) {
    $number .= "five";
}
elseif ($y == 6) {
    $number .= "six";
}
elseif ($y == 7) {
    $number .= "seven";
}
elseif ($y == 8) {
    $number .= "eight";
}
elseif ($y == 9) {
    $number .= "nine";
}
elseif ($y == 0) {
    $number .= "zero";
}

echo $number, "\n";
?>
```

Chapter 19

19.2 Review Questions: True/False

1. true
2. false
3. true
4. false
5. true
6. false
7. true

19.3 Review Exercises

1. Solution

For input value of 1

Step	Statement	\$a	\$x	\$y
1	<code>\$a = (int)readline()</code>	1	?	?
2	<code>\$x = 0</code>	1	0	?
3	<code>\$y = 0</code>	1	0	0
4	<code>case \$a == 1</code>	true		
5	<code>\$x = \$x + 5</code>	1	5	0
6	<code>\$y = \$y + 5</code>	1	5	5
7	<code>echo \$x, ", ", \$y</code>	It displays: 5, 5		

For input value of 3

Step	Statement	\$a	\$x	\$y
1	<code>\$a = (int)readline()</code>	3	?	?
2	<code>\$x = 0</code>	3	0	?
3	<code>\$y = 0</code>	3	0	0
4	<code>case \$a == 1</code>	false		
5	<code>case \$a == 2</code>	false		
6	<code>case \$a == 3</code>	true		
7	<code>\$x = \$x - 9</code>	3	-9	0
8	<code>\$y = \$y + 3</code>	3	-9	3
9	<code>echo \$x, ", ", \$y</code>	It displays: -9, 3		

For input value of 250

Step	Statement	\$a	\$x	\$y
1	<code>\$a = (int)readline()</code>	250	?	?
2	<code>\$x = 0</code>	250	0	?
3	<code>\$y = 0</code>	250	0	0
4	<code>case \$a == 1</code>	false		
5	<code>case \$a == 2</code>	false		
6	<code>case \$a == 3</code>	false		

7	<code>\$x = \$x + 3</code>	250	3	0
8	<code>\$y++</code>	250	3	1
9	<code>echo \$x, ", ", \$y</code>	It displays: 3, 1		

2. Solution

For input values of 10, 2, 5

Step	Statement	\$a	\$x	\$y
1	<code>\$a = (int)readline()</code>	10	?	?
2	<code>\$x = (int)readline()</code>	10	2	?
3	<code>\$y = (int)readline()</code>	10	2	5
4	<code>case \$a == 10</code>	true		
5	<code>\$x = \$x % 2</code>	10	0	5
6	<code>\$y = \$y ** 2</code>	10	0	25
7	<code>echo \$x, ", ", \$y</code>	It displays: 0, 25		

For input values of 5, 2, 3

Step	Statement	\$a	\$x	\$y
1	<code>\$a = (int)readline()</code>	5	?	?
2	<code>\$x = (int)readline()</code>	5	2	?
3	<code>\$y = (int)readline()</code>	5	2	3
4	<code>case \$a == 10</code>	false		
5	<code>case \$a == 3</code>	false		
6	<code>case \$a == 5</code>	true		
7	<code>\$x = \$x + 4</code>	5	6	3
8	<code>\$y += 7</code>	5	6	10
9	<code>echo \$x, ", ", \$y</code>	It displays: 6, 10		

For input values of 4, 6, 2

Step	Statement	\$a	\$x	\$y
1	<code>\$a = (int)readline()</code>	4	?	?
2	<code>\$x = (int)readline()</code>	4	6	?
3	<code>\$y = (int)readline()</code>	4	6	2
4	<code>case \$a == 10</code>	false		
5	<code>case \$a == 3</code>	false		
6	<code>case \$a == 5</code>	false		
7	<code>\$x -= 3</code>	4	3	2.0
8	<code>\$y++</code>	4	3	3.0
9	<code>echo \$x, ", ", \$y</code>	It displays: 3, 3		

3. Solution

```
<?php
$name = readline("Enter the name of a month: ");

switch ($name) {
    case "January":
        echo "1\n";
        break;
    case "February":
        echo "2\n";
        break;
    case "March":
        echo "3\n";
        break;
    case "April":
        echo "4\n";
        break;
    case "May":
        echo "5\n";
        break;
    case "June":
        echo "6\n";
        break;
    case "July":
        echo "7\n";
        break;
    case "August":
        echo "8\n";
        break;
    case "September":
        echo "9\n";
        break;
    case "October":
        echo "10\n";
        break;
    case "November":
        echo "11\n";
        break;
    case "December":
        echo "12\n";
        break;
    default:
        echo "Error\n";
}
?>
```

4. Solution

```
<?php
echo "1. Convert Miles to Yards\n";
```

```
echo "2. Convert Miles to Feet\n";
echo "3. Convert Miles to Inches\n";
$choice = (int)readline("Enter a choice: ");

switch ($choice) {
    case 1:
        $miles = (float)readline("Enter miles: ");
        $yards = $miles * 1760;
        echo $miles, " miles = ", $yards, " yards\n";
        break;
    case 2:
        $miles = (float)readline("Enter miles: ");
        $feet = $miles * 5280;
        echo $miles, " miles = ", $feet, " feet\n";
        break;
    case 3:
        $miles = (float)readline("Enter miles: ");
        $inches = $miles * 63360;
        echo $miles, " miles = ", $inches, " inches\n";
        break;
    default:
        echo "Invalid choice!\n";
}
?>
```

5. Solution

```
<?php
$roman = readline("Enter a Roman numeral between I and X: ");

switch ($roman) {
    case "I":
        echo "1\n";
        break;
    case "II":
        echo "2\n";
        break;
    case "III":
        echo "3\n";
        break;
    case "IV":
        echo "4\n";
        break;
    case "V":
        echo "5\n";
        break;
    case "VI":
        echo "6\n";
        break;
    case "VII":
        echo "7\n";
        break;
}
```

```
    case "VIII":
        echo "8\n";
        break;
    case "IX":
        echo "9\n";
        break;
    case "X":
        echo "10\n";
        break;
    default:
        echo "Error\n";
}
?>
```

6. Solution

```
<?php
$bottles = (int)readline("Enter the total number of wine bottles purchased in a month: ");

switch ($bottles) {
    case 1:
        echo "You are awarded 3 points\n";
        break;
    case 2:
        echo "You are awarded 10 points\n";
        break;
    case 3:
        echo "You are awarded 20 points\n";
        break;
    default:
        echo "You are awarded 45 points\n";
}
?>
```

7. Solution

```
<?php
$name = readline("Enter your name: ");

$i = rand(0, 2);

switch ($i) {
    case 0:
        echo "Hello ", $name, "!\n";
        break;
    case 1:
        echo "Hi ", $name, "!\n";
        break;
    case 2:
        echo "What's up ", $name, "!\n";
        break;
}
```

```
?>
```

8. Solution

```
<?php
$num = readline();

switch ($num) {
    case "zero":
        echo 0, "\n";
        break;
    case "one":
        echo 1, "\n";
        break;
    case "two":
        echo 2, "\n";
        break;
    case "three":
        echo 3, "\n";
        break;
    case "four":
        echo 4, "\n";
        break;
    case "five":
        echo 5, "\n";
        break;
    case "six":
        echo 6, "\n";
        break;
    case "seven":
        echo 7, "\n";
        break;
    case "eight":
        echo 8, "\n";
        break;
    case "nine":
        echo 9, "\n";
        break;
    default:
        echo "I don't know this number!\n";
}
?>
```

9. Solution

```
<?php
$b = (int)readline("Enter Beaufort number: ");

switch ($b) {
    case 0:
        echo "Calm\n";
        break;
```

```
case 1:
    echo "Light Air\n";
    break;
case 2:
    echo "Light breeze\n";
    break;
case 3:
    echo "Gentle breeze\n";
    break;
case 4:
    echo "Moderate breeze\n";
    break;
case 5:
    echo "Fresh breeze\n";
    break;
case 6:
    echo "Strong breeze\n";
    break;
case 7:
    echo "Moderate gale\n";
    break;
case 8:
    echo "Gale\n";
    break;
case 9:
    echo "Strong gale\n";
    break;
case 10:
    echo "Storm\n";
    break;
case 11:
    echo "Violent storm\n";
    break;
case 12:
    echo "Hurricane force\n";
    break;
default:
    echo "Invalid Beaufort number!\n";
}
?>
```

Chapter 20

20.2 Review Questions: True/False

1. true
2. true
3. false
4. false

20.3 Review Exercises

1. Solution

For input values of 20, 1

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	20	?
2	<code>\$y = (int)readline()</code>	20	1
3	<code>if (\$x < 30)</code>	true	
4	<code>case \$y == 1</code>	true	
5	<code>\$x = \$x % 3</code>	2	1
6	<code>\$y = 5</code>	2	5
7	<code>echo \$x, ", ", \$y</code>	It displays: 2, 5	

For input values of 20, 3

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	20	?
2	<code>\$y = (int)readline()</code>	20	3
3	<code>if (\$x < 30)</code>	true	
4	<code>case \$y == 1</code>	false	
5	<code>case \$y == 2</code>	false	
6	<code>case \$y == 3</code>	true	
7	<code>\$x = \$x + 5</code>	25	3
8	<code>\$y += 3</code>	25	6
9	<code>echo \$x, ", ", \$y</code>	It displays: 25, 6	

For input values of 12, 8

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	12	?
2	<code>\$y = (int)readline()</code>	12	8
3	<code>if (\$x < 30)</code>	true	
4	<code>case \$y == 1</code>	false	
5	<code>case \$y == 2</code>	false	
6	<code>case \$y == 3</code>	false	
7	<code>\$x -= 2</code>	10	8
8	<code>\$y++</code>	10	9
9	<code>echo \$x, ", ", \$y</code>	It displays: 10, 9	

For input values of 50, 0

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	50	?

2	<code>\$y = (int)readline()</code>	50	0
3	<code>if (\$x < 30)</code>	false	
4	<code>\$y++</code>	50	1
5	<code>echo \$x, ", ", \$y</code>	It displays: 50, 1	

2. Solution

For input values of 60, 25

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	60	?
2	<code>\$y = (int)readline()</code>	60	25
3	<code>if ((\$x + \$y) / 2 <= 20)</code>	false	
4	<code>if (\$y < 15)</code>	false	
5	<code>elseif (\$y < 23)</code>	false	
6	<code>\$x = 2 * \$x + 5</code>	125	25
7	<code>\$y += 1</code>	125	26
8	<code>echo \$x, ", ", \$y</code>	It displays: 125, 26	

For input values of 50, 8

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	50	?
2	<code>\$y = (int)readline()</code>	50	8
3	<code>if ((\$x + \$y) / 2 <= 20)</code>	false	
4	<code>if (\$y < 15)</code>	true	
5	<code>\$x = \$x % 4</code>	2	8
6	<code>\$y = 2</code>	2	2
7	<code>echo \$x, ", ", \$y</code>	It displays: 2, 2	

For input values of 20, 15

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	20	?
2	<code>\$y = (int)readline()</code>	20	15
3	<code>if ((\$x + \$y) / 2 <= 20)</code>	true	
4	<code>if (\$y < 10)</code>	false	
5	<code>elseif (\$y < 20)</code>	true	
6	<code>\$x = \$x * 5</code>	100	15
7	<code>\$y += 2</code>	100	17
8	<code>echo \$x, ", ", \$y</code>	It displays: 100, 17	

For input values of 10, 30

Step	Statement	\$x	\$y
1	<code>\$x = (int)readline()</code>	10	?
2	<code>\$y = (int)readline()</code>	10	30
3	<code>if ((\$x + \$y) / 2 <= 20)</code>	true	
4	<code>if (\$y < 10)</code>	false	
5	<code>elseif (\$y < 20)</code>	false	
6	<code>\$x = \$x - 2</code>	8	30
7	<code>\$y += 3</code>	8	33
8	<code>echo \$x, ", ", \$y</code>	It displays: 8, 33	

3. Solution

```
<?php
    $a = (int)readline();

    if ($a > 1000)
        echo "Big Positive\n";
    else {
        if ($a > 0)
            echo "Positive\n";
        else {
            if ($a < -1000)
                echo "Big Negative\n";
            else {
                if ($a < 0)
                    echo "Negative\n";
                else
                    echo "Zero\n";
            }
        }
    }
?>
```

4. Solution

First approach

```
<?php
    $age = (int)readline("Enter your age: ");

    if ($age < 0) {
        echo "Error: Invalid age!\n";
    }
    else {
        if ($age < 16) {
            echo "You cannot drive either a small scooter or a car\n";
        }
        else {
            if ($age < 18) {
```

```
        echo "You can drive a small scooter\n";
    }
    else {
        echo "You can drive a car and a small scooter\n";
    }
}
?>
```

Second approach

```
<?php
    $age = (int)readline("Enter your age: ");

    if ($age < 0) {
        echo "Error: Invalid age!\n";
    }
    else {
        if ($age < 16) {
            echo "You cannot drive either a small scooter or a car\n";
        }
        elseif ($age < 18) {
            echo "You can drive a small scooter\n";
        }
        else {
            echo "You can drive a car and a small scooter\n";
        }
    }
}
?>
```

Third approach

```
<?php
    $age = (int)readline("Enter your age: ");

    if ($age < 0) {
        echo "Error: Invalid age!\n";
    }
    elseif ($age < 16) {
        echo "You cannot drive either a small scooter or a car\n";
    }
    elseif ($age < 18) {
        echo "You can drive a small scooter\n";
    }
    else {
        echo "You can drive a car and a small scooter\n";
    }
}
?>
```

5. Solution

```
<?php
    echo "Enter number of hoverboards sold: ";
    $soldHoverboards = (int)readline();
    echo "Enter number of employees: ";
```

```

$employeesNum = (int)readline();

if ($soldHoverboards < 0 || $employeesNum <= 0) {
    echo "Wrong value(s) entered\n";
}
else {
    $hoverboardsCost = $soldHoverboards * 150;
    $insuranceCost = $employeesNum * 1000;
    $totalCost = $hoverboardsCost + $insuranceCost;

    $totalEarnings = $soldHoverboards * 250;
    $profitLoss = $totalEarnings - $totalCost;

    if ($profitLoss > 0) {
        echo "Profit\n";
    }
    elseif ($profitLoss < 0) {
        echo "Loss\n";
    }
    else {
        echo "Broke even\n";
    }
}
?>

```

6. Solution

First approach: Using nested decision structures

```

<?php
$name = readline("Enter your name: ");

$hour = rand(1, 24);
echo "The hour is ", $hour, ":00\n";

if ($hour >= 5 && $hour <= 11) {
    echo "Good Morning ", $name, "!\n";
}
else {
    if ($hour >= 12 && $hour <= 18) {
        echo "Good Afternoon ", $name, "!\n";
    }
    else {
        if ($hour >= 19 && $hour <= 22) {
            echo "Good Evening ", $name, "!\n";
        }
        else {
            echo "Good Night ", $name, "!\n";
        }
    }
}
?>

```

Second approach: Using a multiple-alternative decision structure

```
<?php
$name = readline("Enter your name: ");

$hour = rand(1, 24);
echo "The hour is ", $hour, ":00\n";

if ($hour >= 5 && $hour <= 11) {
    echo "Good Morning ", $name, "!\n";
}
elseif ($hour >= 12 && $hour <= 18) {
    echo "Good Afternoon ", $name, "!\n";
}
elseif ($hour >= 19 && $hour <= 22) {
    echo "Good Evening ", $name, "!\n";
}
else {
    echo "Good Night ", $name, "!\n";
}
?>
```

7. Solution

```
<?php
echo "Enter the three sides of a triangle: ";
$a = (float)readline();
$b = (float)readline();
$c = (float)readline();

if ($a >= $b + $c || $b >= $a + $c || $c >= $a + $b) {
    echo "Provided numbers cannot be lengths of the three sides of a triangle\n";
}
else {
    if ($a == $b && $b == $c) {
        echo "Equilateral\n";
    }
    elseif ($a ** 2 == $b ** 2 + $c ** 2 || $b ** 2 == $a ** 2 + $c ** 2 || $c ** 2 == $a ** 2 + $b ** 2) {
        echo "Right (or right-angled)\n";
    }
    else {
        echo "Not special\n";
    }
}
?>
```

8. Solution

```
<?php
$pin = (int)readline("Enter your four-digit PIN : ");
if ($pin != 1234) {
    $pin = (int)readline("Wrong PIN. Enter your four-digit PIN : ");
    if ($pin != 1234) {
```

```

        $pin = (int)readline("Wrong PIN. Enter your four-digit PIN : ");
    }
}

if ($pin != 1234) {
    echo "PIN locked!\n";
}
else {
    $amount = (int)readline("Enter the amount of money (an integer value) that you want to withdraw:
");
    $usd10 = (int)($amount / 10);
    $r = $amount % 10;
    $usd5 = (int)($r / 5);
    $usd1 = $r % 5;
    echo $usd10, " note(s) of $10 ", $usd5, " note(s) of $5 ";
    echo "and ", $usd1, " note(s) of $1\n";
}
?>

```

9. Solution

First approach

```

<?php
$t = (float)readline("Enter temperature (in Fahrenheit): ");
$w = (float)readline("Enter wind speed (in miles/hour): ");

if ($t > 75) {
    if ($w > 12) {
        echo "The day is hot and windy\n";
    }
    else {
        echo "The day is hot and not windy\n";
    }
}
else {
    if ($w > 12) {
        echo "The day is cold and windy\n";
    }
    else {
        echo "The day is cold and not windy\n";
    }
}
?>

```

Second approach

```

<?php
$t = (float)readline("Enter temperature (in Fahrenheit): ");
$w = (float)readline("Enter wind speed (in miles/hour): ");

if ($t > 75) {
    $message1 = "hot";
}

```

```
else {
    $message1 = "cold";
}

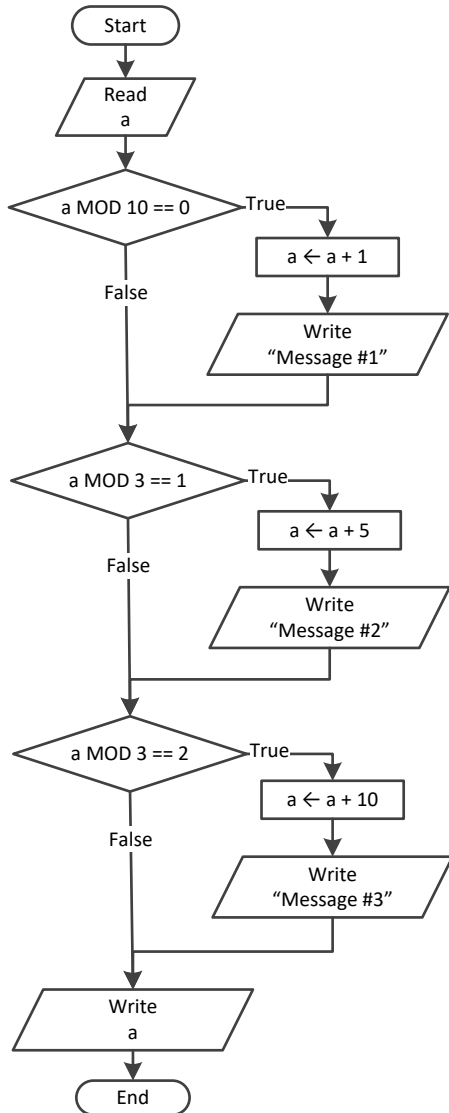
if ($w > 12) {
    $message2 = "windy";
}
else {
    $message2 = "not windy";
}

echo "The day is ", $message1, " and ", $message2, "\n";
?>
```

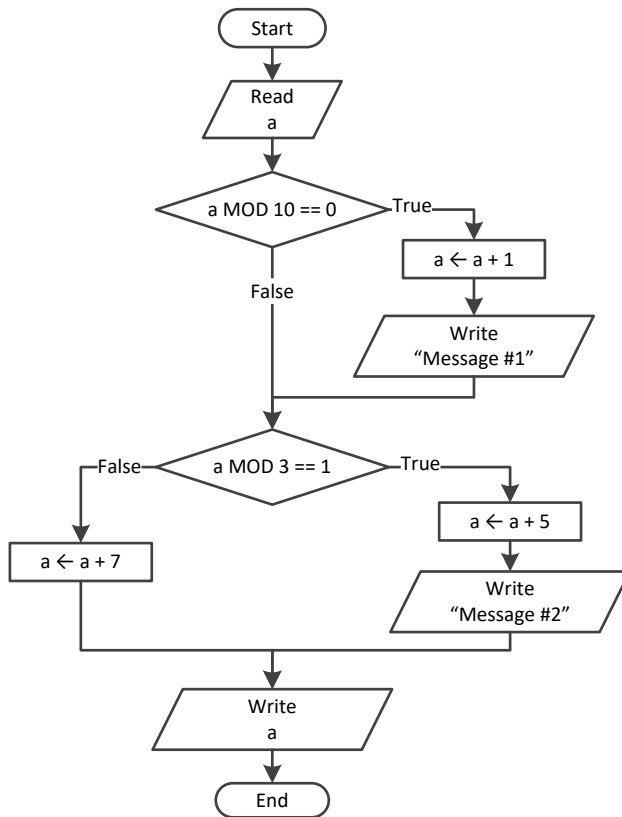
Chapter 21

21.4 Review Exercises

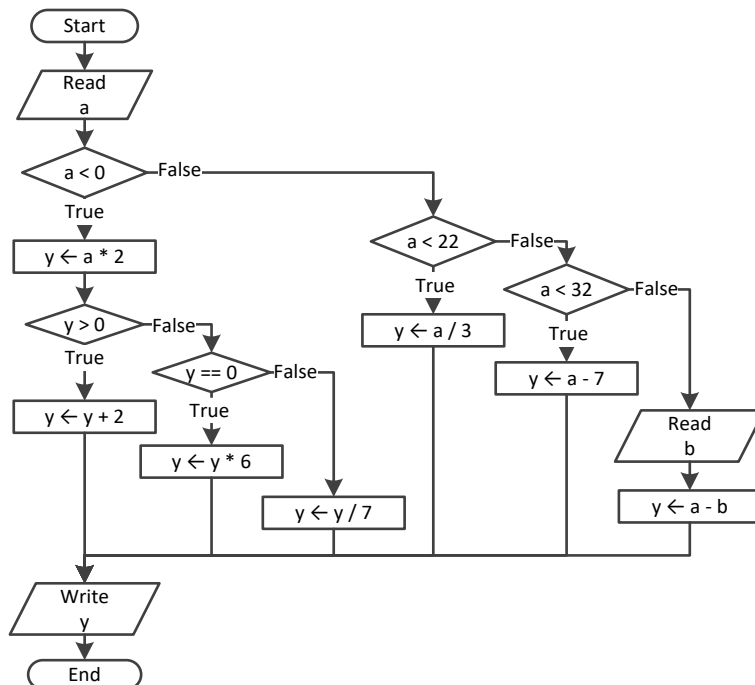
1. Solution



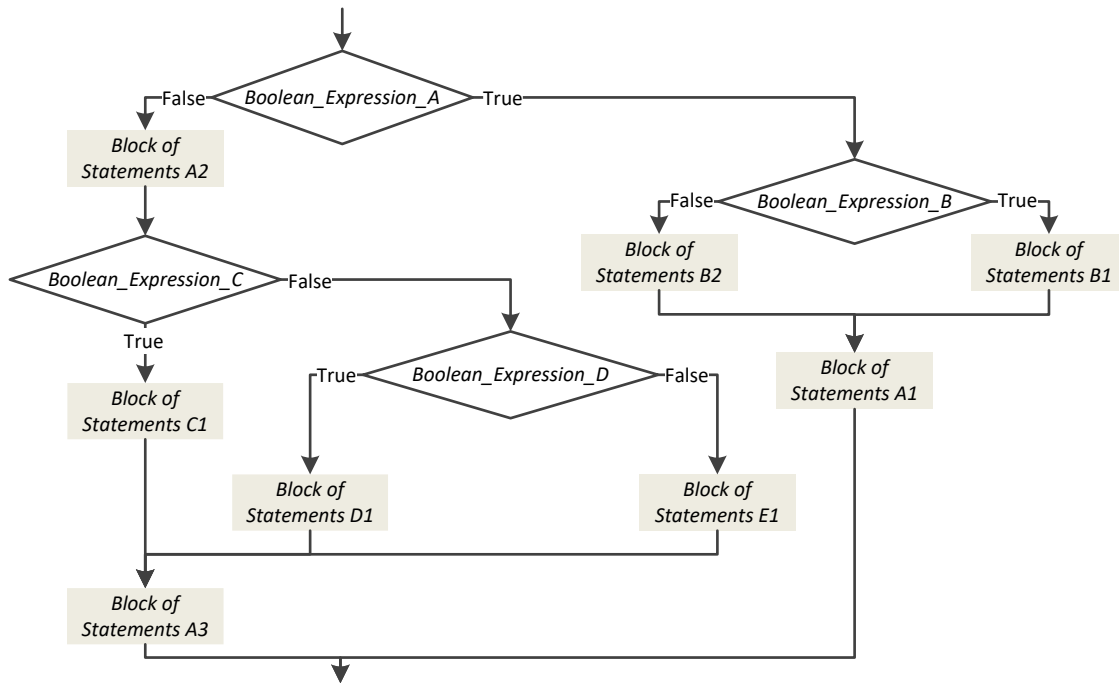
2. Solution



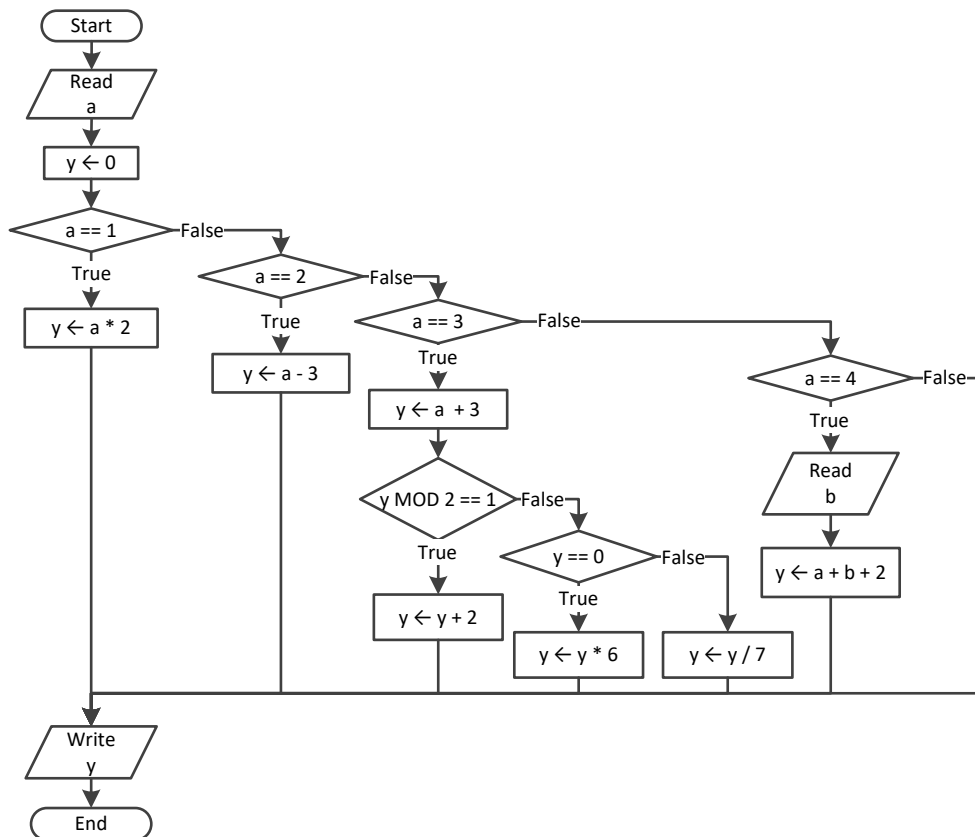
3. Solution



4. Solution



5. Solution



6. Solution

```
<?php
  $x = (float)readline();
  $y = (float)readline();

  if ($x != 100 || $y <= 10) {
    $z = (float)readline();
    if ($z <= $x + $y) {
      $x -= 3;
      $y = $x + 4;
    }
  }
  echo $x, " ", $y;
?>
```

7. Solution

```
<?php
  $x = (int)readline();

  if ($x == 1) {
    echo "Good Morning\n";
    echo "How do you do?\n";
    echo "Is everything okay?\n";
  }
  elseif ($x == 2) {
    echo "Good Evening\n";
    echo "How do you do?\n";
    echo "Is everything okay?\n";
  }
  elseif ($x == 3) {
    echo "Good Afternoon\n";
    echo "Is everything okay?\n";
  }
  else {
    echo "Good Night\n";
  }
?>
```

8. Solution

```
<?php
  $a = (int)readline();
  $b = (int)readline();

  $c = $a % 2;
  $d = (int)($b / 5);

  if ($a >= $b)
    $y = 1;
  elseif ($d > $c && $a > 2)
```

```
$y = 2;
elseif ($d * $c > $a / $b) {
    if ($d * $c > 10)
        $y = 4;
    else
        $y = 3;
}
else
    $y = 5;

echo $y;
?>
```

9. Solution

```
<?php
    $x = (int)readline();

    if ($x > 0) {
        if ($x % 10 == 0) {
            echo "Last digit equal to 0";
        }
        elseif ($x % 10 == 1) {
            echo "Last digit equal to 1";
        }
        else {
            echo "None";
        }
    }
    else {
        if ($x == -1) {
            echo "Bye";
        }
        else {
            echo "Invalid Number";
        }
    }
}
?>
```

10. Solution

```
<?php
    $a = (float)readline();
    $b = (float)readline();

    $y = $a * $b;

    if ($y > 0) {
        $y--;
        $y /= 2;
    }
    else {
```

```
$y +=10;
if ($y > 0) {
    $y /= 2;
}
else {
    $y *= 2;
}
}
?>
```

11. Solution

```
<?php
$a = (float)readline();
$b = (float)readline();
$c = (float)readline();

$c = $a * $b + $c;
if ($c > 0) {
    $c /= 2;
    if ($a > $b) {
        $a *= 2;
        $b *= 2;
    }
    else {
        $c /= 20;
        if ($c <= 10) {
            $b *= 2;
        }
    }
}
else {
    $c /= 3;
    $c /= 20;
    if ($c <= 10) {
        $b *= 2;
    }
}
echo $a, " ", $b, " ", $c;
?>
```

Chapter 22

22.9 Review Questions: True/False

1. false
2. false
3. false
4. true
5. true
6. false
7. false

22.10 Review Questions: Multiple Choice

1. a
2. b
3. a
4. c

22.11 Review Exercises

1. Solution

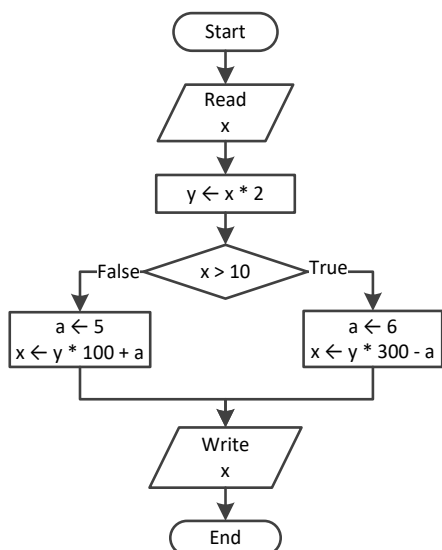
```

<?php
  $y = (int)readline();
  $x = (int)readline();

  if ($y > 0) {
    $a = $x * 4 * $y + 1;
  }
  else {
    $a = $x * 2 * $y + 6;
  }
  echo $y;
  echo $a;
?>

```

2. Solution



3. Solution

```
<?php
$a = (float)readline();

if ($a >= 10) {
    echo "Error!";
}
else {
    if ($a < 1) {
        $y = 5 + $a;
    }
    elseif ($a < 5) {
        $y = 23 / $a;
    }
    else {
        $y = 5 * $a;
    }
    echo $y;
}
?>
```

4. Solution

```
<?php
$day = (int)readline();
$month = (int)readline();
$name = readline();

if ($day == 16 && $month == 2 && $name == "Loukia") {
    echo "Happy Birthday!!!";
}
else {
    echo "No match!";
}
?>
```

5. Solution

It does not operate the same way when variable `$a` is less than or equal to 10. The correct program is

```
<?php
$a = (float)readline();
$b = (float)readline();
$c = (float)readline();

if ($a > 10) {
    if ($c < 2000) {
        $d = ($a + $b + $c) / 12;
        echo "The result is: ", $d;
    }
    else {
        echo "Error!";
    }
}
```

```
    }  
  }  
  else {  
    echo "Error!";  
  }  
?>
```

6. Solution

```
<?php  
$a = (float)readline();  
$b = (float)readline();  
$c = (float)readline();  
  
if ($a > 10 && $b < 2000 && $c != 10) {  
  $d = ($a + $b + $c) / 12;  
  echo "The result is: ", $d;  
}  
  
if ($a <= 10) {  
  echo "Error!";  
}  
?>
```

7. Solution

```
<?php  
$a = (int)readline();  
$b = (int)readline();  
  
$y = 3;  
if ($a > 0) {  
  $y = $y * $a;  
  echo "Hello Zeus";  
}  
  
echo $y, " ", $b;  
?>
```

8. Solution

```
<?php  
$a = (float)readline();  
$b = (float)readline();  
  
$y = 0;  
if ($a > 0) {  
  $y = $y + 7;  
}  
else {  
  echo "Hello Zeus";  
  echo abs($a);  
}
```

```
    echo $y;  
?>
```

9. Solution

```
<?php  
$os = readline("What is your tablet's OS? ");  
  
if ($os == "iOS") {  
    echo "Apple";  
}  
elseif ($os == "Android") {  
    echo "Google";  
}  
elseif ($os == "Windows") {  
    echo "Microsoft";  
}  
?>
```

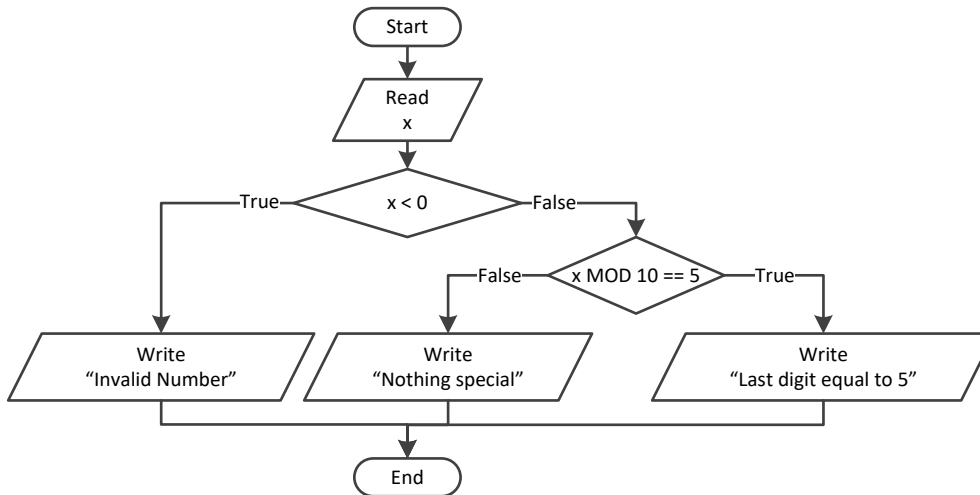

Chapter 23

23.7 Review Exercises

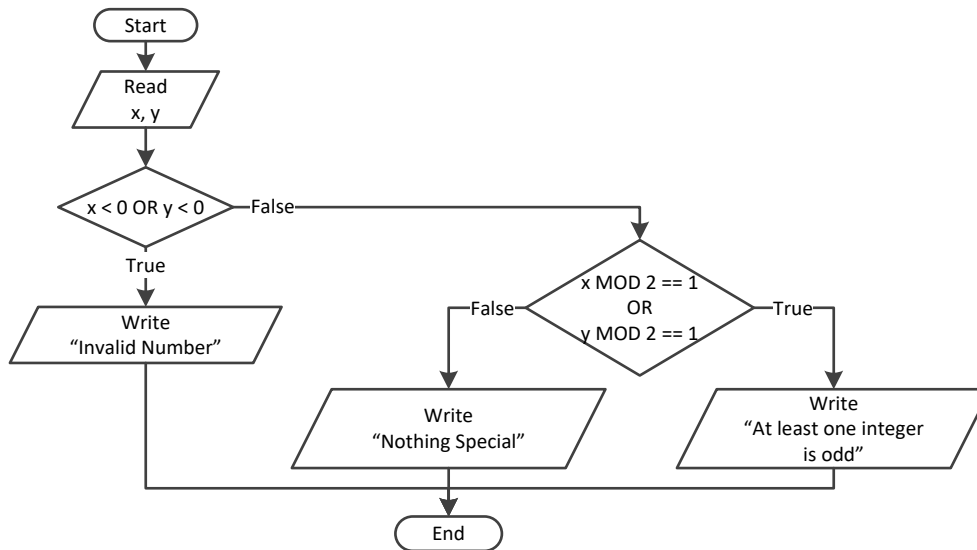
1. Solution

```
<?php
$x = (float)readline("Enter a non-negative number: ");
if ($x < 0) {
    echo "Error! You entered a negative value\n";
}
else {
    echo "The square root of ", $x, " is ", sqrt($x), "\n";
}
?>
```

2. Solution



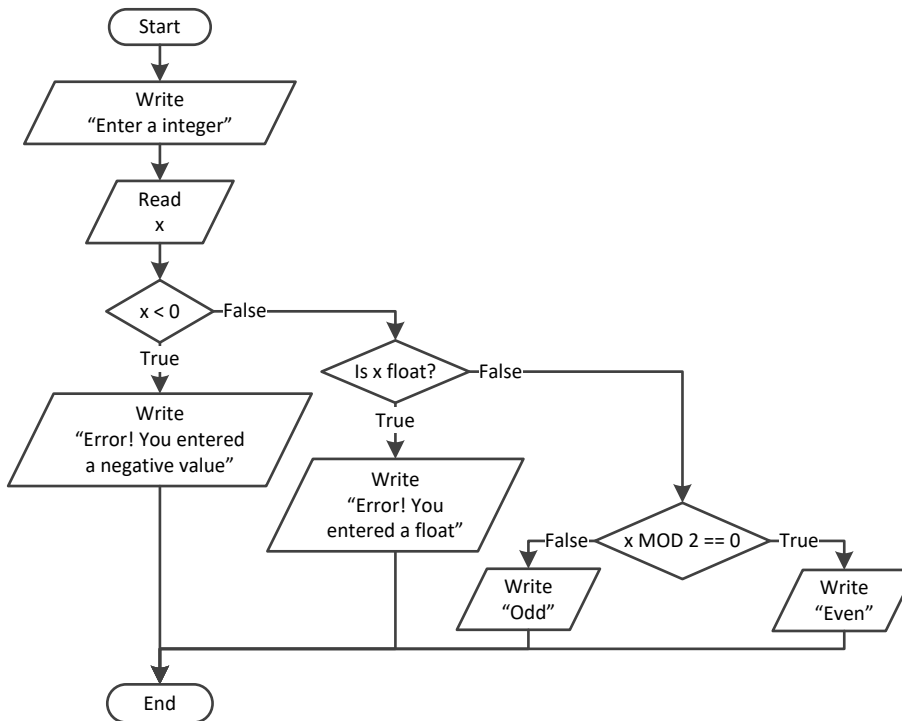
3. Solution



```
<?php
x = (int)readline();
y = (int)readline();

if (x < 0 || y < 0) {
    echo "Invalid Number\n";
}
else {
    if (x % 2 == 1 || y % 2 == 1) {
        echo "At least one integer is odd\n";
    }
    else {
        echo "Nothing Special\n";
    }
}
?>
```

4. Solution

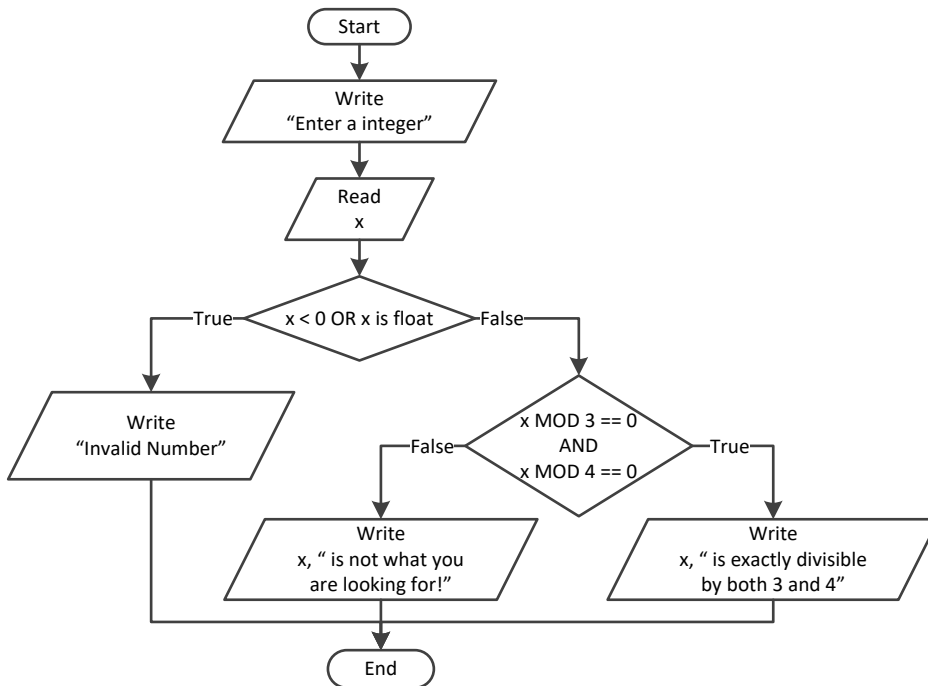


```

<?php
$x = (float)readline("Enter a non-negative number: ");
if ($x < 0) {
    echo "Error! You entered a negative value\n";
}
elseif ($x != (int)$x) {
    echo "Error! You entered a float\n";
}
elseif ($x % 2 == 0) {
    echo "Even\n";
}
else {
    echo "Odd\n";
}
?>

```

5. Solution



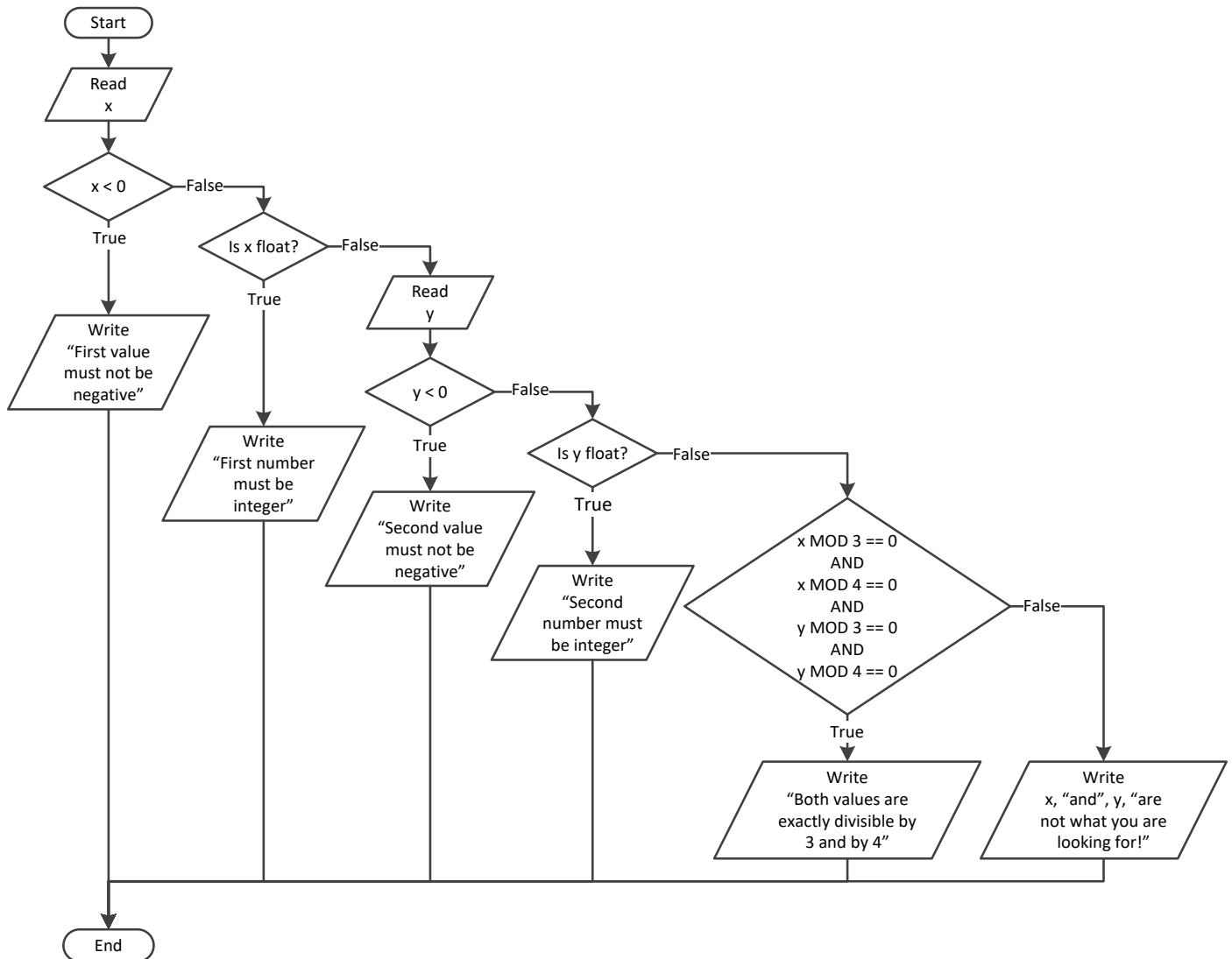
```

<?php
  $x = (float)readline("Enter an integer: ");

  if ($x < 0 || $x != (int)$x) {
    echo "Invalid Number\n";
  }
  elseif ($x % 3 == 0 && $x % 4 == 0) {
    echo $x, " is exactly divisible by both 3 and 4\n";
  }
  else {
    echo $x, " is not what you are looking for!\n";
  }
?>

```

6. Solution



```

<?php
  $x = (float)readline();

  if ($x < 0) {
    echo "First value must be not be negative\n";
  }
  else {
    if ($x != (int)$x) {
      echo "First number must be integer\n";
    }
    else {
      $y = (float)readline();
      if ($y < 0) {
        echo "Second value must be not be negative\n";
      }
      else {
        if ($y != (int)$y) {

```

```

        echo "Second number must be integer\n";
    }
    else {
        if ($x % 3 == 0 && $x % 4 == 0 && $y % 3 == 0 && $y % 4 == 0 ) {
            echo "Both values are exactly divisible by 3 and by 4\n";
        }
        else {
            echo "Nothing Special\n";
        }
    }
}
}
}
?>

```

7. Solution

```

<?php
echo "1. Convert Kelvin to Fahrenheit\n";
echo "2. Convert Fahrenheit to Kelvin\n";
echo "3. Convert Fahrenheit to Celsius\n";
echo "4. Convert Celsius to Fahrenheit\n";
$choice = (int)readline("Enter a choice: ");

$t = (float)readline("Enter a temperature: ");

if ($choice < 1 || $choice > 4) {
    echo "Wrong choice\n";
}
else {
    switch ($choice) {
        case 1:
            if ($t < 0) { //Absolute zero in Kelvin
                echo "Wrong temperature\n";
            }
            else {
                echo 1.8 * $t - 459.67, "\n";
            }
            break;
        case 2:
            if ($t < -459.67) { //Absolute zero in Fahrenheit
                echo "Wrong temperature\n";
            }
            else {
                echo ($t + 459.57) / 1.8, "\n";
            }
            break;
        case 3:
            if ($t < -459.67) { //Absolute zero in Fahrenheit
                echo "Wrong temperature\n";
            }
            else {

```

```

        echo 5 / 9 * ($t - 32), "\n";
    }
    break;
case 4:
    if ($t < -273.15) { //Absolute zero in Celcius
        echo "Wrong temperature\n";
    }
    else {
        echo 9 / 5 * $t + 32, "\n";
    }
    break;
}
}
?>

```

8. Solution

```

<?php
echo "Enter 1st integer: ";
$a = (int)readline();
echo "Enter type of operation: ";
$op = strtoupper(readline());
echo "Enter 2nd integer: ";
$b = (int)readline();

$message = "The result of " . $a . " " . $op . " " . $b . " equals ";

switch ($op) {
    case "+":
        $message .= $a + $b; //Concatenate
        break;
    case "-":
        $message .= $a - $b; //Concatenate
        break;
    case "*":
        $message .= $a * $b; //Concatenate
        break;
    case "/":
        if ($b == 0) {
            $message = "Infinite"; //Replace
        }
        else {
            $message .= $a / $b; //Concatenate
        }
        break;
    case "DIV":
        if ($b == 0) {
            $message = "Infinite"; //Replace
        }
        else {
            $message .= (int)($a / $b); //Concatenate
        }
}

```

```

    break;
case "MOD":
    if ($b == 0) {
        $message = "Infinite"; //Replace
    }
    else {
        $message .= $a % $b; //Concatenate
    }
    break;
case "POWER":
    $message .= $a ** $b; //Concatenate
    break;
}
echo $message, "\n";
?>

```

9. Solution

```

<?php
echo "Enter 1st integer: ";
$a = (int)readline();
echo "Enter type of operation: ";
$op = strtoupper(readline());
echo "Enter 2nd integer: ";
$b = (int)readline();

$message = "The result of " . $a . " " . $op . " " . $b . " equals ";

switch ($op) {
    case "+":
        $message .= $a + $b; //Concatenate
        break;
    case "-":
        $message .= $a - $b; //Concatenate
        break;
    case "*":
        $message .= $a * $b; //Concatenate
        break;
    case "/":
        if ($b == 0) {
            $message = "Infinite"; //Replace
        }
        else {
            $message .= $a / $b; //Concatenate
        }
        break;
    case "DIV":
        if ($b == 0) {
            $message = "Infinite"; //Replace
        }
        else {
            $message .= (int)($a / $b); //Concatenate
        }
    }
}

```



```

    }
    break;
case "MOD":
    if ($b == 0) {
        $message = "Infinite"; //Replace
    }
    else {
        $message .= $a % $b; //Concatenate
    }
    break;
case "POWER":
    $message .= $a ** $b; //Concatenate
    break;
default:
    $message = "Error: Invalid operator"; //Replace
}
echo $message, "\n";
?>

```

10. Solution

```

<?php
    $a1 = (int)readline("Enter the age of the first person: ");
    $n1 = readline("Enter the name of the first person: ");
    $a2 = (int)readline("Enter the age of the second person: ");
    $n2 = readline("Enter the name of the second person: ");
    $a3 = (int)readline("Enter the age of the third person: ");
    $n3 = readline("Enter the name of the third person: ");

    $minimum = $a1;
    $minName = $n1;
    if ($a2 < $minimum) {
        $minimum = $a2;
        $minName = $n2;
    }
    if ($a3 < $minimum) {
        $minimum = $a3;
        $minName = $n3;
    }

    $maximum = $a1;
    $maxName = $n1;
    if ($a2 > $maximum) {
        $maximum = $a2;
        $maxName = $n2;
    }
    if ($a3 > $maximum) {
        $maximum = $a3;
        $maxName = $n3;
    }

    echo $minName, " ", $maxName, "\n";

```

```
| ?>
```

11. Solution

```
<?php
    $artistName = readline("Enter artist's name: ");
    $score1 = (int)readline("Enter score No 1: ");
    $score2 = (int)readline("Enter score No 2: ");
    $score3 = (int)readline("Enter score No 3: ");
    $score4 = (int)readline("Enter score No 4: ");
    $score5 = (int)readline("Enter score No 5: ");

    $minimum = $score1;
    if ($score2 < $minimum) {
        $minimum = $score2;
    }
    if ($score3 < $minimum) {
        $minimum = $score3;
    }
    if ($score4 < $minimum) {
        $minimum = $score4;
    }
    if ($score5 < $minimum) {
        $minimum = $score5;
    }

    $maximum = $score1;
    if ($score2 > $maximum) {
        $maximum = $score2;
    }
    if ($score3 > $maximum) {
        $maximum = $score3;
    }
    if ($score4 > $maximum) {
        $maximum = $score4;
    }
    if ($score5 > $maximum) {
        $maximum = $score5 ;
    }

    $totalScore = $score1 + $score2 + $score3 + $score4 + $score5 - $minimum - $maximum;
    echo $artistName, " received ", $totalScore, " points\n";
?>
```

12. Solution

```
<?php
    $age1 = (int)readline("Enter age for person No1:");
    $age2 = (int)readline("Enter age for person No2:");
    $age3 = (int)readline("Enter age for person No3:");

    $minimum = $age1;
```

```

if ($age2 < $minimum) {
    $minimum = $age2;
}
if ($age3 < $minimum) {
    $minimum = $age3;
}

$maximum = $age1;
if ($age2 > $maximum) {
    $maximum = $age2;
}
if ($age3 > $maximum) {
    $maximum = $age3;
}

$middle = $age1 + $age2 + $age3 - $minimum - $maximum;
echo $middle, "\n";
?>

```

13. Solution

```

<?php
    $a1 = (int)readline("Enter the age of the first person: ");
    $n1 = readline("Enter the name of the first person: ");
    $a2 = (int)readline("Enter the age of the second person: ");
    $n2 = readline("Enter the name of the second person: ");
    $a3 = (int)readline("Enter the age of the third person: ");
    $n3 = readline("Enter the name of the third person: ");

    $minimum = $a1;
    $minName = $n1;
    if ($a2 < $minimum) {
        $minimum = $a2;
        $minName = $n2;
    }
    if ($a3 < $minimum) {
        $minimum = $a3;
        $minName = $n3;
    }

    $maximum = $a1;
    $maxName = $n1;
    if ($a2 > $maximum) {
        $maximum = $a2;
        $maxName = $n2;
    }
    if ($a3 > $maximum) {
        $maximum = $a3;
        $maxName = $n3;
    }

    $middle = $a1 + $a2 + $a3 - $minimum - $maximum;

```

```
    if (abs($maximum - $middle) < abs($minimum - $middle)) {
        echo $maxName, "\n";
    }
    else {
        echo $minName, "\n";
    }
?>
```

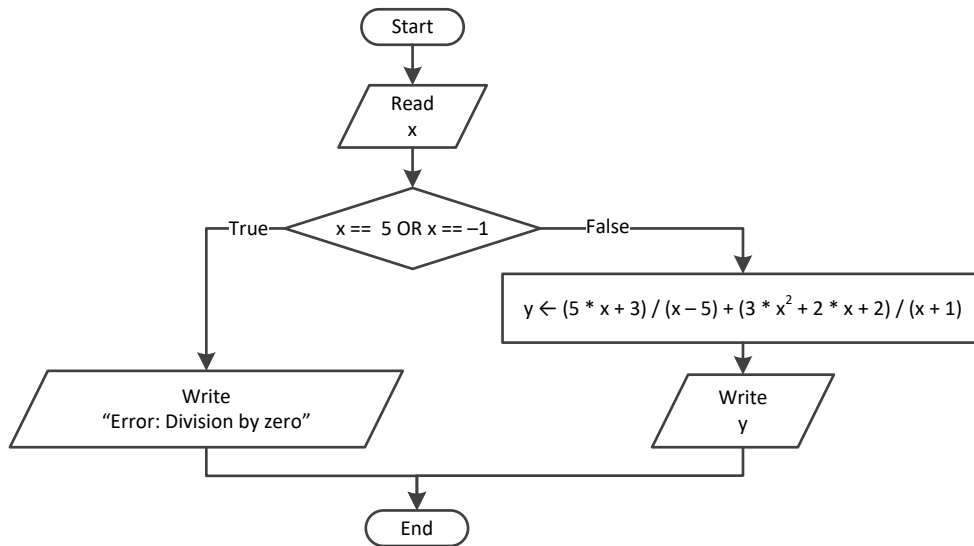
14. Solution

```
<?php
$price1 = (float)readline();
$title1 = readline();
$price2 = (float)readline();
$title2 = readline();
$price3 = (float)readline();
$title3 = readline();

$minimum = $price1;
$minName = $title1;
if ($price2 < $minimum) {
    $minimum = $price2;
    $minName = $title2;
}
if ($price3 < $minimum) {
    $minimum = $price3;
    $minName = $title3;
}

$amount = $price1 + $price2 + $price3 - $minimum;
echo "You need to pay: $", $amount, "\n";
echo "Title provided for free: ", $minName, "\n";
echo "You saved: $", $minimum, "\n";
?>
```

15. Solution



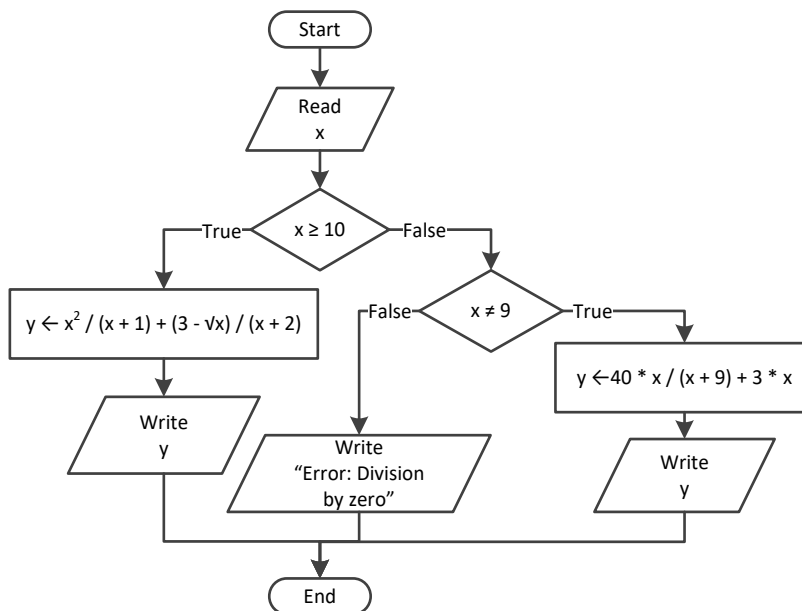
```

<?php
  $x = (float)readline();

  if ($x == 5 || $x == -1) {
    echo "Error: Division by zero\n";
  }
  else {
    $y = (5 * $x + 3) / ($x - 5) + (3 * $x ** 2 + 2 * $x + 2) / ($x + 1);
    echo $y, "\n";
  }
?>

```

16. Solution



```

<?php

```

```

$x = (float)readline();
if ($x >= 10) {
    $y = $x ** 2 / ($x + 1) + (3 - sqrt($x)) / ($x + 2);
    echo $y, "\n";
}
elseif ($x != 9) {
    $y = 40 * $x / ($x + 9) + 3 * $x;
    echo $y, "\n";
}
else {
    echo "Error: Division by zero\n";
}
?>

```

17. Solution

```

<?php
$x = (float)readline();

if ($x < 0 ) {
    $y = 40 * $x / ($x - 5) + 3;
    echo $y, "\n";
}
elseif ($x == 0 || $x == 3) {
    echo "Error: Division by zero!\n";
}
else {
    $y = (7 + $x) / ($x - 3) + (3 - $x) / $x;
    echo $y, "\n";
}
?>

```

18. Solution

```

<?php
$x = (float)readline();
if ($x <= -15 || $x > 25) {
    $y = $x - 1;
    echo $y, "\n";
}
elseif ($x <= -10) {
    $y = $x / sqrt($x + 30) + (8 + $x) ** 2 / ($x + 1);
    echo $y, "\n";
}
elseif ($x <= 0) {
    $y = abs(40 * $x) / ($x - 8);
    echo $y, "\n";
}
else {
    if ($x == 9) {
        echo "Error: Division by zero\n";
    }
}

```

```

elseif ($x < 9) {
    echo "Error: Invalid square root\n";
}
else {
    $y = 3 * $x / sqrt($x - 9);
    echo $y, "\n";
}
}
?>

```

19. Solution

```

<?php
    $x = (int)readline("Enter a three-digit integer: ");

    if ($x != (int)$x) {
        echo "Error! You must enter an integer\n";
    }
    elseif ($x < 100 || $x > 999) {
        echo "Entered integer is not a three-digit integer\n";
    }
    else {
        $digit1 = (int)($x / 100);
        $r = (int)$x % 100;

        $digit2 = (int)($r / 10);
        $digit3 = $r % 10;

        $total = (int)($digit1 ** 3 + $digit2 ** 3 + $digit3 ** 3);

        if ($total == $x) {
            echo "You entered an Armstrong number!\n";
        }
        else {
            echo "You entered a non-Armstrong number!\n";
        }
    }
}
?>

```

20. Solution

```

<?php
    $d = (int)readline("Enter day 1 - 31: ");
    $m = (int)readline("Enter month 1 - 12: ");
    $y = (int)readline("Enter year: ");

    if ($m == 2) {
        if ($y % 4 == 0 && $y % 100 != 0 || $y % 400 == 0) {
            echo 29 - $d, "\n";
        }
        else {
            echo 28 - $d, "\n";
        }
    }
}

```

```

}
elseif ($m == 4 || $m == 6 || $m == 9 || $m == 11) {
    echo 30 - $d, "\n";
}
else {
    echo 31 - $d, "\n";
}
?>

```

21. Solution

First approach

```

<?php
    $word = readline();

    $word1 = strtoupper(substr($word, 0, 1)) .
             strtolower(substr($word, 1, 1)) .
             strtoupper(substr($word, 2, 1)) .
             strtolower(substr($word, 3, 1)) .
             strtoupper(substr($word, 4, 1)) .
             strtolower(substr($word, 5, 1));

    $word2 = strtolower(substr($word, 0, 1)) .
             strtoupper(substr($word, 1, 1)) .
             strtolower(substr($word, 2, 1)) .
             strtoupper(substr($word, 3, 1)) .
             strtolower(substr($word, 4, 1)) .
             strtoupper(substr($word, 5, 1));

    if ($word == $word1 || $word == $word2) {
        echo "Word is okay!\n";
    }
    else {
        echo "Word is not okay\n";
    }
?>

```

Second approach

```

<?php
    $word = readline();

    $word1 = strtoupper($word[0]) .
             strtolower($word[1]) .
             strtoupper($word[2]) .
             strtolower($word[3]) .
             strtoupper($word[4]) .
             strtolower($word[5]);

    $word2 = strtolower($word[0]) .
             strtoupper($word[1]) .
             strtolower($word[2]) .
             strtoupper($word[3]) .
             strtolower($word[4]) .

```



```
        strtoupper($word[5]);

if ($word == $word1 || $word == $word2) {
    echo "Word is okay!\n";
}
else {
    echo "Word is not okay\n";
}
?>
```

22. Solution

```
<?php
    $q = (int)readline("Enter quantity: ");

    if ($q < 3) {
        $discount = 0;
    }
    elseif ($q < 6) {
        $discount = 10;
    }
    elseif ($q < 10) {
        $discount = 15;
    }
    elseif ($q < 14) {
        $discount = 20;
    }
    elseif ($q < 20) {
        $discount = 27;
    }
    else {
        $discount = 30;
    }

    $payment = $q * 10 - $q * 10 * $discount / 100.0;

    echo "You got a discount of ", $discount, "%\n";
    echo "You must pay $", $payment, "\n";
?>
```

23. Solution

```
<?php
    define("VAT", 0.19);

    $amount = (float)readline("Enter a before-tax amount: ");

    if ($amount < 0) {
        echo "Error! You entered a negative value\n";
    }
    else {
        if ($amount < 50) {
            $discount = 0;
```

```
}
elseif ($amount < 100) {
    $discount = 1;
}
elseif ($amount < 250) {
    $discount = 2;
}
else {
    $discount = 3;
}

$amount = $amount - $amount * $discount / 100;
$payment = $amount + $amount * VAT;

echo "You got a discount of ", $discount, "%\n";
echo "You must pay $", $payment, "\n";
}
?>
```

24. Solution

```
<?php
$a = (int)readline("Enter age: ");
if ($a < 18) {
    echo "Invalid age\n";
}
else {
    $w = (int)readline("Enter weight in pounds: ");
    $h = (int)readline("Enter height in inches: ");

    $bmi = $w * 703 / $h ** 2;

    if ($bmi < 15) {
        echo "Very severely underweight\n";
    }
    elseif ($bmi < 16) {
        echo "Severely underweight\n";
    }
    elseif ($bmi < 18.5) {
        echo "Underweight\n";
    }
    elseif ($bmi < 25) {
        echo "Normal\n";
    }
    elseif ($bmi < 30) {
        echo "Overweight\n";
    }
    elseif ($bmi < 35) {
        echo "Severely overweight\n";
    }
    else {
        echo "Very severely overweight\n";
    }
}
```

```

    }
}
?>

```

25. Solution

```

<?php
define("TAX_RATE", 0.10);

$water = (int)readline("Enter water consumption (in cubic feet): ");

if ($water < 0) {
    echo "Error! You entered a negative value\n";
}
else {
    if ($water <= 10) {
        $total = $water * 3;
    }
    elseif ($water <= 20) {
        $total = 10 * 3 + ($water - 10) * 5;
    }
    elseif ($water <= 35) {
        $total = 10 * 3 + 10 * 5 + ($water - 20) * 7;
    }
    else {
        $total = 10 * 3 + 10 * 5 + 15 * 7 + ($water - 35) * 9;
    }

    $total = $total + $total * TAX_RATE;
    echo "Total amount to pay (taxes included): ", $total, "\n";
}
?>

```

26. Solution

```

<?php
$income = (float)readline("Enter taxable income: ");
$children = (float)readline("Enter number of children: ");

if ($income <= 8000) {
    $tax = $income * 0.10;
}
elseif ($income <= 30000) {
    $tax = 8000 * 0.10 + ($income - 8000) * 0.15;
}
elseif ($income <= 70000) {
    $tax = 8000 * 0.10 + 22000 * 0.15 + ($income - 30000) * 0.25;
}
else {
    $tax = 8000 * 0.10 + 22000 * 0.15 + 40000 * 0.25 + ($income - 70000) * 0.30;
}

if ($children > 0) {

```

```
    $tax = $tax - $tax * 0.02;
}
echo "Tax: ", $tax, "\n";
?>
```

27. Solution

```
<?php
$wind = (float)readline("Enter wind speed (in miles/hour): ");

if ($wind < 0) {
    echo "Error! You entered a negative value\n";
}
else {
    if ($wind < 1) {
        echo "Beaufort: 0\nCalm\n";
    }
    elseif ($wind < 4) {
        echo "Beaufort: 1\nLight air\n";
    }
    elseif ($wind < 8) {
        echo "Beaufort: 2\nLight breeze\n";
    }
    elseif ($wind < 13) {
        echo "Beaufort: 3\nGentle breeze\n";
    }
    elseif ($wind < 18) {
        echo "Beaufort: 4\nModerate breeze\n";
    }
    elseif ($wind < 25) {
        echo "Beaufort: 5\nFresh breeze\n";
    }
    elseif ($wind < 31) {
        echo "Beaufort: 6\nStrong breeze\n";
    }
    elseif ($wind < 39) {
        echo "Beaufort: 7\nModerate gale\n";
    }
    elseif ($wind < 47) {
        echo "Beaufort: 8\nGale\n";
    }
    elseif ($wind < 55) {
        echo "Beaufort: 9\nStrong gale\n";
    }
    elseif ($wind < 64) {
        echo "Beaufort: 10\nStorm\n";
    }
    elseif ($wind < 74) {
        echo "Beaufort: 11\nViolent storm\n";
    }
    else {
```

```
    echo "Beaufort: 12\nHurricane force\n";  
}  
  
if ($wind < 13) {  
    echo "It's Fishing Day!!!\n";  
}  
}  
?>
```


Chapter 24

24.3 Review Questions: True/False

1. true
2. true
3. false
4. false
5. true

Chapter 25

25.4 Review Questions: True/False

- | | |
|----------|-----------|
| 1. true | 9. false |
| 2. false | 10. false |
| 3. false | 11. true |
| 4. false | 12. false |
| 5. false | 13. false |
| 6. false | 14. true |
| 7. true | 15. false |
| 8. false | |

25.5 Review Questions: Multiple Choice

- | | |
|------|-------|
| 1. c | 7. c |
| 2. c | 8. b |
| 3. a | 9. b |
| 4. b | 10. d |
| 5. d | 11. a |
| 6. b | 12. d |

25.6 Review Exercises

1. Solution

```
<?php
    $i = 3;
    do {
        echo $i;
        $i--;
    } while ($i >= 0); //Alternatively you can use the logical operator !=
    echo "The end";
?>
```

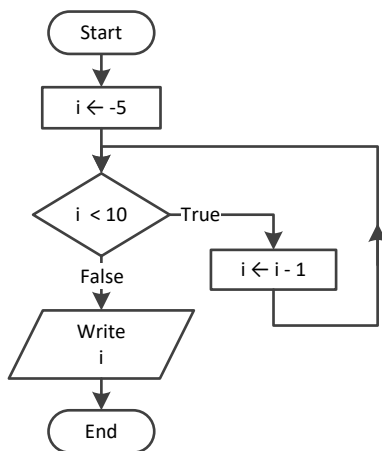
2. Solution

Step	Statement	\$i	\$x
1	\$i = 3	3	?
2	\$x = 0	3	0
3	while (\$i >= 0)	true	
4	\$i--	2	0
5	\$x += \$i	2	2
6	while (\$i >= 0)	true	
7	\$i--	1	2
8	\$x += \$i	1	3
9	while (\$i >= 0)	true	

10	<code>\$i--</code>	0	3
11	<code>\$x += \$i</code>	0	3
12	<code>while (\$i >= 0)</code>	true	
13	<code>\$i--</code>	-1	3
14	<code>\$x += \$i</code>	-1	2
15	<code>while (\$i >= 0)</code>	false	
16	<code>echo \$x</code>	It displays: 2	

It performs 4 iterations

3. Solution



Step	Statement	Notes	\$i
1	<code>\$i = -5</code>		-5
2	<code>while (\$i < 10)</code>	true	
3	<code>\$i--</code>		-6
4	<code>while (\$i < 10)</code>	true	
5	<code>\$i--</code>		-7
6	<code>while (\$i < 10)</code>	true	
7	<code>\$i--</code>		-8
8
9

It performs an infinite number of iterations

4. Solution

Step	Statement	\$a	\$b	\$c	\$d
1	<code>\$a = 2</code>	2	?	?	?
2	<code>while (\$a <= 10)</code>	true			
3	<code>\$b = \$a + 1</code>	2	3	?	?
4	<code>\$c = \$b * 2</code>	2	3	6	?

5	<code>\$d = \$c - \$b + 1</code>	2	3	6	4
6	<code>\$d == 4</code>	true			
7	<code>echo \$b, ", ", \$c</code>	It displays: 3, 6			
8	<code>\$a += 4</code>	6	3	6	4
9	<code>while (\$a <= 10)</code>	true			
10	<code>\$b = \$a + 1</code>	6	7	6	4
11	<code>\$c = \$b * 2</code>	6	7	14	4
12	<code>\$d = \$c - \$b + 1</code>	6	7	14	8
13	<code>\$d == 4</code>	false			
14	<code>\$d == 5</code>	false			
15	<code>\$d == 8</code>	true			
16	<code>echo \$a, ", ", \$b</code>	It displays: 6, 7			
17	<code>\$a += 4</code>	10	7	14	8
18	<code>while (\$a <= 10)</code>	true			
19	<code>\$b = \$a + 1</code>	10	11	14	8
20	<code>\$c = \$b * 2</code>	10	11	22	8
21	<code>\$d = \$c - \$b + 1</code>	10	11	22	12
22	<code>\$d == 4</code>	false			
23	<code>\$d == 5</code>	false			
24	<code>\$d == 8</code>	false			
25	<code>echo \$a, ", ", \$b, ", ", \$d</code>	It displays: 10, 11, 12			
26	<code>\$a += 4</code>	14	11	22	12
27	<code>while (\$a <= 10)</code>	false			

5. Solution

Step	Statement	\$a	\$b	\$c	\$d	\$x
1	<code>\$a = 1</code>	1	?	?	?	?
2	<code>\$b = 1</code>	1	1	?	?	?
3	<code>\$c = 0</code>	1	1	0	?	?
4	<code>\$d = 0</code>	1	1	0	0	?
5	<code>while (\$b < 2)</code>	true				
6	<code>\$x = \$a + \$b</code>	1	1	0	0	2
7	<code>if (\$x % 2 != 0)</code>	false				
8	<code>\$d = \$d + 1</code>	1	1	0	1	2
9	<code>\$a = \$b</code>	1	1	0	1	2
10	<code>\$b = \$c</code>	1	0	0	1	2
11	<code>\$c = \$d</code>	1	0	1	1	2

12	while (\$b < 2)	true				
13	\$x = \$a + \$b	1	0	1	1	1
14	if (\$x % 2 != 0)	true				
15	\$c = \$c + 1	1	0	2	1	1
16	\$a = \$b	0	0	2	1	1
17	\$b = \$c	0	2	2	1	1
18	\$c = \$d	0	2	1	1	1
19	while (\$b < 2)	false				

6. Solution

- i. -1
- ii. 9
- iii. 0.25
- iv. -7
- v. Any value between 17 and 32
- vi. 1.4

7. Solution

Step	Statement	\$x	\$y
1	\$y = 5	?	5
2	\$x = 38	38	5
3	\$y *= 2	38	10
4	\$x++	39	10
5	echo \$y	It displays: 10	
6	while (\$y < \$x)	true	
7	\$y *= 2	39	20
8	\$x++	40	20
9	echo \$y	It displays: 20	
10	while (\$y < \$x)	true	
11	\$y *= 2	40	40
12	\$x++	41	40
13	echo \$y	It displays: 40	
14	while (\$y < \$x)	true	
15	\$y *= 2	41	80
16	\$x++	42	80
17	echo \$y	It displays: 80	
18	while (\$y < \$x)	false	

8. Solution

Step	Statement	Notes	\$x
1	\$x = 1		1
2	if (\$x % 2 == 0)	false	
3	\$x += 3		4
4	echo \$x	It displays: 4	
5	while (\$x < 12)	true	
6	if (\$x % 2 == 0)	true	
7	\$x++		5
8	echo \$x	It displays: 5	
9	while (\$x < 12)	true	
10	if (\$x % 2 == 0)	false	
11	\$x += 3		8
12	echo \$x	It displays: 8	
13	while (\$x < 12)	true	
14	if (\$x % 2 == 0)	true	
15	\$x++		9
16	echo \$x	It displays: 9	
17	while (\$x < 12)	true	
18	if (\$x % 2 == 0)	false	
19	\$x += 3		12
20	echo \$x	It displays: 12	
21	while (\$x < 12)	false	

9. Solution

Step	Statement	\$x	\$y
1	\$y = 2	?	2
2	\$x = 0	0	2
3	\$y = \$y ** 2	0	4
4	if (\$x < 256)	true	
5	\$x = \$x + \$y	4	
6	echo \$x, ", ", \$y	It displays: 4, 4	
7	while (\$y < 65535)	true	
8	\$y = \$y ** 2	4	16
9	if (\$x < 256)	true	
10	\$x = \$x + \$y	20	16

11	echo \$x, ", ", \$y	It displays: 20, 16	
12	while (\$y < 65535)	true	
13	\$y = \$y ** 2	20	256
14	if (\$x < 256)	true	
15	\$x = \$x + \$y	276	256
16	echo \$x, ", ", \$y	It displays: 276, 256	
17	while (\$y < 65535)	true	
18	\$y = \$y ** 2	276	65536
19	if (\$x < 256)	false	
20	echo \$x, ", ", \$y	It displays: 276, 65536	
21	while (\$y < 65535)	false	

10. Solution

Step	Statement	\$a	\$b	\$c	\$d	\$x
1	\$a = 2	2	?	?	?	?
2	\$b = 4	2	4	?	?	?
3	\$c = 0	2	4	0	?	?
4	\$d = 0	2	4	0	0	?
5	\$x = \$a + \$b	2	4	0	0	6
6	if (\$x % 2 != 0)	false				
7	elseif (\$d % 2 == 0)	true				
8	\$d = \$d + 5	2	4	0	5	6
9	\$a = \$b	4	4	0	5	6
10	\$b = \$d	4	5	0	5	6
11	while (\$c < 11)	true				
12	\$x = \$a + \$b	4	5	0	5	9
13	if (\$x % 2 != 0)	true				
14	\$c = \$c + 5	4	5	5	5	9
15	\$a = \$b	5	5	5	5	9
16	\$b = \$d	5	5	5	5	9
17	while (\$c < 11)	true				
18	\$x = \$a + \$b	5	5	5	5	10
19	if (\$x % 2 != 0)	false				

20	elseif (\$d % 2 == 0)	false				
21	\$c = \$c + 3	5	5	8	5	10
22	\$a = \$b	5	5	8	5	10
23	\$b = \$d	5	5	8	5	10
24	while (\$c < 11)	true				
25	\$x = \$a + \$b	5	5	8	5	10
26	if (\$x % 2 != 0)	false				
27	elseif (\$d % 2 == 0)	false				
28	\$c = \$c + 3	5	5	11	5	10
29	\$a = \$b	5	5	11	5	10
30	\$b = \$d	5	5	11	5	10
31	while (\$c < 11)	false				

11. Solution

- i. -1
- ii. 18
- iii. 0.5
- iv. -20
- v. 128
- vi. 11.25

12. Solution

- i. 4
- ii. -2
- iii. 2
- iv. 10

13. Solution

```
<?php
    $n = (int)readline();
    $total = 0

    $i = 1;
    while ($i <= $n) {
        $a = (float)readline();
        $total = $total + $a;
        $i++;
    }

    echo $total, "\n";
    if ($n > 0) {
```

```
    echo $total / $n, "\n";
}
?>
```

14. Solution

```
<?php
$count = 0;

$n = (int)readline();
$p = 1;

$i = 1;
while ($i <= $n) {
    $a = (int)readline();
    if ($a % 2 == 0) {
        $p = $p * $a;
        $count++;
    }
    $i++;
}

if ($count > 0) {
    echo $p, "\n";
}
else {
    echo "You entered no even integers\n";
}
?>
```

15. Solution

```
<?php
$total = 0;

$i = 1;
while ($i <= 100) {
    $a = (int)readline();
    if ($a % 10 == 0) {
        $total = $total + $a;
    }
    $i++;
}
echo $total, "\n";
?>
```

16. Solution

```
<?php
$total = 0;

$i = 1;
while ($i <= 20) {
```

```

$a = (int)readline();
if ($a >= 100 && $a <= 999) {
    $total = $total + $a;
}
$i++;
}
echo $total, "\n";
?>

```

17. Solution

```

<?php
$p = 1;

$a = (float)readline();
while ($a != 0) {
    $p = $p * $a;
    $a = (float)readline();
}
echo $p, "\n";
?>

```

Step	Statement	\$a	\$p
1	\$p = 1	?	1
2	\$a = (float)readline()	3	1
3	while (\$a != 0)	true	
4	\$p = \$p * \$a	3	3
5	\$a = (float)readline()	2	3
6	while (\$a != 0)	true	
7	\$p = \$p * \$a	2	6
8	\$a = (float)readline()	9	6
9	while (\$a != 0)	true	
10	\$p = \$p * \$a	9	54
11	\$a = (float)readline()	0	54
12	while (\$a != 0)	false	
13	echo \$p, "\n"	It displays: 54	

18. Solution

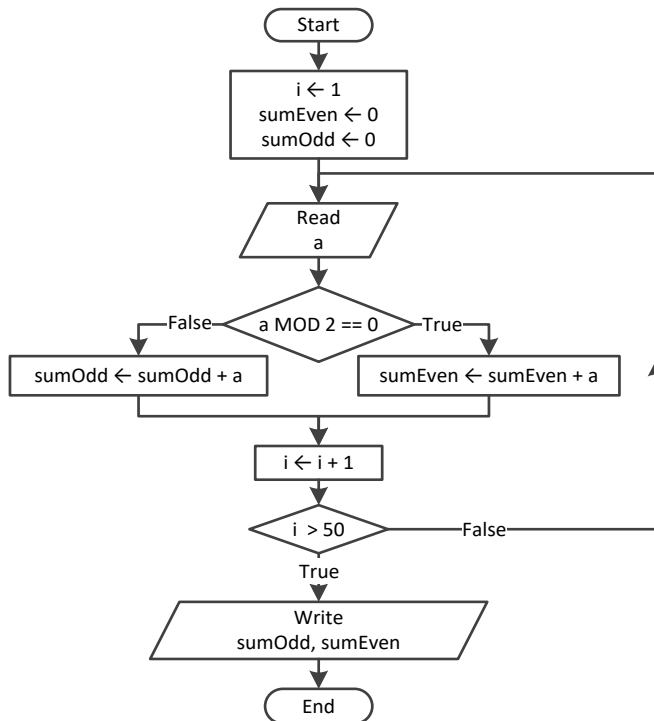
```

<?php
$population = 30000;

$years = 0;
while ($population <= 100000) {
    $population += $population * 0.03;
    $years++;
}
echo $years, "\n";

```


| ?>

19. Solution

```

<?php
$i = 1;
$sumEven = 0;
$sumOdd = 0;
do {
    $a = (int)readline();
    if ($a % 2 == 0) {
        $sumEven += $a;
    }
    else {
        $sumOdd += $a;
    }
    $i++;
} while ($i <= 50);
echo $sumEven, " ", $sumOdd, "\n";
?>
  
```

20. Solution

```

<?php
$n = (int)readline();
$i = 1;
$p = 1;
do {
    $a = (int)readline();
    if ($a < 0) {
  
```

```
    $p *= $a;
  }
  $i++;
} while ($i <= $n);
echo abs($p), "\n";
?>
```

21. Solution

```
<?php
$i = 1;
$p = 1;
do {
    $a = (int)readline("Enter an integer: ");
    if ($a >= 500 && $a <= 599) {
        $p *= $a;
    }
    $i++;
} while ($i <= 5);
echo $p, "\n";
?>
```

22. Solution

```
<?php
$population = 50000;

$years = 0;
do {
    $population -= $population * 0.10;
    $years++;
} while ($population >= 20000);
echo $years, "\n";
?>
```

Chapter 26

26.3 Review Questions: True/False

- | | |
|----------|-----------|
| 1. true | 7. false |
| 2. true | 8. true |
| 3. false | 9. false |
| 4. false | 10. false |
| 5. false | 11. false |
| 6. true | 12. false |

26.4 Review Questions: Multiple Choice

- | | |
|------|-------|
| 1. c | 8. b |
| 2. d | 9. c |
| 3. d | 10. b |
| 4. b | 11. d |
| 5. a | 12. d |
| 6. b | 13. c |
| 7. a | 14. c |

26.5 Review Exercises

1. Solution

Step	Statement	\$a	\$b	\$j
1	\$a = 0	0	?	?
2	\$b = 0	0	0	?
3	\$j = 0	0	0	0
4	\$j <= 8	true		
5	if (\$j < 5)	true		
6	\$b++	0	1	0
7	\$j += 2	0	1	2
8	\$j <= 8	true		
9	if (\$j < 5)	true		
10	\$b++	0	2	2
11	\$j += 2	0	2	4
12	\$j <= 8	true		
13	if (\$j < 5)	true		
14	\$b++	0	3	4
15	\$j += 2	0	3	6
16	\$j <= 8	true		
17	if (\$j < 5)	false		
18	\$a += \$j - 1	5	3	6

19	<code>\$j += 2</code>	5	3	8
20	<code>\$j <= 8</code>	true		
21	<code>if (\$j < 5)</code>	false		
22	<code>\$a += \$j - 1</code>	12	3	8
23	<code>\$j += 2</code>	12	3	10
24	<code>\$j <= 8</code>	false		
25	<code>echo \$a, ", ", \$b</code>	It displays: 12, 3		

2. Solution

For input value of 10

Step	Statement	\$a	\$b	\$j
1	<code>\$a = (int)readline()</code>	10	?	?
2	<code>\$b = \$a</code>	10	10	?
3	<code>\$j = \$a - 5</code>	10	10	5
4	<code>\$j <= \$a</code>	true		
5	<code>if (\$j % 2 != 0)</code>	true		
6	<code>\$b = \$a + \$j + 5</code>	10	20	5
7	<code>\$j += 2</code>	10	20	7
8	<code>\$j <= a</code>	true		
9	<code>if (\$j % 2 != 0)</code>	true		
10	<code>\$b = \$a + \$j + 5</code>	10	22	7
11	<code>\$j += 2</code>	10	22	9
12	<code>\$j <= a</code>	true		
13	<code>if (\$j % 2 != 0)</code>	true		
14	<code>\$b = \$a + \$j + 5</code>	10	24	9
15	<code>\$j += 2</code>	10	24	11
16	<code>\$j <= \$a</code>	false		
17	<code>echo \$b</code>	It displays: 24		

For input value of 21

Step	Statement	\$a	\$b	\$j
1	<code>\$a = (int)readline()</code>	21	?	?
2	<code>\$b = \$a</code>	21	21	?
3	<code>\$j = \$a - 5</code>	21	21	16
4	<code>\$j <= \$a</code>	true		
5	<code>if (\$j % 2 != 0)</code>	false		
6	<code>\$b = \$a + \$j + 5</code>	21	5	16
7	<code>\$j += 2</code>	21	5	18

8	<code>\$j <= \$a</code>	true		
9	<code>if (\$j % 2 != 0)</code>	false		
10	<code>\$b = \$a + \$j + 5</code>	21	3	18
11	<code>\$j += 2</code>	21	3	20
12	<code>\$j <= \$a</code>	true		
13	<code>if (\$j % 2 != 0)</code>	false		
14	<code>\$b = \$a + \$j + 5</code>	21	1	20
15	<code>\$j += 2</code>	21	1	22
16	<code>\$j <= \$a</code>	false		
17	<code>echo \$b</code>	It displays: 1		

3. Solution

For input value of 12

Step	Statement	\$a	\$x	\$y	\$j
1	<code>\$a = (int)readline()</code>	12	?	?	?
2	<code>\$j = 2</code>	12	?	?	2
3	<code>\$j <= \$a - 1</code>	true			
4	<code>\$x = \$j * 3 + 3</code>	12	9	?	2
5	<code>\$y = \$j * 2 + 10</code>	12	9	14	2
6	<code>if (\$y - \$x > 0 \$x > 30)</code>	true			
7	<code>\$y *= 2</code>	12	9	28	2
8	<code>\$x += 4</code>	12	13	28	2
9	<code>echo \$x, ", ", \$y</code>	It displays: 13, 28			
10	<code>\$j += 3</code>	12	13	28	5
11	<code>\$j <= \$a - 1</code>	true			
12	<code>\$x = \$j * 3 + 3</code>	12	18	28	5
13	<code>\$y = \$j * 2 + 10</code>	12	18	20	5
14	<code>if (\$y - \$x > 0 \$x > 30)</code>	true			
15	<code>\$y *= 2</code>	12	18	40	5
16	<code>\$x += 4</code>	12	22	40	5
17	<code>echo \$x, ", ", \$y</code>	It displays: 22, 40			
18	<code>\$j += 3</code>	12	22	40	8
19	<code>\$j <= \$a - 1</code>	true			
20	<code>\$x = \$j * 3 + 3</code>	12	27	40	8
21	<code>\$y = \$j * 2 + 10</code>	12	27	26	8
22	<code>if (\$y - \$x > 0 \$x > 30)</code>	false			
23	<code>\$x += 4</code>	12	31	26	8

24	echo \$x, ", ", \$y	It displays: 31, 26			
25	\$j += 3	12	31	26	11
26	\$j <= \$a - 1	true			
27	\$x = \$j * 3 + 3	12	36	26	11
28	\$y = \$j * 2 + 10	12	36	32	11
29	if (\$y - \$x > 0 \$x > 30)	true			
30	\$y *= 2	12	36	64	11
31	\$x += 4	12	40	64	11
32	echo \$x, ", ", \$y	It displays: 40, 64			
33	\$j += 3	12	40	64	14
34	\$j <= \$a - 1	false			

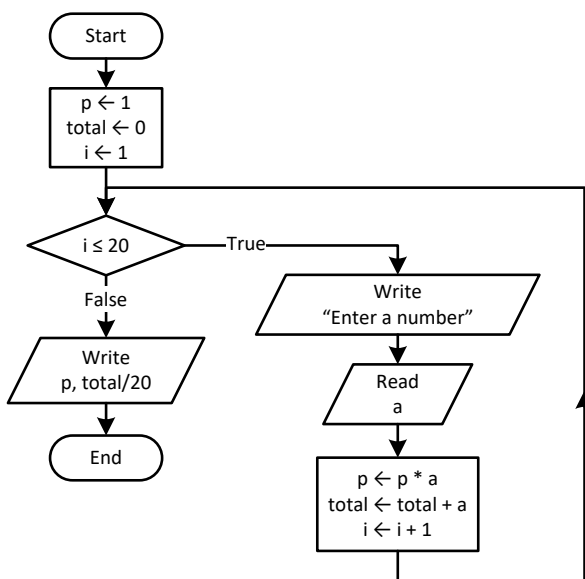
4. Solution

- i. 9
- ii. Any value greater than or equal to 2 and less than 2.5 ($2 \leq x < 2.5$)
- iii. -7 (or -6)
- iv. -1

5. Solution

It displays: sueZ

6. Solution



```

<?php
  $p = 1;
  $total = 0;
  for ($i = 1; $i <= 20; $i++) {
    $a = (float)readline("Enter a number: ");
  
```

```
    $p = $p * $a;
    $total = $total + $a;
}
echo $p, "\n";
echo $total / 20, "\n";
?>
```

7. Solution

```
<?php
for ($i = 0 ; $i <= 360; $i += 0.5) {
    echo sin($i * pi() / 180), "\n";
}
?>
```

8. Solution

```
<?php
$deg = (int)readline("Enter degrees: ");
for ($i = 0; $i <= $deg; $i++) {
    echo cos($i * pi() / 180), "\n";
}
?>
```

9. Solution

```
<?php
$s = 0;
for ($i = 1; $i <= 99; $i += 2) {
    $s += $i;
}
echo $s, "\n";
?>
```

10. Solution

```
<?php
$n = (int)readline();
$p = 1;
for ($i = 2; $i <= 2 * $n; $i += 2) {
    $p *= $i ** ($i - 1);
}
echo $p, "\n";
?>
```

11. Solution

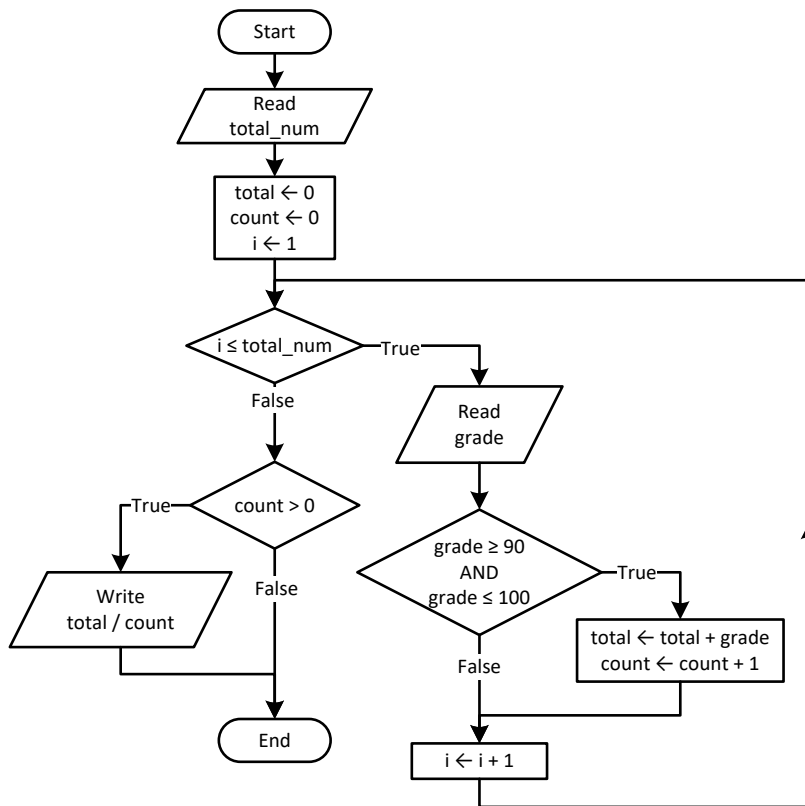
```
<?php
$s = 0;
$i = 1;
$offset = 0;
while ($i <= 191) {
```

```

    $s += $i;
    $offset++;
    $i += $offset;
}
echo $s, "\n";
?>

```

12. Solution



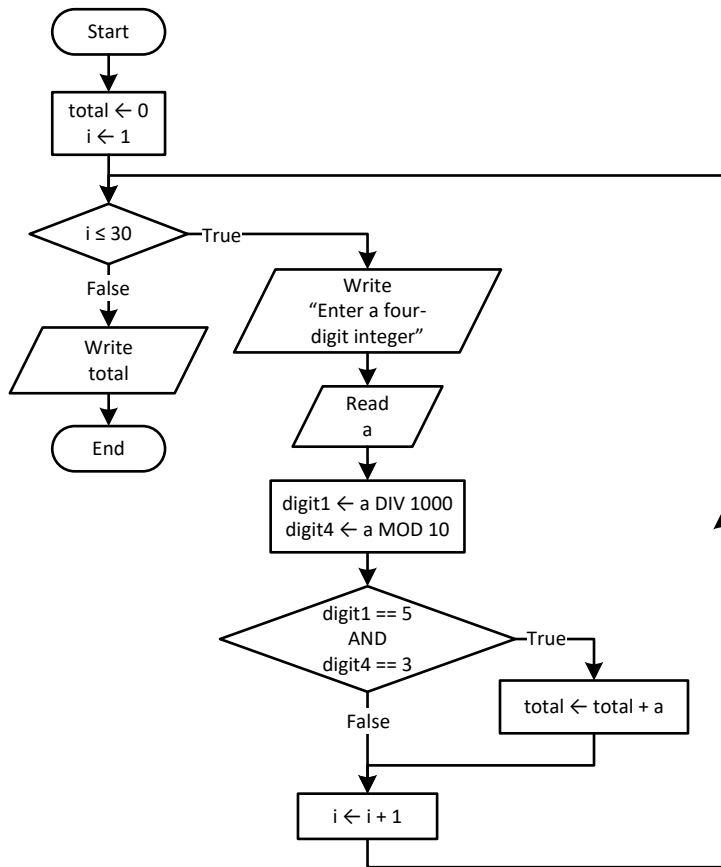
```

<?php
$totalNum = (int)readline();
$total = 0;
$count = 0;
for ($i = 1; $i <= $totalNum; $i++) {
    $grade = (int)readline();
    if ($grade >= 90 && $grade <= 100) {
        $total += $grade;
        $count++;
    }
}
if ($count > 0) {
    echo $total / $count, "\n";
}
?>

```


13. Solution

First approach

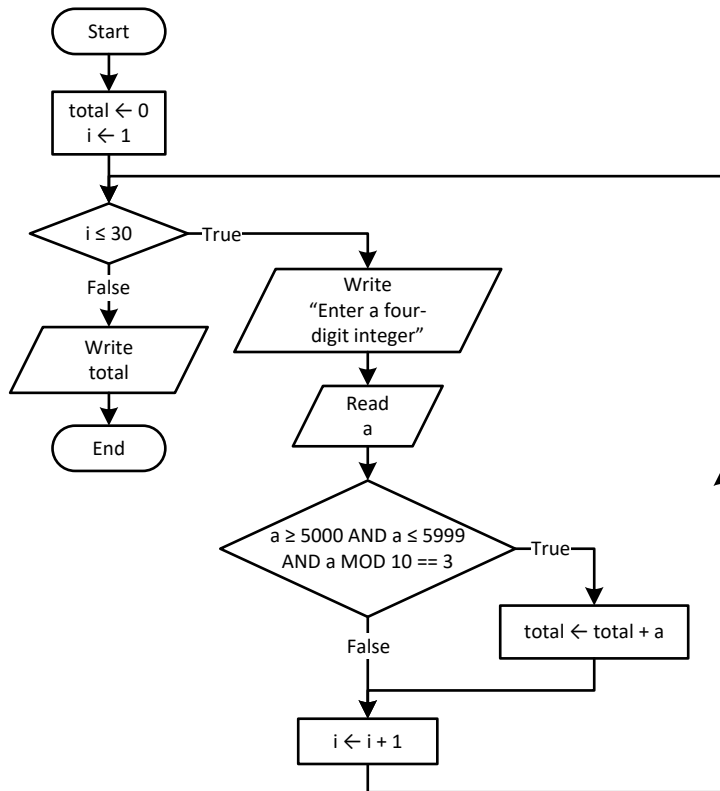


```

<?php
$total = 0;
for ($i = 1; $i <= 30; $i++) {
    $a = (int)readline("Enter a four-digit integer: ");
    $digit1 = (int)($a / 1000);
    $digit4 = $a % 10;
    if ($digit1 == 5 && $digit4 == 3) {
        $total += $a;
    }
}
echo $total, "\n";
?>

```

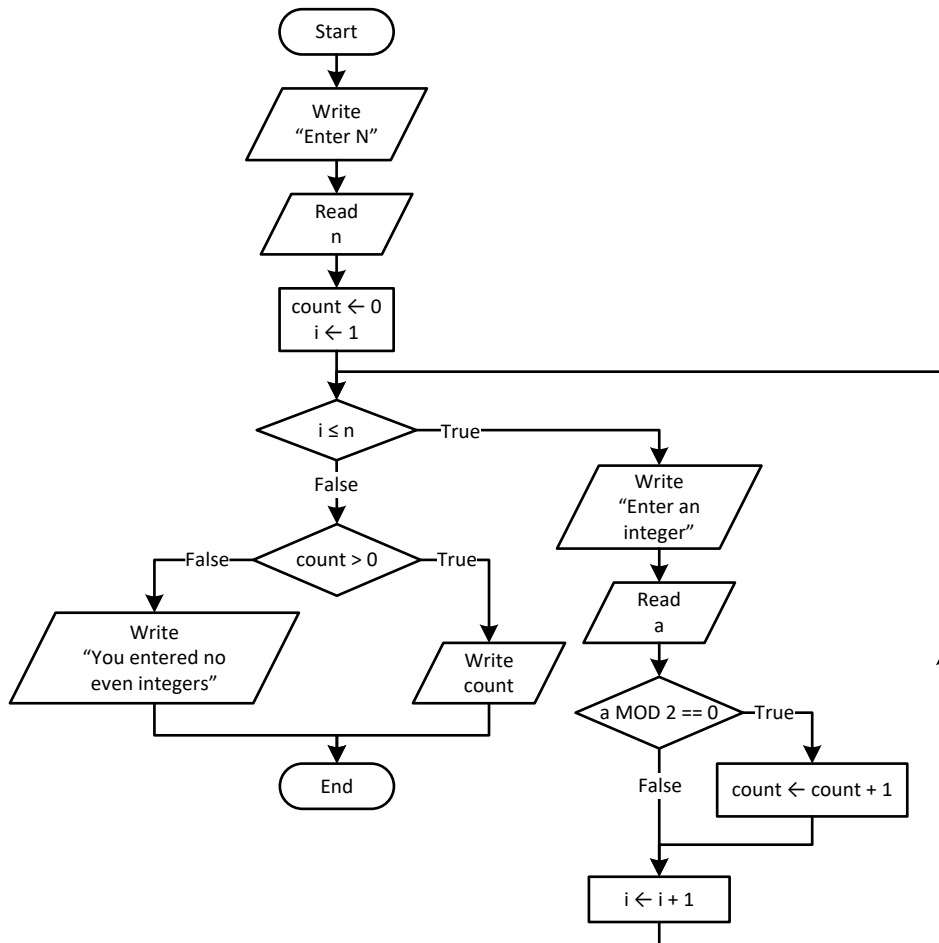
Second approach



```

<?php
$total = 0;
for ($i = 1; $i <= 30; $i++) {
    $a = (int)readline("Enter a four-digit integer: ");
    if ($a >= 5000 && $a <= 5999 && $a % 10 == 3) {
        $total += $a;
    }
}
echo $total, "\n";
?>
  
```

14. Solution

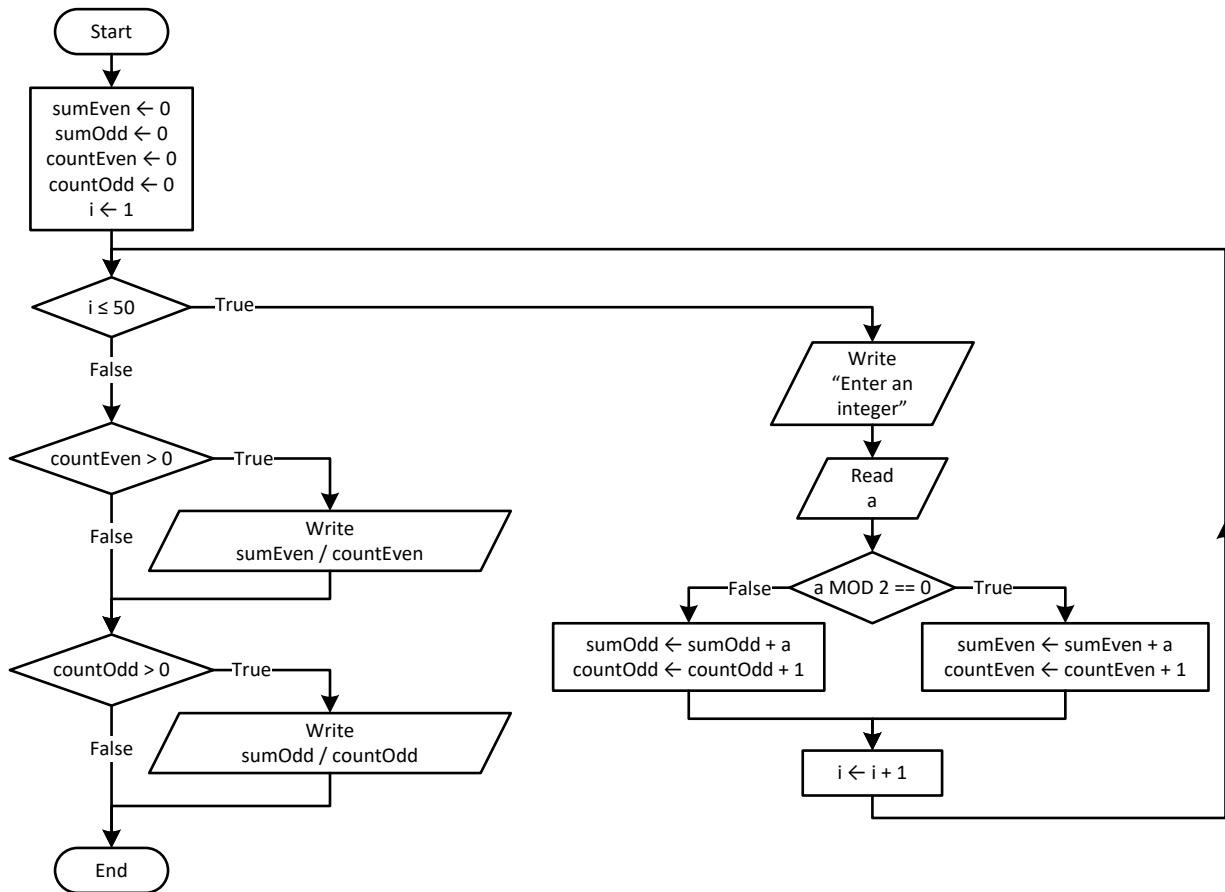


```

<?php
    $n = (int)readline("Enter N: ");
    $count = 0;
    for ($i = 1; $i <= $n; $i++) {
        $a = (int)readline("Enter an integer: ");
        if ($a % 2 == 0) {
            $count++;
        }
    }
    if ($count > 0) {
        echo $count, "\n";
    }
    else {
        echo "You entered no even integers\n";
    }
?>

```

15. Solution

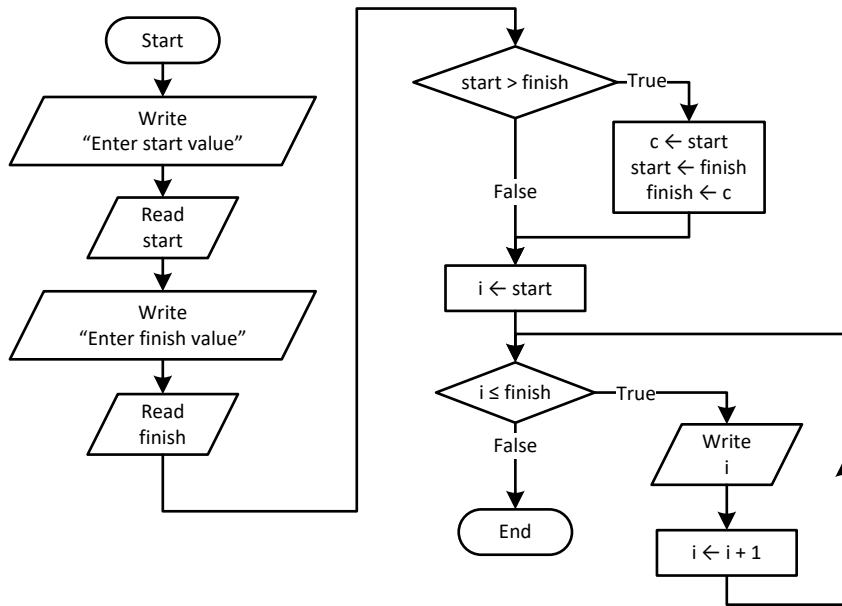


```

<?php
$sumEven = 0;
$sumOdd = 0;
$countEven = 0;
$countOdd = 0;
for ($i = 1; $i <= 50; $i++) {
    $a = (int)readline("Enter an integer: ");
    if ($a % 2 == 0) {
        $sumEven += $a;
        $countEven++;
    }
    else {
        $sumOdd += $a;
        $countOdd++;
    }
}
if ($countEven > 0) {
    echo $sumEven / $countEven, "\n";
}
if ($countOdd > 0) {
    echo $sumOdd / $countOdd, "\n";
}
?>

```

16. Solution



```

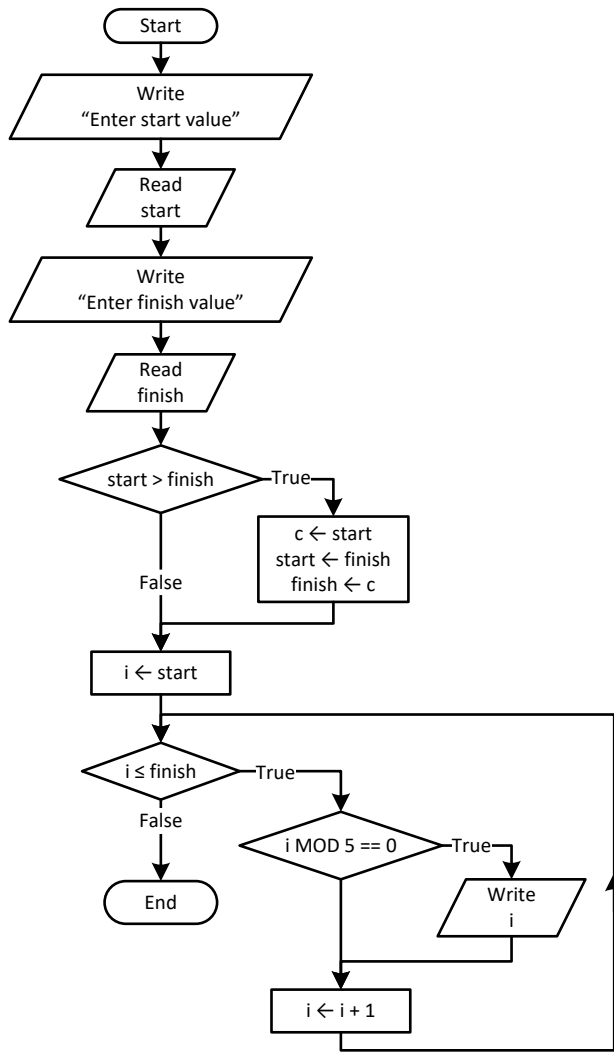
<?php
$start = (int)readline("Enter start value: ");
$finish = (int)readline("Enter finish value: ");

if ($start > $finish) {
    $c = $start;
    $start = $finish;
    $finish = $c;
}

for ($i = $start; $i <= $finish; $i++) {
    echo $i, "\n";
}
?>

```

17. Solution



```

<?php
$start = (int)readline("Enter start value: ");
$finish = (int)readline("Enter finish value: ");

if ($start > $finish) {
    $c = $start;
    $start = $finish;
    $finish = $c;
}

for ($i = $start; $i <= $finish; $i++) {
    if ($i % 5 == 0) {
        echo $i, "\n";
    }
}
?>

```

18. Solution

First approach

```
<?php
$b = (float)readline("Enter a value for base: ");
$exp = (int)readline("Enter an integer for exponent: ");

$p = 1;
if ($exp >= 0) {
    for ($i = 1; $i <= $exp; $i++) {
        $p *= $b;
    }
}
else {
    for ($i = 1; $i <= -$exp; $i++) {
        $p *= 1 / $b;
    }
}
echo $p, "\n";
?>
```

Second approach

```
<?php
$b = (float)readline("Enter a value for base: ");
$exp = (int)readline("Enter an integer for exponent: ");

$p = 1;
for ($i = 1; $i <= abs($exp); $i++) {
    $p *= $b;
}
if ($exp < 0) {
    $p = 1 / $p;
}
echo $p, "\n";
?>
```

19. Solution

```
<?php
$msg = readline("Enter a message: ");

$count = 0;
for ($i = 0; $i <= strlen($msg) - 1; $i++) {
    $character = $msg[$i];
    if ($character == " ") {
        $count++;
    }
}
$words = $count + 1;

echo "The message entered contains ", $words, " words\n";
?>
```

20. Solution

```

<?php
    $msg = readline("Enter a message: ");

    $characters = strlen($msg);
    $count = 0;
    for ($i = 0; $i <= $characters - 1; $i++) {
        $character = $msg[$i];
        if ($character == " ") {
            $count++;
        }
    }

    $words = $count + 1;
    echo "The average number of letters in each word is ";
    echo ($characters - $count) / $words, "\n";
?>

```

21. Solution

```

<?php
    $consonants = "BCDFGHJKLMNPQRSTVWZYX";

    $message = strtoupper(readline("Enter an English message: "));

    $count = 0;
    for ($i = 0; $i <= strlen($message) - 1; $i++) {
        $character = $message[$i];

        if (strpos($consonants, $character) !== false) { //If character is found in consonants
            $count++;
        }
    }
    echo "Consonants: ", $count, "\n";
?>

```

22. Solution

```

<?php
    $vowels = "AEIOU";
    $consonants = "BCDFGHJKLMNPQRSTVWZYX";
    $digits = "0123456789";

    $message = strtoupper(readline("Enter an English message: "));

    $countv = $countc = $countd = 0;
    for ($i = 0; $i <= strlen($message) - 1; $i++) {
        $character = $message[$i];

        if (strpos($vowels, $character) !== false) { //If character is found in vowels
            $countv++;
        }
    }

```



```
    elseif (strpos($consonants, $character) !== false) { //If character is found in consonants
        $countc++;
    }
    elseif (strpos($digits, $character) !== false) { //If character is found in digits
        $countd++;
    }
}
echo "Vowels: ", $countv, "\n";
echo "Consonants: ", $countc, "\n";
echo "Digits: ", $countd, "\n";
?>
```

Chapter 27

27.3 Review Questions: True/False

- | | |
|----------|----------|
| 1. true | 6. false |
| 2. true | 7. true |
| 3. false | 8. true |
| 4. true | 9. true |
| 5. true | 10. true |

27.4 Review Questions: Multiple Choice

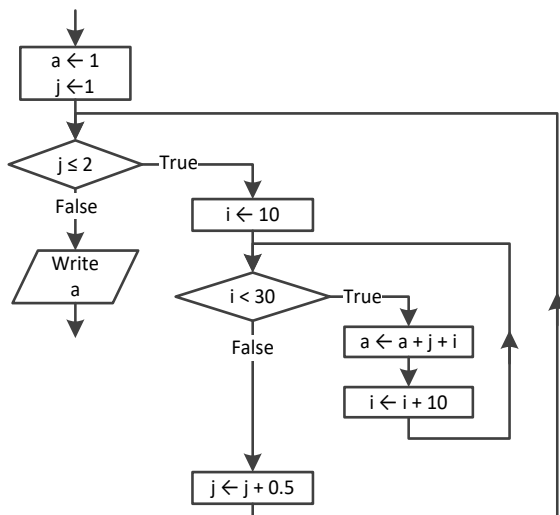
- | | |
|------|------|
| 1. b | 4. a |
| 2. a | 5. b |
| 3. c | |

27.5 Review Exercises

1. Solution

- 10
- A value greater than or equal to 4.5 and less than 5.0 ($4.5 \leq x < 5.0$)
- 7 (or -8)
- 138 (or 139)

2. Solution



Step	Statement	\$a	\$i	\$j
1	$\$a = 1$	1	?	?
2	$\$j = 1$	1	?	1
3	$\$j \leq 2$	true		
4	$\$i = 10$	1	10	1
5	$\$i < 30$	true		

6	$\$a = \$a + \$j + \i	12	10	1
7	$\$i += 10$	12	20	1
8	$\$i < 30$	true		
9	$\$a = \$a * \$j + \i	33	20	1
10	$\$i += 10$	33	30	1
11	$\$i < 30$	false		
12	$\$j += 0.5$	33	30	1.5
13	$\$j \leq 2$	true		
14	$\$i = 10$	33	10	1.5
15	$\$i < 30$	true		
16	$\$a = \$a + \$j + \i	44.5	10	1.5
17	$\$i += 10$	44.5	20	1.5
18	$\$i < 30$	true		
19	$\$a = \$a * \$j + \i	66	20	1.5
20	$\$i += 10$	66	30	1.5
21	$\$i < 30$	false		
22	$\$j += 0.5$	66	30	2
23	$\$j \leq 2$	true		
24	$\$i = 10$	66	10	2
25	$\$i < 30$	true		
26	$\$a = \$a + \$j + \i	78	10	2
27	$\$i += 10$	78	20	2
28	$\$i < 30$	true		
29	$\$a = \$a * \$j + \i	100	20	2
30	$\$i += 10$	100	30	2
31	$\$i < 30$	false		
32	$\$j += 0.5$	100	30	2.5
33	$\$j \leq 2$	false		
34	echo \$a	It displays: 100		

3. Solution

Step	Statement	\$s	\$i	\$j
1	$\$s = 0$	0	?	?
2	$\$i = 1$	0	1	?
3	$\$i \leq 4$	true		
4	$\$j = 3$	0	1	3
5	$\$j \geq \i	true		

6	<code>\$s = \$s + \$i * \$j</code>	3	1	3
7	<code>\$j--</code>	3	1	2
8	<code>\$j >= \$i</code>	true		
9	<code>\$s = \$s + \$i * \$j</code>	5	1	2
10	<code>\$j--</code>	5	1	1
11	<code>\$j >= \$i</code>	true		
12	<code>\$s = \$s + \$i * \$j</code>	6	1	1
13	<code>\$j--</code>	6	1	0
14	<code>\$j >= i</code>	false		
15	<code>\$i++</code>	6	2	0
16	<code>\$i <= 4</code>	true		
17	<code>\$j = 3</code>	6	2	3
18	<code>\$j >= \$i</code>	true		
19	<code>\$s = \$s + \$i * \$j</code>	12	2	3
20	<code>\$j--</code>	12	2	2
21	<code>\$j >= \$i</code>	true		
22	<code>\$s = \$s + \$i * \$j</code>	16	2	2
23	<code>\$j--</code>	16	2	1
24	<code>\$j >= \$i</code>	false		
25	<code>\$i++</code>	16	3	1
26	<code>\$i <= 4</code>	true		
27	<code>\$j = 3</code>	16	3	3
28	<code>\$j >= \$i</code>	true		
29	<code>\$s = \$s + \$i * \$j</code>	25	3	3
30	<code>\$j--</code>	25	3	2
31	<code>\$j >= \$i</code>	false		
32	<code>\$i++</code>	25	4	2
33	<code>\$i <= 4</code>	true		
34	<code>\$j = 3</code>	25	4	3
35	<code>\$j >= \$i</code>	false		
36	<code>\$i++</code>	25	5	3
37	<code>\$i <= 4</code>	false		
38	<code>echo \$s</code>	It displays: 25		

The statement `$s = $s + $i * $j` is executed 6 times

4. Solution

For input value of "NO"

Step	Statement	\$s	\$y	\$i	\$ans
1	<code>\$s = 1</code>	1	?	?	?
2	<code>\$y = 25</code>	1	25	?	?
3	<code>\$i = 1</code>	1	25	1	?
4	<code>\$i <= 3</code>	true			
5	<code>\$s = \$s + \$y</code>	26	25	1	?
6	<code>\$y -= 5</code>	26	20	1	?
7	<code>\$i++</code>	26	20	2	?
8	<code>\$i <= 3</code>	true			
9	<code>\$s = \$s + \$y</code>	46	20	2	?
10	<code>\$y -= 5</code>	46	15	2	?
11	<code>\$i++</code>	46	15	3	?
12	<code>\$i <= 3</code>	true			
13	<code>\$s = \$s + \$y</code>	61	15	3	?
14	<code>\$y -= 5</code>	61	10	3	?
15	<code>\$i++</code>	61	10	4	?
16	<code>\$i <= 3</code>	false			
17	<code>\$ans = readline()</code>	61	10	4	"NO"
18	<code>while (\$ans == "YES")</code>	false			
19	<code>echo \$s</code>	It displays: 61			

For input values of "YES", "NO"

Step	Statement	\$s	\$y	\$i	\$ans
1	<code>\$s = 1</code>	1	?	?	?
2	<code>\$y = 25</code>	1	25	?	?
3	<code>\$i = 1</code>	1	25	1	?
4	<code>\$i <= 3</code>	true			
5	<code>\$s = \$s + \$y</code>	26	25	1	?
6	<code>\$y -= 5</code>	26	20	1	?
7	<code>\$i++</code>	26	20	2	?
8	<code>\$i <= 3</code>	true			
9	<code>\$s = \$s + \$y</code>	46	20	2	?
10	<code>\$y -= 5</code>	46	15	2	?
11	<code>\$i++</code>	46	15	3	?
12	<code>\$i <= 3</code>	true			
13	<code>\$s = \$s + \$y</code>	61	15	3	?
14	<code>\$y -= 5</code>	61	10	3	?
15	<code>\$i++</code>	61	10	4	?

16	<code>\$i <= 3</code>	false			
17	<code>\$ans = readline()</code>	61	10	4	"YES"
18	<code>while (\$ans == "YES")</code>	true			
19	<code>\$i = 1</code>	61	10	1	"YES"
20	<code>\$i <= 3</code>	true			
21	<code>\$s = \$s + \$y</code>	71	10	1	"YES"
22	<code>\$y -= 5</code>	71	5	1	"YES"
23	<code>\$i++</code>	71	5	2	"YES"
24	<code>\$i <= 3</code>	true			
25	<code>\$s = \$s + \$y</code>	76	5	2	"YES"
26	<code>\$y -= 5</code>	76	0	2	"YES"
27	<code>\$i++</code>	76	0	3	"YES"
28	<code>\$i <= 3</code>	true			
29	<code>\$s = \$s + \$y</code>	76	0	3	"YES"
30	<code>\$y -= 5</code>	76	-5	3	"YES"
31	<code>\$i++</code>	76	-5	4	"YES"
32	<code>\$i <= 3</code>	false			
33	<code>\$ans = readline()</code>	76	-5	4	"NO"
34	<code>while (\$ans == "YES")</code>	false			
35	<code>echo \$s</code>	It displays: 76			

For input values of "YES", "YES", "NO"

Step	Statement	\$s	\$y	\$i	\$ans
1	<code>\$s = 1</code>	1	?	?	?
2	<code>\$y = 25</code>	1	25	?	?
3	<code>\$i = 1</code>	1	25	1	?
4	<code>\$i <= 3</code>	true			
5	<code>\$s = \$s + \$y</code>	26	25	1	?
6	<code>\$y -= 5</code>	26	20	1	?
7	<code>\$i++</code>	26	20	2	?
8	<code>\$i <= 3</code>	true			
9	<code>\$s = \$s + \$y</code>	46	20	2	?
10	<code>\$y -= 5</code>	46	15	2	?
11	<code>\$i++</code>	46	15	3	?
12	<code>\$i <= 3</code>	true			
13	<code>\$s = \$s + \$y</code>	61	15	3	?
14	<code>\$y -= 5</code>	61	10	3	?
15	<code>\$i++</code>	61	10	4	?

16	<code>\$i <= 3</code>	false			
17	<code>\$ans = readline()</code>	61	10	4	"YES"
18	<code>while (\$ans == "YES")</code>	true			
19	<code>\$i = 1</code>	61	10	1	"YES"
20	<code>\$i <= 3</code>	true			
21	<code>\$s = \$s + \$y</code>	71	10	1	"YES"
22	<code>\$y -= 5</code>	71	5	1	"YES"
23	<code>\$i++</code>	71	5	2	"YES"
24	<code>\$i <= 3</code>	true			
25	<code>\$s = \$s + \$y</code>	76	5	2	"YES"
26	<code>\$y -= 5</code>	76	0	2	"YES"
27	<code>\$i++</code>	76	0	3	"YES"
28	<code>\$i <= 3</code>	true			
29	<code>\$s = \$s + \$y</code>	76	0	3	"YES"
30	<code>\$y -= 5</code>	76	-5	3	"YES"
31	<code>\$i++</code>	76	-5	4	"YES"
32	<code>\$i <= 3</code>	false			
33	<code>\$ans = readline()</code>	76	-5	4	"YES"
34	<code>while (\$ans == "YES")</code>	true			
35	<code>\$i = 1</code>	76	-5	1	"YES"
36	<code>\$i <= 3</code>	true			
37	<code>\$s = \$s + \$y</code>	71	-5	1	"YES"
38	<code>\$y -= 5</code>	71	-10	1	"YES"
39	<code>\$i++</code>	71	-10	2	"YES"
40	<code>\$i <= 3</code>	true			
41	<code>\$s = \$s + \$y</code>	61	-10	2	"YES"
42	<code>\$y -= 5</code>	61	-15	2	"YES"
43	<code>\$i++</code>	61	-15	3	"YES"
44	<code>\$i <= 3</code>	true			
45	<code>\$s = \$s + \$y</code>	46	-15	3	"YES"
46	<code>\$y -= 5</code>	46	-20	3	"YES"
47	<code>\$i++</code>	46	-20	4	"YES"
48	<code>\$i <= 3</code>	false			
49	<code>\$ans = readline()</code>	46	-20	4	"NO"
50	<code>while (\$ans == "YES")</code>	false			
51	<code>echo \$s</code>	It displays: 46			

5. Solution

```
<?php
    for ($hour = 0; $hour <= 23; $hour++) {
        for ($minutes = 0; $minutes <= 59; $minutes++) {
            echo $hour, "\t", $minutes, "\n";
        }
    }
?>
```

6. Solution

```
<?php
    for ($i = 5; $i >= 1; $i--) {
        for ($j = 1; $j <= $i; $j++) {
            echo $i, " ";
        }
        echo "\n";
    }
?>
```

7. Solution

```
<?php
    for ($i = 0; $i <= 5; $i++) {
        for ($j = 0; $j <= $i; $j++) {
            echo $j, " ";
        }
        echo "\n";
    }
?>
```

8. Solution

```
<?php
    for ($i = 1; $i <= 4; $i++) {
        for ($j = 1; $j <= 10; $j++) {
            echo "* ";
        }
        echo "\n";
    }
?>
```

9. Solution

```
<?php
    $y = (int)readline("Enter an integer between 3 and 20: ");

    for ($i = 1; $i <= $y; $i++) {
        for ($j = 1; $j <= $y; $j++) {
            echo "* ";
        }
    }
```



```
    echo "\n";
}
?>
```

10. Solution

```
<?php
    $y = (int)readline("Enter an integer between 3 and 20: ");

    for ($j = 1; $j <= $y; $j++) {
        echo "* ";
    }
    echo "\n";

    for ($i = 1; $i <= $y - 2; $i++) {
        echo "* ";
        for ($j = 1; $j <= $y - 2; $j++) {
            echo " ";
        }
        echo "* \n";
    }

    for ($j = 1; $j <= $y; $j++) {
        echo "* ";
    }
?>
```

11. Solution

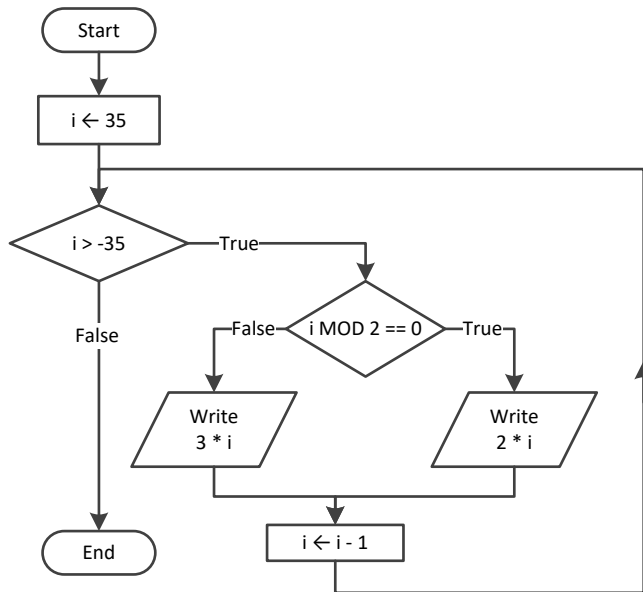
```
<?php
    for ($i = 1; $i <= 5; $i++) {
        for ($j = 1; $j <= $i; $j++) {
            echo "* ";
        }
        echo "\n";
    }

    for ($i = 4; $i >= 1; $i--) {
        for ($j = 1; $j <= $i; $j++) {
            echo "* ";
        }
        echo "\n";
    }
?>
```

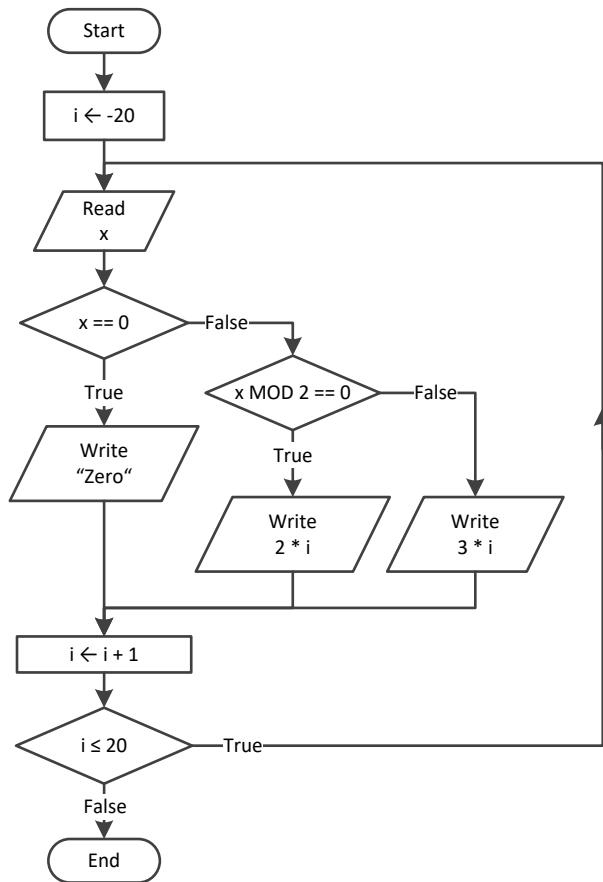
Chapter 28

28.4 Review Exercises

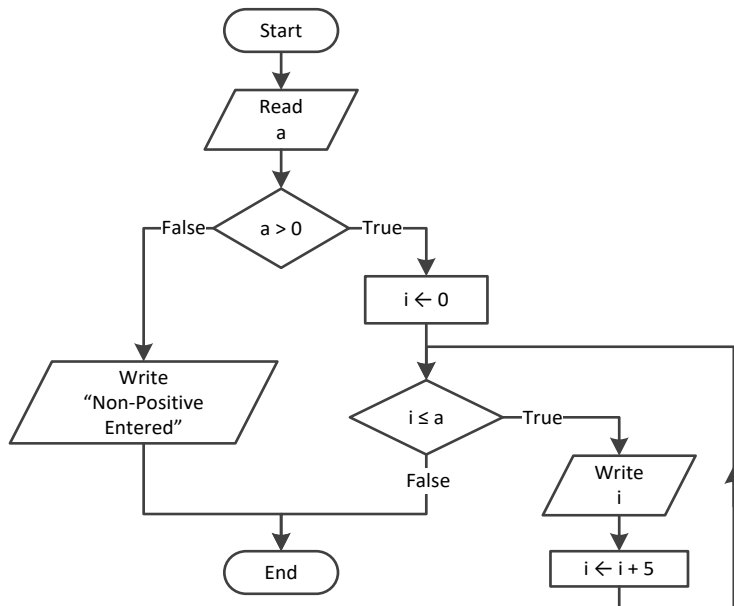
1. Solution



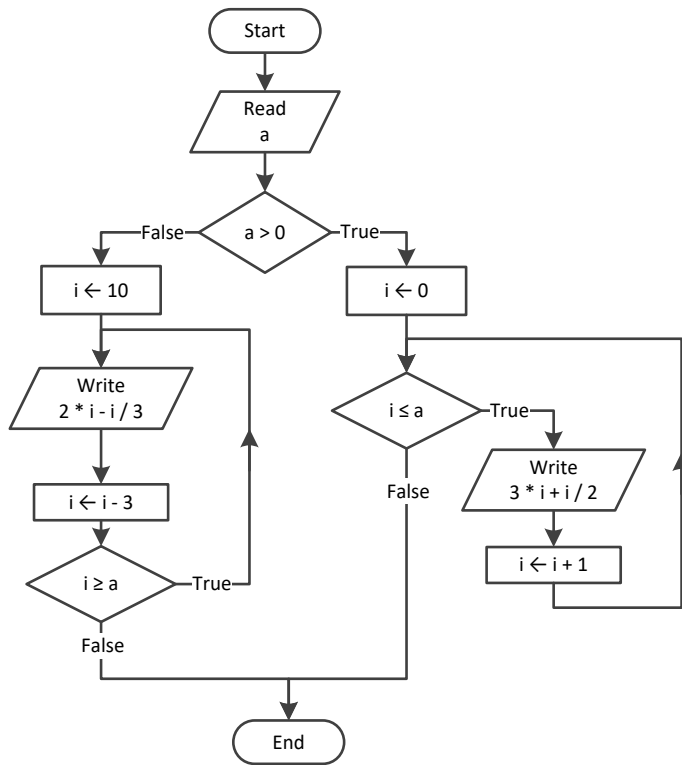
2. Solution



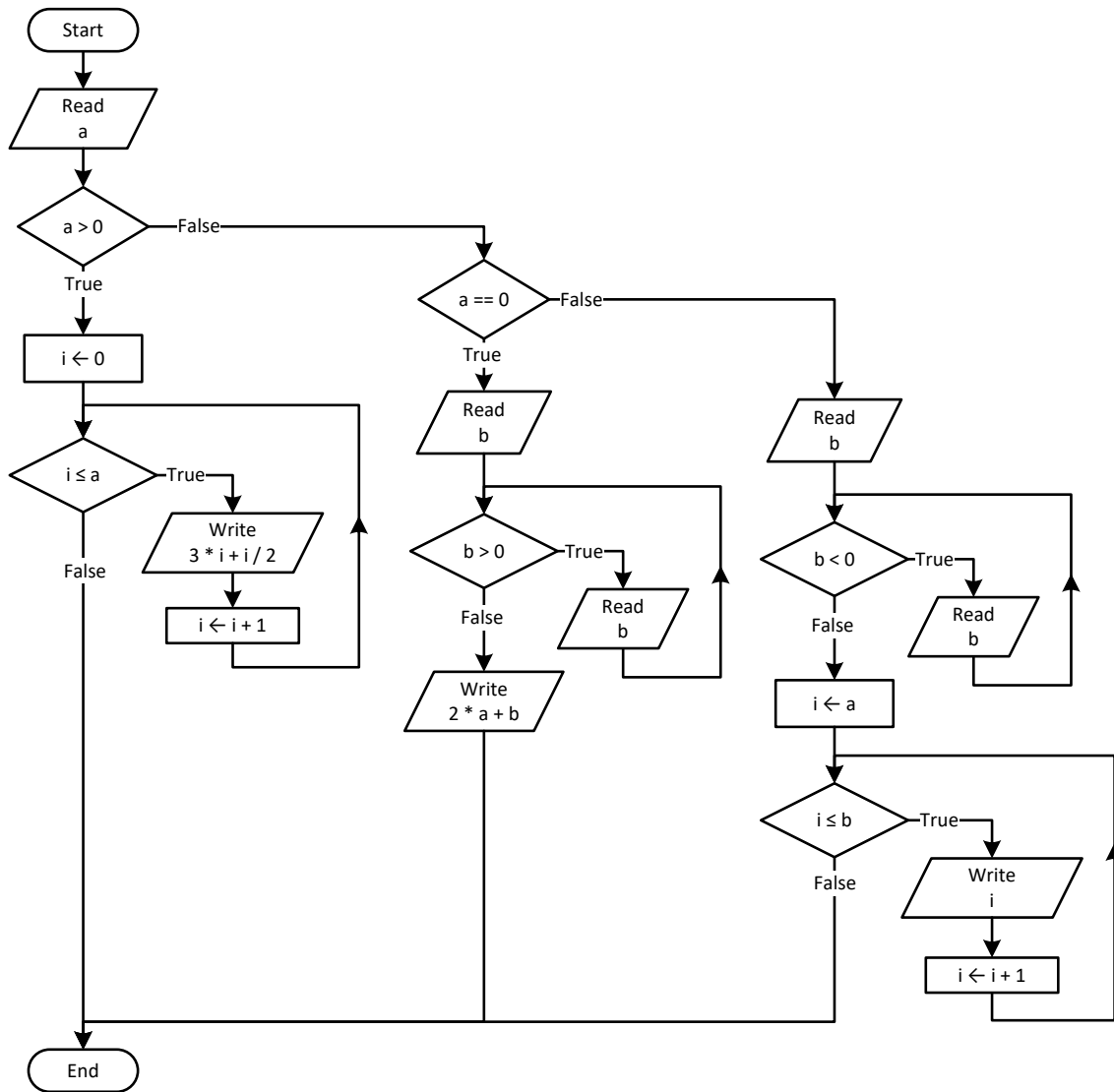
3. Solution

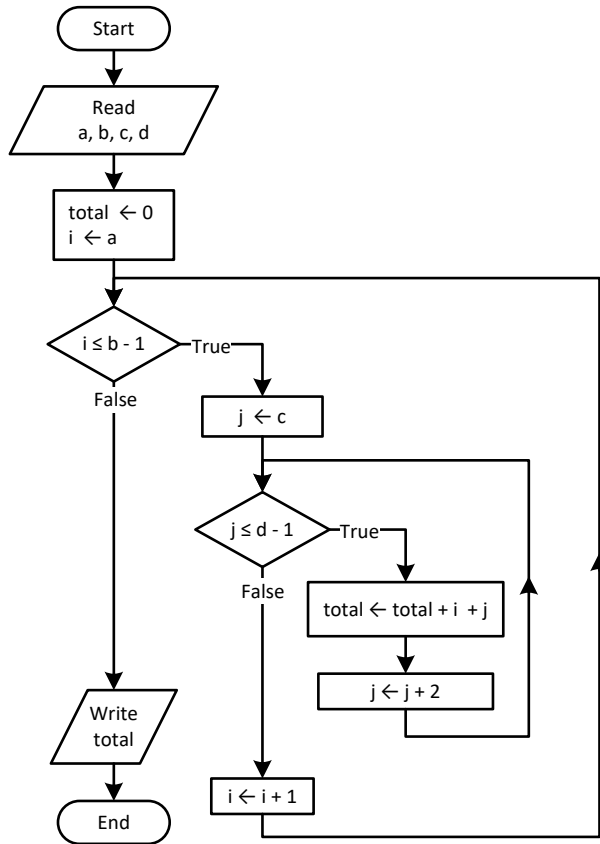


4. Solution

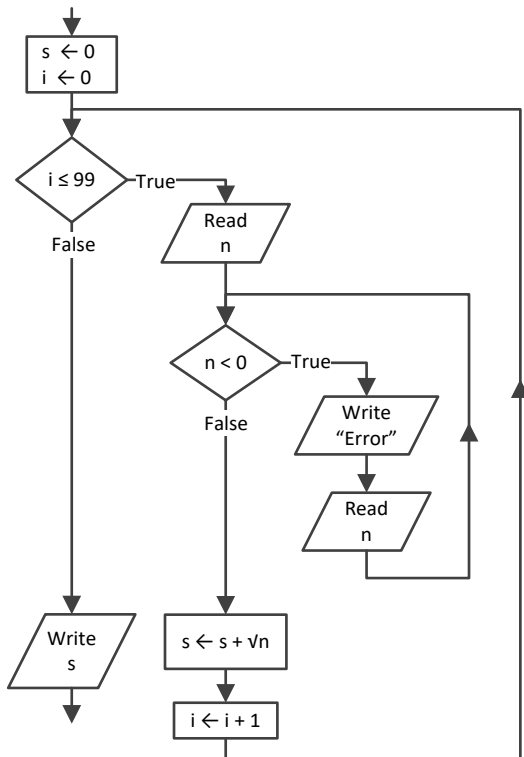


5. Solution

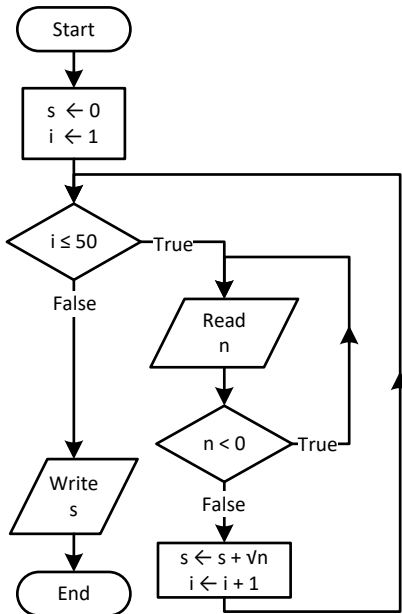


6. Solution

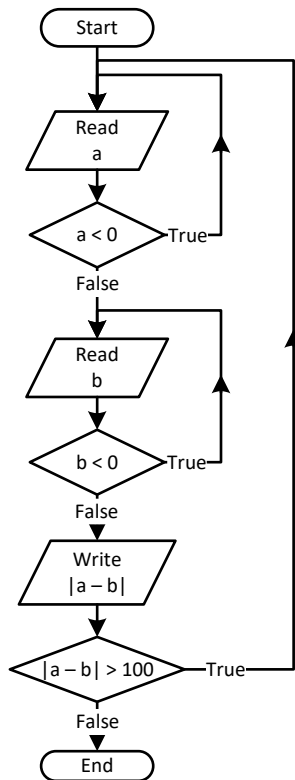
7. Solution



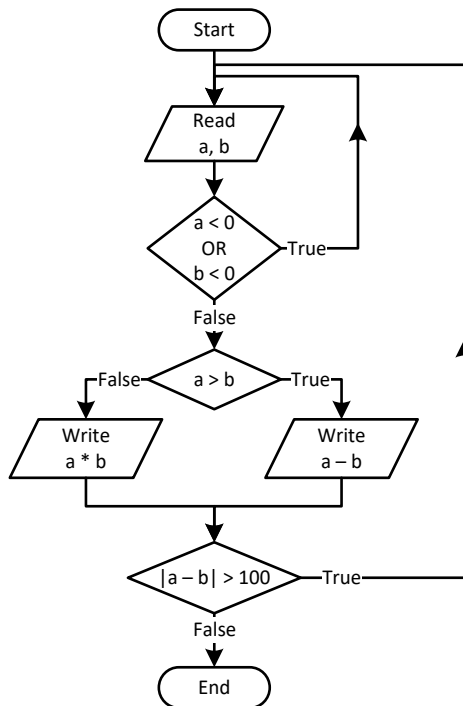
8. Solution



9. Solution



10. Solution



11. Solution

```
<?php
    $i = 0;
    $a = (int)readline();
    do {
        if ($i % 2 != 0) {
            echo $i;
        }
        $i += 5;
    } while ($i < $a);
?>
```

12. Solution

```
<?php
    $a = (int)readline();
    while ($a != -1) {
        do {
            $b = (int)readline();
        } while ($b <= $a);
        for ($i = $a; $i <= $b; $i++) {
            echo $i;
        }
        $a = (int)readline();
    }
?>
```

13. Solution

```
<?php
    $i = 1;
    $$ = 0;
    $P = 1;
    $a = 0;

    while (true) {
        if ($i < 45) {
            $$ += $a;
        }
        else {
            $P *= $a;
        }
        $i++;
        if ($i >= 90) break;
        $a = (float)readline();
    }

    echo $$, " ", $P;
?>
```

Chapter 29

29.8 Review Questions: True/False

- | | |
|----------|-----------|
| 1. false | 8. false |
| 2. false | 9. true |
| 3. false | 10. true |
| 4. true | 11. false |
| 5. true | 12. false |
| 6. false | 13. false |
| 7. false | 14. true |

29.9 Review Questions: Multiple Choice

- | | |
|------|------|
| 1. c | 5. c |
| 2. d | 6. c |
| 3. b | 7. c |
| 4. a | |

29.10 Review Exercises

1. Solution

```

$countNames = 0;
$countNotJohns = 0;
$name = "";
$name = readline("Enter a name: ");
while ($name != "STOP") {
    $name = readline("Enter a name: ");
    $countNames+= "John" {+};
    if ($name !
        $countNotJohns++;
    }
    $name = readline("Enter a name: ");
}
echo "Total names entered: ", $countNames, "\n";
echo "Names other than John entered: ", $countNotJohns, "\n";

```

2. Solution

First approach

```

<?php
$text = readline("Enter a text: ");

$found = false;
for ($i = 0; $i <= strlen($text) - 1; $i++) {
    $character = $text[$i];
    if ($character == " ") {
        $found = true;
        break;
    }
}

if (!$found) {

```

```

    echo "One Single Word\n";
}
else {
    echo "Complete Sentence\n";
}
?>

```

Second approach

```

<?php
$text = readline("Enter a text: ");

if (strpos($text, " ") !== false) {
    echo "Complete Sentence\n";
}
else {
    echo "One Single Word\n";
}
?>

```

3. Solution

First approach

```

<?php
$digits = "0123456789";

$sentence = readline("Enter a text: ");

$found = false;
for ($i = 0; $i <= strlen($sentence) - 1; $i++) {
    $character = $sentence[$i];
    if (strpos($digits, $character) !== false) {
        $found = true;
        break;
    }
}

if ($found) {
    echo "The sentence contains a number\n";
}
?>

```

Second approach

```

<?php
$sentence = readline("Enter a text: ");

$found = false;
for ($i = 0; $i <= 9; $i++) {
    $digit = $i;
    if (strpos($sentence, $digit) !== false) {
        $found = true;
        break;
    }
}

if ($found) {

```

```

    echo "The sentence contains a number\n";
}
?>

```

4. Solution

```

echo "Printing all integers from 1 to 100\n";
$i = 1;
while ($i < 101) {
    echo $i;
    $i++;
}

```

5. Solution

```

echo "Printing odd integers from 1 to 99\n";
$i = 1;
while ($i < 100) {
    echo $i;
    $i += 2;
}

```

6. Solution

```

$s = 0;
$i = 1;
$count = 100;
do {
    $number = (float)readline();
    $s = $s + $number;
    i++;
} while ($i <= $count);
$average = $s / $count;
echo $average;

```

7. Solution

```

$s = 0;

$denom = 1;
for ($i = 1; $i <= 100; $i++) {
    $denom *= $i;
}

for ($i = 1; $i <= 100; $i++) {
    $s += $i / $denom;
}
echo $s;

```

8. Solution

```

<?php
for ($i = 1; $i <= 4; $i++) {
    for ($j = 1; $j <= 4; $j++) {

```

```

        echo $i, " x ", $j, " = ", ($i * $j), "\n";
    }
}
?>

```

9. Solution

```

<?php
echo "\t|\t";
for ($i = 1; $i <= 12; $i++) {
    echo $i, "\t";
}
echo "\n";

for ($i = 1; $i <= 12; $i++) {
    echo "-----";
}
echo "\n";

for ($i = 1; $i <= 12; $i++) {
    echo $i, "\t|\t";
    for ($j = 1; $j <= 12; $j++) {
        echo $i * $j, "\t";
    }
    echo "\n";
}
?>

```

10. Solution

```

<?php
$n = (int)readline("Enter an integer: ");

echo "\t|\t";
for ($i = 1; $i <= $n; $i++) {
    echo $i, "\t";
}
echo "\n";

for ($i = 1; $i <= $n; $i++) {
    echo "-----";
}
echo "\n";

for ($i = 1; $i <= $n; $i++) {
    echo $i, "\t|\t";
    for ($j = 1; $j <= $n; $j++) {
        echo $i * $j, "\t";
    }
    echo "\n";
}
?>

```

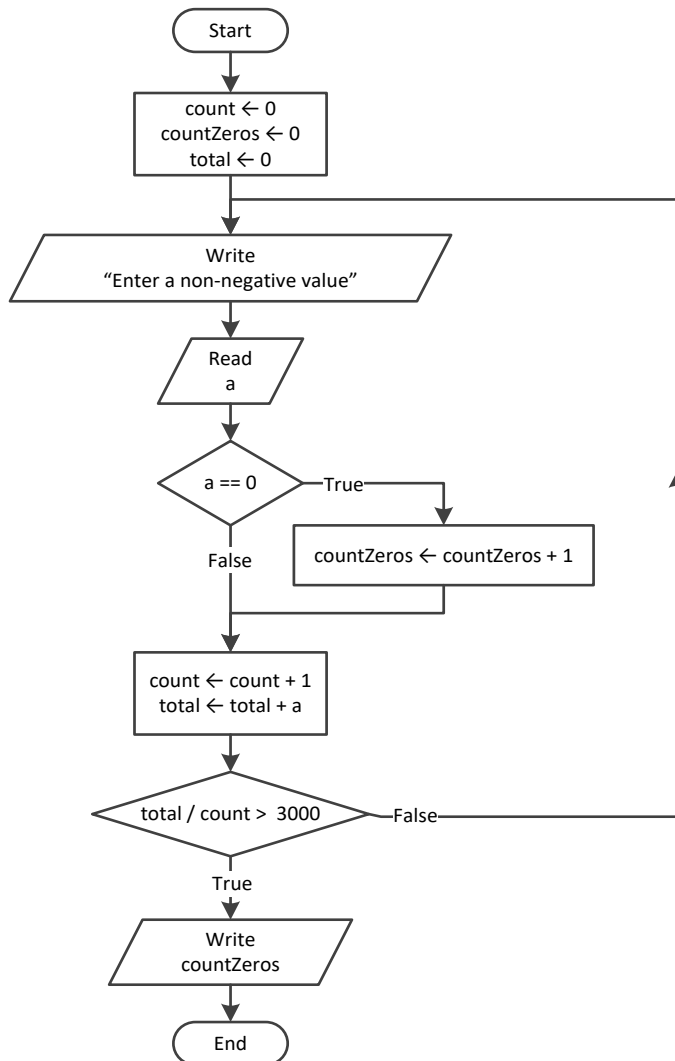
Chapter 30

30.7 Review Questions: True/False

- | | |
|----------|----------|
| 1. true | 5. false |
| 2. false | 6. false |
| 3. true | 7. true |
| 4. false | |

30.8 Review Exercises

1. Solution



```

<?php
$count = 0;
$countZeros = 0;
$total = 0;
do {
    $a = (float) readline("Enter a non-negative value: ");
    if ($a == 0) {

```

```

        $countZeros++;
    }
    $count++;
    $total += $a;
} while ($total / $count <= 3000);
echo $countZeros, "\n";
?>

```

2. Solution

First approach

```

<?php
$a = (int)readline("Enter an integer between 1 and 20: ");
for ($i = 1000; $i <= 9999; $i++) {
    $d4 = $i % 10;
    $r = (int)($i / 10);
    $d3 = $r % 10;
    $r = (int)($r / 10);
    $d2 = $r % 10;
    $d1 = (int)($r / 10);
    if ($d1 + $d2 + $d3 + $d4 < $a) {
        echo $i, "\n";
    }
}
?>

```

Second approach

```

<?php
$a = (int)readline("Enter an integer between 1 and 20: ");
for ($d1 = 1; $d1 <= 9; $d1++) {
    for ($d2 = 0; $d2 <= 9; $d2++) {
        for ($d3 = 0; $d3 <= 9; $d3++) {
            for ($d4 = 0; $d4 <= 9; $d4++) {
                if ($d1 + $d2 + $d3 + $d4 < $a) {
                    echo $d1 * 1000 + $d2 * 100 + $d3 * 10 + $d4, "\n";
                }
            }
        }
    }
}
?>

```

3. Solution

First approach

```

<?php
for ($i = 1000; $i <= 9999; $i++) {
    $d4 = $i % 10;
    $r = (int)($i / 10);
    $d3 = $r % 10;
    $r = (int)($r / 10);
    $d2 = $r % 10;

```

```

    $d1 = (int)($r / 10);
    if ($d1 > $d2 && $d2 == $d3 && $d3 < $d4) {
        echo $i, "\n";
    }
}
?>

```

Second approach

```

<?php
for ($d1 = 1; $d1 <= 9; $d1++) {
    for ($d2 = 0; $d2 <= 9; $d2++) {
        for ($d3 = 0; $d3 <= 9; $d3++) {
            for ($d4 = 0; $d4 <= 9; $d4++) {
                if ($d1 > $d2 && $d2 == $d3 && $d3 < $d4) {
                    echo $d1 * 1000 + $d2 * 100 + $d3 * 10 + $d4, "\n";
                }
            }
        }
    }
}
?>

```

4. Solution

First approach

```

<?php
$x = (int)readline("Enter an integer: ");

$count = 0;

while ($x != 0) {
    $count++;
    $x = (int)($x / 10);
}

echo $count, "\n";
?>

```

Second approach

```

<?php
$x = (int)readline("Enter an integer: ");

//Convert the absolute value of $x to string and get its length
$count = strlen((string)abs($x));
echo $count, "\n";
?>

```

5. Solution

```

$x = (int)readline();
while ($x != 1 && $x != 0) {
    echo "Error\n";
    $x = (int)readline();
}

```


6. Solution

```
do {
    $gender = strtoupper(readline());
} while ($gender != "M" && $gender != "F" && $gender != "O");
```

7. Solution

```
<?php
    $x = (float)readline("Enter a non-negative number: ");
    $count = 0;
    while ($x < 0) {
        $count++;
        if ($count == 2) break;

        echo "Error: Invalid number!\n";
        $x = (float)readline("Enter a non-negative number: ");
    }

    if ($count < 2) {
        $y = sqrt($x);
        echo $y, "\n";
    }
    else {
        echo "Dude, you are dumb!\n";
    }
?>
```

8. Solution

```
<?php
    do {
        $r = (float)readline("Enter the length of a radius: ");
        while ($r <= 0) {
            $r = (float)readline("Invalid radius. Enter the length of a radius: ");
        }

        $area = pi() * $r ** 2;
        echo "The area is: ", $area, "\n";

        $answer = readline("Would you like to repeat? ");
    } while (strtoupper($answer) == "YES");
?>
```

9. Solution

```
<?php
    $maximum = -460;
    $total = 0;
    for ($i = 1; $i <= 31; $i++) {
        $t = (float)readline("Enter temperature for day " . $i . ": ");
        while ($t < -459.67) {
```

```

    echo "Error! Wrong temperature.\n";
    $t = (float)readline("Enter temperature for day " . $i . ": ");
}

$total += $t;
if ($t > $maximum) {
    $maximum = $t;
}
}

echo $total / 31, " ", $maximum, "\n";
?>

```

10. Solution

```

<?php
$level = (float)readline();
if ($level != 9999) {
    $hour = (int)readline();
    $minutes = (int)readline();

    $maximum = $level;
    $maxHour = $hour;
    $maxMinutes = $minutes;

    $minimum = $level;
    $minHour = $hour;
    $minMinutes = $minutes;

    $level = (float)readline();
    while ($level != 9999) {
        $hour = (int)readline();
        $minutes = (int)readline();

        if ($level > $maximum) {
            $maximum = $level;
            $maxHour = $hour;
            $maxMinutes = $minutes;
        }

        if ($level < $minimum) {
            $minimum = $level;
            $minHour = $hour;
            $minMinutes = $minutes;
        }

        $level = (float)readline();
    }

    echo $maximum, ", ", $maxHour, ", ", $maxMinutes, "\n";
    echo $minimum, ", ", $minHour, ", ", $minMinutes, "\n";
}
?>

```

11. Solution

```

<?php
    $number = (int)readline("Enter an integer: ");

    do {
        $total = 0;
        while ($number > 0) {
            $total += $number % 10;
            $number = (int)($number / 10);
        }

        if ($total > 26) {
            $number = $total;
        }
    } while ($total > 26);

    $alphabet = "ABCDEFGHIJKLMNOPQRSTUVWXYZ";
    echo "The name of the person who might be thinking ";
    echo "of you starts with a(an): ", $alphabet[$total - 1], "\n";
?>

```

12. Solution

```

<?php
    for ($x = -100; $x <= 100; $x++) {
        for ($y = -100; $y <= 100; $y++) {
            if (5 * $x + 3 * $y ** 2 == 0) {
                echo $x, ", ", $y, "\n";
            }
        }
    }
?>

```

13. Solution

```

<?php
    for ($x = -10; $x <= 10; $x++) {
        for ($y = -10; $y <= 10; $y++) {
            for ($z = -10; $z <= 10; $z++) {
                if (($x + $y) / 2.0 + 3.0 * $z ** 2 / ($x + 3 * $y + 45) == $x / 3.0) {
                    echo $x, ", ", $y, ", ", $z, "\n";
                }
            }
        }
    }
?>

```

14. Solution

```

<?php
    $m1 = (int)readline();

```

```

$m2 = (int)readline();
$m3 = (int)readline();

$s = 0;
while ($m2 != 0) {
    if ($m2 % 2 != 0) {
        $s += $m1;
    }
    $m1 *= 2;
    $m2 = (int)($m2 / 2);
}

$m1 = $s;
$m2 = $m3;

$s = 0;
while ($m2 != 0) {
    if ($m2 % 2 != 0) {
        $s += $m1;
    }
    $m1 *= 2;
    $m2 = (int)($m2 / 2);
}

echo $s, "\n";
?>

```

15. Solution

```

<?php
$a = (float)readline();
while ($a <= 0 || $a != (int)$a) {
    echo "Error! You must enter a positive integer\n";
    $a = (float)readline();
}
$x = (int)$a;

$numberOfDivisors = 2;
for ($i = 2; $i <= (int)($x / 2); $i++) {
    if ($x % $i == 0) {
        $numberOfDivisors++;
    }
}
echo $numberOfDivisors, "\n";
?>

```

16. Solution

```

<?php
$x = (int)readline("Enter an integer greater than 1: ");
while ($x <= 1) {
    echo "Error!\n";
    $x = (int)readline("Enter an integer greater than 1: ");
}

```

```

}

$numberOfDivisors = 2;
for ($i = 2; $i <= (int)($x / 2); $i++) {
    if ($x % $i == 0) {
        $numberOfDivisors++;
        break;
    }
}

if ($numberOfDivisors == 2) {
    echo "Number ", $x, " is prime\n";
}
?>

```

17. Solution

```

<?php
echo "Enter an positive integer: ";
$start = (int)readline();
echo "Enter a second positive integer: ";
$finish = (int)readline();

if ($start > $finish) {
    $c = $start;
    $start = $finish;
    $finish = $c;
}

for ($x = $start; $x <= $finish; $x++) {
    for ($y = $x; $y <= $finish; $y++) {
        $z = sqrt($x * $x + $y * $y);
        //If result is integer and less than or equal to finish, display x, y, z
        if ($z == (int)$z && $z <= $finish) {
            echo $x, " ", $y, " ", $z, "\n";
        }
    }
}
?>

```

18. Solution

```

<?php
$a = (int)readline("Enter an integer greater than 1: ");
while ($a < 2) {
    $a = (int)readline("Wrong number. Please enter an integer greater than 1: ");
}

$b = (int)readline("Enter a second integer greater than 1: ");
while ($b < 2) {
    $b = (int)readline("Wrong number. Please enter a second integer greater than 1: ");
}

```

```

if ($a > $b) {
    $c = $a;
    $a = $b;
    $b = $c;
}

for ($x = $a; $x <= $b; $x++) {
    $numberOfDivisors = 2;
    $i = 2;
    while ($i <= (int)($x / 2) && $numberOfDivisors == 2) {
        if ($x % $i == 0) {
            $numberOfDivisors++;
        }
        $i++;
    }
    if ($numberOfDivisors == 2) {
        echo "Number ", $x, " is prime\n";
    }
}
?>

```

19. Solution

```

<?php
echo "Enter a positive integer: ";
$y = (float)readline();
while ($y <= 0 || $y != (int)$y) {
    echo "Wrong number! Enter a positive integer: ";
    $y = (float)readline();
}
$x = (int)$y;

$total = 0;
for ($i = 1; $i <= $x - 1; $i++) {
    if ($x % $i == 0) {
        $total += $i;
    }
}

if ($total == $x) {
    echo "Number ", $x, " is a perfect number\n";
}
else {
    echo "Number ", $x, " is not a perfect number\n";
}
?>

```

20. Solution

```

<?php
echo "Enter a positive integer: ";
$y = (float)readline();

```

```

while ($y <= 0 || $y != (int)$y) {
    echo "Wrong number! Enter a positive integer: ";
    $y = (float)readline();
}
$a = (int)$y;

echo "Enter a second positive integer: ";
$y = (float)readline();
while ($y <= 0 || $y != (int)$y) {
    echo "Wrong number! Enter a second positive integer: ";
    $y = (float)readline();
}
$b = (int)$y;

if ($a > $b) {
    $c = $a;
    $a = $b;
    $b = $c;
}

for ($x = $a; $x <= $b + 1 - 1; $x++) {
    $total = 0;
    for ($j = 1; $j <= $x - 1; $j++) {
        if ($x % $j == 0) {
            $total += $j;
        }
    }

    if ($total == $x) {
        echo "Number ", $x, " is a perfect number\n";
    }
}
?>

```

21. Solution

```

<?php
$a = (int)readline("Enter a positive four-digit integer: ");
while ($a < 1000 || $a > 9999) {
    $a = (int)readline("Wrong number. Please enter a positive four-digit integer: ");
}

$b = (int)readline("Enter a second positive four-digit integer: ");
while ($b < 1000 || $b > 9999) {
    $b = (int)readline("Wrong number. Please enter a second positive four-digit integer: ");
}

if ($a > $b) {
    $c = $a;
    $a = $b;
    $b = $c;
}

```

```

for ($x = $a; $x <= $b; $x++) {
    $d4 = $x % 10;
    $r = (int)($x / 10);
    $d3 = $r % 10;
    $r = (int)($r / 10);
    $d2 = $r % 10;
    $d1 = (int)($r / 10);

    if ($d1 == $d4 && $d2 == $d3) {
        echo $x, "\n";
    }
}
?>

```

22. Solution

```

<?php
for ($i = 0; $i <= 30; $i++) {
    echo 2 ** $i, "\n";
}
?>

```

23. Solution

```

<?php
$offset = 10;
$i = 1;
while ($i <= 401) {
    echo $i, "\n";
    $i += $offset;
    $offset += 2;
}
?>

```

24. Solution

```

<?php
for ($i = 1; $i <= 100; $i++) {
    echo -$i, "\n", $i, "\n";
}
?>

```

25. Solution

First approach

```

<?php
$value = 0;
for ($i = 1; $i <= 8; $i++) {
    $offset = 10 ** ($i - 1);
    $value += $offset;
    echo $value, "\n";
}

```



```
?>
```

Second approach

```
<?php
$value = "1";
for ($i = 1; $i <= 8; $i++) {
    echo $value, "\n";
    $value .= "1";
}
?>
```

26. Solution

```
<?php
$a = (int)readline();

$fibPrevious2 = 0;
$fibPrevious = 1;
$fib = 1;
for ($i = 1; $i <= $a; $i++) {
    echo $fibPrevious2, "\n";
    $fib = $fibPrevious + $fibPrevious2;
    $fibPrevious2 = $fibPrevious;
    $fibPrevious = $fib;
}
?>
```

27. Solution

```
<?php
$a = (int)readline();

$fibPrevPrev = 0;
$fibPrev = 1;
$fib = 1;
while ($fib < $a) {
    echo $fib, "\n";
    $fib = $fibPrev + $fibPrevPrev;
    $fibPrevPrev = $fibPrev;
    $fibPrev = $fib;
}
?>
```

28. Solution

```
<?php
$n = (int)readline("Enter a positive integer: ");
while ($n <= 0) {
    $n = (int)readline("Wrong number. Please enter a positive integer: ");
}

$nominator = 0;
for ($i = 2; $i <= 2 * $n; $i += 2) {
```

```

    $nominator += $i;
}

$denominator = 1;
for ($i = 1; $i <= $n; $i++) {
    $denominator *= $i;
}

$y = $nominator / $denominator;
echo $y, "\n";
?>

```

29. Solution

```

<?php
    $n = (int)readline("Enter a positive integer: ");
    while ($n <= 0) {
        $n = (int)readline("Wrong number. Please enter a positive integer: ");
    }

    $nominator = 0;
    $sign = 1;
    for ($i = 1; $i <= 2 * $n + 1; $i += 2) {
        $nominator += $sign * $i;
        $sign = -$sign;
    }

    $y = $nominator / $n;
    echo $y, "\n";
?>

```

30. Solution

```

<?php
    $n = (int)readline("Enter an integer greater than 2: ");
    while ($n <= 2) {
        $n = (int)readline("Wrong number. Please enter an integer greater than 2: ");
    }

    $y = 0.5; //This is equal to the first two terms: 1 - 1 / 2

    $sign = 1;
    for ($i = 3; $i <= $n; $i += 2) {
        $y += $sign / $i;
        $sign = -$sign;
    }

    echo $y, "\n";
?>

```

31. Solution

```

<?php

```

```

$n = (int)readline("Enter a positive integer: ");
while ($n <= 0) {
    $n = (int)readline("Wrong number. Please enter a positive integer: ");
}

$y = 0;
for ($i = 1; $i <= $n; $i++) {
    $y += 1 / $i ** ($n - $i + 1);
}

echo $y, "\n";
?>

```

32. Solution


```

<?php
$n = (int)readline("Enter a non-negative integer: ");

$factorial = 1;
for ($i = 1; $i <= $n; $i++) {
    $factorial *= $i;
}

echo $factorial, "\n";
?>

```

 Please note that this code operates properly for all non-negative integers, including zero.

33. Solution

First approach

```

<?php
define("ACCURACY", 0.00001);

$x = (float)readline();

$exponential = 0;
$i = 0;
do {
    $exponentialPrevious = $exponential;

    $factorial = 1;
    for ($j = 1; $j <= $i; $j++) {
        $factorial *= $j;
    }

    $exponential += $x ** $i / $factorial;

    $i++;
} while (abs($exponential - $exponentialPrevious) > ACCURACY);

echo "e(", $x, ") ~= ", $exponential, "\n";
?>

```

Second approach

```

<?php
    define("ACCURACY", 0.00001);

    $x = (float)readline();

    $exponential = 1;
    $i = 1;
    $factorial = 1;
    do {
        $exponentialPrevious = $exponential;

        $factorial *= $i;

        $exponential += $x ** $i / $factorial;

        $i++;
    } while (abs($exponential - $exponentialPrevious) > ACCURACY);

    echo "e(", $x, ") ~= ", $exponential, "\n";
?>

```

34. Solution**First approach**

```

<?php
    define("ACCURACY", 0.00001);

    $x = (float)readline();

    $sign = 1;
    $sinus = 0;
    $i = 1;
    do {
        $sinusPrevious = $sinus;

        $factorial = 1;
        for ($j = 1; $j <= $i; $j++) {
            $factorial *= $j;
        }

        $sinus += $sign * $x ** $i / $factorial;

        $sign = -$sign;
        $i += 2;
    } while (abs($sinus - $sinusPrevious) > ACCURACY);

    echo "sin(", $x, ") ~= ", $sinus, "\n";
?>

```

Second approach

```

<?php
    define("ACCURACY", 0.00001);

    $x = (float)readline();

```

```

$sign = -1;
$sinus = $x;
$i = 3;
$factorial = 1;
do {
    $sinusPrevious = $sinus;

    $factorial *= $i * ($i - 1);

    $sinus += $sign * $x ** $i / $factorial;

    $sign = -$sign;
    $i += 2;
} while (abs($sinus - $sinusPrevious) > ACCURACY);

echo "sin(", $x, ") ~= ", $sinus, "\n";
?>

```

35. Solution

First approach

```

<?php
define("ACCURACY", 0.00001);

$x = (float)readline();

$sign = 1;
$cosinus = 0;
$i = 0;
do {
    $cosinusPrevious = $cosinus;

    $factorial = 1;
    for ($j = 1; $j <= $i; $j++) {
        $factorial *= $j;
    }

    $cosinus += $sign * $x ** $i / $factorial;

    $sign = -$sign;
    $i += 2;
} while (abs($cosinus - $cosinusPrevious) > ACCURACY);

echo "cos(", $x, ") ~= ", $cosinus, "\n";
?>

```

Second approach

```

<?php
define("ACCURACY", 0.00001);

$x = (float)readline();

$sign = -1;
$cosinus = 1;

```

```

$i = 2;
$factorial = 1;
do {
    $cosinusPrevious = $cosinus;

    $factorial *= $i * ($i - 1);

    $cosinus += $sign * $x ** $i / $factorial;

    $sign = -$sign;
    $i += 2;
} while (abs($cosinus - $cosinusPrevious) > ACCURACY);

echo "cos(", $x, ") ~= ", $cosinus, "\n";
?>

```

36. Solution

```

<?php
$alphabet = "abcdefghijklmnopqrstuvwxyz";

do {
    $a = (int)readline("Enter an integer between 1 and 26: ");

    $failure = false;
    if ($a < 1) {
        echo "Please enter positive integers!\n";
        $failure = true;
    }
    elseif ($a > 26) {
        echo "Please enter a value less than or equal to 26!\n";
        $failure = true;
    }
} while ($failure);

do {
    $b = (int)readline("Enter an integer between 1 and 26: ");

    $failure = false;
    if ($b < 1) {
        echo "Please enter positive integers!\n";
        $failure = true;
    }
    elseif ($b > 26) {
        echo "Please enter a value less than or equal to 26!\n";
        $failure = true;
    }
} while ($failure);

if ($a > $b) {
    $c = $a;
    $a = $b;
    $b = $c;
}

```

```

}
for ($i = $a; $i <= $b; $i++) {
    echo $alphabet[$i - 1];
}
?>

```

37. Solution

```

<?php
    $secretNumber = rand(1, 100);

    $attempts = 1;
    $guess = (int)readline("Enter a guess: ");
    while ($guess != $secretNumber) {
        if ($guess > $secretNumber) {
            echo "Your guess is bigger than my secret number. Try again.\n";
        }
        else {
            echo "Your guess is smaller than my secret number. Try again.\n";
        }
        $attempts++;
        $guess = (int)readline("Enter a guess: ");
    }
    echo "You found it!\n";
    echo "Attempts: ", $attempts, "\n";
?>

```

38. Solution

```

<?php
    $attempts = 0;
    $firstPlayerAttempts = 0;

    for ($i = 1; $i <= 2; $i++) {
        $secretNumber = rand(1, 100);

        $attempts = 1;
        $guess = (int)readline("Enter a guess: ");
        while ($guess != $secretNumber) {
            if ($guess > $secretNumber) {
                echo "Your guess is bigger than my secret number. Try again.\n";
            }
            else {
                echo "Your guess is smaller than my secret number. Try again.\n";
            }
            $attempts++;
            $guess = (int)readline("Enter a guess: ");
        }
        echo "You found it!\n";
        echo "Attempts: ", $attempts, "\n";

        if ($i == 1) {

```

```

    $firstPlayerAttempts = $attempts;
}
}

if ($firstPlayerAttempts < $attempts) {
    echo "First player wins!\n";
}
elseif ($firstPlayerAttempts > $attempts) {
    echo "Second player wins!\n";
}
else {
    echo "It's a draw\n";
}
?>

```

39. Solution

```

<?php
do {
    echo "1. 4/3 TV Screen\n";
    echo "2. 16/9 TV Screen\n";
    echo "3. Exit\n";
    $choice = (int)readline("Enter a choice: ");

    if ($choice == 1) {
        $diagonal = (int)readline("Enter diagonal: ");
        echo "Width: ", ($diagonal * 0.8), "\n";
        echo "Height: ", ($diagonal * 0.6), "\n";
    }
    elseif ($choice == 2) {
        $diagonal = (int)readline("Enter diagonal: ");
        echo "Width: ", ($diagonal * 0.87), "\n";
        echo "Height: ", ($diagonal * 0.49), "\n";
    }
} while ($choice != 3);
?>

```

40. Solution

```

<?php
$n = (int)readline("Enter total number of students: ");
while ($n <= 0) {
    $n = (int)readline("Wrong number. Please enter total number of students: ");
}

$total = 0;
$totalA = 0;
$countA = 0;
$totalB = 0;
$countB = 0;
$totalABoys = 0;
$countABoys = 0;

```



```
$countCdefGirls = 0;

$maximum = -1;
$minimum = 101;

for ($i = 1; $i <= $n; $i++) {
    $grade = (int)readline("Enter grade for student No " . $i . ": ");
    while ($grade < 0 || $grade > 100) {
        $grade = (int)readline("Wrong grade. Please enter grade for student No " . $i . ": ");
    }

    $gender = strtoupper(readline("Enter gender for student No " . $i . ": "));
    while ($gender != "M" && $gender != "F" && $gender != "O") {
        $gender = strtoupper(readline("Wrong gender. Please enter gender for student No " . $i . ": "));
    }

    if ($grade >= 90 && $grade <= 100) {
        $totalA += $grade;
        $countA++;
        if ($gender == "M") {
            $totalABoys += $grade;
            $countABoys++;
        }
    }
    elseif ($grade >= 80 && $grade <= 89) {
        $totalB += $grade;
        $countB++;
    }
    else {
        if ($gender == "F") {
            $countCdefGirls++;
        }
    }

    if ($grade > $maximum) {
        $maximum = $grade;
    }

    if ($grade < $minimum) {
        $minimum = $grade;
    }

    $total += $grade;
}

if ($countA > 0) {
    echo "The average value of those who got an 'A' is: ";
    echo $totalA / $countA, "\n";
}
if ($countB > 0) {
    echo "The average value of those who got a 'B' is: ";
    echo $totalB / $countB, "\n";
}
```

```

if ($countABoys > 0) {
    echo "The average value of boys who got an 'A' is: ";
    echo $totalABoys / $countABoys, "\n";
}
echo "The total number of girls that got less than 'B' is: ", $countCdefGirls, "\n";
echo "The highest grade is: ", $maximum, "\n";
echo "The lowest grade is: ", $minimum, "\n";
echo "The average grade of the whole class is: ", $total / $n, "\n";
?>

```

41. Solution

```

<?php
do {
    $amount = (float)readline("Enter amount: ");
    while ($amount <= 0) {
        $amount = (float)readline("Wrong amount. Please enter amount: ");
    }

    if ($amount < 20) {
        $discount = 0;
    }
    elseif ($amount < 50) {
        $discount = 3;
    }
    elseif ($amount < 100) {
        $discount = 5;
    }
    else {
        $discount = 10;
    }

    echo "Discount: ", $discount, "%\n";
    echo "Amount to pay (discount included): ", ($amount - $amount * $discount / 100), "\n";

    $answer = strtoupper(readline("Would you like to repeat? "));
} while ($answer == "YES");
?>

```

42. Solution

```

<?php
define("TAX_RATE", 0.25);

$kwh = (int)readline("Enter number of Kilowatt-hours consumed: ");
while ($kwh < 0 && $kwh != -1) {
    $kwh = (int)readline("Wrong value. Please enter number of Kilowatt-hours consumed: ");
}

while ($kwh != -1) {
    if ($kwh <= 400) {
        $t = $kwh * 0.11;
    }
}

```

```
    elseif ($kwh <= 1500) {
        $t = 400 * 0.11 + ($kwh - 400) * 0.22;
    }
    elseif ($kwh <= 3500) {
        $t = 400 * 0.11 + 1100 * 0.22 + ($kwh - 1500) * 0.25;
    }
    else {
        $t = 400 * 0.11 + 1100 * 0.22 + 2000 * 0.25 + ($kwh - 3500) * 0.50;
    }

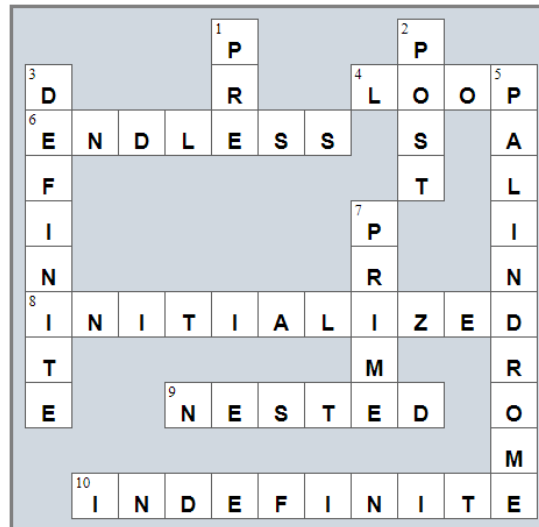
    $t += $t * TAX_RATE;
    echo "Total amount to pay (taxes included): ", $t, "\n";

    $kwh = (int)readline("Enter number of Kilowatt-hours consumed: ");
    while ($kwh < 0 && $kwh != -1) {
        $kwh = (int)readline("Wrong value. Please enter number of Kilowatt-hours consumed: ");
    }
}
?>
```

Review in "Loop Control Structures"

Review Crossword Puzzle

1.



Chapter 31

31.13 Review Questions: True/False

1. true
2. true
3. false
4. false
5. false
6. true
7. false
8. true
9. false
10. true
11. true
12. true
13. false
14. false
15. false
16. true
17. false
18. true
19. true
20. false
21. true
22. false
23. true
24. false
25. true
26. false
27. false
28. true
29. false
30. true
31. true
32. false
33. false
34. true
35. true
36. true
37. false
38. false
39. true

31.14 Review Questions: Multiple Choice

1. b
2. a
3. c
4. b
5. d
6. b
7. d
8. d
9. c
10. a
11. b
12. a
13. b
14. b

31.15 Review Exercises

1. Solution

$\$weights =$	170	0	}	<i>People</i>
	190	1		
	193	2		
	165	3		
	200	4		

2. Solution

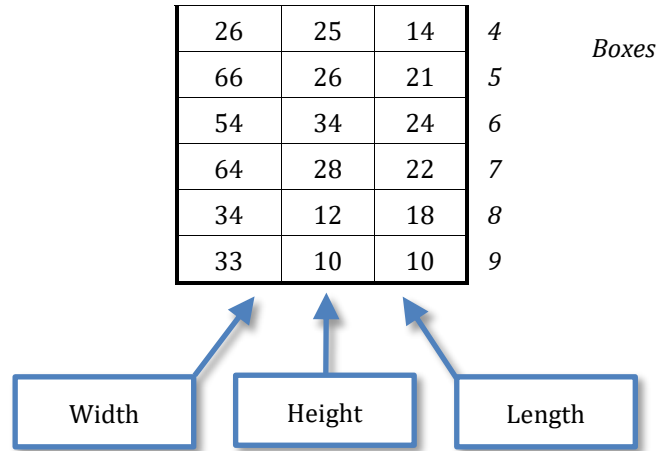
$\$names =$	John Thompson		}	<i>People</i>
	Chloe Brown			
	Ryan Miller			
	Antony Harris			
	Alexander Lewis			
	Samantha Clark			
	Ava Parker			
$\$weights =$	170	0	}	<i>People</i>
	190	1		
	193	2		
	165	3		
	200	4		
	170	5		
	172	6		

3. Solution

$\$names =$	Toba		}	<i>Lakes</i>		
	Issyk Kul					
	Baikal					
	Crater					
	Karakul					
$\$areas =$	<i>Months</i>			}	<i>Lakes</i>	
	0 1 2					
	440	438	437			0
	2408	2405	2402			1
	12248	12247	12240			2
21	20	18	3			
150	145	142	4			
June	July	August				

4. Solution

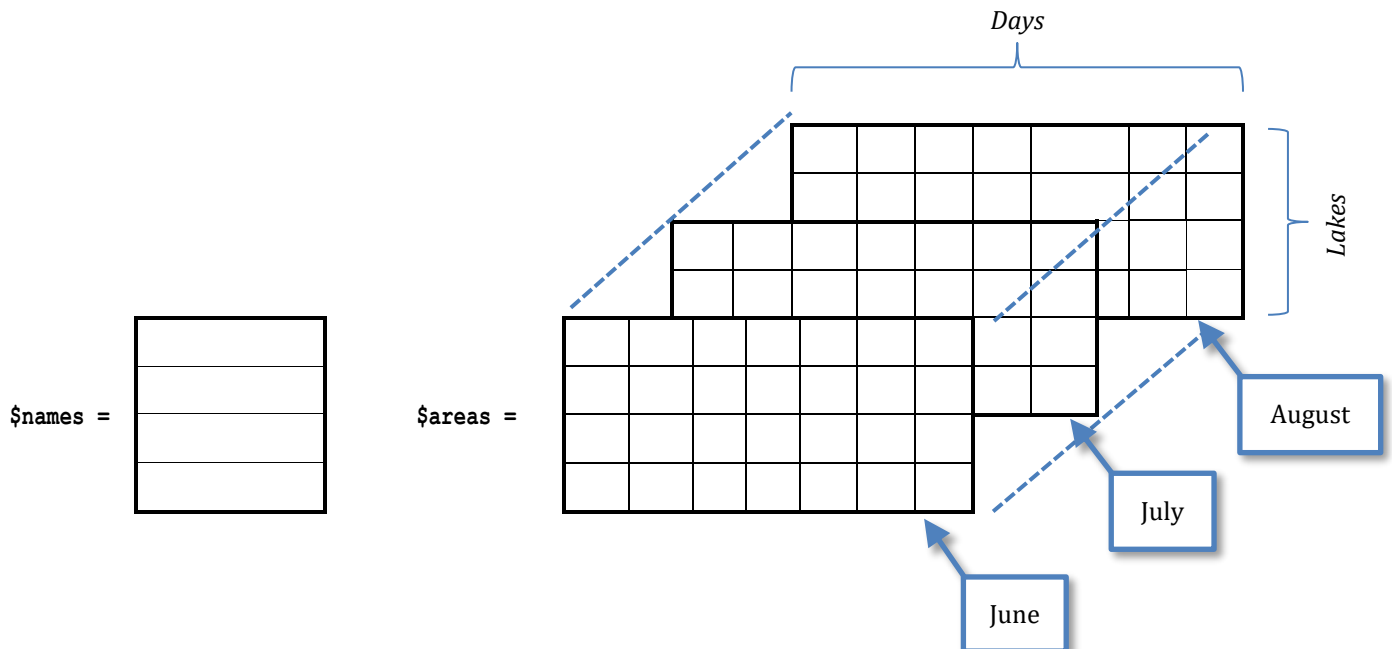
$\$boxes =$	<i>Dimensions</i>			}	
	0 1 2				
	10	31	15		0
	15	12	17		1
	22	10	18		2
22	20	12	3		



5. *Solution*

\$names =	Toba	\$areas =	440	\$depths =	1660	0	}	<i>Lakes</i>
	Issyk Kul		2408		2192	1		
	Baikal		12248		5380	2		
	Crater		21		1950	3		
	Karakul		150		750	4		
	Quesnel		103		2000	5		
	Urmia		2317		52	6		
	Albert		2045		190	7		

6. *Solution*



7. Solution

Step	Statement	\$x	\$a[0]	\$a[1]	\$a[2]
1	\$a = []	?	?	?	?
2	\$a[2] = 1	?	?	?	1
3	\$x = 0	0	?	?	1
4	\$a[\$x + \$a[2]] = 4	0	?	4	1
5	\$a[\$x] = \$a[\$x + 1] * 4	0	16	4	1

8. Solution

Step	Statement	\$x	\$a[0]	\$a[1]	\$a[2]	\$a[3]	\$a[4]
1	\$a = []	?	?	?	?	?	?
2	\$a[1] = 5	?	?	5	?	?	?
3	\$x = 0	0	?	5	?	?	?
4	\$a[\$x] = 4	0	4	5	?	?	?
5	\$a[\$a[0]] = \$a[\$x + 1] % 3	0	4	5	?	?	2
6	\$a[\$a[0] / 2] = 10	0	4	5	10	?	2
7	\$x += 2	2	4	5	10	?	2
8	\$a[\$x + 1] = \$a[\$x] + 9	2	4	5	10	19	2

9. Solution

For input value of 3

Step	Statement	\$x	\$a[0]	\$a[1]	\$a[2]	\$a[3]
1	\$a = []	?	?	?	?	?
2	\$a[1] = (int)readline()	?	?	3	?	?
3	\$x = 0	0	?	3	?	?
4	\$a[\$x] = 3	0	3	3	?	?
5	\$a[\$a[0]] = \$a[\$x + 1] % 2	0	3	3	?	1
6	\$a[\$a[0] % 2] = 10	0	3	10	?	1
7	\$x++	1	3	10	?	1
8	\$a[\$x + 1] = \$a[\$x] + 9	1	3	10	19	1

For input value of 4

Step	Statement	\$x	\$a[0]	\$a[1]	\$a[2]	\$a[3]
1	\$a = []	?	?	?	?	?
2	\$a[1] = (int)readline()	?	?	4	?	?
3	\$x = 0	0	?	4	?	?
4	\$a[\$x] = 3	0	3	4	?	?

5	$\$a[\$a[0]] = \$a[\$x + 1] \% 2$	0	3	4	?	0
6	$\$a[\$a[0] \% 2] = 10$	0	3	10	?	0
7	$\$x++$	1	3	10	?	0
8	$\$a[\$x + 1] = \$a[\$x] + 9$	1	3	10	19	0

For input value of 1

Step	Statement	$\$x$	$\$a[0]$	$\$a[1]$	$\$a[2]$	$\$a[3]$
1	$\$a = []$?	?	?	?	?
2	$\$a[1] = (\text{int})\text{readline}()$?	?	1	?	?
3	$\$x = 0$	0	?	1	?	?
4	$\$a[\$x] = 3$	0	3	1	?	?
5	$\$a[\$a[0]] = \$a[\$x + 1] \% 2$	0	3	1	?	3
6	$\$a[\$a[0] \% 2] = 10$	0	3	10	?	3
7	$\$x++$	1	3	10	?	3
8	$\$a[\$x + 1] = \$a[\$x] + 9$	1	3	10	19	3

10. Solution

For input value of 100

Step	Statement	$\$x$	$\$a[0]$	$\$a[1]$	$\$a[2]$	$\$a[3]$
1	$\$a = []$?	?	?	?	?
2	$\$a[1] = (\text{int})\text{readline}()$?	?	100	?	?
3	$\$x = 0$	0	?	100	?	?
4	$\$a[\$x] = 3$	0	3	100	?	?
5	$\$a[\$a[0]] = \$a[\$x + 1] \% 10$	0	3	100	?	0
6	$\text{if } (\$a[3] > 5)$	false				
7	$\$a[2] = 3$	0	3	100	3	0

For input value of 108

Step	Statement	$\$x$	$\$a[0]$	$\$a[1]$	$\$a[2]$	$\$a[3]$
1	$\$a = []$?	?	?	?	?
2	$\$a[1] = (\text{int})\text{readline}()$?	?	108	?	?
3	$\$x = 0$	0	?	108	?	?
4	$\$a[\$x] = 3$	0	3	108	?	?
5	$\$a[\$a[0]] = \$a[\$x + 1] \% 10$	0	3	108	?	8
6	$\text{if } (\$a[3] > 5)$	true				
7	$\$a[\$a[0] \% 2] = 9$	0	3	9	?	8
8	$\$x += 1$	1	3	9	?	8
9	$\$a[\$x + 1] = \$a[\$x] + 9$	1	3	9	18	8

For input value of 1

Step	Statement	\$x	\$a[0]	\$a[1]	\$a[2]	\$a[3]
1	\$a = []	?	?	?	?	?
2	\$a[1] = (int)readline()	?	?	1	?	?
3	\$x = 0	0	?	1	?	?
4	\$a[\$x] = 3	0	3	1	?	?
5	\$a[\$a[0]] = \$a[\$x + 1] % 10	0	3	1	?	1
6	if (\$a[3] > 5)	false				
7	\$a[2] = 3	0	3	1	3	1

11. Solution

Step	Statement	\$x	\$y	\$a[0]	\$a[1]	\$a[2]
1	\$a = []	?	?	?	?	?
2	\$x = 4	4	?	?	?	?
3	\$y = \$x - 1	4	3	?	?	?
4, 5	if (\$x > \$y) \$a[0] = 1 ; else \$a[0] = \$y;	4	3	1	?	?
6	\$a[1] = \$x + 3	4	3	1	7	?
7	\$y = \$y - 1	4	2	1	7	?
8	\$a[\$y] = (\$x + 5) % 2	4	2	1	7	1

12. Solution

Step	Statement	\$i	\$a[0]	\$a[1]	\$a[2]	\$a[3]	\$a[4]	\$a[5]
1	\$a = [17, 12, 45, 12, 12, 49]	?	17	12	45	12	12	49
2	\$i = 0	0	17	12	45	12	12	49
3	\$i <= 5	true						
4	if (\$a[\$i] == 12)	false						
5	\$a[\$i]++	0	18	12	45	12	12	49
6	\$i++	1	18	12	45	12	12	49
7	\$i <= 5	true						
8	if (\$a[\$i] == 12)	true						
9	\$a[\$i]--	1	18	11	45	12	12	49
10	\$i++	2	18	11	45	12	12	49
11	\$i <= 5	true						
12	if (\$a[\$i] == 12)	false						
13	\$a[\$i]++	2	18	11	46	12	12	49

14	<code>\$i++</code>	3	18	11	46	12	12	49
15	<code>\$i <= 5</code>	true						
16	<code>if (\$a[\$i] == 12)</code>	true						
17	<code>\$a[\$i]--</code>	3	18	11	46	11	12	49
18	<code>\$i++</code>	4	18	11	46	11	12	49
19	<code>\$i <= 5</code>	true						
20	<code>if (\$a[\$i] == 12)</code>	true						
21	<code>\$a[\$i]--</code>	4	18	11	46	11	11	49
22	<code>\$i++</code>	5	18	11	46	11	11	49
23	<code>\$i <= 5</code>	true						
24	<code>if (\$a[\$i] == 12)</code>	false						
25	<code>\$a[\$i]++</code>	5	18	11	46	11	11	50
26	<code>\$i++</code>	6	18	11	46	11	11	50
27	<code>\$i <= 5</code>	false						

13. Solution

Step	Statement	\$i	\$a[0]	\$a[1]	\$a[2]	\$a[3]	\$a[4]	\$a[5]
1	<code>\$a = [10, 15, 12, 23, 22, 19]</code>	?	10	15	12	23	22	19
2	<code>\$i = 1</code>	1	10	15	12	23	22	19
3	<code>\$i <= 4</code>	true						
4	<code>\$a[\$i] = \$a[\$i + 1] + \$a[\$i - 1]</code>	1	10	22	12	23	22	19
5	<code>\$i++</code>	2	10	22	12	23	22	19
6	<code>\$i <= 4</code>	true						
7	<code>\$a[\$i] = \$a[\$i + 1] + \$a[\$i - 1]</code>	2	10	22	45	23	22	19
8	<code>\$i++</code>	3	10	22	45	23	22	19
9	<code>\$i <= 4</code>	true						
10	<code>\$a[\$i] = \$a[\$i + 1] + \$a[\$i - 1]</code>	3	10	22	45	67	22	19
11	<code>\$i++</code>	4	10	22	45	67	22	19
12	<code>\$i <= 4</code>	true						
13	<code>\$a[\$i] = \$a[\$i + 1] + \$a[\$i - 1]</code>	4	10	22	45	67	86	19
14	<code>\$i++</code>	5	10	22	45	67	86	19
15	<code>\$i <= 4</code>	false						

14. Solution

It displays:

Navajo

Cherokee

Sioux

15. Solution

```
<?php
define("ELEMENTS", 100);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (float)readline();
}

for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    echo $a[$i] ** 3, "\n";
}
?>
```

16. Solution

```
<?php
define("ELEMENTS", 80);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (float)readline();
}

for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = $a[$i] ** 2;
}

for ($i = ELEMENTS - 1; $i >= 0; $i--) {
    echo $a[$i], "\n";
}
?>
```

17. Solution

```
<?php
define("ELEMENTS", 90);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (int)readline();
}

for ($i = ELEMENTS - 1; $i >= 0; $i--) {
    if ($a[$i] % 5 == 0) {
        echo $a[$i], "\n";
    }
}
?>
```

18. Solution

```
<?php
define("ELEMENTS", 50);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (int)readline();
}

for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    if ($a[$i] % 2 == 0 || $a[$i] > 10) {
        echo $a[$i], "\n";
    }
}
?>
```

19. Solution

```
<?php
define("ELEMENTS", 30);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (float)readline();
}

$total = 0;
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    if ($a[$i] > 0) {
        $total += $a[$i];
    }
}
echo $total, "\n";
?>
```

20. Solution

```
<?php
define("ELEMENTS", 50);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (int)readline();
}

$total = 0;
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    if ($a[$i] >= 10 && $a[$i] <= 99) {
        $total += $a[$i];
    }
}
echo $total, "\n";
```

```
| ?>
```

21. Solution

```
<?php
    define("ELEMENTS", 40);

    $a = [];
    for ($i = 0; $i <= ELEMENTS - 1; $i++) {
        $a[$i] = (float)readline();
    }

    $sumPos = 0;
    $sumNeg = 0;
    for ($i = 0; $i <= ELEMENTS - 1; $i++) {
        if ($a[$i] > 0 ) {
            $sumPos += $a[$i];
        }
        elseif ($a[$i] < 0) {
            $sumNeg += $a[$i];
        }
    }
    echo $sumPos, ", ", $sumNeg, "\n";
?>
```

22. Solution

```
<?php
    define("ELEMENTS", 20);

    $a = [];
    for ($i = 0; $i <= ELEMENTS - 1; $i++) {
        $a[$i] = (float)readline();
    }

    $total = 0;
    for ($i = 0; $i <= ELEMENTS - 1; $i++) {
        $total += $a[$i];
    }
    echo $total / ELEMENTS, "\n";
?>
```

23. Solution

```
<?php
    define("ELEMENTS", 50);

    $a = [];
    for ($i = 0; $i <= ELEMENTS - 1; $i++) {
        $a[$i] = (int)readline("Enter an integer: ");
    }

    for ($i = 0; $i <= ELEMENTS - 1; $i++) {
        if ($a[$i] < 20) {
```

```

        echo $a[$i], "\n";
    }
}
?>

```

24. Solution

```

<?php
define("ELEMENTS", 60);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (float)readline("Enter a number: ");
}

for ($i = 0; $i <= ELEMENTS - 1; $i += 2) {
    echo $a[$i], "\n";
}
?>

```

25. Solution

```

<?php
define("ELEMENTS", 20);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (float)readline("Enter a number: ");
}

$total = 0;
for ($i = 0; $i <= ELEMENTS - 1; $i += 2) {
    $total += $a[$i];
}
echo $total, "\n";
?>

```

26. Solution

```

<?php
define("ELEMENTS", 100);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = $i + 1;
}
...

```

27. Solution

First approach

```

<?php
define("ELEMENTS", 100);

$a = [];
$k = 2;

```

```

for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = $k;
    $k += 2;
}

```

...

Second approach

```

<?php
define("ELEMENTS", 100);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = ($i + 1) * 2;
}

```

...

28. Solution

```

<?php
$n = (int)readline("Enter N: ");
while ($n < 1) {
    echo "Error! Value must be greater than or equal to 1\n";
    $n = (int)readline("Enter N: ");
}

$a = [];
for ($i = 1; $i <= $n; $i++) {
    $a[$i - 1] = (int)($i ** 2);
}

for ($i = 0; $i <= $n - 1; $i++) {
    echo $a[$i], "\n";
}
?>

```

29. Solution

```

<?php
define("ELEMENTS", 10);

$a = [];
for ($i = 1; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (float)readline("Enter a number: ");
}

for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    if ($a[$i] == (int)$a[$i]) {
        echo $i, "\n";
    }
}
?>

```

30. Solution

```

<?php
define("ELEMENTS", 50);

```



```

$a = [];
for ($i = 1; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (float)readline("Enter a number: ");
}

$count = 0;
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    if ($a[$i] < 0) {
        $count++;
    }
}
echo $count, "\n";
?>

```

31. Solution

```

<?php
define("WORDS", 50);

$a = [];
for ($i = 0; $i <= WORDS - 1; $i++) {
    $a[$i] = readline();
}

for ($i = 0; $i <= WORDS - 1; $i++) {
    if (strlen($a[$i]) >= 10 ) {
        echo $a[$i], "\n";
    }
}
?>

```

32. Solution

```

<?php
define("ELEMENTS", 30);

$words = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $words[$i] = readline();
}

$lengthLimits = [0, 5, 10, 20];

for ($k = 1; $k <= 3; $k++) {
    for ($i = 0; $i <= ELEMENTS - 1; $i++) {
        if (strlen($words[$i]) >= $lengthLimits[$k - 1] && strlen($words[$i]) < $lengthLimits[$k]) {
            echo $words[$i], "\n";
        }
    }
}
?>

```

33. Solution

```
<?php
define("WORDS", 40);

$a = [];
for ($i = 0; $i <= WORDS - 1; $i++) {
    $a[$i] = readline("Enter a word: ");
}

for ($i = 0; $i <= WORDS - 1; $i++) {
    $count = 0;
    for ($j = 0; $j <= strlen($a[$i]) - 1; $j++) {
        if (substr($a[$i], $j, 1) == "w") { //Alternatively use: if ($a[$i][$j] == "w")
            $count++;
        }
    }
    if ($count >= 2) {
        echo $a[$i], "\n";
    }
}
?>
```

34. Solution

```
<?php
$number = (int)readline("Enter a number between 1 and 99: ");

$digit1 = (int)($number / 10);
$digit2 = $number % 10;

$number2romanOnes = [
    1 => "I", 2 => "II", 3 => "III", 4 => "IV", 5 => "V", 6 => "VI", 7 => "VII", 8 => "VIII", 9 => "IX"
];

$number2romanTens = [
    1 => "X", 2 => "XX", 3 => "XXX", 4 => "XL", 5 => "L", 6 => "LX", 7 => "LXX", 8 => "LXXX", 9 => "XC"
];

$roman = $number2romanTens[$digit1] . $number2romanOnes[$digit2];
echo $roman, "\n";
?>
```

Chapter 32

32.7 Review Questions: True/False

- | | | |
|----------|-----------|-----------|
| 1. false | 10. true | 19. false |
| 2. true | 11. true | 20. true |
| 3. false | 12. true | 21. true |
| 4. false | 13. false | 22. true |
| 5. false | 14. true | 23. false |
| 6. true | 15. true | 24. true |
| 7. false | 16. true | 25. true |
| 8. true | 17. true | 26. true |
| 9. true | 18. true | 27. false |

32.8 Review Questions: Multiple Choice

- | | | |
|------|------|-------|
| 1. b | 5. d | 9. c |
| 2. b | 6. a | 10. c |
| 3. c | 7. d | 11. b |
| 4. a | 8. c | |

32.9 Review Exercises

1. Solution

Step	Statement	\$x	\$a						
1	$\$a = [[]]$?	<table border="1"> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	?	?	?	?	?	?
?	?	?							
?	?	?							
2	$\$a[0][2] = 1$?	<table border="1"> <tr><td>?</td><td>?</td><td>1</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	?	?	1	?	?	?
?	?	1							
?	?	?							
3	$\$x = 0$	0	<table border="1"> <tr><td>?</td><td>?</td><td>1</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	?	?	1	?	?	?
?	?	1							
?	?	?							
4	$\$a[0][\$x] = 9$	0	<table border="1"> <tr><td>9</td><td>?</td><td>1</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	9	?	1	?	?	?
9	?	1							
?	?	?							
5	$\$a[0][\$x + \$a[0][2]] = 4$	0	<table border="1"> <tr><td>9</td><td>4</td><td>1</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	9	4	1	?	?	?
9	4	1							
?	?	?							
6	$\$a[\$a[0][2]][2] = 19$	0	<table border="1"> <tr><td>9</td><td>4</td><td>1</td></tr> <tr><td>?</td><td>?</td><td>19</td></tr> </table>	9	4	1	?	?	19
9	4	1							
?	?	19							

7	$\$a[\$a[0][2]][\$x + 1] = 13$	0	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>4</td><td>1</td></tr> <tr><td>?</td><td>13</td><td>19</td></tr> </table>	9	4	1	?	13	19
9	4	1							
?	13	19							
8	$\$a[\$a[0][2]][\$x] = 15$	0	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>9</td><td>4</td><td>1</td></tr> <tr><td>15</td><td>13</td><td>19</td></tr> </table>	9	4	1	15	13	19
9	4	1							
15	13	19							

2. Solution

Step	Statement	$\$i$	$\$j$	$\$a$						
1	$\$a = [[]]$?	?	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	?	?	?	?	?	?
?	?	?								
?	?	?								
2	$\$i = 0$	0	?	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	?	?	?	?	?	?
?	?	?								
?	?	?								
3	$\$i \leq 1$	true								
4	$\$j = 0$	0	0	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	?	?	?	?	?	?
?	?	?								
?	?	?								
5	$\$j \leq 2$	true								
6	$\$a[\$i][\$j] = (\$i + 1) * 5 + \$j$	0	0	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>5</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	5	?	?	?	?	?
5	?	?								
?	?	?								
7	$\$j++$	0	1	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>5</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	5	?	?	?	?	?
5	?	?								
?	?	?								
8	$\$j \leq 2$	true								
9	$\$a[\$i][\$j] = (\$i + 1) * 5 + \$j$	0	1	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>5</td><td>6</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	5	6	?	?	?	?
5	6	?								
?	?	?								
10	$\$j++$	0	2	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>5</td><td>6</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	5	6	?	?	?	?
5	6	?								
?	?	?								
11	$\$j \leq 2$	true								
12	$\$a[\$i][\$j] = (\$i + 1) * 5 + \$j$	0	2	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	5	6	7	?	?	?
5	6	7								
?	?	?								
13	$\$j++$	0	3	<table border="1" style="border-collapse: collapse; text-align: center;"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	5	6	7	?	?	?
5	6	7								
?	?	?								
14	$\$j \leq 2$	false								

15	<code>\$i++</code>	1	3	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	5	6	7	?	?	?
5	6	7								
?	?	?								
16	<code>\$i <= 1</code>	true								
17	<code>\$j = 0</code>	1	0	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	5	6	7	?	?	?
5	6	7								
?	?	?								
18	<code>\$j <= 2</code>	true								
19	<code>\$a[\$i][\$j] = (\$i + 1) * 5 + \$j</code>	1	0	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>10</td><td>?</td><td>?</td></tr> </table>	5	6	7	10	?	?
5	6	7								
10	?	?								
20	<code>\$j++</code>	1	1	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>10</td><td>?</td><td>?</td></tr> </table>	5	6	7	10	?	?
5	6	7								
10	?	?								
21	<code>\$j <= 2</code>	true								
22	<code>\$a[\$i][\$j] = (\$i + 1) * 5 + \$j</code>	1	1	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>10</td><td>11</td><td>?</td></tr> </table>	5	6	7	10	11	?
5	6	7								
10	11	?								
23	<code>\$j++</code>	1	2	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>10</td><td>11</td><td>?</td></tr> </table>	5	6	7	10	11	?
5	6	7								
10	11	?								
24	<code>\$j <= 2</code>	true								
25	<code>\$a[\$i][\$j] = (\$i + 1) * 5 + \$j</code>	1	2	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>10</td><td>11</td><td>12</td></tr> </table>	5	6	7	10	11	12
5	6	7								
10	11	12								
26	<code>\$j++</code>	1	3	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>10</td><td>11</td><td>12</td></tr> </table>	5	6	7	10	11	12
5	6	7								
10	11	12								
27	<code>\$j <= 2</code>	false								
28	<code>\$i++</code>	2	3	<table border="1"> <tr><td>5</td><td>6</td><td>7</td></tr> <tr><td>10</td><td>11</td><td>12</td></tr> </table>	5	6	7	10	11	12
5	6	7								
10	11	12								
29	<code>\$i <= 1</code>	false								

3. Solution

Step	Statement	\$i	\$j	\$a									
1	<code>\$a = [[]]</code>	?	?	<table border="1"> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	?	?	?	?	?	?	?	?	?
?	?	?											
?	?	?											
?	?	?											
2	<code>\$j = 0</code>	?	0	<table border="1"> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </table>	?	?	?	?	?	?	?	?	?
?	?	?											
?	?	?											
?	?	?											

3	<code>\$j <= 2</code>			True									
4	<code>\$i = 0</code>	0	0	<table border="1"> <tbody> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </tbody> </table>	?	?	?	?	?	?	?	?	?
?	?	?											
?	?	?											
?	?	?											
5	<code>\$i <= 2</code>			True									
6	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	0	0	<table border="1"> <tbody> <tr><td>2</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </tbody> </table>	2	?	?	?	?	?	?	?	?
2	?	?											
?	?	?											
?	?	?											
7	<code>\$i++</code>	1	0	<table border="1"> <tbody> <tr><td>2</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> <tr><td>?</td><td>?</td><td>?</td></tr> </tbody> </table>	2	?	?	?	?	?	?	?	?
2	?	?											
?	?	?											
?	?	?											
8	<code>\$i <= 2</code>			True									
9	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	1	0	<table border="1"> <tbody> <tr><td>2</td><td>?</td><td>?</td></tr> <tr><td>4</td><td>?</td><td>?</td></tr> <tr><td>6</td><td>?</td><td>?</td></tr> </tbody> </table>	2	?	?	4	?	?	6	?	?
2	?	?											
4	?	?											
6	?	?											
10	<code>\$i++</code>	2	0	<table border="1"> <tbody> <tr><td>2</td><td>?</td><td>?</td></tr> <tr><td>4</td><td>?</td><td>?</td></tr> <tr><td>6</td><td>?</td><td>?</td></tr> </tbody> </table>	2	?	?	4	?	?	6	?	?
2	?	?											
4	?	?											
6	?	?											
11	<code>\$i <= 2</code>			True									
12	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	2	0	<table border="1"> <tbody> <tr><td>2</td><td>?</td><td>?</td></tr> <tr><td>4</td><td>?</td><td>?</td></tr> <tr><td>6</td><td>?</td><td>?</td></tr> </tbody> </table>	2	?	?	4	?	?	6	?	?
2	?	?											
4	?	?											
6	?	?											
13	<code>\$i++</code>	3	0	<table border="1"> <tbody> <tr><td>2</td><td>?</td><td>?</td></tr> <tr><td>4</td><td>?</td><td>?</td></tr> <tr><td>6</td><td>?</td><td>?</td></tr> </tbody> </table>	2	?	?	4	?	?	6	?	?
2	?	?											
4	?	?											
6	?	?											
14	<code>\$i <= 2</code>			False									
15	<code>\$j++</code>	3	1	<table border="1"> <tbody> <tr><td>2</td><td>?</td><td>?</td></tr> <tr><td>4</td><td>?</td><td>?</td></tr> <tr><td>6</td><td>?</td><td>?</td></tr> </tbody> </table>	2	?	?	4	?	?	6	?	?
2	?	?											
4	?	?											
6	?	?											
16	<code>\$j <= 2</code>			True									
17	<code>\$i = 0</code>	0	1	<table border="1"> <tbody> <tr><td>2</td><td>?</td><td>?</td></tr> <tr><td>4</td><td>?</td><td>?</td></tr> <tr><td>6</td><td>?</td><td>?</td></tr> </tbody> </table>	2	?	?	4	?	?	6	?	?
2	?	?											
4	?	?											
6	?	?											
18	<code>\$i <= 2</code>			True									
19	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	0	1	<table border="1"> <tbody> <tr><td>2</td><td>6</td><td>?</td></tr> <tr><td>4</td><td>?</td><td>?</td></tr> </tbody> </table>	2	6	?	4	?	?			
2	6	?											
4	?	?											

				6	?	?
20	<code>\$i++</code>	1	1	2	6	?
				4	?	?
				6	?	?
21	<code>\$i <= 2</code>	True				
22	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	1	1	2	6	?
				4	8	?
				6	?	?
23	<code>\$i++</code>	2	1	2	6	?
				4	8	?
				6	?	?
24	<code>\$i <= 2</code>	True				
25	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	2	1	2	6	?
				4	8	?
				6	10	?
26	<code>\$i++</code>	3	1	2	6	?
				4	8	?
				6	10	?
27	<code>\$i <= 2</code>	False				
28	<code>\$j++</code>	3	2	2	6	?
				4	8	?
				6	10	?
29	<code>\$j <= 2</code>	True				
30	<code>\$i = 0</code>	0	2	2	6	?
				4	8	?
				6	10	?
31	<code>\$i <= 2</code>	True				
32	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	0	2	2	6	10
				4	8	?
				6	10	?
33	<code>\$i++</code>	1	2	2	6	10
				4	8	?
				6	10	?
34	<code>\$i <= 2</code>	True				
35	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	1	2	2	6	10
				4	8	12

				6	10	?
36	<code>\$i++</code>	2	2	2	6	10
				4	8	12
				6	10	?
37	<code>\$i <= 2</code>	True				
38	<code>\$a[\$i][\$j] = (\$i + 1) * 2 + \$j * 4</code>	2	2	2	6	10
				4	8	12
				6	10	14
39	<code>\$i++</code>	3	2	2	6	10
				4	8	12
				6	10	14
40	<code>\$i <= 2</code>	False				
41	<code>\$j++</code>	3	3	2	6	10
				4	8	12
				6	10	14
42	<code>\$j <= 2</code>	False				

4. Solution

For input value of 5

0	5	10
0	6	12

For input value of 9

0	9	18
0	10	20

For input value of 3

0	3	6
0	4	8

5. Solution

For input value of 13

0	3	3
0	17	18

For input value of 10

0	10	3
0	11	15

For input value of 8

3	3	3
11	12	13

6. Solution

19	5	31
28	6	20

7. Solution

26	29
37	34
59	49

8. Solution

- i. -1 15 22 25 12 16 7 9 1
- ii. 7 9 1 25 12 16 -1 15 22
- iii. 22 15 -1 16 12 25 1 9 7
- iv. 1 9 7 16 12 25 22 15 -1
- v. -1 25 7 15 12 9 22 16 1
- vi. 7 25 -1 9 12 15 1 16 22
- vii. 22 16 1 15 12 9 -1 25 7
- viii. 1 16 22 9 12 15 7 25 -1

9. Solution

```

<?php
define("ROWS", 10);
define("COLUMNS", 15);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = (int)readline();
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        if ($a[$i][$j] % 2 != 0) {
            echo $i, ", ", $j, "\n";
        }
    }
}
?>

```

10. Solution

```
<?php
define("ROWS", 10);
define("COLUMNS", 6);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = (float)readline();
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j += 2) {
        echo $a[$i][$j], "\n";
    }
}
?>
```

11. Solution

```
<?php
define("ROWS", 12);
define("COLUMNS", 8);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = (float)readline();
    }
}

$total = 0;
for ($i = 1; $i <= ROWS - 1; $i += 2) {
    for ($j = 0; $j <= COLUMNS - 1; $j += 2) {
        $total += $a[$i][$j];
    }
}
echo $total, "\n";
?>
```

12. Solution

```
<?php
define("N", 8);

$a = [[]];
for ($i = 0; $i <= N - 1; $i++) {
    for ($j = 0; $j <= N - 1; $j++) {
        $a[$i][$j] = (float)readline();
    }
}
```

```

}

$sumDiagonal = 0;
$sumAntidiagonal = 0;
for ($k = 0; $k <= N - 1; $k++) {
    $sumDiagonal += $a[$k][$k];
    $sumAntidiagonal += $a[$k][N - $k - 1];
}
echo $sumDiagonal / N, ", ", $sumAntidiagonal / N, "\n";
?>

```

13. Solution

```

<?php
define("N", 5);

$a = [[]];
for ($i = 0; $i <= N - 1; $i++) {
    for ($j = 0; $j <= N - 1; $j++) {
        if ($i == N - $j - 1) {
            $a[$i][$j] = 5;
        }
        elseif ($i > N - $j - 1) {
            $a[$i][$j] = 88;
        }
        else {
            $a[$i][$j] = 11;
        }
    }
}

for ($i = 0; $i <= N - 1; $i++) {
    for ($j = 0; $j <= N - 1; $j++) {
        echo $a[$i][$j], "\t";
    }
    echo "\n";
}
?>

```

14. Solution

```

<?php
define("N", 5);

$a = [[]];
for ($i = 0; $i <= N - 1; $i++) {
    for ($j = 0; $j <= N - 1; $j++) {
        if ($i == N - $j - 1) {
            $a[$i][$j] = 5;
        }
        elseif ($i > N - $j - 1) {
            $a[$i][$j] = 88;
        }
    }
}

```

```

    }
    else {
        $a[$i][$j] = 11;
    }
    if ($i == $j) {
        $a[$i][$j] = 0;
    }
}
}
}

for ($i = 0; $i <= N - 1; $i++) {
    for ($j = 0; $j <= N - 1; $j++) {
        echo $a[$i][$j], "\t";
    }
    echo "\n";
}
?>

```

15. Solution

```

<?php
define("ROWS", 5);
define("COLUMNS", 4);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = (float)readline();
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        if ($a[$i][$j] == (int)$a[$i][$j]) {
            echo $i, ", ", $j, "\n";
        }
    }
}
?>

```

16. Solution

```

<?php
define("ROWS", 10);
define("COLUMNS", 4);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = (float)readline();
    }
}

```

```

$count = 0;
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        if ($a[$i][$j] < 0) {
            $count++;
        }
    }
}
echo $count, "\n";
?>

```

17. Solution

```

<?php
define("ROWS", 3);
define("COLUMNS", 4);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = readline();
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        echo $a[$i][$j], " ";
    }
}
?>

```

18. Solution

```

<?php
define("ROWS", 20);
define("COLUMNS", 14);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = readline();
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        if (strlen($a[$i][$j]) < 5) {
            echo $a[$i][$j], "\n";
        }
    }
}
?>

```

19. Solution

First approach

```
<?php
define("ROWS", 20);
define("COLUMNS", 14);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = readline();
    }
}

$lengthLimits = [5, 10, 20];

for ($k = 0; $k <= 2; $k++) {
    for ($i = 0; $i <= ROWS - 1; $i++) {
        for ($j = 0; $j <= COLUMNS - 1; $j++) {
            if (strlen($a[$i][$j]) < $lengthLimits[$k]) {
                echo $a[$i][$j], "\n";
            }
        }
    }
}
?>
```

Second approach

```
<?php
define("ROWS", 20);
define("COLUMNS", 14);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $a[$i][$j] = readline();
    }
}

for ($k = 0; $k <= 2; $k++) {
    for ($i = 0; $i <= ROWS - 1; $i++) {
        for ($j = 0; $j <= COLUMNS - 1; $j++) {
            if (strlen($a[$i][$j]) < 5 * 2 ** $k) {
                echo $a[$i][$j], "\n";
            }
        }
    }
}
?>
```

Chapter 33

33.8 Review Questions: True/False

- | | |
|----------|-----------|
| 1. true | 9. false |
| 2. false | 10. false |
| 3. false | 11. true |
| 4. false | 12. true |
| 5. false | 13. true |
| 6. false | 14. true |
| 7. true | 15. true |
| 8. true | |

33.9 Review Questions: Multiple Choice

- | | |
|------|-------|
| 1. a | 7. a |
| 2. b | 8. a |
| 3. c | 9. c |
| 4. d | 10. a |
| 5. b | 11. a |
| 6. a | |

33.10 Review Exercises

1. Solution

```
<?php
define("STUDENTS", 15);
define("TESTS", 5);

$grades = [[]];
for ($i = 0; $i <= STUDENTS - 1; $i++) {
    for ($j = 0; $j <= TESTS - 1; $j++) {
        $grades[$i][$j] = (int)readline();
    }
}

$average = [];
for ($i = 0; $i <= STUDENTS - 1; $i++) {
    $average[$i] = 0;
    for ($j = 0; $j <= TESTS - 1; $j++) {
        $average[$i] += $grades[$i][$j];
    }
    $average[$i] /= TESTS;
}

for ($i = 0; $i <= STUDENTS - 1; $i++) {
    echo "Student No ", $i + 1, ": ";

    if ($average[$i] < 60) {
        echo "E/F\n";
    }
}
```

```

    elseif ($average[$i] < 70) {
        echo "D\n";
    }
    elseif ($average[$i] < 80) {
        echo "C\n";
    }
    elseif ($average[$i] < 90) {
        echo "B\n";
    }
    else {
        echo "A\n";
    }
}
?>

```

2. Solution

```

<?php
define("OBJECTS", 5);
define("FALLS", 10);

$g = [[]];
for ($i = 0; $i <= OBJECTS - 1; $i++) {
    for ($j = 0; $j <= FALLS - 1; $j++) {
        $g[$i][$j] = (int)readline();
    }
}

for ($i = 0; $i <= OBJECTS - 1; $i++) {
    $total = 0;
    for ($j = 0; $j <= FALLS - 1; $j++) {
        $total += $g[$i][$j];
    }
    echo "Average g for object No ", $i + 1, ": ", ($total / FALLS), "\n";
}

for ($j = 0; $j <= FALLS - 1; $j++) {
    $total = 0;
    for ($i = 0; $i <= OBJECTS - 1; $i++) {
        $total += $g[$i][$j];
    }
    echo "Average g for fall No ", $j + 1, ": ", ($total / OBJECTS), "\n";
}

$total = 0;
for ($i = 0; $i <= OBJECTS - 1; $i++) {
    for ($j = 0; $j <= FALLS - 1; $j++) {
        $total += $g[$i][$j];
    }
}
echo "Overall average g: ", ($total / (OBJECTS * FALLS)), "\n";
?>

```


3. Solution

```

<?php
define("PLAYERS", 15);
define("MATCHES", 12);

$points = [[]];
for ($i = 0; $i <= PLAYERS - 1; $i++) {
    for ($j = 0; $j <= MATCHES - 1; $j++) {
        $points[$i][$j] = (int)readline();
    }
}

for ($i = 0; $i <= PLAYERS - 1; $i++) {
    $total = 0;
    for ($j = 0; $j <= MATCHES - 1; $j++) {
        $total += $points[$i][$j];
    }
    echo "Total number of points for player No ", $i + 1, ": ", $total, "\n";
}

for ($j = 0; $j <= MATCHES - 1; $j++) {
    $total = 0;
    for ($i = 0; $i <= PLAYERS - 1; $i++) {
        $total += $points[$i][$j];
    }
    echo "Total number of points for match No ", $j + 1, ": ", $total, "\n";
}
?>

```

4. Solution

```

<?php
define("CITIES", 20);
define("HOURS", 24);

$temperatures = [[]];
for ($i = 0; $i <= CITIES - 1; $i++) {
    for ($j = 0; $j <= HOURS - 1; $j++) {
        $temperatures[$i][$j] = (float)readline();
    }
}

for ($j = 0; $j <= HOURS - 1; $j++) {
    $total = 0;
    for ($i = 0; $i <= CITIES - 1; $i++) {
        $total += $temperatures[$i][$j];
    }
    if ($total / CITIES < 10) {
        echo "Hour: ", $j + 1, "\n";
    }
}

```

| ?>

5. Solution

```

<?php
define("PLAYERS", 24);
define("MATCHES", 10);

$names = [];
$goals = [[]];
for ($i = 0; $i <= PLAYERS - 1; $i++) {
    $names[$i] = readline();
    for ($j = 0; $j <= MATCHES - 1; $j++) {
        $goals[$i][$j] = (int)readline();
    }
}

for ($i = 0; $i <= PLAYERS - 1; $i++) {
    $total = 0;
    for ($j = 0; $j <= MATCHES - 1; $j++) {
        $total += $goals[$i][$j];
    }
    echo $names[$i], ": ", ($total / MATCHES), "\n";
}

for ($j = 0; $j <= MATCHES - 1; $j++) {
    $total = 0;
    for ($i = 0; $i <= PLAYERS - 1; $i++) {
        $total += $goals[$i][$j];
    }
    echo "Match No ", $j + 1, ": ", $total, "\n";
}
?>

```

6. Solution

```

<?php
define("STUDENTS", 12);
define("LESSONS", 6);

$names = [];
$grades = [[]];
for ($i = 0; $i <= STUDENTS - 1; $i++) {
    $names[$i] = readline();
    for ($j = 0; $j <= LESSONS - 1; $j++) {
        $grades[$i][$j] = (int)readline();
    }
}

$average = [];
for ($i = 0; $i <= STUDENTS - 1; $i++) {
    $total = 0;
    for ($j = 0; $j <= LESSONS - 1; $j++) {

```

```

        $total += $grades[$i][$j];
    }
    $average[$i] = $total / LESSONS;
    echo $names[$i], ": ", $average[$i], "\n";
}

for ($j = 0; $j <= LESSONS - 1; $j++) {
    $total = 0;
    for ($i = 0; $i <= STUDENTS - 1; $i++) {
        $total += $grades[$i][$j];
    }
    echo $total / STUDENTS, "\n";
}

for ($i = 0; $i <= STUDENTS - 1; $i++) {
    if ($average[$i] < 60) {
        echo $names[$i], "\n";
    }
}

for ($i = 0; $i <= STUDENTS - 1; $i++) {
    if ($average[$i] > 89) {
        echo $names[$i], " Bravo!\n";
    }
}
}
?>

```

7. Solution

```

<?php
define("ARTISTS", 15);
define("JUDGES", 5);

$judgeNames = [];
for ($j = 0; $j <= JUDGES - 1; $j++) {
    $judgeNames[$j] = readline("Enter name for judge No " . ($j + 1) . ": ");
}

$artistNames = [];
$songTitles = [];
$score = [[]];
for ($i = 0; $i <= ARTISTS - 1; $i++) {
    $artistNames[$i] = readline("Enter name for artist No " . ($i + 1) . ": ");
    $songTitles[$i] = readline("Enter song title for artist " . $artistNames[$i] . ": ");
    for ($j = 0; $j <= JUDGES - 1; $j++) {
        echo "Enter score for artist: " . $artistNames[$i];
        $score[$i][$j] = (int)readline(" gotten from judge " . $judgeNames[$j] . ": ");
    }
}

for ($i = 0; $i <= ARTISTS - 1; $i++) {
    $total = 0;
    for ($j = 0; $j <= JUDGES - 1; $j++) {

```

```

        $total += $score[$i][$j];
    }
    echo $artistNames[$i], ", ", $songTitles[$i], ": ", $total, "\n";
}

for ($j = 0; $j <= JUDGES - 1; $j++) {
    $total = 0;
    for ($i = 0; $i <= ARTISTS - 1; $i++) {
        $total += $score[$i][$j];
    }
    echo $judgeNames[$j], ": ", $total / ARTISTS, "\n";
}
?>

```

8. Solution

```

<?php
define("PEOPLE", 30);
define("MONTHS", 12);

$weights = [[]];
$heights = [[]];
for ($i = 0; $i <= PEOPLE - 1; $i++) {
    for ($j = 0; $j <= MONTHS - 1; $j++) {
        $weights[$i][$j] = (int)readline();
        $heights[$i][$j] = (int)readline();
    }
}

for ($i = 0; $i <= PEOPLE - 1; $i++) {
    $sumWeights = 0;
    $sumHeights = 0;
    for ($j = 0; $j <= MONTHS - 1; $j++) {
        $sumWeights += $weights[$i][$j];
        $sumHeights += $heights[$i][$j];
    }
    $averageWeight = $sumWeights / MONTHS;
    $averageHeight = $sumHeights / MONTHS;
    echo $averageWeight, ", ", $averageHeight, "\n";
    echo $averageWeight * 702 / $averageHeight ** 2, "\n";
}

for ($i = 0; $i <= PEOPLE - 1; $i++) {
    echo $weights[$i][4] * 702 / $heights[$i][4] ** 2, "\n";
    echo $weights[$i][7] * 702 / $heights[$i][7] ** 2, "\n";
}
?>

```

9. Solution

```

<?php
define("VAT", 0.19);

```

```

define("CONSUMERS", 1000);

$meterReading = [[]];
for ($i = 0; $i <= CONSUMERS - 1; $i++) {
    $meterReading[$i][0] = (int)readline();
    $meterReading[$i][1] = (int)readline();
}

$total = 0;
for ($i = 0; $i <= CONSUMERS - 1; $i++) {
    $consumed = $meterReading[$i][1] - $meterReading[$i][0];
    echo $consumed, "\n";
    $payment = $consumed * 0.07;
    $payment += VAT * $payment;
    echo $payment, "\n";

    $total += $consumed;
}

echo $total, ", ", ($total * 0.07 + $total * 0.07 * VAT), "\n";
?>

```

10. Solution

```

<?php
define("CURRENCIES", 4);
define("DAYS", 5);

$sud = (float)readline("Enter an amount in US dollars: ");

$currency = ["British Pounds Sterling", "Euros", "Canadian Dollars", "Australian Dollars"];

$rate = [
    [1.420, 1.421, 1.432, 1.431, 1.441],
    [1.043, 1.056, 1.038, 1.022, 1.029],
    [0.757, 0.764, 0.760, 0.750, 0.749],
    [0.620, 0.625, 0.629, 0.636, 0.639]
];

for ($i = 0; $i <= CURRENCIES - 1; $i++) {
    $total = 0;
    for ($j = 0; $j <= DAYS - 1; $j++) {
        $total += $rate[$i][$j];
    }
    $average = $total / DAYS;
    echo $sud, " US dollars = ", ($sud / $average), " ", $currency[$i], "\n";
}
?>

```

11. Solution

```

<?php

```

```

define("EMPLOYEES", 10);
define("DAYS", 5);

$days = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday"];

$payRate = (float)readline();

$names = [];
$hoursWorkedPerDay = [[]];
for ($i = 0; $i <= EMPLOYEES - 1; $i++) {
    $names[$i] = readline();
    for ($j = 0; $j <= DAYS - 1; $j++) {
        $hoursWorkedPerDay[$i][$j] = (int)readline();
    }
}

$hoursWorkedPerWeek = [];
for ($i = 0; $i <= EMPLOYEES - 1; $i++) {
    $hoursWorkedPerWeek[$i] = 0;
    for ($j = 0; $j <= DAYS - 1; $j++) {
        $hoursWorkedPerWeek[$i] += $hoursWorkedPerDay[$i][$j];
    }
    if ($hoursWorkedPerWeek[$i] > 40) {
        echo $names[$i], "\n";
    }
}

$totalGrossPay = 0;
for ($i = 0; $i <= EMPLOYEES - 1; $i++) {
    if ($hoursWorkedPerWeek[$i] <= 40) {
        $grossPay = $payRate * $hoursWorkedPerWeek[$i];
    }
    else {
        $grossPay = $payRate * 40 + 1.5 * $payRate * ($hoursWorkedPerWeek[$i] - 40);
    }
    $totalGrossPay += $grossPay;
    echo $names[$i], ", ", $grossPay / 5, "\n";
}

echo $totalGrossPay, "\n";

for ($i = 0; $i <= EMPLOYEES - 1; $i++) {
    if ($hoursWorkedPerWeek[$i] > 40) {
        for ($j = 0; $j <= DAYS - 1; $j++) {
            if ($hoursWorkedPerDay[$i][$j] > 8) {
                echo $names[$i], ", ", $days[$j], " Overtime!\n";
            }
        }
    }
}

for ($j = 0; $j <= DAYS - 1; $j++) {
    $total = 0;
}

```

```

for ($i = 0; $i <= EMPLOYEES - 1; $i++) {
    if ($hoursWorkedPerDay[$i][$j] <= 8) {
        $grossPay = $payRate * $hoursWorkedPerDay[$i][$j];
    }
    else {
        $grossPay = $payRate * 8 + 1.5 * $payRate * ($hoursWorkedPerDay[$i][$j] - 8);
    }
    $total += $grossPay;
}
echo $days[$j], ", ", $total, "\n";
}
?>

```

12. Solution

First approach

```

<?php
define("ROWS", 3);
define("COLUMNS", 4);

$a = [
    [9, 9, 2, 6],
    [4, 1, 10, 11],
    [12, 15, 7, 3]
];

$b = [];
$k = 0;
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $b[$k++] = $a[$i][$j];
    }
}

for ($k = 0; $k <= sizeof($b) - 1; $k++) {
    echo $b[$k], " ";
}
?>

```

Second approach

```

<?php
define("ROWS", 3);
define("COLUMNS", 4);

$a = [
    [9, 9, 2, 6],
    [4, 1, 10, 11],
    [12, 15, 7, 3]
];

$b = [];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {

```

```
        $b[] = $a[$i][$j];
    }
}

for ($k = 0; $k <= sizeof($b) - 1; $k++) {
    echo $b[$k], " ";
}
?>
```

13. Solution

```
<?php
define("ROWS", 3);
define("COLUMNS", 3);

$a = [16, 12, 3, 5, 6, 9, 18, 19, 20];

$b = [[]];
$k = 0;
for ($i = ROWS - 1; $i >= 0; $i--) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $b[$i][$j] = $a[$k++];
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        echo $b[$i][$j], "\t";
    }
    echo "\n";
}
?>
```


Chapter 34

34.7 Review Questions: True/False

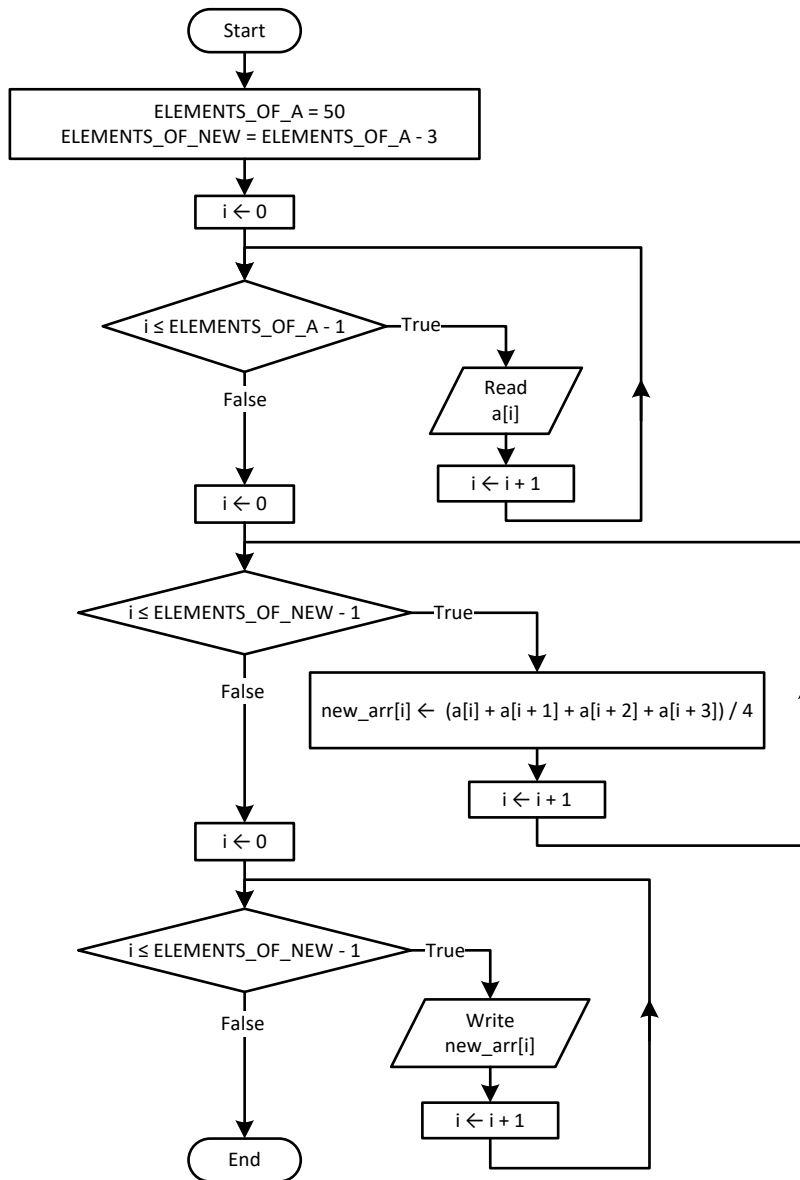
- | | |
|-----------|-----------|
| 1. true | 21. true |
| 2. false | 22. true |
| 3. true | 23. true |
| 4. true | 24. false |
| 5. true | 25. true |
| 6. true | 26. false |
| 7. true | 27. false |
| 8. false | 28. false |
| 9. true | 29. true |
| 10. false | 30. true |
| 11. false | 31. true |
| 12. true | 32. false |
| 13. false | 33. true |
| 14. false | 34. false |
| 15. false | 35. true |
| 16. true | 36. true |
| 17. true | 37. false |
| 18. true | 38. true |
| 19. false | 39. true |
| 20. false | 40. false |

34.8 Review Exercises

1. Solution

```
for ($i = 0; $i <= ROWS - 1; $i++) {  
    for ($j = 0; $j <= COLUMNS - 1; $j++) {  
        $a[$i][$j] = (float)readline();  
        while ($a[$i][$j] == 0) {  
            echo "Error\n";  
            $a[$i][$j] = (float)readline();  
        }  
    }  
}
```

2. Solution



```

<?php
define("ELEMENTS_OF_A", 50);
define("ELEMENTS_OF_NEW", ELEMENTS_OF_A - 3);

$a = [];
for ($i = 0; $i <= ELEMENTS_OF_A - 1; $i++) {
    $a[$i] = (float)readline();
}

$newArr = [];
for ($i = 0; $i <= ELEMENTS_OF_NEW - 1; $i++) {
    $newArr[$i] = ($a[$i] + $a[$i + 1] + $a[$i + 2] + $a[$i + 3]) / 4;
}

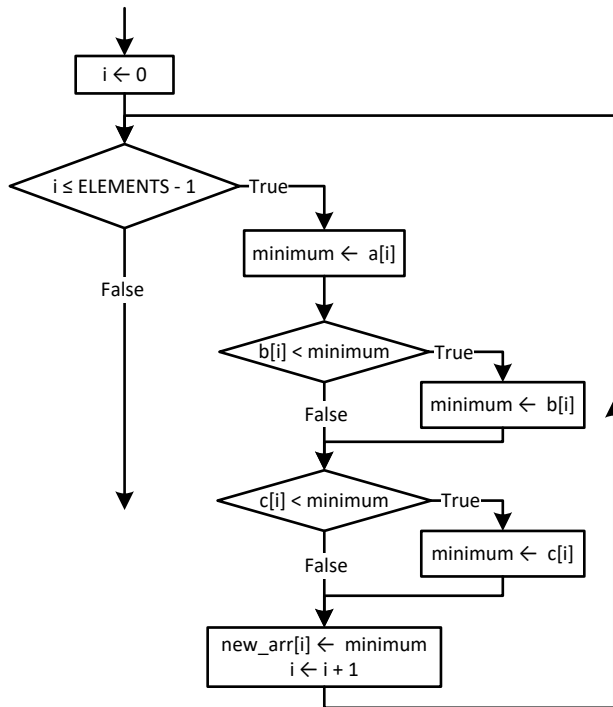
for ($i = 0; $i <= ELEMENTS_OF_NEW - 1; $i++) {

```

```
    echo $newArr[$i], "\t\n";  
  }  
?>
```

3. Solution

```
<?php  
define("ELEMENTS", 15);  
  
$a = [];  
for ($i = 0; $i <= ELEMENTS - 1; $i++) {  
    $a[$i] = (float)readline();  
}  
$b = [];  
for ($i = 0; $i <= ELEMENTS - 1; $i++) {  
    $b[$i] = (float)readline();  
}  
$c = [];  
for ($i = 0; $i <= ELEMENTS - 1; $i++) {  
    $c[$i] = (float)readline();  
}  
  
$newArr = [];  
for ($i = 0; $i <= ELEMENTS - 1; $i++) {  
    $minimum = $a[$i];  
    if ($b[$i] < $minimum) {  
        $minimum = $b[$i];  
    }  
    if ($c[$i] < $minimum) {  
        $minimum = $c[$i];  
    }  
    $newArr[$i] = $minimum;  
}  
  
for ($i = 0; $i <= ELEMENTS - 1; $i++) {  
    echo $newArr[$i], "\n";  
}  
?>
```



4. Solution

First approach

```

<?php
define("ELEMENTS_OF_A", 10);
define("ELEMENTS_OF_B", 5);
define("ELEMENTS_OF_C", 15);
define("ELEMENTS_OF_NEW", ELEMENTS_OF_A + ELEMENTS_OF_B + ELEMENTS_OF_C);

$a = [];
for ($i = 0; $i <= ELEMENTS_OF_A - 1; $i++) {
    $a[$i] = (float)readline();
}
$b = [];
for ($i = 0; $i <= ELEMENTS_OF_B - 1; $i++) {
    $b[$i] = (float)readline();
}
$c = [];
for ($i = 0; $i <= ELEMENTS_OF_C - 1; $i++) {
    $c[$i] = (float)readline();
}

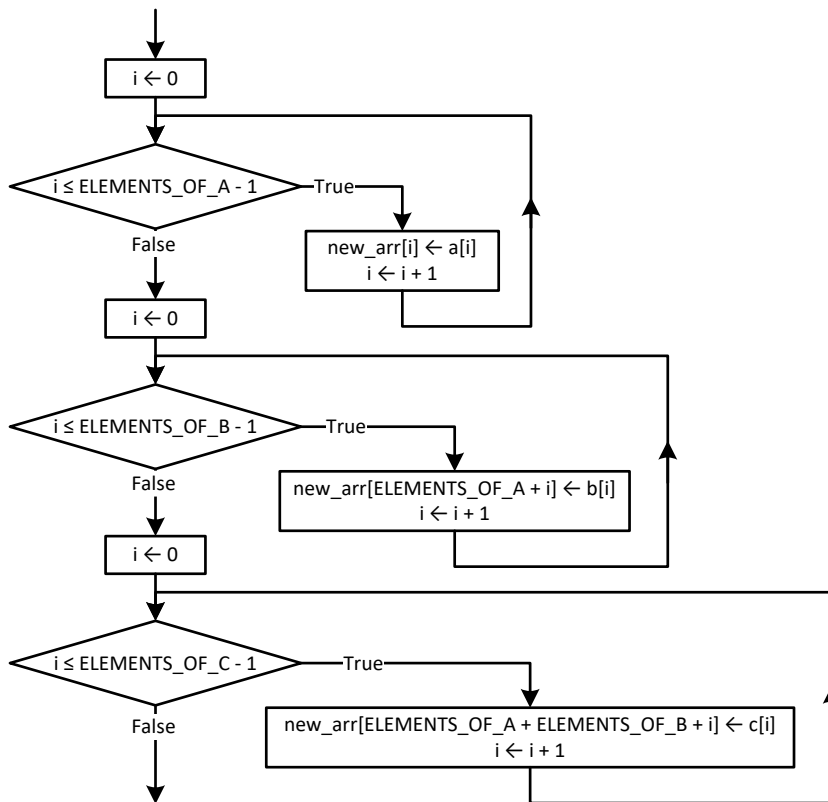
$newArr = [];
for ($i = 0; $i <= ELEMENTS_OF_C - 1; $i++) {
    $newArr[$i] = $c[$i];
}
for ($i = 0; $i <= ELEMENTS_OF_B - 1; $i++) {
    $newArr[ELEMENTS_OF_C + $i] = $b[$i];
}
  
```

```

for ($i = 0; $i <= ELEMENTS_OF_A - 1; $i++) {
    $newArr[ELEMENTS_OF_B + ELEMENTS_OF_C + $i] = $a[$i];
}

//Display array $newArr
for ($i = 0; $i <= ELEMENTS_OF_NEW - 1; $i++) {
    echo $newArr[$i], "\t";
}
?>

```



Second approach

```

<?php
define("ELEMENTS_OF_A", 10);
define("ELEMENTS_OF_B", 5);
define("ELEMENTS_OF_C", 15);
define("ELEMENTS_OF_NEW", ELEMENTS_OF_A + ELEMENTS_OF_B + ELEMENTS_OF_C);

$a = [];
for ($i = 0; $i <= ELEMENTS_OF_A - 1; $i++) {
    $a[$i] = (float)readline();
}
$b = [];
for ($i = 0; $i <= ELEMENTS_OF_B - 1; $i++) {
    $b[$i] = (float)readline();
}
$c = [];
for ($i = 0; $i <= ELEMENTS_OF_C - 1; $i++) {
    $c[$i] = (float)readline();
}

```

```

}

$newArr = [];
for ($i = 0; $i <= ELEMENTS_OF_C - 1; $i++) {
    $newArr[] = $c[$i];
}
for ($i = 0; $i <= ELEMENTS_OF_B - 1; $i++) {
    $newArr[] = $b[$i];
}
for ($i = 0; $i <= ELEMENTS_OF_A - 1; $i++) {
    $newArr[] = $a[$i];
}

//Display array $newArr
for ($i = 0; $i <= ELEMENTS_OF_NEW - 1; $i++) {
    echo $newArr[$i], "\t";
}
?>

```

5. Solution

First approach

```

<?php
define("COLUMNS", 4);

//Create arrays $a and $b
$a = [
    [10, 11, 12, 85],
    [3, 1, 5, 10],
    [-1, 2, -5, -10]
];

$b = [
    [10, 11, 16, 33],
    [11, 13, 5, 55],
    [-1, -2, -4, 44],
    [55, 33, 77, 12],
    [-110, 120, 132, 43]
];

//Create array $newArr
$newArr = [[]];
for ($i = 0; $i <= sizeof($a) - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $newArr[$i][$j] = $a[$i][$j];
    }
}
for ($i = 0; $i <= sizeof($b) - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $newArr[sizeof($a) + $i][$j] = $b[$i][$j];
    }
}

```

```

}

//Display array $newArr
for ($i = 0; $i <= sizeof($newArr) - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        echo $newArr[$i][$j], "\t";
    }
    echo "\n";
}
?>

```

Second approach

```

?php
$a = [[10, 11, 12, 85], [3, 1, 5, 10], [-1, 2, -5, -10] ];

$b = [
    [10, 11, 16, 33],
    [11, 13, 5, 55],
    [-1, -2, -4, 44],
    [55, 33, 77, 12],
    [-110, 120, 132, 43]
];

//Create array $newArr
$newArr = [[]];
foreach ($a as $row) {
    $newArr[] = $row;
}
foreach ($b as $row) {
    $newArr[] = $row;
}

//Display array $newArr
foreach ($newArr as $row) {
    foreach ($row as $element) {
        echo $element, "\t";
    }
    echo "\n";
}
?>

```

6. Solution

First approach

```

<?php
define("COLUMNS_OF_A", 10);
define("COLUMNS_OF_B", 15);
define("COLUMNS_OF_C", 20);
define("ROWS", 5);
define("COLUMNS", COLUMNS_OF_A + COLUMNS_OF_B + COLUMNS_OF_C);

$a = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {

```

```

    for ($j = 0; $j <= COLUMNS_OF_A - 1; $j++) {
        $a[$i][$j] = (float)readline();
    }
}

$b = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_B - 1; $j++) {
        $b[$i][$j] = (float)readline();
    }
}

$c = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_C - 1; $j++) {
        $c[$i][$j] = (float)readline();
    }
}

$newArr = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_A - 1; $j++) {
        $newArr[$i][$j] = $a[$i][$j];
    }
}
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_B - 1; $j++) {
        $newArr[$i][COLUMNS_OF_A + $j] = $b[$i][$j];
    }
}
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_C - 1; $j++) {
        $newArr[$i][COLUMNS_OF_A + COLUMNS_OF_B + $j] = $c[$i][$j];
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        echo $newArr[$i][$j], "\t";
    }
    echo "\n";
}
?>

```

Second approach

```

<?php
define("COLUMNS_OF_A", 10);
define("COLUMNS_OF_B", 15);
define("COLUMNS_OF_C", 20);
define("ROWS", 5);
define("COLUMNS", COLUMNS_OF_A + COLUMNS_OF_B + COLUMNS_OF_C);

$a = [[]];

```



```

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_A - 1; $j++) {
        $a[$i][$j] = (float)readline();
    }
}

$b = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_B - 1; $j++) {
        $b[$i][$j] = (float)readline();
    }
}

$c = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_C - 1; $j++) {
        $c[$i][$j] = (float)readline();
    }
}

$newArr = [];
foreach ($a as $row) {
    $newArr[] = $row;
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_B - 1; $j++) {
        $newArr[$i][] = $b[$i][$j];
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS_OF_C - 1; $j++) {
        $newArr[$i][] = $c[$i][$j];
    }
}

for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        echo $newArr[$i][$j], "\t";
    }
    echo "\n";
}
?>

```

7. Solution

```

<?php
define("ELEMENTS", 50);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (float)readline();
}

```

```

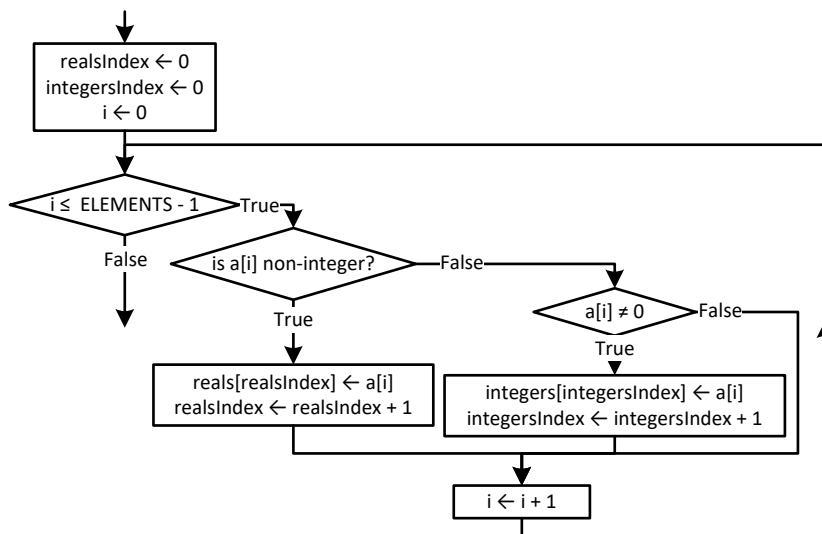
}

$reals = [];
$integers = [];
$realsIndex = 0;
$integersIndex = 0;
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    if ($a[$i] != (int)$a[$i]) {
        $reals[$realsIndex] = $a[$i];
        $realsIndex++;
    }
    elseif ($a[$i] != 0) {
        $integers[$integersIndex] = (int)$a[$i];
        $integersIndex++;
    }
}

for ($i = 0; $i <= $realsIndex - 1; $i++) {
    echo $reals[$i], "\t";
}

echo "\n";
for ($i = 0; $i <= $integersIndex - 1; $i++) {
    echo $integers[$i], "\t";
}
?>

```



8. Solution

```

<?php
define("ELEMENTS", 50);

$a = [];
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $a[$i] = (int)readline();
}

```

```

}

$b = [];
$k = 0;
for ($i = 0; $i <= ELEMENTS - 1; $i++) {
    $digit3 = $a[$i] % 10;
    $r = (int)($a[$i] / 10);
    $digit2 = $r % 10;
    $digit1 = (int)($r / 10);

    if ($digit1 < $digit2 && $digit2 < $digit3) {
        $b[$k] = $a[$i];
        $k++;
    }
}

for ($i = 0; $i <= $k - 1; $i++) {
    echo $b[$i], "\t";
}
?>

```

9. Solution

```

<?php
define("PRODUCTS", 10);
define("CITIZENS", 200);

$prodNames = [];
$answers = [[]];
for ($i = 0; $i <= PRODUCTS - 1; $i++) {
    $prodNames[$i] = readline();
    for ($j = 0; $j <= CITIZENS - 1; $j++) {
        $answers[$i][$j] = readline();
        while ($answers[$i][$j] < "A" || $answers[$i][$j] > "D") > 0) {
            echo "Error! \n";
            $answers[$i][$j] = readline();
        }
    }
}

$countA = [];
for ($i = 0; $i <= PRODUCTS - 1; $i++) {
    $countA[$i] = 0;
    for ($j = 0; $j <= CITIZENS - 1; $j++) {
        if ($answers[$i][$j] == "A") {
            $countA[$i]++;
        }
    }
    echo $prodNames[$i], ", ", $countA[$i], "\n";
}

for ($j = 0; $j <= CITIZENS - 1; $j++) {
    $countB = 0;

```

```

    for ($i = 0; $i <= PRODUCTS - 1; $i++) {
        if ($answers[$i][$j] == "B") {
            $countB++;
        }
    }
    echo $countB, "\n";
}

$maximum = $countA[0];
for ($i = 1; $i <= PRODUCTS - 1; $i++) {
    if ($countA[$i] > $maximum) {
        $maximum = $countA[$i];
    }
}
for ($i = 0; $i <= PRODUCTS - 1; $i++) {
    if ($countA[$i] == $maximum) {
        echo $prodNames[$i], "\n";
    }
}
?>

```

10. Solution

```

<?php
define("US_CITIES", 20);
define("CANADIAN_CITIES", 20);

$usNames = [];
for ($i = 0; $i <= US_CITIES - 1; $i++) {
    $usNames[$i] = readline("Enter name for US city No " . ($i + 1) . ": ");
}

$canadianNames = [];
for ($j = 0; $j <= CANADIAN_CITIES - 1; $j++) {
    $canadianNames[$j] = readline("Enter name for Canadian city No " . ($j + 1) . ": ");
}

$distances = [[]];
for ($i = 0; $i <= US_CITIES - 1; $i++) {
    for ($j = 0; $j <= CANADIAN_CITIES - 1; $j++) {
        $distances[$i][$j] = (float)readline("Enter distance between " . $usNames[$i] . " and " .
            $canadianNames[$j] . ": ");
    }
}

for ($i = 0; $i <= US_CITIES - 1; $i++) {
    $minimum = $distances[$i][0];
    $minJ = 0;
    for ($j = 1; $j <= CANADIAN_CITIES - 1; $j++) {
        if ($distances[$i][$j] < $minimum) {
            $minimum = $distances[$i][$j];
            $minJ = $j;
        }
    }
}

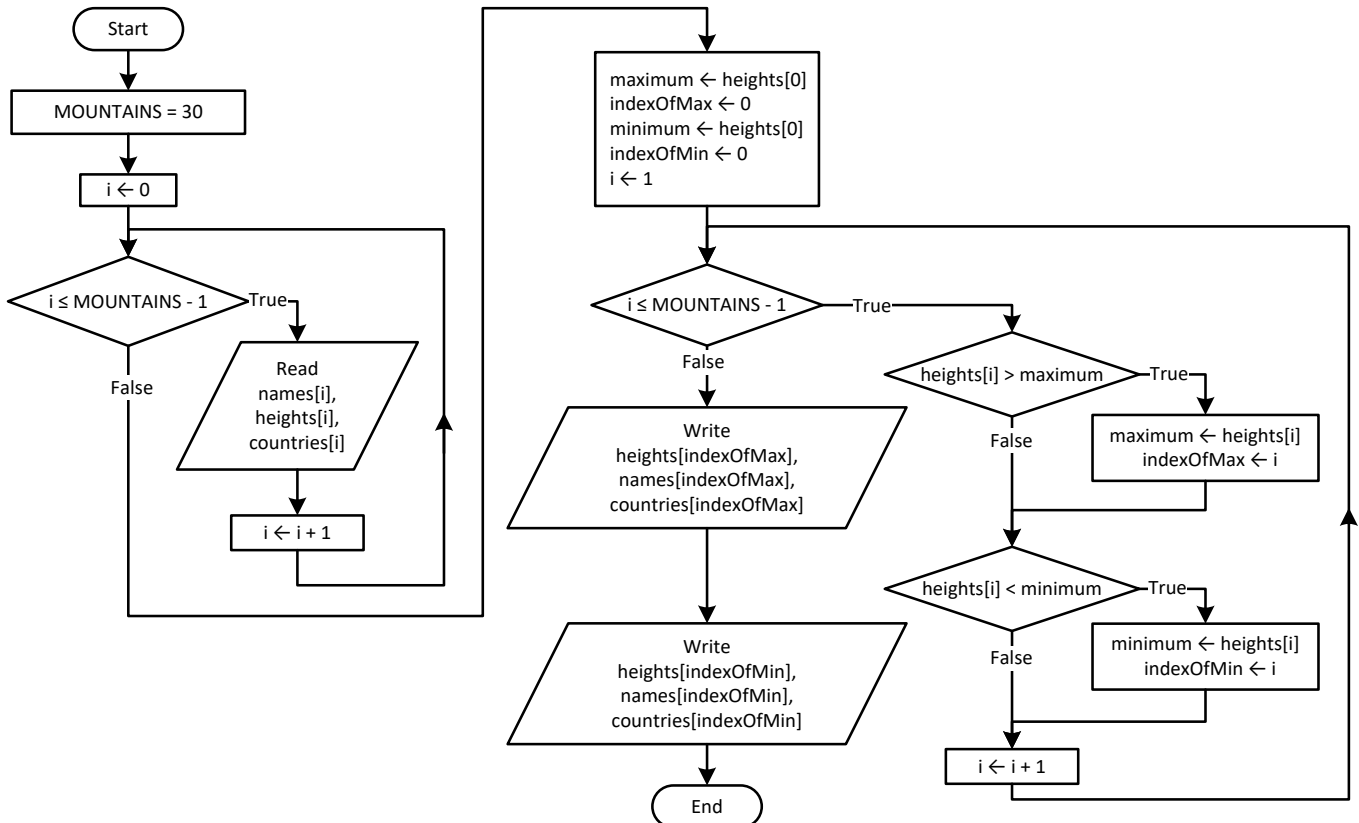
```

```

    }
  }
  echo "Closest Canadian city to ", $usNames[$i], " is ", $canadianNames[$minJ], "\n";
}
?>

```

11. Solution



```

<?php
define("MOUNTAINS", 30);

$names = [];
$heights = [];
$countries = [];
for ($i = 0; $i <= MOUNTAINS - 1; $i++) {
    $names[$i] = readline();
    $heights[$i] = (float)readline();
    $countries[$i] = readline();
}

$max = $heights[0];
$indexOfMax = 0;
$min = $heights[0];
$indexOfMin = 0;
for ($i = 1; $i <= MOUNTAINS - 1; $i++) {
    if ($heights[$i] > $max) {
        $max = $heights[$i];
    }
}

```

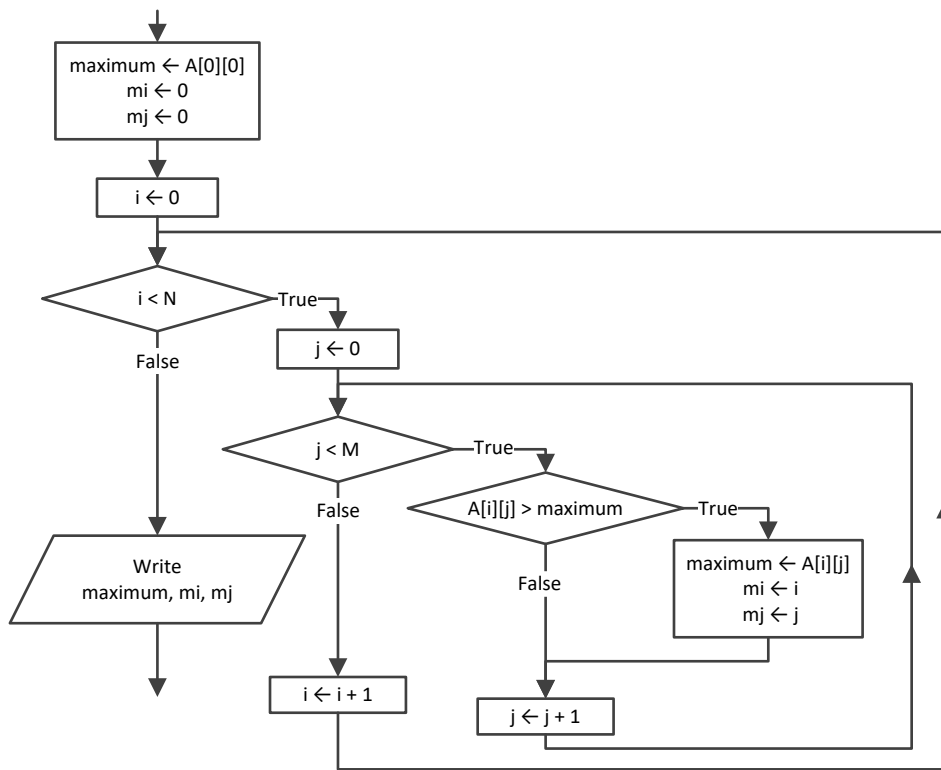
```

    $indexOfMax = $i;
  }
  if ($heights[$i] < $minimum) {
    $minimum = $heights[$i];
    $indexOfMin = $i;
  }
}

echo $heights[$indexOfMax], " ", $names[$indexOfMax], " ", $countries[$indexOfMax], "\n";
echo $heights[$indexOfMin], " ", $names[$indexOfMin], " ", $countries[$indexOfMin], "\n";
?>

```

12. Solution



13. Solution

```

<?php
define("TEAMS", 26);
define("GAMES", 15);

$names = [];
$results = [[]];
for ($i = 0; $i <= TEAMS - 1; $i++) {
    $names[$i] = readline();
    for ($j = 0; $j <= GAMES - 1; $j++) {
        $results[$i][$j] = readline();
    }
}
}

```

```

$points = [];
for ($i = 0; $i <= TEAMS - 1; $i++) {
    $points[$i] = 0;
    for ($j = 0; $j <= GAMES - 1; $j++) {
        if ($results[$i][$j] == "W") {
            $points[$i] += 3;
        }
        elseif ($results[$i][$j] == "T") {
            $points[$i] += 1;
        }
    }
}

$maximum = $points[0];
$m_i = 0;
for ($i = 1; $i <= TEAMS - 1; $i++) {
    if ($points[$i] > $maximum) {
        $maximum = $points[$i];
        $m_i = $i;
    }
}

echo $names[$m_i], "\n";
?>

```

14. Solution

```

<?php
define("OBJECTS", 10);
define("FALLS", 20);

$heights = [[]];
$times = [[]];
for ($i = 0; $i <= OBJECTS - 1; $i++) {
    for ($j = 0; $j <= FALLS - 1; $j++) {
        $heights[$i][$j] = (float)readline();
        $times[$i][$j] = (float)readline();
    }
}

$g = [[]];
for ($i = 0; $i <= OBJECTS - 1; $i++) {
    for ($j = 0; $j <= FALLS - 1; $j++) {
        $g[$i][$j] = 2 * $heights[$i][$j] / $times[$i][$j] ** 2;
    }
}

$minimum = [];
$maximum = [];
for ($i = 0; $i <= OBJECTS - 1; $i++) {
    $minimum[$i] = $g[$i][0];
    $maximum[$i] = $g[$i][0];
}

```

```

    for ($j = 1; $j <= FALLS - 1; $j++) {
        if ($g[$i][$j] < $minimum[$i]) {
            $minimum[$i] = $g[$i][$j];
        }
        if ($g[$i][$j] > $maximum[$i]) {
            $maximum[$i] = $g[$i][$j];
        }
    }
}

for ($i = 0; $i <= OBJECTS - 1; $i++) {
    echo $minimum[$i], " ", $maximum[$i], "\n";
}

$maxi = $maximum[0];
$mini = $minimum[0];
for ($i = 1; $i <= OBJECTS - 1; $i++) {
    if ($maximum[$i] > $maxi) {
        $maxi = $maximum[$i];
    }
    if ($minimum[$i] < $mini) {
        $mini = $minimum[$i];
    }
}

echo $mini, " ", $maxi, "\n";
?>

```

15. Solution

```

<?php
define("STATIONS", 10);
define("DAYS", 365);

$names = [];
$co2 = [[]];
for ($i = 0; $i <= STATIONS - 1; $i++) {
    $names[$i] = readline();
    for ($j = 0; $j <= DAYS - 1; $j++) {
        $co2[$i][$j] = (float)readline();
    }
}

$average = [];
for ($i = 0; $i <= STATIONS - 1; $i++) {
    $average[$i] = 0;
    for ($j = 0; $j <= DAYS - 1; $j++) {
        $average[$i] += $co2[$i][$j];
    }
    $average[$i] /= DAYS;
}

$minimum = $average[0];

```

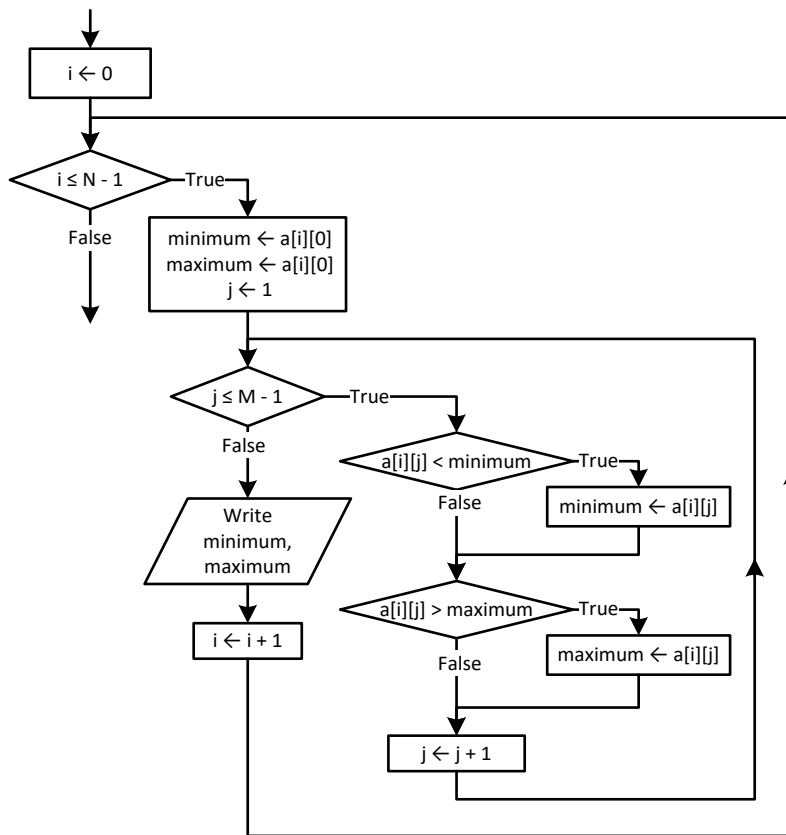


```

$m_i = 0;
for ($i = 1; $i <= STATIONS - 1; $i++) {
    if ($average[$i] < $minimum) {
        $minimum = $average[$i];
        $m_i = $i;
    }
}
echo $names[$m_i], "\n";
?>

```

16. Solution



17. Solution

First approach

```

<?php
define("ROWS", 20);
define("COLUMNS", 30);

$b = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $b[$i][$j] = (float)readline();
    }
}

```

```

$minimum = [];
$maximum = [];
for ($j = 0; $j <= COLUMNS - 1; $j++) {
    $minimum[$j] = $b[0][$j];
    $maximum[$j] = $b[0][$j];
    for ($i = 1; $i <= ROWS - 1; $i++) {
        if ($b[$i][$j] < $minimum[$j]) {
            $minimum[$j] = $b[$i][$j];
        }
        if ($b[$i][$j] > $maximum[$j]) {
            $maximum[$j] = $b[$i][$j];
        }
    }
}

for ($j = 0; $j <= COLUMNS - 1; $j++) {
    echo $minimum[$j], " ", $maximum[$j], "\n";
}
?>

```

Second approach

```

<?php
define("ROWS", 20);
define("COLUMNS", 30);

$b = [[]];
for ($i = 0; $i <= ROWS - 1; $i++) {
    for ($j = 0; $j <= COLUMNS - 1; $j++) {
        $b[$i][$j] = (float)readline();
    }
}

for ($j = 0; $j <= COLUMNS - 1; $j++) {
    $minimum = $b[0][$j];
    $maximum = $b[0][$j];
    for ($i = 1; $i <= ROWS - 1; $i++) {
        if ($b[$i][$j] < $minimum) {
            $minimum = $b[$i][$j];
        }
        if ($b[$i][$j] > $maximum) {
            $maximum = $b[$i][$j];
        }
    }
    echo $minimum, " ", $maximum, "\n";
}
?>

```

18. Solution

```

<?php
define("TEAMS", 20);
define("GAMES", 10);

```

```

$names = [];
$results = [[]];
for ($i = 0; $i <= TEAMS - 1; $i++) {
    $names[$i] = (float)readline("Enter team name: ");
    for ($j = 0; $j <= GAMES - 1; $j++) {
        $results[$i][$j] = readline("Enter result for team " . $names[$i] . " for game No " . ($j + 1) .
            ": ");
        while ($results[$i][$j] != "W" && $results[$i][$j] != "L" && $results[$i][$j] != "T") {
            $results[$i][$j] = readline("Error! Enter only value W, L, or T: ");
        }
    }
}

$points = [];
for ($i = 0; $i <= TEAMS - 1; $i++) {
    $points[$i] = 0;
    for ($j = 0; $j <= GAMES - 1; $j++) {
        if ($results[$i][$j] == "W") {
            $points[$i] += 3;
        }
        elseif ($results[$i][$j] == "T") {
            $points[$i] += 1;
        }
    }
}

for ($m = 1; $m <= 3; $m++) {    //Perform only three passes
    $swaps = false;
    for ($n = TEAMS - 1; $n >= $m; $n--) {
        if ($points[$n] > $points[$n - 1]) {
            $temp = $points[$n];
            $points[$n] = $points[$n - 1];
            $points[$n - 1] = $temp;

            $temp = $names[$n];
            $names[$n] = $names[$n - 1];
            $names[$n - 1] = $temp;

            $swaps = true;
        }
    }
    if (!$swaps) break;
}

echo "Gold: ", $names[0], "\n";
echo "Silver: ", $names[1], "\n";
echo "Bronze: ", $names[2], "\n";
?>

```

19. Solution

```
<?php
```

```

define("PEOPLE", 50);

$names = [];
$heights = [];
for ($i = 0; $i <= PEOPLE - 1; $i++) {
    $names[$i] = readline("Enter name for person No. " . ($i + 1) . ": ");
    $heights[$i] = (float)readline("Enter height for person No. " . ($i + 1) . ": ");
}

for ($m = 1; $m <= PEOPLE - 1; $m++) {
    for ($n = PEOPLE - 1; $n >= $m; $n--) {
        if ($heights[$n] > $heights[$n - 1]) {
            $temp = $heights[$n];
            $heights[$n] = $heights[$n - 1];
            $heights[$n - 1] = $temp;

            $temp = $names[$n];
            $names[$n] = $names[$n - 1];
            $names[$n - 1] = $temp;
        }
        elseif ($heights[$n] == $heights[$n - 1]) {
            if ($names[$n] < $names[$n - 1]) {
                $temp = $names[$n];
                $names[$n] = $names[$n - 1];
                $names[$n - 1] = $temp;
            }
        }
    }
}

for ($i = 0; $i <= PEOPLE - 1; $i++) {
    echo $heights[$i], "\t", $names[$i], "\n";
}
?>

```

20. Solution

```

<?php
define("PEOPLE", 50);

$firstNames = [];
$lastNames = [];
$fatherNames = [];

for ($i = 0; $i <= PEOPLE - 1; $i++) {
    $firstNames[$i] = readline("Enter first name for person No." . ($i + 1) . ": ");
    $lastNames[$i] = readline("Enter last name for person No." . ($i + 1) . ": ");
    $fatherNames[$i] = readline("Enter father's name for person No." . ($i + 1) . ": ");
}

for ($m = 1; $m <= PEOPLE - 1; $m++) {
    for ($n = PEOPLE - 1; $n >= $m; $n--) {
        if ($lastNames[$n] < $lastNames[$n - 1]) {

```

```

    $tempStr = $lastNames[$n];
    $lastNames[$n] = $lastNames[$n - 1];
    $lastNames[$n - 1] = $tempStr;

    $tempStr = $firstNames[$n];
    $firstNames[$n] = $firstNames[$n - 1];
    $firstNames[$n - 1] = $tempStr;

    $tempStr = $fatherNames[$n];
    $fatherNames[$n] = $fatherNames[$n - 1];
    $fatherNames[$n - 1] = $tempStr;
}
elseif ($lastNames[$n] == $lastNames[$n - 1]) {
    if ($firstNames[$n] < $firstNames[$n - 1]) {
        $tempStr = $firstNames[$n];
        $firstNames[$n] = $firstNames[$n - 1];
        $firstNames[$n - 1] = $tempStr;

        $tempStr = $fatherNames[$n];
        $fatherNames[$n] = $fatherNames[$n - 1];
        $fatherNames[$n - 1] = $tempStr;
    }
    elseif ($firstNames[$n] == $firstNames[$n - 1]) {
        if ($fatherNames[$n] < $fatherNames[$n - 1]) {
            $tempStr = $fatherNames[$n];
            $fatherNames[$n] = $fatherNames[$n - 1];
            $fatherNames[$n - 1] = $tempStr;
        }
    }
}
}
}
}

for ($i = 0; $i <= PEOPLE - 1; $i++) {
    echo $lastNames[$i], "\t", $firstNames[$i], "\t", $fatherNames[$i], "\n";
}
?>

```

21. Solution

```

<?php
define("ARTISTS", 12);
define("JUDGES", 10);

$artistNames = [];
$score = [[]];
for ($i = 0; $i <= ARTISTS - 1; $i++) {
    $artistNames[$i] = readline("Enter name for artist No " . ($i + 1) . ": ");
    for ($j = 0; $j <= JUDGES - 1; $j++) {
        echo "Enter score for artist: ", $artistNames[$i];
        $score[$i][$j] = (int)readline(" gotten from judge No " . ($j + 1) . ": ");
    }
}

```

```

}

$total = [];
for ($i = 0; $i <= ARTISTS - 1; $i++) {
    $total[$i] = 0;
    for ($j = 1; $j <= JUDGES - 1; $j++) {
        $total[$i] += $score[$i][$j];
    }
}

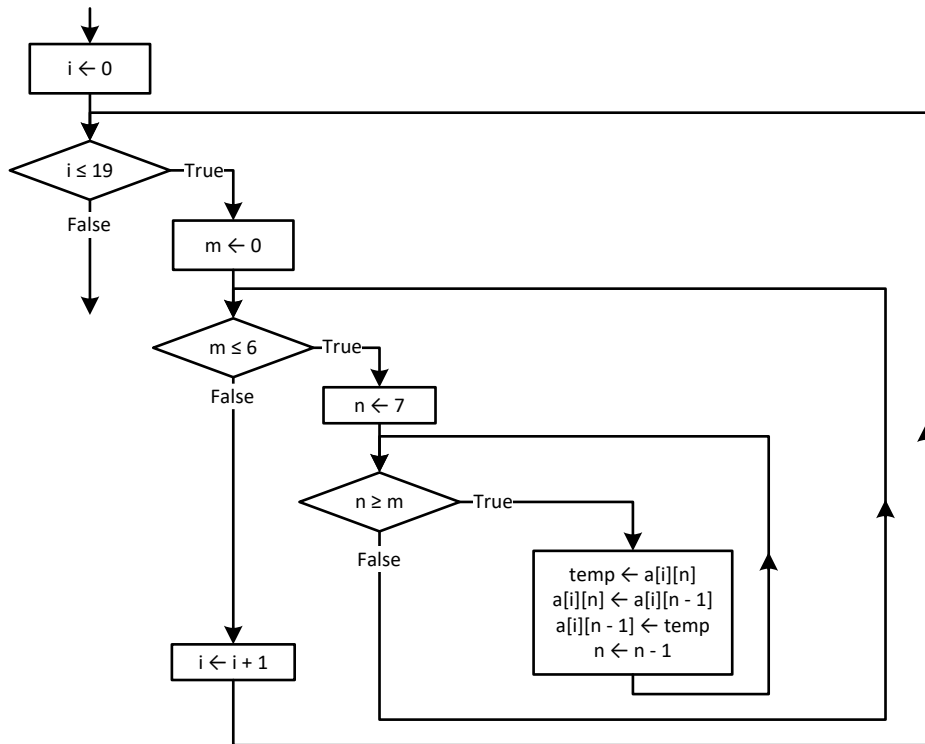
for ($i = 0; $i <= ARTISTS - 1; $i++) {
    $minimum = $score[$i][0];
    $maximum = $score[$i][0];
    for ($j = 1; $j <= JUDGES - 1; $j++) {
        if ($score[$i][$j] < $minimum) {
            $minimum = $score[$i][$j];
        }
        if ($score[$i][$j] > $maximum) {
            $maximum = $score[$i][$j];
        }
    }
    $total[$i] = $total[$i] - $minimum - $maximum;
    echo $total[$i], "\n";
}

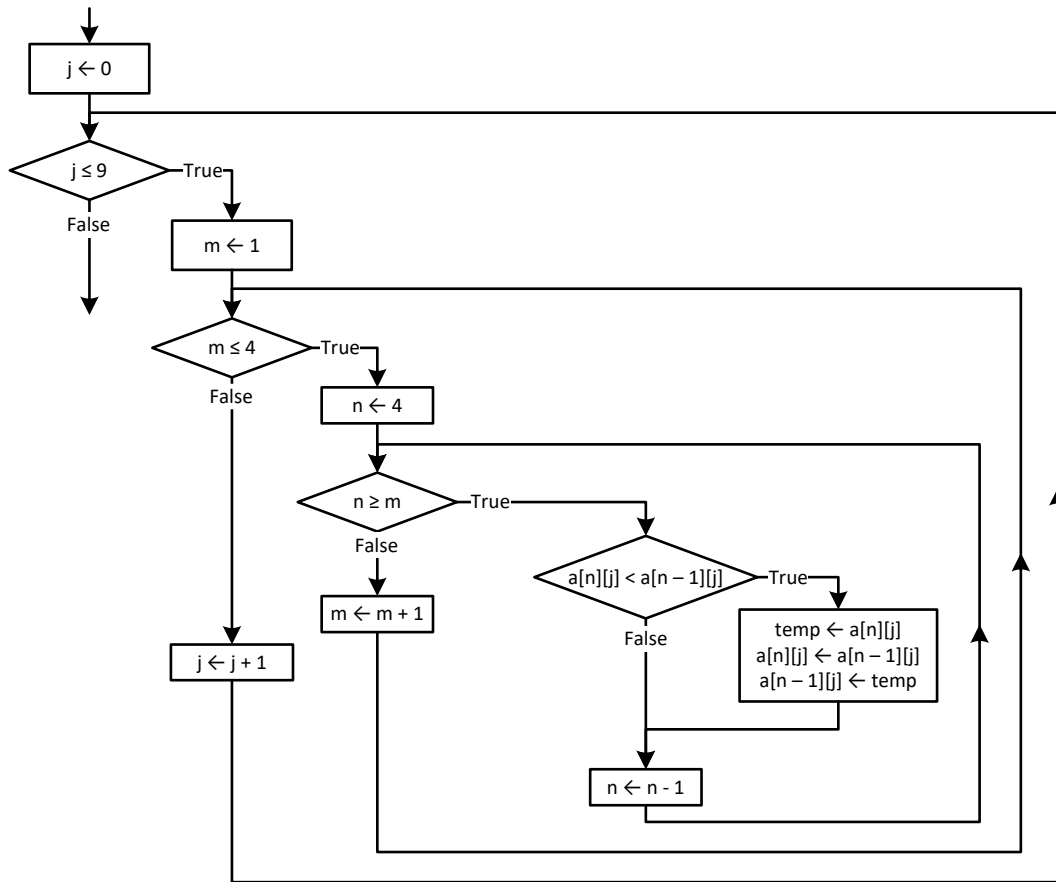
for ($m = 1; $m <= ARTISTS - 1; $m++) {
    for ($n = ARTISTS - 1; $n >= $m; $n--) {
        if ($total[$n] > $total[$n - 1]) {
            $temp = $total[$n];
            $total[$n] = $total[$n - 1];
            $total[$n - 1] = $temp;

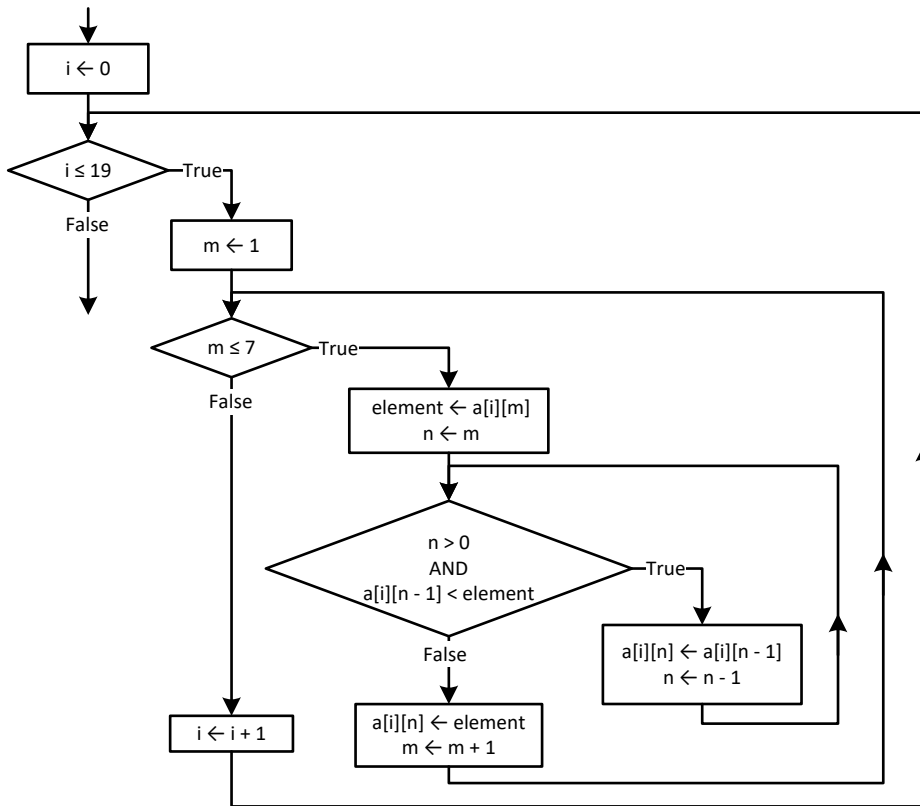
            $temp = $artistNames[$n];
            $artistNames[$n] = $artistNames[$n - 1];
            $artistNames[$n - 1] = $temp;
        }
        elseif ($total[$n] == $total[$n - 1]) {
            if ($artistNames[$n] < $artistNames[$n - 1]) {
                $temp = $artistNames[$n];
                $artistNames[$n] = $artistNames[$n - 1];
                $artistNames[$n - 1] = $temp;
            }
        }
    }
}

for ($i = 0; $i <= ARTISTS - 1; $i++) {
    echo $artistNames[$i], ", ", $total[$i], "\n";
}
?>

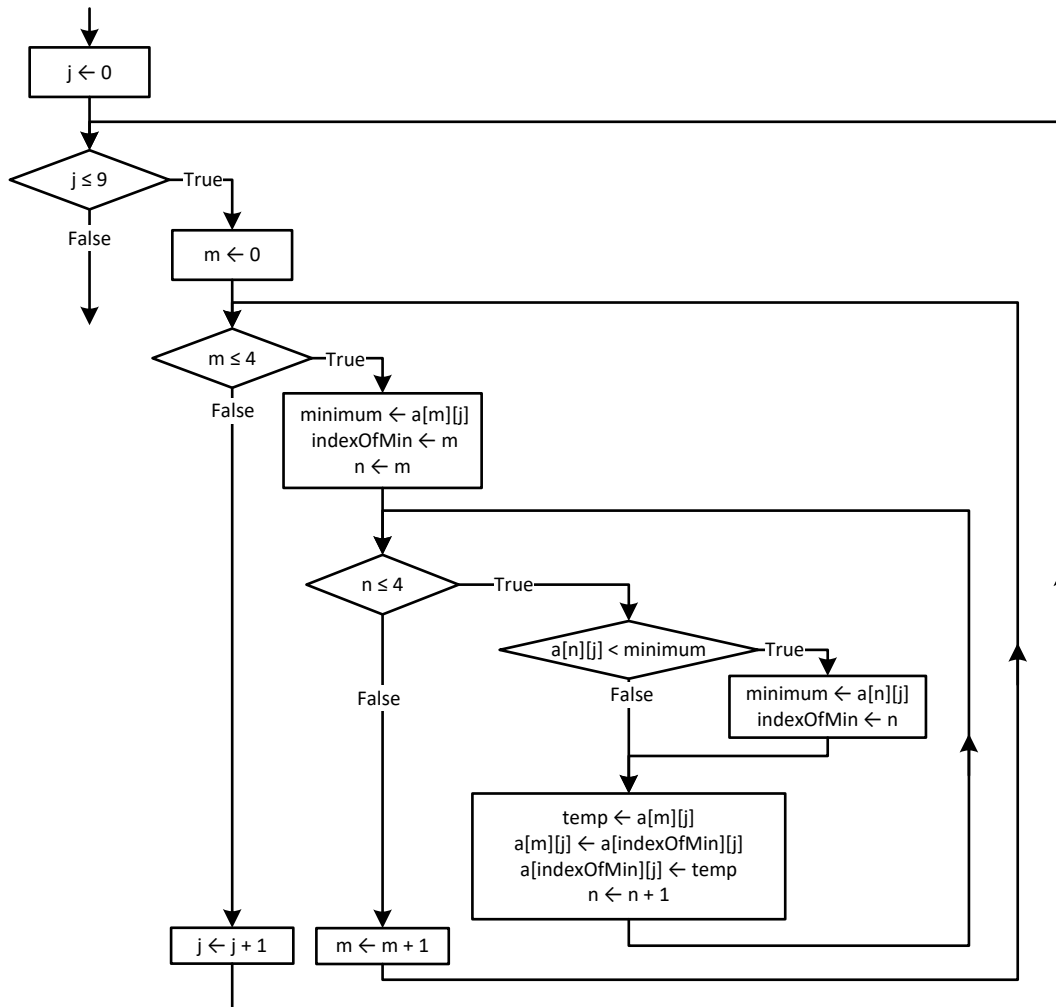
```

22. Solution

23. Solution

24. Solution

25. Solution



26. Solution

```

<?php
define("PEOPLE", 10);
define("PUZZLES", 8);

$names = [];
$times = [[]];
for ($i = 0; $i <= PEOPLE - 1; $i++) {
    $names[$i] = readline();
    for ($j = 0; $j <= PUZZLES - 1; $j++) {
        $hours = (int)readline();
        $minutes = (int)readline();
        $seconds = (int)readline();
        $times[$i][$j] = $hours * 3600 + $minutes * 60 + $seconds;
    }
}

```

```

for ($i = 0; $i <= PEOPLE - 1; $i++) {
  for ($m = 0; $m <= PUZZLES - 1; $m++) {
    $minimum = $times[$i][$m];
    $indexOfMin = $m;
    for ($n = $m; $n <= PUZZLES - 1; $n++) {
      if ($times[$i][$n] < $minimum) {
        $minimum = $times[$i][$n];
        $indexOfMin = $n;
      }
    }
    $iTemp = $times[$i][$m];
    $times[$i][$m] = $times[$i][$indexOfMin];
    $times[$i][$indexOfMin] = $iTemp;
  }
}

for ($i = 0; $i <= PEOPLE - 1; $i++) {
  echo $names[$i], "\n";
  for ($j = 0; $j <= 2; $j++) {
    echo $times[$i][$j], "\n";
  }
}

$average = [];
for ($i = 0; $i <= PEOPLE - 1; $i++) {
  $average[$i] = 0;
  for ($j = 0; $j <= PUZZLES - 1; $j++) {
    $average[$i] += $times[$i][$j];
  }
  $average[$i] /= PUZZLES;
}

for ($m = 0; $m <= 2; $m++) { //Perform only 3 iterations
  $minimum = $average[$m];
  $indexOfMin = $m;
  for ($n = $m; $n <= PEOPLE - 1; $n++) {
    if ($average[$n] < $minimum) {
      $minimum = $average[$n];
      $indexOfMin = $n;
    }
  }
  $dTemp = $average[$m];
  $average[$m] = $average[$indexOfMin];
  $average[$indexOfMin] = $dTemp;

  $temp = $names[$m];
  $names[$m] = $names[$indexOfMin];
  $names[$indexOfMin] = $temp;
}

echo $names[0], ", ", $names[1], ", ", $names[2], "\n";
?>

```

27. Solution

```
<?php
define("AREAS", 5);
define("HOURS", 48);

$names = [];
$CO2 = [[]];
for ($i = 0; $i <= AREAS - 1; $i++) {
    $names[$i] = readline();
    for ($j = 0; $j <= HOURS - 1; $j++) {
        $CO2[$i][$j] = (float)readline();
    }
}

$averagePerHour = [];
for ($i = 0; $i <= AREAS - 1; $i++) {
    $averagePerHour[$i] = 0;
    for ($j = 0; $j <= HOURS - 1; $j++) {
        $averagePerHour[$i] += $CO2[$i][$j];
    }
    $averagePerHour[$i] /= HOURS;
}

for ($i = 0; $i <= AREAS - 1; $i++) {
    echo $names[$i], ", ", $averagePerHour[$i], "\n";
}

$averagePerCity = [];
for ($j = 0; $j <= HOURS - 1; $j++) {
    $averagePerCity[$j] = 0;
    for ($i = 0; $i <= AREAS - 1; $i++) {
        $averagePerCity[$j] += $CO2[$i][$j];
    }
    $averagePerCity[$j] /= AREAS;
}

for ($j = 0; $j <= HOURS - 1; $j++) {
    echo $averagePerCity[$j], "\n";
}

$maximum = $averagePerCity[0];
$m_j = 0;
for ($j = 1; $j <= HOURS - 1; $j++) {
    if ($averagePerCity[$j] > $maximum) {
        $maximum = $averagePerCity[$j];
        $m_j = $j;
    }
}
echo $m_j, "\n";

$maximum = $CO2[0][0];
```

```

$m_i = 0;
$m_j = 0;
for ($i = 0; $i <= AREAS - 1; $i++) {
  for ($j = 0; $j <= HOURS - 1; $j++) {
    if ($CO2[$i][$j] > $maximum) {
      $maximum = $CO2[$i][$j];
      $m_i = $i;
      $m_j = $j;
    }
  }
}
echo $m_j, ", ", $names[$m_i], "\n";

for ($m = 1; $m <= AREAS - 1; $m++) {
  $element1 = $averagePerHour[$m];
  $element2 = $names[$m];

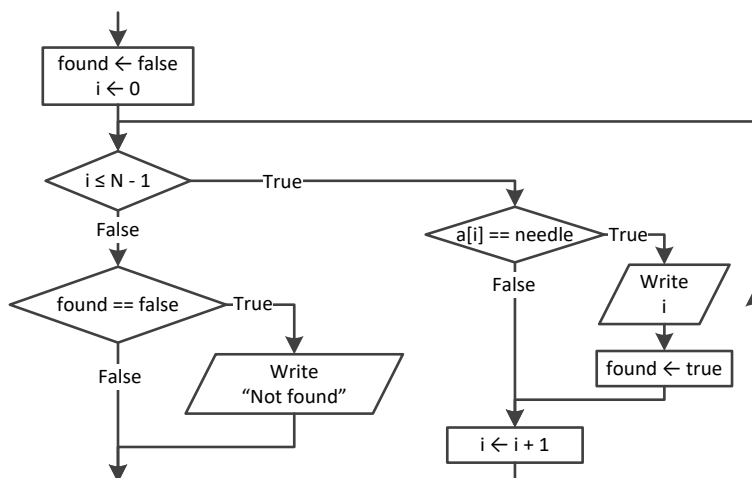
  $n = $m;
  while ($n > 0 && $averagePerHour[$n - 1] < $element1) {
    $averagePerHour[$n] = $averagePerHour[$n - 1];
    $names[$n] = $names[$n - 1];
    $n--;
  }

  $averagePerHour[$n] = $element1;
  $names[$n] = $element2;
}

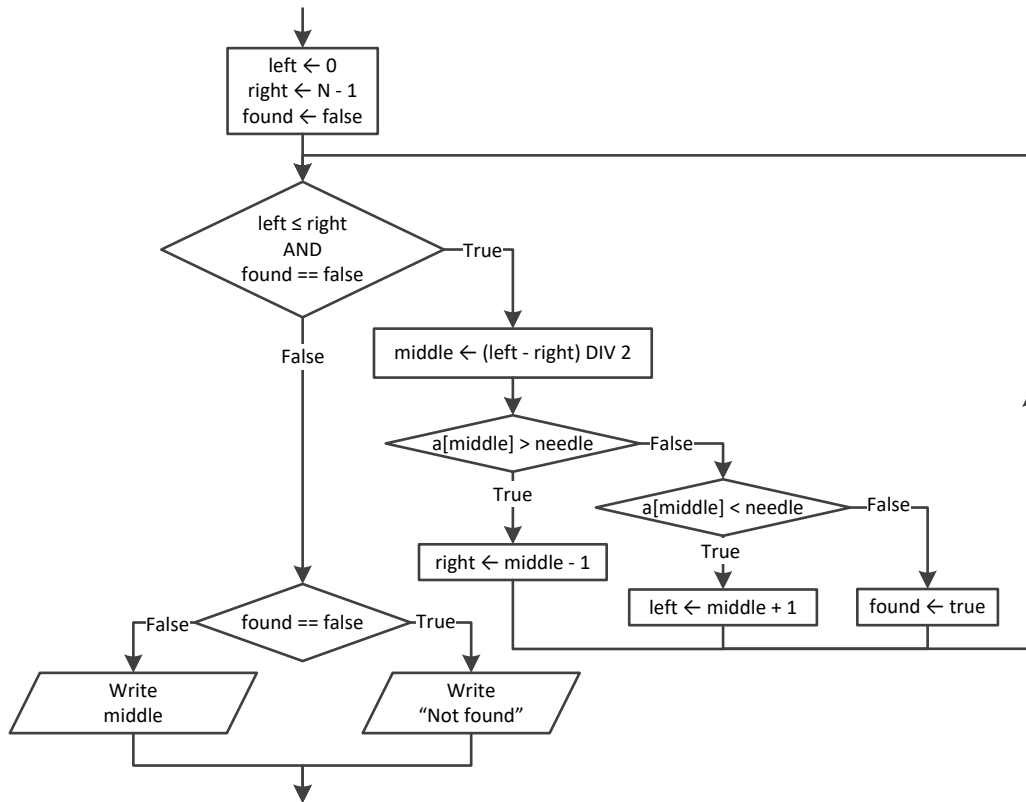
echo $names[0], ", ", $names[1], ", ", $names[2], "\n";
?>

```

28. Solution



29. Solution



30. Solution

```

<?php
define("TEAMS", 20);
define("WEEKS", 12);

$names = [];
$results = [[]];
for ($i = 0; $i <= TEAMS - 1; $i++) {
    $names[$i] = readline("Enter name for team No. " . ($i + 1) . ": ");
    for ($j = 0; $j <= WEEKS - 1; $j++) {
        echo "Enter result for";
        $results[$i][$j] = readline(" week No. " . ($j + 1) . " for " . $names[$i] . ": ");
    }
}

//Get value to search and convert it to uppercase
$needle = strtoupper(readline("Enter a result to search: "));

for ($i = 0; $i <= TEAMS - 1; $i++) {
    $found = false;
    echo "Found results for ", $names[$i], "\n";
    for ($j = 0; $j <= WEEKS - 1; $j++) {
        if (strtoupper($results[$i][$j]) == $needle) {

```

```

        echo "Week ", $j + 1, "\n";
        $found = true;
    }
}

if (!$found) {
    echo "No results!\n";
}
}
?>

```

31. Solution

```

<?php
define("TEAMS", 10);
define("GAMES", 16);

$names = [];
$goalsScored = [[]];
$goalsLetIn = [[]];
for ($i = 0; $i <= TEAMS - 1; $i++) {
    $names[$i] = readline("Enter team name: ");
    for ($j = 0; $j <= GAMES - 1; $j++) {
        $goalsScored[$i][$j] = (int)readline("Enter goals scored: ");
        while ($goalsScored[$i][$j] < 0) {
            $goalsScored[$i][$j] = (int)readline("Error! Enter goals scored: ");
        }

        $goalsLetIn[$i][$j] = (int)readline("Enter goals let in: ");
        while ($goalsLetIn[$i][$j] < 0) {
            $goalsLetIn[$i][$j] = (int)readline("Error! Enter goals let in: ");
        }
    }
}

$needle = readline("Enter a team to search: ");

$i = 0;
while ($i < TEAMS - 1 && $names[$i] != $needle) {
    $i++;
}

if ($names[$i] != $needle) {
    echo "This team does not exist\n";
}
else {
    $total = 0;
    for ($j = 0; $j <= GAMES - 1; $j++) {
        if ($goalsScored[$i][$j] > $goalsLetIn[$i][$j]) {
            $total += 3;
        }
        elseif ($goalsScored[$i][$j] == $goalsLetIn[$i][$j]) {
            $total += 1;
        }
    }
}

```

```

    }
}
echo $total, "\n";
}
?>

```

32. Solution

```

<?php
define("CLASS1", 20);
define("CLASS2", 25);

echo "Class 1\n";
$names1 = [];
for ($i = 0; $i <= CLASS1 - 1; $i++) {
    $names1[$i] = readline("Enter name: ");
}
echo "Class 2\n";
$names2 = [];
for ($i = 0; $i <= CLASS2 - 1; $i++) {
    $names2[$i] = readline("Enter name: ");
}

//Bubble sort
for ($m = 1; $m <= CLASS1 - 1; $m++) {
    for ($n = CLASS1 - 1; $n >= $m; $n--) {
        if ($names1[$n] < $names1[$n - 1]) {
            $temp = $names1[$n];
            $names1[$n] = $names1[$n - 1];
            $names1[$n - 1] = $temp;
        }
    }
}
for ($m = 1; $m <= CLASS2 - 1; $m++) {
    for ($n = CLASS2 - 1; $n >= $m; $n--) {
        if ($names2[$n] < $names2[$n - 1]) {
            $temp = $names2[$n];
            $names2[$n] = $names2[$n - 1];
            $names2[$n - 1] = $temp;
        }
    }
}

echo "\nClass 1\n";
for ($i = 0; $i <= CLASS1 - 1; $i++) {
    echo $names1[$i], "\n";
}
echo "\nClass 2\n";
for ($i = 0; $i <= CLASS2 - 1; $i++) {
    echo $names2[$i], "\n";
}

```



```

$needle = readline("Enter a name to search: ");

$left = 0;
$right = CLASS1 - 1;
$found = false;
while ($left <= $right && !$found) {
    $middle = (int)(($left + $right) / 2);

    if ($needle < $names1[$middle]) {
        $right = $middle - 1;
    }
    elseif ($needle > $names1[$middle]) {
        $left = $middle + 1;
    }
    else {
        $found = true;
    }
}

if ($found) {
    echo "Student found in Class No 1\n";
}
else {
    $left = 0;
    $right = CLASS2 - 1;
    while ($left <= $right && !$found) {
        $middle = (int)(($left + $right) / 2);

        if ($needle < $names2[$middle]) {
            $right = $middle - 1;
        }
        elseif ($needle > $names2[$middle]) {
            $left = $middle + 1;
        }
        else {
            $found = true;
        }
    }

    if ($found) {
        echo "Student found in Class No 2\n";
    }
    else {
        echo "Student not found in either class\n";
    }
}
?>

```

33. Solution

```

$usr = strtoupper(readline("Enter username: "));
$pwd = strtoupper(readline("Enter password: "));

```

```

$i = 0;
while ($i < 99 && strtoupper($usernames[$i]) != $usr) {
    $i++;
}

if (strtoupper($usernames[$i]) == $usr && strtoupper($passwords[$i]) == $pwd) {
    echo "Login OK!\n";
}
else {
    echo "Login Failed!\n";
}

```

34. Solution

```

$valueStr = readline("Enter a value to search: ");

$found = false;

for ($i = 0; $i <= 999; $i++) {
    if ($names[$i] == $valueStr) {
        echo $SSNs[$i], "\n";
        $found = true;
    }
}

if (!$found) {
    $value = (int)$valueStr;
    $i = 0;
    while ($i < 999 && $SSNs[$i] != $value) {
        $i++;
    }

    if ($SSNs[$i] == $value) {
        $found = true;
        echo $names[$i], "\n";
    }
}

if (!$found) {
    echo "This value does not exist\n";
}

```

35. Solution

```

<?php
define("STUDENTS", 12);
define("LESSONS", 6);

$grades = [[]];
for ($i = 0; $i <= STUDENTS - 1; $i++) {
    for ($j = 0; $j <= LESSONS - 1; $j++) {
        do {
            $grades[$i][$j] = (int)readline();

```

```

    $failure = false;
    if ($grades[$i][$j] < 0) {
        echo "Error! You entered a negative value\n";
        $failure = true;
    }
    elseif ($grades[$i][$j] > 100) {
        echo "Error! You entered a value grater than 100\n";
        $failure = true;
    }
} while ($failure);
}
}

$average = [];
for ($i = 0; $i <= STUDENTS - 1; $i++) {
    $average[$i] = 0;
    for ($j = 0; $j <= LESSONS - 1; $j++) {
        $average[$i] += $grades[$i][$j];
    }
    $average[$i] /= LESSONS;
}

$found = false;
for ($i = 0; $i <= STUDENTS - 1; $i++) {
    if ($average[$i] < 70) {
        $found = true;
        break;
    }
}

if ($found) {
    echo "There is at least one student that has an average value below 70\n";
}
?>

```

36. Solution

```

<?php
$morseAlphabet = [
    "A" => ".-.",
    "B" => "-...",
    "C" => "-.-.",
    "D" => "-..",
    "E" => ".",
    "F" => "...-",
    "G" => "--.",
    "H" => "....",
    "I" => "..",
    "J" => ".---",
    "K" => "-.-",
    "L" => "-.-.",
    "M" => "--",

```

```

"N" => "-.",
"O" => "---",
"P" => ".--.",
"Q" => "--.",
"R" => "-.",
"S" => "...",
"T" => "-",
"U" => "..-",
"V" => "...-",
"W" => ".--",
"X" => "-..-",
"Y" => "-.--",
"Z" => "--..",
" " => "/"
];

$word = readline("Enter an English message: ");

for ($i = 0; $i <= strlen($word) - 1; $i++) {
    $letter = $word[$i];
    echo $morseAlphabet[strtoupper($letter)], " ";
}
?>

```

37. Solution

```

<?php
$alphabet = "ABCDEFGHIJKLMNOPQRSTUVWXYZ";

//Create an associative array to store the frequencies of each letter with initial
//frequencies all set to zero.
$lettersFrequency = [];
for ($i = 0; $i <= strlen($alphabet) - 1; $i++) {
    $letter = $alphabet[$i];
    $lettersFrequency[$letter] = 0;
}

$sentence = readline("Enter an English sentence: ");

//Iterate through the characters of the user-provided sentence and if it is a letter,
//update (increase) the corresponding frequency count in the lettersFrequency dictionary.
//Also count number of space characters and existing letters
$countSpaces = 0;
$countExistingLetters = 0;
for ($i = 0; $i <= strlen($sentence) - 1; $i++) {
    $letter = strtoupper($sentence[$i]);
    if (arrayKeyExists($letter , $lettersFrequency)) {
        $lettersFrequency[$letter]++;
        $countExistingLetters++;
    }
    elseif ($letter == " ") {
        $countSpaces++;
    }
}

```

```
    }
}

//Display the frequency of each existing letter
foreach ($lettersFrequency as $key => $value) {
    if ($value > 0) {
        echo $key, ": ", $value, "\n";
    }
}

//Count and display all non existing letters
$countNonExistingLetters = 0;
foreach ($lettersFrequency as $key => $value) {
    if ($value == 0) {
        $countNonExistingLetters += 1;
        echo $key, "\n";
    }
}

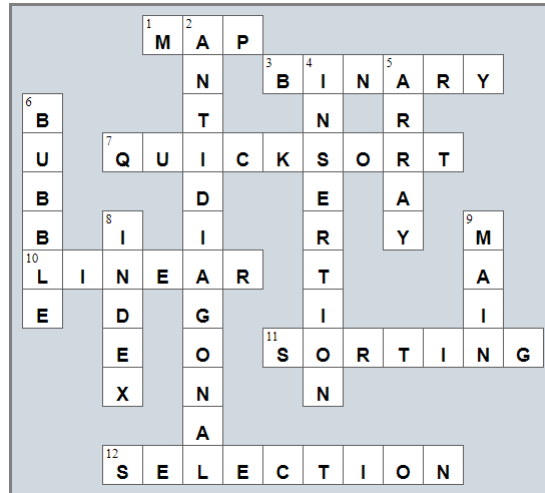
//Display percentage of letters that do not exist in relation to the letters of the English alphabet
echo $countNonExistingLetters * 100 / 26, "%\n";

//Display percentage of non-alphabetic characters in relation to the characters of
//the user-provided sentence (excluding space characters)
$countUserProvidedCharacters = strlen($sentence) - $countSpaces;
$countNonAlphabeticCharacters = $countUserProvidedCharacters - $countExistingLetters;
echo $countNonAlphabeticCharacters * 100 / $countUserProvidedCharacters, "%\n";
?>
```

Review in "Arrays in PHP"

Review Crossword Puzzle

1.



Chapter 35

35.4 Review Questions: True/False

1. true
2. true
3. false
4. false
5. true
6. true
7. true
8. true
9. true
10. true
11. false
12. true

Chapter 36

36.8 Review Questions: True/False

- | | |
|-----------|-----------|
| 1. true | 18. true |
| 2. true | 19. false |
| 3. false | 20. true |
| 4. true | 21. true |
| 5. true | 22. true |
| 6. false | 23. true |
| 7. true | 24. true |
| 8. false | 25. false |
| 9. true | 26. true |
| 10. false | 27. false |
| 11. true | 28. true |
| 12. true | 29. false |
| 13. true | 30. true |
| 14. true | 31. true |
| 15. true | 32. true |
| 16. false | 33. true |
| 17. false | 34. false |

36.9 Review Exercises

1. Solution

```
function findMax($a, $b) {
    if ($a > $b) {
        $maximum = $a;
    }
    else {
        $maximum = $b;
    }
    return $maximum;
}
```

2. Solution

Step	Statement	Main Code		Method sumDigits()		
		\$s	\$i	\$a	\$d1	\$d2
1	\$s = 0	0	?			
2	\$i = 25	0	25			
3	\$i <= 27	true				
4	\$s += sumDigits(\$i)			25	?	?
5	\$d1 = \$a % 10			25	5	?
6	\$d2 = (int)(\$a / 10)			25	5	2

7	return \$d1 + \$d2	7	25			
8	\$i++	7	26			
9	\$i <= 27	true				
10	\$s += sumDigits(\$i)			26	?	?
11	\$d1 = \$a % 10			26	6	?
12	\$d2 = (int)(\$a / 10)			26	6	2
13	return \$d1 + \$d2	15	26			
14	\$i++	15	27			
15	\$i <= 27	true				
16	\$s += sumDigits(\$i)			27	?	?
17	\$d1 = \$a % 10			27	7	?
18	\$d2 = (int)(\$a / 10)			27	7	2
19	return \$d1 + \$d2	24	27			
20	\$i++	24	28			
21	\$i <= 27	false				
22	echo \$s	It displays: 24				

3. Solution

Step	Statement	Main Code		Method sss()		
		\$s	\$i	\$a	\$total	\$k
1	\$i = 1	?	1			
2	\$s = 0	0	1			
3	while(\$i < 6)	true				
4	if (\$i % 2 == 1)	true				
5	\$s += 1	1	1			
6	\$i++	1	2			
7	while(\$i < 6)	true				
8	if (\$i % 2 == 1)	false				
9	\$s += sss(\$i)			2	?	?
10	\$total = 0			2	0	?
11	\$k = 1			2	0	1
12	\$k <= \$a	true				
13	\$total += \$k			2	1	1
14	\$k++			2	1	2
15	\$k <= \$a	true				
16	\$total += \$k			2	3	2
17	\$k++			2	3	3

18	<code>\$k <= \$a</code>			false		
19	<code>return \$total</code>	4	2			
20	<code>\$i++</code>	4	3			
21	<code>while(\$i < 6)</code>	true				
22	<code>if (\$i % 2 == 1)</code>	true				
23	<code>\$s += 1</code>	5	3			
24	<code>\$i++</code>	5	4			
25	<code>while(\$i < 6)</code>	true				
26	<code>if (\$i % 2 == 1)</code>	false				
27	<code>\$s += sss(\$i)</code>			4	?	?
28	<code>\$total = 0</code>			4	0	?
29	<code>\$k = 1</code>			4	0	1
30	<code>\$k <= \$a</code>			true		
31	<code>\$total += \$k</code>			4	1	1
32	<code>\$k++</code>			4	1	2
33	<code>\$k <= \$a</code>			true		
34	<code>\$total += \$k</code>			4	3	2
35	<code>\$k++</code>			4	3	3
36	<code>\$k <= \$a</code>			true		
37	<code>\$total += \$k</code>			4	6	4
38	<code>\$k++</code>			4	6	4
39	<code>\$k <= \$a</code>			true		
40	<code>\$total += \$k</code>			4	10	4
41	<code>\$k++</code>			4	10	5
42	<code>\$k <= \$a</code>			false		
43	<code>return \$total</code>	15	4			
44	<code>\$i++</code>	15	5			
45	<code>while(\$i < 6)</code>	true				
46	<code>if (\$i % 2 == 1)</code>	true				
47	<code>\$s += 1</code>	16	5			
48	<code>\$i++</code>	16	6			
49	<code>while(\$i < 6)</code>	false				
50	<code>echo \$s</code>	It displays: 16				

4. Solution

Step	Statement	Main Code				Method customDiv()	
		\$k	\$m	\$a	\$x	\$b	\$d
1	\$k = (int)readline()	12	?	?	?		
2	\$m = 2	12	2	?	?		
3	\$a = 1	12	2	1	?		
4	while (\$a < 6)	true					
5	if (\$k % \$m != 0)	false					
6	\$x = \$a + \$m + customDiv(\$m, \$a)					2	1
7	return (int)((\$b + \$d) / 2)	12	2	1	4		
8	echo \$m, " ", \$a, " ", \$x;	It displays: 2 1 4					
9	\$a += 2	12	2	3	4		
10	\$m++	12	3	3	4		
11	while (\$a < 6)	true					
12	if (\$k % \$m != 0)	false					
13	\$x = \$a + \$m + customDiv(\$m, \$a)					3	3
14	return (int)((\$b + \$d) / 2)	12	3	3	9		
15	echo \$m, " ", \$a, " ", \$x;	It displays: 3 3 9					
16	\$a += 2	12	3	5	9		
17	\$m++	12	4	5	9		
18	while (\$a < 6)	true					
19	if (\$k % \$m != 0)	false					
20	\$x = \$a + \$m + customDiv(\$m, \$a)					4	5
21	return (int)((\$b + \$d) / 2)	12	4	5	13		
22	echo \$m, " ", \$a, " ", \$x;	It displays: 4 5 13					
23	\$a += 2	12	4	7	13		
24	\$m++	12	5	7	13		
25	while (\$a < 6)	false					

5. Solution

Step	Statement	Main Code		void Method display()
		\$i	\$x	\$a
1	\$i = 1	1	?	
2	\$i <= 5	true		
3	\$x = (int)readline()	1	3	

4	display(\$x)			3
5	if (\$a % 2 == 0)			false
6	echo \$a, " is odd"	It displays: 3 is odd		
7	\$i++	2	3	
8	\$i <= 5	true		
9	\$x = (int)readline()	2	7	
10	display(\$x)			7
11	if (\$a % 2 == 0)			false
12	echo \$a, " is odd"	It displays: 7 is odd		
13	\$i++	3	7	
14	\$i <= 5	true		
15	\$x = (int)readline()	3	9	
16	display(\$x)			9
17	if (\$a % 2 == 0)			false
18	echo \$a, " is odd"	It displays: 9 is odd		
19	\$i++	4	9	
20	\$i <= 5	true		
21	\$x = (int)readline()	4	2	
22	display(\$x)			2
23	if (\$a % 2 == 0)			true
24	echo \$a, " is even"	It displays: 2 is even		
25	\$i++	5	2	
26	\$i <= 5	true		
27	\$x = (int)readline()	5	4	
28	display(\$x)			4
29	if (a % 2 == 0)			true
30	echo \$a, " is even"	It displays: 4 is even		
31	\$i++	6	4	
32	\$i <= 5	false		

6. Solution

Step	Statement	Main Code		void Method division()	
		\$x	\$y	\$a	\$b
1	\$x = 20	20	?		
2	\$y = 30	20	30		
3	while (\$x % \$y < 30)	true			

4	division(\$y, \$x)			30	20
5	\$b = (int)(\$b / \$a)			30	0
6	echo \$a * \$b	It displays: 0			
7	\$x = 4 * \$y	120	30		
8	\$y++	120	31		
9	while (\$x % \$y < 30)	true			
10	division(\$y, \$x)			31	120
11	\$b = (int)(\$b / \$a)			31	3
12	echo \$a * \$b	It displays: 93			
13	\$x = 4 * \$y	124	31		
14	\$y++	124	32		
15	while (\$x % \$y < 30)	true			
16	division(\$y, \$x)			32	124
17	\$b = (int)(\$b / \$a)			32	3
18	echo \$a * \$b	It displays: 96			
19	\$x = 4 * \$y	128	32		
20	\$y++	128	33		
21	while (\$x % \$y < 30)	true			
22	division(\$y, \$x)			33	128
23	\$b = (int)(\$b / \$a)			33	3
24	echo \$a * \$b	It displays: 99			
25	\$x = 4 * \$y	132	33		
26	\$y++	132	34		
27	while (\$x % \$y < 30)	false			

7. Solution

Step	Statement	Main Code		void Method calculate ()		
		\$i	\$m	\$n	\$s	\$j
1	\$i = 1	1	?			
2	\$i <= 3	true				
3	\$m = (int)readline()	1	2			
4	calculate(\$m)			2	?	?
5	\$s = 0			2	0	?
6	\$j = 2			2	0	2
7	\$j <= 2 * \$n	true				
8	\$s = \$s + \$j ** 2			2	4	2

9	<code>\$j += 2</code>			2	4	4
10	<code>\$j <= 2 * \$n</code>			true		
11	<code>\$s = \$s + \$j ** 2</code>			2	20	4
12	<code>\$j += 2</code>			2	20	6
13	<code>\$j <= 2 * \$n</code>			false		
14	<code>echo \$s</code>	It displays: 20				
15	<code>\$i++</code>	2	2			
16	<code>\$i <= 3</code>	true				
17	<code>\$m = (int)readline()</code>	2	3			
18	<code>calculate(\$m)</code>			3	?	?
19	<code>\$s = 0</code>			3	0	?
20	<code>\$j = 2</code>			3	0	2
21	<code>\$j <= 2 * \$n</code>			true		
22	<code>\$s = \$s + \$j ** 2</code>			3	4	2
23	<code>\$j += 2</code>			3	4	4
24	<code>\$j <= 2 * \$n</code>			true		
25	<code>\$s = \$s + \$j ** 2</code>			3	20	4
26	<code>\$j += 2</code>			3	20	6
27	<code>\$j <= 2 * \$n</code>			true		
28	<code>\$s = \$s + \$j ** 2</code>			3	56	6
29	<code>\$j += 2</code>			3	56	8
30	<code>\$j <= 2 * \$n</code>			false		
31	<code>echo \$s</code>	It displays: 56				
32	<code>\$i++</code>	3	3			
33	<code>\$i <= 3</code>	true				
34	<code>\$m = (int)readline()</code>	3	4			
35	<code>calculate(\$m)</code>			4	?	?
36	<code>\$s = 0</code>			4	0	?
37	<code>\$j = 2</code>			4	0	2
38	<code>\$j <= 2 * \$n</code>			true		
39	<code>\$s = \$s + \$j ** 2</code>			4	4	2
40	<code>\$j += 2</code>			4	4	4
41	<code>\$j <= 2 * \$n</code>			true		
42	<code>\$s = \$s + \$j ** 2</code>			4	20	4
43	<code>\$j += 2</code>			4	20	6
44	<code>\$j <= 2 * \$n</code>			true		
45	<code>\$s = \$s + \$j ** 2</code>			4	56	6

46	<code>\$j += 2</code>			4	56	8
47	<code>\$j <= 2 * \$n</code>				true	
48	<code>\$s = \$s + \$j ** 2</code>			4	120	8
49	<code>\$j += 2</code>			4	120	10
50	<code>\$j <= 2 * \$n</code>				false	
51	<code>echo \$s</code>	It displays: 120				
52	<code>\$i++</code>	4	4			
53	<code>\$i <= 3</code>	false				

8. Solution

```
function findSum($a, $b, $c) {
    return $a + $b + $c;
}
```

9. Solution

```
function findAvg($a, $b, $c, $d) {
    return ($a + $b + $c + $d) / 4;
}
```

10. Solution

```
function maximum($a, $b, $c) {
    $m = $a;
    if ($b > $m) {
        $m = $b;
    }
    if ($c > $m) {
        $m = $c;
    }
    return $m;
}
```

11. Solution

```
function displayMax($a, $b, $c, $d, $e) {
    $m = $a;
    if ($b > $m) {
        $m = $b;
    }
    if ($c > $m) {
        $m = $c;
    }
    if ($d > $m) {
        $m = $d;
    }
    if ($e > $m) {
        $m = $e;
    }
}
```

```

    }
    echo $m;
}

```

12. Solution

```

function myRound($x) {
    $digitToCheck = (int)($x * 1000) % 10;
    if ($digitToCheck >= 5) {
        $returnValue = ((int)($x * 100) + 1) / 100.0;
    }
    else {
        $returnValue = ((int)($x * 100)) / 100.0;
    }

    return $returnValue;
}

```

13. Solution

```

<?php
function findMin($a, $b) {
    $minimum = $a;
    if ($b < $minimum) {
        $minimum = $b;
    }
    return $minimum;
}

echo "Enter four numbers: \n";
$x1 = (float)readline();
$x2 = (float)readline();
$x3 = (float)readline();
$x4 = (float)readline();

//First approach
$temp1 = findMin($x1, $x2);
$temp2 = findMin($x3, $x4);
echo findMin($temp1, $temp2), "\n";

//Second approach
echo findMin(findMin($x1, $x2), findMin($x3, $x4)), "\n";
?>

```

14. Solution

```

<?php
function KelvinToFahrenheit($kelvin) {
    return 1.8 * $kelvin - 459.67;
}

function KelvinToCelsius($kelvin) {
    return $kelvin - 273.15;
}

```



```

}

$k = (float)readline("Enter a temperature in degrees Kelvin: ");
echo "Fahrenheit: ", KelvinToFahrenheit($k), "\n";
echo "Celsius: ", KelvinToCelsius($k), "\n";
?>

```

15. Solution

```

<?php
function bmi($w, $h) {
    $b = $w * 703 / $h ** 2;
    if ($b < 16) {
        $returnValue = "You must add weight.";
    }
    elseif ($b < 18.5) {
        $returnValue = "You should add some weight.";
    }
    elseif ($b < 25) {
        $returnValue = "Maintain your weight.";
    }
    elseif ($b < 30) {
        $returnValue = "You should lose some weight.";
    }
    else {
        $returnValue = "You must lose weight.";
    }

    return $returnValue;
}

$weight = (float)readline("Enter your weight (in pounds): ");
while ($weight < 0) {
    $weight = (float)readline("Error! Enter your weight (in pounds): ");
}

$age = (int)readline("Enter your age: ");
while ($age < 18) {
    $age = (int)readline("Error! Enter your age: ");
}

$height = (float)readline("Enter your height (in inches): ");
while ($height < 0) {
    $height = (float)readline("Error! Enter your height (in inches): ");
}

echo bmi($weight, $height), "\n";
?>

```

16. Solution

```

<?php
function numOfDay($year, $month) {

```

```
switch ($month) {
    case 4:
    case 6:
    case 9:
    case 11:
        $days = 30;
        break;
    case 2:
        if ($year % 4 == 0 && $year % 100 != 0 || $year % 400 == 0) {
            $days = 29;
        }
        else {
            $days = 28;
        }
        break;
    default:
        $days = 31;
}

echo $days, "\n";
}

$y = (int)readline("Enter a year: ");
for ($m = 1; $m <= 12; $m++) {
    numOfDay($y, $m);
}
?>
```

17. Solution

```
<?php
function numOfDay($year, $month) {
    switch ($month) {
        case 4:
        case 6:
        case 9:
        case 11:
            $days = 30;
            break;
        case 2:
            if ($year % 4 == 0 && $year % 100 != 0 || $year % 400 == 0) {
                $days = 29;
            }
            else {
                $days = 28;
            }
            break;
        default:
            $days = 31;
    }

    return $days;
}
```

```

}

$y = (int)readline("Enter a year: ");
$m1 = (int)readline("Enter a month: ");
$m2 = (int)readline("Enter a second month: ");

$total = 0;
for ($m = $m1; $m <= $m2; $m++) {
    $total += numOfDay($y, $m);
}
echo $total, "\n";
?>

```

18. Solution

```

<?php
function displayMenu() {
    echo "\n";
    echo "1. Convert meters to miles\n";
    echo "2. Convert miles to meters\n";
    echo "3. Exit\n";
    echo "Enter a choice: ";
}

function metersToMiles($meters) {
    echo $meters, " meters equals ", ($meters / 1609.344), " miles\n";
}

function milesToMeters($miles) {
    echo $miles, " miles equals ", ($miles * 1609.344), " meters\n";
}

displayMenu();
$choice = (int)readline();
while ($choice != 3) {
    $distance = (float)readline("Enter distance: ");
    if ($choice == 1) {
        metersToMiles($distance);
    }
    else {
        milesToMeters($distance);
    }

    displayMenu();
    $choice = (int)readline();
}
?>

```

19. Solution

```

<?php
function amountToPay($seconds) {
    if ($seconds <= 600) {

```

```
    $extra = 0;
}
elseif ($seconds <= 1200) {
    $extra = ($seconds - 600) * 0.01;
}
else {
    $extra = 600 * 0.01 + ($seconds - 1200) * 0.02;
}

$totalWithoutTax = 10 + $extra;
$tax = $totalWithoutTax * 11 / 100;
$total = $totalWithoutTax + $tax;

echo "Total amount to pay: ", $total, "\n";
}

$seconds = (int)readline("Enter number of seconds: ");
amountToPay($seconds);
?>
```

Chapter 37

37.9 Review Questions: True/False

- | | |
|-----------|-----------|
| 1. true | 13. true |
| 2. true | 14. false |
| 3. true | 15. true |
| 4. false | 16. true |
| 5. true | 17. false |
| 6. false | 18. true |
| 7. true | 19. true |
| 8. false | 20. false |
| 9. true | 21. true |
| 10. false | 22. true |
| 11. true | 23. true |
| 12. true | |

37.10 Review Exercises

1. *Solution*

It displays: 5

2. *Solution*

It displays: 14

3. *Solution*

It displays: 14

4. *Solution*

It displays: hellohellohello

5. *Solution*

It displays: 15

6. *Solution*

It displays: 11 4

7. *Solution*

It displays: 3

8. *Solution*

Within the function `getNumOfDigits()`, variable `$x` eventually becomes 0, and since the variable `$val` is passed to the function by reference, that 0 also reflects back to the main code. So, when the flow of execution returns to the main code, the value of variable `$val` is zeroed!

To resolve this issue, all you have to do is remove the ampersand (&) sign from the beginning of the actual argument `$x`. If you do so, the variable `$val` is passed to the function by value, so that no matter what happens to variable `$x` within the function, nothing can affect the value of the variable `$val` of the main code.

9. Solution

```
<?php
define("STUDENTS", 10);
define("LESSONS", 5);

function part1(&$names, &$grades) {
    for ($i = 0; $i <= STUDENTS - 1; $i++) {
        $names[$i] = readline("Enter name for student No. " . ($i + 1) . ": ");
        for ($j = 0; $j <= LESSONS - 1; $j++) {
            $grades[$i][$j] = (int)readline("Enter grade for lesson No. " . ($j + 1) . ": ");
        }
    }
}

function part2($grades) {
    $average = [];
    for ($i = 0; $i <= STUDENTS - 1; $i++) {
        $average[$i] = 0;
        for ($j = 0; $j <= LESSONS - 1; $j++) {
            $average[$i] += $grades[$i][$j];
        }
        $average[$i] /= LESSONS;
    }
    return $average;
}

function part3(&$average, &$names) {
    for ($m = 1; $m <= STUDENTS - 1; $m++) {
        for ($n = STUDENTS - 1; $n >= $m; $n--) {
            if ($average[$n] > $average[$n - 1]) {
                $temp = $average[$n];
                $average[$n] = $average[$n - 1];
                $average[$n - 1] = $temp;

                $temp = $names[$n];
                $names[$n] = $names[$n - 1];
                $names[$n - 1] = $temp;
            }
            elseif ($average[$n] == $average[$n - 1]) {
                if ($names[$n] < $names[$n - 1]) {
                    $temp = $names[$n];
                    $names[$n] = $names[$n - 1];
                    $names[$n - 1] = $temp;
                }
            }
        }
    }
}
```

```

}

$names = [];
$grades = [[]];

part1($names, $grades);

$average = part2($grades);

part3($average, $names);

for ($i = 0; $i <= STUDENTS - 1; $i++) {
    echo $names[$i], "\t", $average[$i], "\n";
}
?>

```

10. Solution

```

<?php
function part1() {
    $message = strtolower(readline("Enter a message: "));
    return $message;
}

function part2($message) {
    $messageClean = "";
    for ($i = 0; $i <= strlen($message) - 1; $i++) {
        $letter = $message[$i];
        if ($letter != " " && $letter != "," && $letter != "." && $letter != "?") {
            $messageClean .= $letter;
        }
    }
    return $messageClean;
}

function part3($messageClean) {
    $middlePos = (int)((strlen($messageClean) - 1) / 2);
    $j = strlen($messageClean) - 1;
    $palindrome = true;
    for ($i = 0; $i <= $middlePos; $i++) {
        $leftLetter = $messageClean[$i];
        $rightLetter = $messageClean[$j];
        if ($leftLetter != $rightLetter) {
            $palindrome = false;
            break;
        }
        $j--;
    }
    return $palindrome;
}

function part4($message) {
    $messageClean = part2($message);

```

```

    $palindrome = part3($messageClean);
    return $palindrome;
}

$message = part1();
$palindrome = part4($message);
if ($palindrome) {
    echo "The message is palindrome\n";
}
?>

```

11. Solution

```

<?php
$a = (int)readline();
$b = (int)readline();
$c = (int)readline();
$d = (int)readline();

$maximum = $a;
if ($b > $maximum) {
    $maximum = $b;
}
if ($c > $maximum) {
    $maximum = $c;
}
if ($d > $maximum) {
    $maximum = $d;
}

echo $maximum;
?>

```

12. Solution

First approach

```

function f1($a, $b, $c, &$total, &$average) {
    $total = $a + $b + $c;
    $average = $total / 3;
}

```

Second approach

```

function f1($a, $b, $c, &$returningArray) {
    $returningArray[0] = $a + $b + $c;
    $returningArray[1] = $returningArray[0] / 3;
}

```

13. Solution

```

function myRound($x, $decimalPlaces = 2) {
    $digitToCheck = (int)($x * (10 ** ($decimalPlaces + 1))) % 10;
    if ($digitToCheck >= 5) {
        $returnValue = (int)(($x * 10 ** $decimalPlaces) + 1) / 10 ** $decimalPlaces;
    }
}

```



```

}
else {
    $returnValue = (int)($x * 10 ** $decimalPlaces) / 10 ** $decimalPlaces;
}
return $returnValue;
}

```

14. Solution

```

<?php
function getInput() {
    do {
        $answer = strtoupper(readline("Enter Yes or No: "));
    } while ($answer != "YES" && $answer != "NO");

    return $answer == "YES"; //This returns true or false
}

function findArea($b, $h) {
    return $b * $h;
}

do {
    $b = (float)readline("Enter the base of the parallelogram: ");
    $h = (float)readline("Enter the height of the parallelogram: ");

    echo "Area = ", findArea($b, $h), "\n";

    echo "Would you like to repeat? \n";
} while (getInput());
?>

```

15. Solution

```

<?php
define("STUDENTS", 100);

function getArrays(&$names, &$grades) {
    for ($i = 0; $i <= STUDENTS - 1; $i++) {
        $names[$i] = readline("Enter name: ");
        $grades[$i] = (int)readline("Enter grade: ");
    }
}

function getAverage($grades) {
    for ($i = 0; $i <= STUDENTS - 1; $i++) {
        $total += $grades[$i];
    }
    return $total / STUDENTS;
}

function sortArrays(&$grades, &$names) {
    for ($m = 1; $m <= STUDENTS - 1; $m++) {

```

```

    $elementGrds = $grades[$m];
    $elementNms = $names[$m];

    $n = $m;
    while ($n > 0 && $grades[$n - 1] > $elementGrds) {
        $grades[$n] = $grades[$n - 1];
        $names[$n] = $names[$n - 1];
        $n--;
    }

    $grades[$n] = $elementGrds;
    $names[$n] = $elementNms;
}
}

$names = [];
$grades = [];

getArrays($names, $grades);
$average = getAverage($grades);
sortArrays($grades, $names);
for ($i = 0; $i <= STUDENTS - 1; $i++) {
    if ($grades[$i] < $average) {
        echo $names[$i], "\n";
    }
}
?>

```

16. Solution

```

<?php
define("JUDGES", 10);

function getArray() {
    $score = [];

    for ($i = 0; $i <= JUDGES - 1; $i++) {
        $score[$i] = (int)readline("Judge No " . ($i + 1) . ". Enter score: ");
    }

    return $score;
}

function findMinMax($score, &$minimum, &$maximum) {
    $minimum = $score[0];
    $maximum = $score[0];
    for ($i = 1; $i <= JUDGES - 1; $i++) {
        if ($score[$i] > $maximum) {
            $maximum = $score[$i];
        }
        if ($score[$i] < $minimum) {
            $minimum = $score[$i];
        }
    }
}

```

```

}

$name = readline("Enter artist's name: ");
$score = getArray();
findMinMax($score, $minimum, $maximum);

$total = 0;
for ($i = 0; $i <= JUDGES - 1; $i++) {
    $total += $score[$i];
}

$points = $total - $minimum - $maximum;
echo "Artist ", $name, " got ", $points, " points\n";
?>

```

17. Solution

```

<?php
function sumRecursive($n) {
    if ($n == 1) {
        return 1;
    }
    else {
        return sumRecursive($n - 1) + $n;
    }
}

//Main code starts here
$num = (int)readline();
echo sumRecursive($num), "\n";
?>

```

18. Solution

```

<?php
function woc($index) {
    if ($index == 1) {
        return 1;
    }
    else {
        return 2 * woc($index - 1);
    }
}

$total = 0;
for ($i = 1; $i <= 64; $i++) {
    $total += woc($i);
}
echo $total, "\n";
?>

```

19. Solution

```
<?php
function fib($n) {
    if ($n <= 1) {
        return $n;
    }
    else {
        return fib($n - 1) + fib($n - 2);
    }
}

//Main code starts here
$num = (int)readline();
echo fib($num - 1), "\n";
?>
```

20. Solution

```
function tribonacci($n) {
    if ($n == 0) {
        return 0;
    }
    elseif ($n == 1 || $n == 2) {
        return 1;
    }
    else {
        return tribonacci($n - 1) + tribonacci($n - 2) + tribonacci($n - 3);
    }
}
```

21. Solution

```
function myPow($n, $p) {
    if ($p == 0)
        return 1;
    elseif ($p < 0)
        return 1 / ($n * myPow($n, -$p - 1));
    else
        return $n * myPow($n, $p - 1);
}
```

22. Solution

```
<?php
function factorial($value) {
    if ($value == 1) {
        return 1;
    }
    else {
        return $value * factorial($value - 1);
    }
}
```

```
}  
  
function myCos($x, $i = 40) {  
  if ($i == 0) {  
    return 1;  
  }  
  else {  
    return myCos($x, $i - 4) + $x ** $i / factorial($i) - $x ** ($i - 2) / factorial($i - 2);  
  }  
}  
  
echo myCos(pi() / 4), "\n";  
?>
```

Chapter 38

38.3 Review Exercises

1. Solution

```
<?php
function displayMenu() {
    echo "1. Convert USD to Euro (EUR)\n";
    echo "2. Convert USD to British Pound Sterling (GBP)\n";
    echo "3. Convert USD to Japanese Yen (JPY)\n";
    echo "4. Convert USD to Canadian Dollar (CAD)\n";
    echo "5. Exit\n";
    echo "-----\n";
    echo "Enter a choice: ";
}

function USD_to_EU($value) {
    return $value * 0.94;
}

function USD_to_GBP($value) {
    return $value * 0.81;
}

function USD_to_JPY($value) {
    return $value * 149.11;
}

function USD_to_CAD($value) {
    return $value * 1.36;
}

//Main code starts here
displayMenu();
$choice = (int)readline();
while ($choice != 5) {
    $amount = (float)readline("Enter an amount in US dollars: ");
    switch ($choice) {
        case 1:
            echo $amount, " USD = ", USD_to_EU($amount), " Euro\n";
            break;
        case 2:
            echo $amount, " USD = ", USD_to_GBP($amount), " GBP\n";
            break;
        case 3:
            echo $amount, " USD = ", USD_to_JPY($amount), " JPY\n";
            break;
        case 4:
            echo $amount, " USD = ", USD_to_CAD($amount), " CAD\n";
            break;
    }
}
```

```

    }

    displayMenu();
    $choice = (int)readline();
}
?>

```

2. Solution

```

<?php
function displayMenu() {
    echo "-----\n";
    echo "1. Convert USD to Euro (EUR)\n";
    echo "2. Convert USD to British Pound Sterling (GBP)\n";
    echo "3. Convert EUR to USD\n";
    echo "4. Convert EUR to GBP\n";
    echo "5. Convert GBP to USD\n";
    echo "6. Convert GBP to EUR\n";
    echo "7. Exit\n";
    echo "-----\n";
    echo "Enter a choice: ";
}

function USD_to_EUR($value) {
    return $value * 0.94;
}

function USD_to_GBP($value) {
    return $value * 0.81;
}

displayMenu();
$choice = (int)readline();
while ($choice != 7) {
    $amount = (float)readline("Enter an amount: ");
    switch ($choice) {
        case 1:
            echo $amount, " USD = ", USD_to_EUR($amount), " Euro\n";
            break;
        case 2:
            echo $amount, " USD = ", USD_to_GBP($amount), " GBP\n";
            break;
        case 3:
            echo $amount, " EUR = ", 1 / USD_to_EUR(1 / $amount), " USD\n";
            break;
        case 4:
            echo $amount, " EUR = ", USD_to_GBP(1 / USD_to_EUR(1 / $amount)), " GBP\n";
            break;
        case 5:
            echo $amount, " GBP = ", 1 / USD_to_GBP(1 / $amount), " USD\n";
            break;
        case 6:

```

```

        echo $amount, " GBP = ", USD_to_EUR(1 / USD_to_GBP(1 / $amount)), " EUR\n";
        break;
    }

    displayMenu();
    $choice = (int)readline();
}
?>

```

3. Solution

```

<?php
define("ACCURACY", 0.000000001);

function factorial($n) {
    $returnValue = 1;
    for ($i = 1; $i <= $n; $i++) {
        $returnValue *= $i;
    }
    return $returnValue;
}

function mySin($x) {
    $sign = 1;
    $sinus = 0;
    $i = 1;
    do {
        $sinusPrevious = $sinus;
        $sinus += $sign * $x ** $i / factorial($i);

        $sign = -$sign;
        $i += 2;
    } while (abs($sinus - $sinusPrevious) > ACCURACY);
    return $sinus;
}

function degreesToRad($degrees) {
    return 2 * pi() * $degrees / 360;
}

for ($i = 0; $i <= 360; $i++) {
    echo "sin(" . $i . ") ~= ", mySin(degreesToRad($i)), "\n";
}
?>

```

4. Solution

```

<?php
function isLeap($year) {
    $returnValue = false;
    if ($year % 4 == 0 && $year % 100 != 0 || $year % 400 == 0) {
        $returnValue = true;
    }
}

```



```
    return $returnValue;
}

function numOfDay($year, $month) {
    switch ($month) {
        case 4:
        case 6:
        case 9:
        case 11:
            $days = 30;
            break;
        case 2:
            if (isLeap($year)) {
                $days = 29;
            }
            else {
                $days = 28;
            }
            break;
        default:
            $days = 31;
    }

    return $days;
}

function checkDate($day, $month, $year) {
    $returnValue = true;
    if ($month < 1 || $month > 12) {
        $returnValue = false;
    }
    elseif ($day < 1 || $day > numOfDay($year, $month)) {
        $returnValue = false;
    }
    return $returnValue;
}

$day = (int)readline("Enter day: ");
$month = (int)readline("Enter month: ");
$year = (int)readline("Enter year: ");
while (!checkDate($day, $month, $year)) {
    echo "Error!\n";
    $day = (int)readline("Enter day: ");
    $month = (int)readline("Enter month: ");
    $year = (int)readline("Enter year: ");
}

$total = 0;
for ($i = 1; $i <= $month - 1; $i++) {
    $total += numOfDay($year, $i);
}
$total += $day;
```

```
    echo $total, "\n";
?>
```

5. Solution

```
<?php
function dice() {
    return rand(1, 6);
}

$names = [];

$names[0] = readline("Player1 - Enter name: ");
$names[1] = readline("Player2 - Enter name: ");

for ($player = 0; $player <= 1; $player++) {
    $total = 0;
    for ($i = 1; $i <= 10; $i++) {
        echo $names[$player], ", hit enter to roll the dice!\n";
        readline(); //This statement just waits the user to hit the enter key

        $dice1 = dice();
        $dice2 = dice();
        echo $dice1, " ", $dice2, "\n";
        $total += $dice1 + $dice2;
    }
    if ($player == 1) {
        $totalPlayer1 = $total;
    }
    else {
        $totalPlayer2 = $total;
    }
}

if ($totalPlayer1 == $totalPlayer2) {
    echo "Tie!\n";
}
elseif ($totalPlayer1 > $totalPlayer2) {
    echo $names[0], " wins\n";
}
else {
    echo $names[1], " wins\n";
}
?>
```

6. Solution

```
<?php
define("GAS", 1);
define("DIESEL", 2);
define("HYBRID", 3);
define("TAX_RATE", 0.10);
```

```
define("CARS", 40);

function getChoice() {
    echo "1. Gas\n";
    echo "2. Diesel\n";
    echo "3. Hybrid\n";
    return (int)readline("Enter type of the car: ");
}

function getDays() {
    return (int)readline("Enter total number of rental days: ");
}

function getCharge($carType, $rentalDays) {
    if ($carType == GAS) {
        if ($rentalDays <= 5) {
            $charge = $rentalDays * 24;
        }
        elseif ($rentalDays <= 8) {
            $charge = 5 * 24 + ($rentalDays - 5) * 22;
        }
        else {
            $charge = 5 * 24 + 3 * 22 + ($rentalDays - 8) * 18;
        }
    }
    elseif ($carType == DIESEL) {
        if ($rentalDays <= 5) {
            $charge = $rentalDays * 28;
        }
        elseif ($rentalDays <= 8) {
            $charge = 5 * 28 + ($rentalDays - 5) * 25;
        }
        else {
            $charge = 5 * 28 + 3 * 25 + ($rentalDays - 8) * 21;
        }
    }
    else {
        if ($rentalDays <= 5) {
            $charge = $rentalDays * 30;
        }
        elseif ($rentalDays <= 8) {
            $charge = 5 * 30 + ($rentalDays - 5) * 28;
        }
        else {
            $charge = 5 * 30 + 3 * 28 + ($rentalDays - 8) * 23;
        }
    }
    $charge = $charge * (1 + TAX_RATE); //This is equivalent to charge += charge * TAX_RATE;
    return $charge;
}

$rentedCarTypes = [];
```

```

$rentedDays = [];

for ($i = 0; $i <= CARS - 1; $i++) {
    $rentedCarTypes[$i] = getChoice();
    $rentedDays[$i] = getDays();
}

$total = 0;
for ($i = 0; $i <= CARS - 1; $i++) {
    $charge = getCharge($rentedCarTypes[$i], $rentedDays[$i]);
    echo "Car No ", $i + 1, ": ", $charge, "\n";
    $total += $charge;
}

$count = 0;
for ($i = 0; $i <= CARS - 1; $i++) {
    if ($rentedCarTypes[$i] == HYBRID) {
        $count++;
    }
}

echo "Hybrids rented: ", $count, "\n";
echo "Net profit: ", $total / (1 + TAX_RATE), "\n";
?>

```

7. Solution

```

<?php
define("CHANNELS", 10);
define("DAYS", 7);
define("DAY_NAMES", ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday", "Sunday"]);

function getData(&$names, &$viewers) {
    for ($i = 0; $i <= CHANNELS - 1; $i++) {
        $names[$i] = readline("Enter name for channel No. " . ($i + 1) . ": ");
        for ($j = 0; $j <= DAYS - 1; $j++) {
            $viewers[$i][$j] = readline("Enter the number of viewers of the main news program on " .
                DAY_NAMES[$j] . " for channel " . $names[$i] . ": ");
        }
    }
}

function getAverage($a) {
    $total = 0;
    for ($i = 0; $i <= 4; $i++) {
        $total += $a[$i];
    }
    return $total / 5.0;
}

$names = [];
$viewers = [[]];
getData($names, $viewers);

```

```

$temporaryArray = [];
for ($i = 0; $i <= CHANNELS - 1; $i++) {
    for ($j = 0; $j <= 4; $j++) {
        $temporaryArray[$j] = $viewers[$i][$j];
    }
    $weekend = ($viewers[$i][DAYS - 2] + $viewers[$i][DAYS - 1]) / 2;
    if ($weekend >= 1.2 * getAverage($temporaryArray)) {
        echo $names[$i], "\n";
    }
}

for ($i = 0; $i <= CHANNELS - 1; $i++) {
    $increasing = true;
    for ($j = 1; $j <= DAYS - 1; $j++) {
        if ($viewers[$i][$j] <= $viewers[$i][$j - 1]) {
            $increasing = false;
        }
    }
    if ($increasing) {
        echo $names[$i], "\n";
    }
}
?>

```

8. Solution

```

<?php
define("CITIZENS", 300);

function inputData(&$SSNs, &$answers) {
    for ($i = 0; $i <= CITIZENS - 1; $i++) {
        $SSNs[$i] = (int)readline("Enter SSN: ");
        $answers[$i] = readline("Enter answer: ");
    }
}

function sortArrays(&$SSNs, &$answers) {
    for ($m = 0; $m <= CITIZENS - 1; $m++) {
        $minimum = $SSNs[$m];
        $indexOfMin = $m;
        for ($n = $m; $n <= CITIZENS - 1; $n++) {
            if ($SSNs[$n] < $minimum) {
                $minimum = $SSNs[$n];
                $indexOfMin = $n;
            }
        }
        $temp = $SSNs[$m];
        $SSNs[$m] = $SSNs[$indexOfMin];
        $SSNs[$indexOfMin] = $temp;
        $temp = $answers[$m];
        $answers[$m] = $answers[$indexOfMin];
    }
}

```

```

    $answers[$indexOfMin] = $temp;
}
}

function searchArray($SSNs, $SSN) {
    $left = 0;
    $right = CITIZENS - 1;
    $found = false;
    while ($left <= $right && !$found) {
        $middle = (int)(($left + $right) / 2);

        if ($SSN < $SSNs[$middle]) {
            $right = $middle - 1;
        }
        elseif ($SSN > $SSNs[$middle]) {
            $left = $middle + 1;
        }
        else {
            $found = true;
        }
    }

    if (!$found) {
        echo "SSN not found!\n";
        return -1;
    }
    else {
        return $middle;
    }
}

function countAnswers($answers, $answer) {
    $count = 0;
    for ($i = 0; $i <= CITIZENS - 1; $i++) {
        if ($answers[$i] == $answer) {
            $count++;
        }
    }
    return $count;
}

$SSNs = [];
$answers = [];

do {
    inputData($SSNs, $answers);
    sortArrays($SSNs, $answers);

    $SSN = (int)readline("Enter an SSN to search: ");

    $index = searchArray($SSNs, $SSN);
    if ($index != -1) {
        $answer = $answers[$index];
    }
}

```

```

    echo $answer, "\n";

    $count = countAnswers($answers, $answer);
    echo $count * 100 / CITIZENS, "\n";
}
$answer = readline("Repeat? ");
} while ($answer == "yes");
?>

```

9. Solution

```

<?php
define("TEAMS", 8);
define("GAMES", 12);

function inputData(&$names, &$results) {
    for ($i = 0; $i <= TEAMS - 1; $i++) {
        $names[$i] = readline("Enter team name: ");
        for ($j = 0; $j <= GAMES - 1; $j++) {
            $results[$i][$j] = readline("Enter result (W, L, T): ");
        }
    }
}

function displayResult($names, $results) {
    $result = readline("Enter a result to search (W, L, T): ");
    for ($i = 0; $i <= TEAMS - 1; $i++) {
        echo "Team: ", $names[$i], "\n";
        $found = false;
        for ($j = 0; $j <= GAMES - 1; $j++) {
            if ($results[$i][$j] == $result) {
                echo "Week: ", $j + 1, "\n";
                $found = true;
            }
        }
        if (!$found) {
            echo "Nothing found\n";
        }
    }
}

function findTeam($names) {
    $name = readline("Enter a name to search: ");

    $i = 0;
    while ($i < TEAMS - 1 && $names[$i] != $name) {
        $i++;
    }

    if ($names[$i] != $name) {
        $returnValue = -1;
    }
    else {

```

```

        $returnValue = $i;
    }
    return $returnValue;
}

$names = [];
$results = [[]];

inputData($names, $results);
displayResult($names, $results);

$index = findTeam($names);
while ($index != -1) {
    $total = 0;
    for ($j = 0; $j <= GAMES - 1; $j++) {
        if ($results[$index][$j] == "W") {
            $total += 3;
        }
        elseif ($results[$index][$j] == "T") {
            $total += 1;
        }
    }
    echo "Points: ", $total, "\n";
    $index = findTeam($names);
}

if ($index == -1) {
    echo "Team not found\n";
}
?>

```

10. Solution

```

<?php
function hasDuplicateDigits($num) {
    //Initialize an array to store the count of each digit
    $digitCount = [0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0];

    while ($num > 0) {
        $digit = $num % 10; //Extract the last digit
        if ($digitCount[$digit] > 0) {
            return true; //If this digit has been seen before, return true
        }
        $digitCount[$digit]++; //Increment the count of this digit
        $x = (int)($x / 10); //Move to the next digit
    }

    return false; //No duplicate digits found
}

echo "Enter an integer: ";
$num = (int)readline();
while ($num < 11) {

```



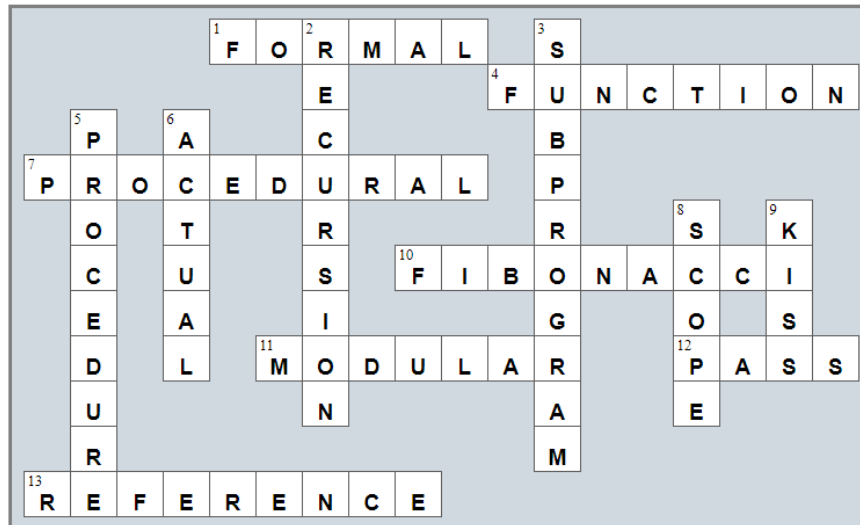
```
    echo "Wrong number! Enter an integer greater than 10: ";
    $num = (int)readline();
}

if (hasDuplicateDigits($num)) {
    echo "The integer contains duplicate digits\n";
}
else {
    echo "The integer does not contain duplicate digits\n";
}
?>
```

Review in "Subprograms"

Review Crossword Puzzle

1.



Chapter 39

39.8 Review Questions: True/False

- | | | |
|----------|-----------|-----------|
| 1. false | 7. false | 13. true |
| 2. true | 8. true | 14. false |
| 3. true | 9. true | 15. true |
| 4. false | 10. false | 16. false |
| 5. false | 11. true | 17. false |
| 6. false | 12. true | |

39.9 Review Exercises

1. Solution

```
<?php
class Geometry {
    function rectangleArea($b, $h) {
        return $b * $h;
    }

    function triangleArea($b, $h) {
        return $b * $h / 2;
    }
}

$gmtr = new Geometry();

$sqrSide = (float)readline("Enter square side: ");

$rctnglBase = (float)readline("Enter rectangle base: ");
$rctnglHeight = (float)readline("Enter rectangle height: ");

$trnglBase = (float)readline("Enter triangle base: ");
$trnglHeight = (float)readline("Enter triangle height: ");

echo $gmtr->rectangleArea($sqrSide, $sqrSide), "\n";
echo $gmtr->rectangleArea($rctnglBase, $rctnglHeight), "\n";
echo $gmtr->triangleArea($trnglBase, $trnglHeight), "\n";
?>
```

2. Solution

```
<?php
class Pet {
    public $kind;
    public $legsNumber;

    function startRunning() {
        echo "Pet is running\n";
    }

    function stopRunning() {
```

```
        echo "Pet stopped\n";
    }
}

$pet1 = new Pet();
$pet1->kind = "dog";
$pet1->legsNumber = 4;

$pet2 = new Pet();
$pet2->kind = "monkey";
$pet2->legsNumber = 2;

$pet1->startRunning();
$pet2->startRunning();
$pet1->stopRunning();
?>
```

3. Solution

```
<?php
class Pet {
    private $_kind;
    private $_legsNumber;

    //Define the constructor
    function __construct($kind, $legsNumber) {
        $this->setKind($kind);
        $this->setLegsNumber($legsNumber);
    }

    function getKind() {
        return $this->_kind;
    }

    function setKind($value) {
        if ($value != "") {
            $this->_kind = $value;
        }
        else {
            throw new Exception("Cannot be empty");
        }
    }

    function getLegsNumber() {
        return $this->_legsNumber;
    }

    function setLegsNumber($value) {
        if ($value >= 0) {
            $this->_legsNumber = $value;
        }
        else {
            throw new Exception("Cannot be negative");
        }
    }
}
```

```

    }
}

function startRunning() {
    echo "Pet is running\n";
}

function stopRunning() {
    echo "Pet stopped\n";
}
}

$pet1 = new Pet("dog", 4);

$pet1->startRunning();
$pet1->stopRunning();

$pet1->setKind(""); //This will throw an error
$pet1->setLegsNumber(-1); //This will throw an error
?>

```

4. Solution

```

<?php
class Box {
    private $_width;
    private $_length;
    private $_height;

    //Define the constructor
    function __construct ($w, $l, $h) {
        //Initialize fields
        $this->_width = $w;
        $this->_length = $l;
        $this->_height = $h;
    }

    function displayVolume() {
        echo "Volume: ", ($this->_width * $this->_length * $this->_height), "\n";
    }

    function displayDimensions() {
        echo $this->_width, " x ", $this->_length, " x ", $this->_height, "\n";
    }
}

define("BOXES", 30);

$listOfObj = []; //create an array

for ($i = 0; $i <= BOXES - 1; $i++) {
    $w = (float)readline("Enter width: ");
    $l = (float)readline("Enter length: ");
    $h = (float)readline("Enter height: ");
}

```

```

    //Add each new object to the array
    $listOfObj[$i] = new Box($w, $l, $h);
}

for ($i = 0; $i <= BOXES - 1; $i++) {
    $listOfObj[$i]->displayDimensions();
    $listOfObj[$i]->displayVolume();
}
?>

```

5. Solution

```

<?php
class Box {
    private $_width;
    private $_length;
    private $_height;

    //Define the constructor
    function __construct($w, $l, $h) {
        //Initialize fields (using the corresponding set methods)
        $this->setWidth($w);
        $this->setLength($l);
        $this->setHeight($h);
    }

    //Define the getter
    function getWidth() {
        return $this->_width;
    }

    //Define the setter
    function setWidth($value) {
        if ($value > 0) {
            $this->_width = $value;
        }
        else {
            throw new Exception("Cannot be negative or zero");
        }
    }

    //Define the getter
    function getLength() {
        return $this->_length;
    }

    //Define the setter
    function setLength($value) {
        if ($value > 0) {
            $this->_length = $value;
        }
        else {

```

```

        throw new Exception("Cannot be negative or zero");
    }
}

//Define the getter
function getHeight() {
    return $this->_height;
}

//Define the setter
function setHeight($value) {
    if ($value > 0) {
        $this->_height = $value;
    }
    else {
        throw new Exception("Cannot be negative or zero");
    }
}

function displayVolume() {
    echo "Volume: ", ($this->getWidth() * $this->getLength() * $this->getHeight()), "\n";
}

function displayDimensions() {
    echo $this->getWidth(), " x ", $this->getLength(), " x ", $this->getHeight(), "\n";
}
}

define("BOXES", 30);

$listOfObj = []; //Create an array

for ($i = 0; $i <= BOXES - 1; $i++) {
    $w = (float)readline("Enter width: ");
    $l = (float)readline("Enter length: ");
    $h = (float)readline("Enter height: ");

    //Add each new object to the array
    $listOfObj[$i] = new Box($w, $l, $h);
}

for ($i = 0; $i <= BOXES - 1; $i++) {
    $listOfObj[$i]->displayDimensions();
    $listOfObj[$i]->displayVolume();
}
?>

```

6. Solution

```

<?php
class Cube {
    private $_edge;

    //Define the constructor

```

```

function __construct($edge) {
    $this->_edge = $edge;
}

function displayVolume() {
    echo "Volume: ", $this->_edge ** 3, "\n";
}

function displayOneSurface() {
    echo "One surface: ", $this->_edge ** 2, "\n";
}

function displayTotalSurface() {
    echo "Total surface: ", 6 * $this->_edge ** 2, "\n";
}
}

$edge = (float)readline("Enter edge length of a cube: ");

$cubel = new Cube($edge);

$cubel->displayVolume();
$cubel->displayOneSurface();
$cubel->displayTotalSurface();
?>

```

7. Solution

```

<?php
class Cube {
    private $_edge;

    //Define the constructor
    function __construct($edge) {
        $this->setEdge($edge);
    }

    //Define the getter
    function getEdge() {
        return $this->_edge;
    }

    //Define the setter
    function setEdge($value) {
        if ($value > 0) {
            $this->_edge = $value;
        }
        else {
            throw new Exception("Cannot be negative or zero");
        }
    }

    function displayVolume() {
        echo "Volume: ", $this->getEdge() ** 3, "\n";
    }
}

```



```

    }

    function displayOneSurface() {
        echo "One surface: ", $this->getEdge() ** 2, "\n";
    }

    function displayTotalSurface() {
        echo "Total surface: ", 6 * $this->getEdge() ** 2, "\n";
    }
}

$edge = (float)readline("Enter edge length of a cube: ");

$cubel = new Cube($edge);

$cubel->displayVolume();
$cubel->displayOneSurface();
$cubel->displayTotalSurface();
?>

```

8. Solution

```

<?php
class Circle {
    private $_radius = -1;

    //Define the getter
    function getRadius() {
        if ($this->_radius > 0) {
            return $this->_radius;
        }
        else {
            throw new Exception("Radius is not set");
        }
    }

    //Define the setter
    function setRadius($value) {
        if ($value > 0) {
            $this->_radius = $value;
        }
        else {
            throw new Exception("Cannot be negative or zero");
        }
    }

    function getDiameter() {
        return 2 * $this->getRadius();
    }

    function getArea() {
        return 3.14 * $this->getRadius() ** 2;
    }
}

```

```

    function getPerimeter() {
        return 2 * 3.14 * $this->getRadius();
    }
}

function displayMenu() {
    echo "1. Enter radius\n";
    echo "2. Display radius\n";
    echo "3. Display diameter\n";
    echo "4. Display area\n";
    echo "5. Display perimeter\n";
    echo "6. Exit\n";
}

$circle1 = new Circle();

do {
    displayMenu();
    $choice = (int)readline("Enter a choice: ");

    if ($choice == 1) {
        $radius = (float)readline("Enter radius: ");
        $circle1->setRadius($radius);
    }
    elseif ($choice == 2) {
        echo "Radius: ", $circle1->getRadius(), "\n";
    }
    elseif ($choice == 3) {
        echo "Diameter: ", $circle1->getDiameter(), "\n";
    }
    elseif ($choice == 4) {
        echo "Area: ", $circle1->getArea(), "\n";
    }
    elseif ($choice == 5) {
        echo "Perimeter: ", $circle1->getPerimeter(), "\n";
    }
} while ($choice != 6);
?>

```

9. Solution

```

<?php
class Info {
    private $_userText;

    //Define the getter
    function getUserText() {
        return $this->_userText;
    }

    //Define the setter
    function setUserText($value) {

```

```
    if ($value != "") {
        $this->_userText = $value;
    }
    else {
        throw new Exception("Cannot be set to empty");
    }
}

function getSpacesCount() {
    $count = 0;
    for ($i = 0; $i <= strlen($this->getUserText()) - 1; $i++) {
        $character = $this->getUserText()[$i];
        if ($character == " ") {
            $count += 1;
        }
    }
    return $count;
}

function getWordsCount() {
    return $this->getSpacesCount() + 1;
}

function getVowelsCount() {
    $count = 0;
    for ($i = 0; $i <= strlen($this->getUserText()) - 1; $i++) {
        $character = strtolower($this->getUserText())[$i];
        if (strpos("aeiou", $character) !== false) {
            $count += 1;
        }
    }
    return $count;
}

function getLettersCount() {
    return strlen($this->getUserText()) - $this->getSpacesCount();
}
}

$inf = new Info();

$inf->setUserText(readline("Enter a text: "));

echo "Text: ", $inf->getUserText(), "\n";
echo "Spaces: ", $inf->getSpacesCount(), "\n";
echo "Words: ", $inf->getWordsCount(), "\n";
echo "Vowels: ", $inf->getVowelsCount(), "\n";
echo "Total number of letters: ", $inf->getLettersCount(), "\n";
?>
```

10. Solution

```
<?php
```

```
define("alphabet", " abcdefghijklmnopqrstuvwxyz"); //space is a valid character!

class EncryptDecrypt {
    private $_encrDecrKey = -1;

    //Define the getter
    function getEncrDecrKey() {
        if ($this->_encrDecrKey != -1) {
            return $this->_encrDecrKey;
        }
        else {
            throw new Exception("Key is not set");
        }
    }

    //Define the setter
    function setEncrDecrKey($value) {
        if ($value >= 1 && $value <= 26) {
            $this->_encrDecrKey = $value;
        }
        else {
            throw new Exception("Must be between 1 and 26");
        }
    }

    function encrypt($message) {
        $returnValue = "";
        for ($i = 0; $i <= strlen($message) - 1; $i++) {
            $character = $message[$i];
            $index = strpos(alphabet, $character);
            $newIndex = $index + $this->getEncrDecrKey();
            if ($newIndex >= 27) {
                $newIndex -= 27;
            }
            $newLetter = alphabet[$newIndex];
            $returnValue .= $newLetter;
        }
        return $returnValue;
    }

    function decrypt($encMessage) {
        $returnValue = "";
        for ($i = 0; $i <= strlen($encMessage) - 1; $i++) {
            $character = $encMessage[$i];
            $index = strpos(alphabet, $character);
            $newIndex = $index - $this->getEncrDecrKey();
            if ($newIndex < 0) {
                $newIndex += 27;
            }
            $newLetter = alphabet[$newIndex];
            $returnValue .= $newLetter;
        }
    }
}
```

```

        return $returnValue;
    }
}

function displayMenu() {
    echo "1. Enter encryption/decryption key\n";
    echo "2. Encrypt a message\n";
    echo "3. Decrypt a message\n";
    echo "4. Exit\n";
}

$ed = new EncryptDecrypt();

displayMenu();
$choice = (int)readline("Enter a choice: ");
while ($choice != 4) {
    if ($choice == 1) {
        $ed->setEncrDecrKey((int)readline("Enter encryption/decryption key: "));
    }
    elseif ($choice == 2) {
        $text = readline("Enter message to encrypt: ");
        echo "Encrypted message: ", $ed->encrypt($text), "\n";
    }
    elseif ($choice == 3) {
        $text = readline("Enter message to decrypt: ");
        echo "Decrypted message: ", $ed->decrypt($text), "\n";
    }

    displayMenu();
    $choice = (int)readline("Enter a choice: ");
}
?>

```

11. Solution

```

<?php
class Vehicle {
    public $numberOfWheels;
    public $color;
    public $length, $width, $height;

    //Define the constructor
    function __construct($numberOfWheels, $color, $length, $width, $height) {
        $this->numberOfWheels = $numberOfWheels;
        $this->color = $color;
        $this->length = $length;
        $this->width = $width;
        $this->height = $height;
    }

    function startEngine() {
        echo "The engine started\n";
    }
}

```

```
function stopEngine() {
    echo "The engine stopped\n";
}

class Car extends Vehicle {
    public $bootCapacity;

    //Define the constructor
    function __construct($numberOfWheels, $color, $length, $width, $height) {
        parent::__construct($numberOfWheels, $color, $length, $width, $height);
        $this->bootCapacity = 0;
    }

    public function turnWindshieldWipersOn() {
        echo "The windshield wipers have been turned on!\n";
    }
}

class Motorcycle extends Vehicle {
    public $hasLuggage;

    //Define the constructor
    function __construct($numberOfWheels, $color, $length, $width, $height) {
        parent::__construct($numberOfWheels, $color, $length, $width, $height);
        $this->hasLuggage = false;
    }

    public function doAWheelie() {
        echo "I am doing a wheelie!!!\n";
    }
}

$car1 = new Car(4, "Red", 5, 2, 1.5);
$car1->bootCapacity = 300;
$car1->startEngine();
$car1->turnWindshieldWipersOn();
$car1->stopEngine();

$car2 = new Car(4, "Green", 4.5, 2.2, 1.4);
$car2->bootCapacity = 400;
$car2->startEngine();
$car2->turnWindshieldWipersOn();
$car2->stopEngine();

$motorcycle1 = new Motorcycle(2, "Blue", 2, 0.9, 1.3);
$motorcycle1->hasLuggage = true;
$motorcycle1->startEngine();
$motorcycle1->doAWheelie();
$motorcycle1->stopEngine();

?>
```

12. Solution

```
<?php
class SchoolMember {
    private $_name;
    private $_age;

    function __construct($name, $age) {
        $this->setName($name);
        $this->setAge($age);
        echo "A school member was initialized\n";
    }

    function getName() {
        return $this->_name;
    }

    function setName($value) {
        if ($value != "" )
            $this->_name = $value;
        else
            throw new Exception("Name cannot be empty");
    }

    function getAge() {
        return $this->_age;
    }

    function setAge($value) {
        if ($value > 0)
            $this->_age = $value;
        else
            throw new Exception("Age cannot be negative or zero");
    }
}

class Teacher extends SchoolMember {
    private $_salary;

    //Define the constructor
    function __construct($name, $age, $salary) {
        parent::__construct($name, $age);
        $this->setSalary($salary);
        echo "A teacher was initialized\n";
    }

    function displayValues() {
        echo "Name: ", $this->getName(), "\n";
        echo "Age: ", $this->getAge(), "\n";
        echo "Salary: ", $this->getSalary(), "\n";
    }

    function getSalary() {
```

```
        return $this->_salary;
    }

    function setSalary($value) {
        if ($value >= 0)
            $this->_salary = $value;
        else
            throw new Exception("Salary cannot be negative");
    }
}

class Student extends SchoolMember {
    private $_finalGrade;

    //Define the constructor
    function __construct($name, $age, $finalGrade) {
        parent::__construct($name, $age);
        $this->setFinalGrade($finalGrade);
        echo "A student was initialized\n";
    }

    function displayValues() {
        echo "Name: ", $this->getName(), "\n";
        echo "Age: ", $this->getAge(), "\n";
        echo "Final grade: ", $this->getFinalGrade(), "\n";
    }

    function getFinalGrade() {
        return $this->_finalGrade;
    }

    function setFinalGrade($value) {
        if ($value == "A" || $value == "B" || $value == "C" || $value == "D" || $value == "E" || $value == "F")
            $this->_finalGrade = $value;
        else
            throw new Exception("Final grade must be in the range of 'A' to 'F'");
    }
}

$teacher1 = new Teacher("Mr. John Scott", 43, 35000);
$teacher2 = new Teacher("Mrs. Ann Carter", 5, 32000);

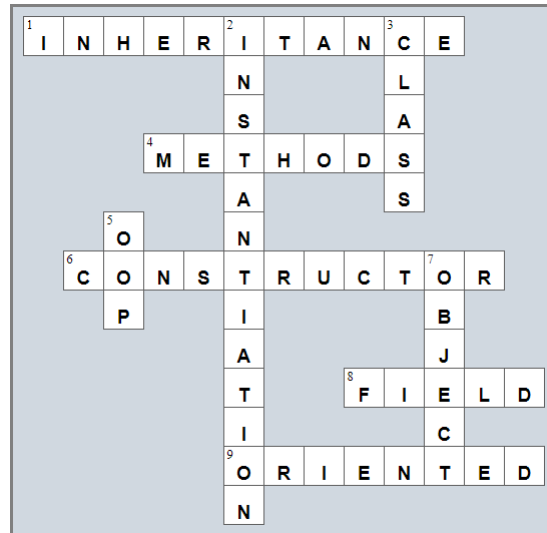
$student1 = new Student("Mark Nelson", 14, "A");
$student2 = new Student("Mary Morgan", 13, "B");

$teacher1->displayValues();
$teacher2->displayValues();
$student1->displayValues();
$student2->displayValues();
?>
```


Review in "Object Oriented Programming"

Review Crossword Puzzle

1.



Chapter 40

40.8 Review Questions: True/False

- | | | |
|----------|-----------|-----------|
| 1. false | 9. true | 17. false |
| 2. false | 10. false | 18. false |
| 3. true | 11. true | 19. false |
| 4. false | 12. false | 20. true |
| 5. false | 13. false | 21. true |
| 6. false | 14. false | 22. true |
| 7. false | 15. true | |
| 8. false | 16. true | |

40.9 Review Exercises

1. Solution

```
<?php
define("PATH", "c:/temp/");

$days = ["Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday"];

$f = fopen(PATH . "days_of_week.txt", "w");
foreach ($days as $d) {
    fwrite($f, $d . "\n");
}
fclose($f);
?>
```

2. Solution

```
<?php
define("PATH", "c:/temp/");

$days = [];

$f = fopen(PATH . "days_of_week.txt", "r");
for ($i = 0; $i <= 6; $i++) {
    $days[$i] = trim(fgets($f));
}
fclose($f);

for ($i = 6; $i >= 0; $i--) {
    echo $days[$i], "\n";
}
?>
```

3. Solution

```
<?php
```

```

define("PATH", "c:/temp/");

$f = fopen(PATH . "days_of_week.txt", "a");
fwrite($f, "*** End of File ***\n");
fclose($f);
?>

```

4. Solution

```

<?php
define("PATH", "c:/temp/");

$f = fopen(PATH . "randoms.txt", "w");
for ($i = 0; $i <= 49; $i++) {
    fwrite($f, rand(1, 100) . "\n");
}
fclose($f);
?>

```

5. Solution

```

<?php
define("PATH", "c:/temp/");

for ($i = 1; $i <= 10; $i++) {
    $f = fopen(PATH . "file" . $i . ".txt", "w");
    fwrite($f, rand(100, 9999));
    fclose($f);
}
?>

```

6. Solution

```

<?php
define("PATH", "c:/temp/");

$f = fopen(PATH . "multiplication_table.txt", "w");

for ($i = 1; $i <= 10; $i++) {
    for ($j = 1; $j <= 4; $j++) {
        fwrite($f, $i . " x " . $j . " = " . ($i * $j) . "\n");
    }
}
fclose($f);
?>

```

7. Solution

```

<?php
define("PATH", "c:/temp/");

$f = fopen(PATH . "a_file.txt", "r");
while (!feof($f)) {

```

```

    echo strlen(fgets($f)) - 2, "\n";    //Minus 2 due to \n at the end of the line
}
fclose($f);
?>

```

8. Solution

First approach

```

<?php
define("PATH", "c:/temp/");

$f = fopen(PATH . "a_file.txt", "r");

$i = 1;
while (!feof($f)) {
    $line = trim(fgets($f));
    foreach (str_split($line) as $character) {
        if (strpos(",.!", $character) !== false) {
            echo "There is a punctuation mark on line No ", $i, "\n";
            break;
        }
    }
    $i++;
}

fclose($f);
?>

```

Second approach

```

<?php
define("PATH", "c:/temp/");

$f = fopen(PATH . "a_file.txt", "r");

$i = 1;
while (!feof($f)) {
    $line = trim(fgets($f));
    if (strpos($line, ",") !== false || strpos($line, ".") !== false || strpos($line, "!") !== false) {
        echo "There is a punctuation mark on line No ", $i, "\n";
    }
    $i++;
}

fclose($f);
?>

```

Chapter 41

41.2 Review Exercises

1. Solution

First approach

```
<?php
    define("PATH", "c:/temp/");

    $fin = fopen(PATH . "f_data41.2-1.txt", "r");
    $values = trim(fgets($fin));
    fclose($fin);

    $total = 0;
    $count = 0;
    for ($i = 0; $i < 10; $i++) {
        $number = (int)substr($values, $i * 3, 2);
        if ($number > 50) {
            $total += $number;
            $count += 1;
        }
    }

    if ($count > 0) {
        echo $total / $count, "\n";
    }
?>
```

Second approach

```
<?php
    define("PATH", "c:/temp/");

    $fin = fopen(PATH . "f_data41.2-1.txt", "r");

    $total = 0;
    $count = 0;
    for ($i = 0; $i < 10; $i++) {
        $number = (int)fgets($fin, 3);
        if ($number > 50) {
            $total += $number;
            $count += 1;
        }
        $space = fgets($fin, 2);
    }

    fclose($fin);
    if ($count > 0) {
        echo $total / $count, "\n";
    }
?>
```

2. Solution

First approach

```
<?php
define("PATH", "c:/temp/");

$fin = fopen(PATH . "f_data41.2-2.txt", "r");
$values = trim(fgets($fin));
fclose($fin);

$total = 0;
$count = 0;
$i = 0;
while ($i < strlen($values) / 4) {
    $number = (int)substr($values, $i * 4, 3);
    if ($number >= 300 && $number <= 500) {
        $total += $number;
        $count += 1;
    }
    $i++;
}

if ($count > 0) {
    echo $total / $count, "\n";
}
?>
```

Second approach

```
<?php
define("PATH", "c:/temp/");

$fin = fopen(PATH . "f_data41.2-2.txt", "r");
$total = 0;
$count = 0;

do {
    $number = (int)fgets($fin, 4);
    if ($number >= 300 && $number <= 500) {
        $total += $number;
        $count += 1;
    }
    $comma = fgets($fin, 2);
} while (!feof($fin));

fclose($fin);

if ($count > 0) {
    echo $total / $count, "\n";
}
?>
```

3. Solution

```

<?php
    define("PATH", "c:/temp/");

    $fin = fopen(PATH . "f_data41.2-3.txt", "r");

    //Read the first line
    $line = trim(fgets($fin));

    $commaPosition = strpos($line, ",");
    $grade = (int)substr($line, 0, $commaPosition - 1);
    $name = substr($line, $commaPosition + 1);

    $maximum = $minimum = $grade;
    $maxName = $minName = $name;

    //Read the rest of the lines
    while (!feof($fin)) {
        $line = trim(fgets($fin));

        $commaPosition = strpos($line, ",");
        $grade = (int)substr($line, 0, $commaPosition - 1);
        $name = substr($line, $commaPosition + 1);

        if ($grade > $maximum) {
            $maximum = $grade;
            $maxName = $name;
        }
        if ($grade < $minimum) {
            $minimum = $grade;
            $minName = $name;
        }
    }

    fclose($fin);

    echo $maxName, "\n";
    echo $minName, "\n";
?>

```

4. Solution

```

<?php
    define("PATH", "c:/temp/");

    echo "Enter keyword to search: ";
    $keyword = strtolower(readline());

    $fin = fopen(PATH . "f_data41.2-4.txt", "r");

    $maximum = $total = 0;
    $maximumDescription = $stringInfo1 = $stringInfo2 = "";
    while (!feof($fin)) {

```

```

$width = (float)fgets($fin, 6);
$space = fgets($fin, 2);
$length = (float)fgets($fin, 6);
$space = fgets($fin, 2);
$height = (float)fgets($fin, 6);
$space = fgets($fin, 2);
$description = trim(fgets($fin));

if (strpos(strtolower($description), $keyword) !== false) {
    $stringInfo1 .= $description . " - Dimensions: " .
        $width . " x " . $length . " x " . $height . "\n";
}

$volume = $width * $length * $height / 1728;
$stringInfo2 .= $description . " - Volume = " . $volume . " cubic feet\n";

$total += $volume;

if ($volume > $maximum) {
    $maximum = $volume;
    $maximumDescription = $description;
}
}

fclose($fin);

if ($stringInfo1 != "") {
    echo "Keyword ' ", $keyword, "' found!\n";
    echo $stringInfo1, "\n";
}

echo "Volume of each item:\n";
echo $stringInfo2, "\n";

echo "Total volume: ", $total, "\n";
echo "Greatest box: ", $maximumDescription, "\n";
?>

```

5. Solution

First approach

```

<?php
$filename1 = readline("Enter filename No 1: ");

if (substr($filename1, strlen($filename1) - 4) != ".txt") {
    echo "Wrong filename\n";
}
else {
    $filename2 = readline("Enter filename No 2: ");
    if (substr($filename2, strlen($filename2) - 4) != ".txt") {
        echo "Wrong filename\n";
    }
    else {

```



```

$content = "";
$fin = fopen($filename2, "r");
while (!feof($fin)) {
    $content .= fgets($fin);
}
fclose($fin);

$fin = fopen($filename1, "r");
while (!feof($fin)) {
    $content .= fgets($fin);
}
fclose($fin);

$fout = fopen("final.txt", "w");
fwrite($fout, $content);
fclose($fout);
}
}
?>

```

Second approach

```

<?php
$filename1 = readline("Enter filename No 1: ");

if (substr($filename1, strlen($filename1) - 4) != ".txt") {
    echo "Wrong filename\n";
}
else {
    $filename2 = readline("Enter filename No 2: ");
    if (substr($filename2, strlen($filename2) - 4) != ".txt") {
        echo "Wrong filename\n";
    }
    else {
        $fin1 = fopen($filename1, "r");
        $fin2 = fopen($filename2, "r");
        $fout = fopen("final.txt", "w");

        $content = "";
        while (!feof($fin2)) {
            $content .= fgets($fin2);
        }
        while (!feof($fin1)) {
            $content .= fgets($fin1);
        }

        fwrite($fout, $content);

        fclose($fin1);
        fclose($fin2);
        fclose($fout);
    }
}
?>

```

6. Solution

```

<?php
    define("PATH", "c:/temp/");

    $numbers = [];

    $fin = fopen(PATH . "f_data30.2-6.txt", "r");
    $i = 0;
    while (!feof($fin)) {
        $numbers[$i] = (float) fgets($fin);
        $i++;
    }
    fclose($fin);

    $elements = sizeof($numbers);    //Get the size of the array

    //Bubble sort
    for ($m = 1; $m <= $elements - 1; $m++) {
        for ($n = $elements - 1; $n >= $m; $n--) {
            if ($numbers[$n] < $numbers[$n - 1]) {
                $temp = $numbers[$n];
                $numbers[$n] = $numbers[$n - 1];
                $numbers[$n - 1] = $temp;
            }
        }
    }

    $fout = fopen(PATH . "f_data30.2-6.txt", "a");
    fwrite($fout, "\n***** Sorted numbers *****");
    foreach ($numbers as $number) {
        fwrite($fout, $number . "\n");
    }
    fclose($fout);
?>

```

7. Solution

```

<?php
    define("PATH", "c:/temp/");
    define("NUMBER_OF_CITIES", 8);

    $fin = fopen(PATH . "f_data41.2-7.txt", "r");

    $cities = [];
    $temperatures = [];

    $onCityLine = true;
    while (!feof($fin)) {
        if ($onCityLine) {
            $cities[] = trim(fgets($fin));
        }
        else {

```

```

    $temperatures[] = (float) fgets($fin);
}

$onCityLine = !$onCityLine; //Toggle between true and false with each iteration of the code
}

$total = 0;
for ($i = 0; $i < NUMBER_OF_CITIES; $i++) {
    $total += $temperatures[$i];
}

$average = $total / NUMBER_OF_CITIES;
echo $average, "\n";

$maximum = max($temperatures);
echo "Highest temperature: ", $maximum, "\n";
for ($i = 0; $i < NUMBER_OF_CITIES; $i++) {
    if ($temperatures[$i] == $maximum) {
        echo $cities[$i], "\n";
    }
}
?>

```

8. Solution

```

<?php
define("PATH", "c:/temp/");

function abbreviate($word) {
    if (strlen($word) > 10) {
        return $word[0] . strlen($word) . $word[-1];
    }
    else {
        return $word;
    }
}

$fin = fopen(PATH . "f_data41.2-8.txt", "r");

while (!feof($fin)) {
    $line = trim(fgets($fin));

    $spaceIndex = strpos($line, " "); //Find the first space
    while ($spaceIndex !== false) {
        $word = substr($line, 0, $spaceIndex); //Get the word and
        $line = substr($line, $spaceIndex + 1); //remove the word from line

        echo abbreviate($word) . " ";

        $spaceIndex = strpos($line, " ");
    }
    //Display the last word remained in the string line
    echo abbreviate($line), "\n";
}

```

```
fclose($fin);
?>
```

9. Solution

```
<?php
define("PATH", "c:/temp/");

function pigLatinTranslator($word) {
    $vowels = "aeiou";

    if (strpos($vowels, $word[0]) !== false) { //If first character is vowel
        $pigLatinWord = $word . "way";
    }
    else {
        //Find the index of the first vowel
        $firstVowelIndex = false;
        for ($i = 0; $i <= strlen($word) - 1; $i++) {
            if (strpos($vowels, $word[$i]) !== false) {
                $firstVowelIndex = $i;
                break;
            }
        }

        //If at least one vowel found
        if ($firstVowelIndex !== false) {
            //Move the consonants to the end
            $word = substr($word, $firstVowelIndex) . substr($word, 0, $firstVowelIndex);
        }
        $pigLatinWord = $word . "ay";
    }
    return $pigLatinWord;
}

$fin = fopen(PATH . "f_data41.2-9.txt", "r");
$fout = fopen(PATH . "pig_latin_translation.txt", "w");

while (!feof($fin)) {
    $line = trim(fgets($fin));

    $spaceIndex = strpos($line, " "); //Find the first space
    while ($spaceIndex !== false) {
        $word = substr($line, 0, $spaceIndex); //Get the word and
        $line = substr($line, $spaceIndex + 1); //remove the word from line

        fwrite($fout, pigLatinTranslator($word) . " ");

        $spaceIndex = strpos($line, " ");
    }
    //Write the last word remained in the string line
    fwrite($fout, pigLatinTranslator($line) . "\n");
}
```

```

fclose($fin);
fclose($fout);
?>

```

10. Solution

```

<?php
define("PATH", "c:/temp/");

define("X", " ABCDEFGHIJKLMNOPQRSTUVWXYZ"); //The space character remains as is
define("Y", " JKWCTAMEDXSLFBYUNGRZOIQVHP");

$initialMessage = strtoupper(readline("Enter a message to encrypt: "));

$encryptedMessage = "";
foreach (str_split($initialMessage) as $letter) {
    //Search for letter in const X
    for ($i = 0; $i < 27; $i++) {
        if ($letter == X[$i]) {
            //Create encrypted message using letters from const Y
            $encryptedMessage .= Y[$i];
            break;
        }
    }
}

$fout = fopen(PATH . "encrypted.txt", "w");
fwrite($fout, $encryptedMessage);
fclose($fout);
?>

```

11. Solution

```

<?php
define("PATH", "c:/temp/");

define("X", " ABCDEFGHIJKLMNOPQRSTUVWXYZ"); //The space character remains as is
define("Y", " JKWCTAMEDXSLFBYUNGRZOIQVHP");

$fin = fopen(PATH . "encrypted.txt", "r");
$encryptedMessage = fgets($fin);
fclose($fin);

$initialMessage = "";
foreach (str_split($encryptedMessage) as $letter) {
    //Search for letter in const Y
    for ($i = 0; $i < 27; $i++) {
        if ($letter == Y[$i]) {
            //Create decrypted message using letters from const X
            $initialMessage .= X[$i];
            break;
        }
    }
}

```

```

    }
}

$fout = fopen(PATH . "decrypted.txt", "w");
fwrite($fout, $initialMessage);
fclose($fout);
?>

```

12. Solution

First approach

```

function copyFile($source, $destination) {
    $fin = fopen($source, "r");
    $x = "";
    while (!feof($fin)) {
        $x .= fgets($fin);
    }
    fclose($fin);

    $fout = fopen($destination, "w");
    fwrite($fout, $x);
    fclose($fout);
}

```

Second approach

```

function copyFile($source, $destination) {
    $fin = fopen($source, "r");
    $fout = fopen($destination, "w");

    while (!feof($fin)) {
        fwrite($fout, fgets($fin));
    }

    fclose($fin);
    fclose($fout);
}

```

13. Solution

```

<?php
define("PATH", "c:/temp/");

class Triangle {
    private $_sideA, $_sideB, $_sideC;

    //Define the constructor
    function __construct() {
        $fin = fopen(PATH . "f_data41.2-13.txt", "r");
        $this->_sideA = (float)(fgets($fin));
        $this->_sideB = (float)(fgets($fin));
        $this->_sideC = (float)(fgets($fin));
        fclose($fin);
    }
}

```

```
function canBeTriangle() {
    if ($this->_sideA > 0 && $this->_sideB > 0 && $this->_sideC > 0 &&
        $this->_sideA + $this->_sideB > $this->_sideC &&
        $this->_sideB + $this->_sideC > $this->_sideA &&
        $this->_sideC + $this->_sideA > $this->_sideB) {
        return true;
    }
    else {
        return false;
    }
}

function displayLengths() {
    echo "Side A: ", $this->_sideA, "\n";
    echo "Side B: ", $this->_sideB, "\n";
    echo "Side C: ", $this->_sideC, "\n";
    if ($this->canBeTriangle()) {
        echo "Can be lengths of the three sides of a triangle!\n";
    }
    else {
        echo "Cannot be lengths of the three sides of a triangle!\n";
    }
}

function displayArea() {
    if ($this->canBeTriangle()) {
        $s = ($this->_sideA + $this->_sideB + $this->_sideC) / 2;
        $area = sqrt($s * ($s - $this->_sideA) * ($s - $this->_sideB) * ($s - $this->_sideC));
        echo "Area: ", $area, "\n";
    }
}

function displayPerimeter() {
    if ($this->canBeTriangle()) {
        $perimeter = $this->_sideA + $this->_sideB + $this->_sideC;
        echo "Perimeter: ", $perimeter, "\n";
    }
}

$str = new Triangle();

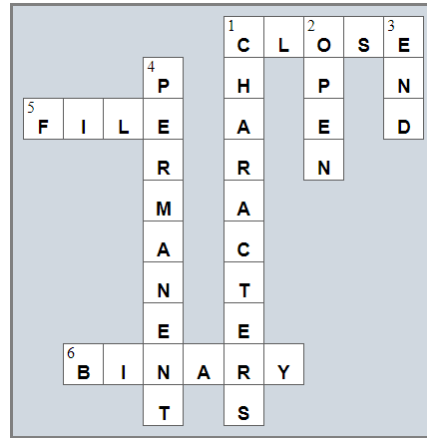
$str->displayLengths();
$str->displayArea();
$str->displayPerimeter();

?>
```

Review in "Files"

Review Crossword Puzzle

1.



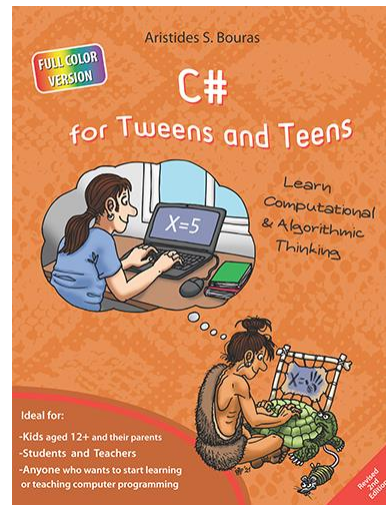
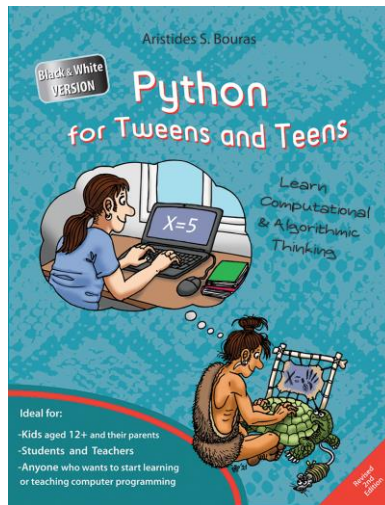
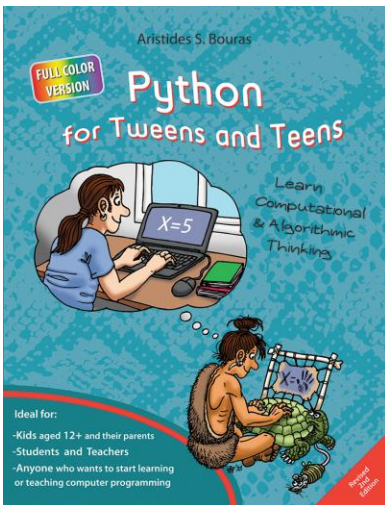
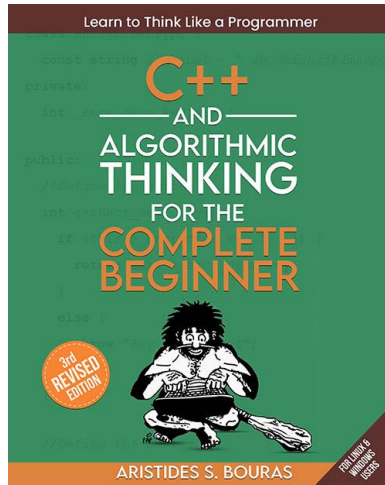
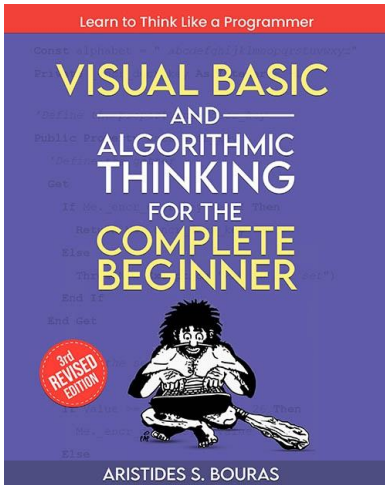
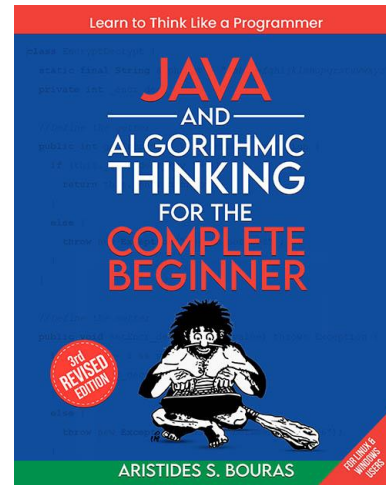
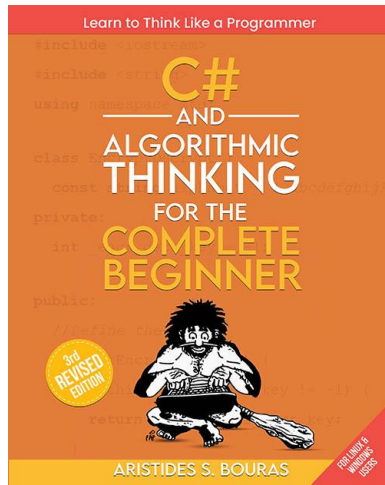
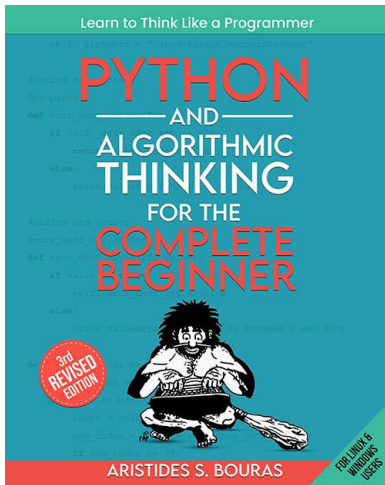
Some Final Words from the Author

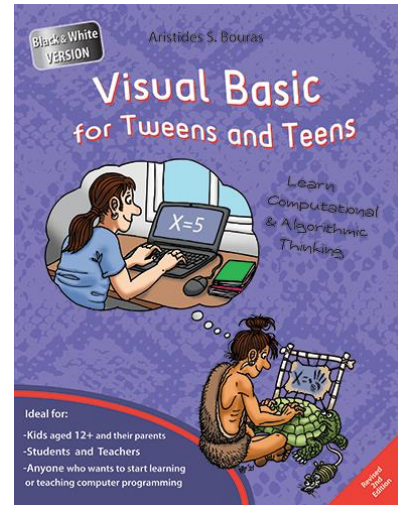
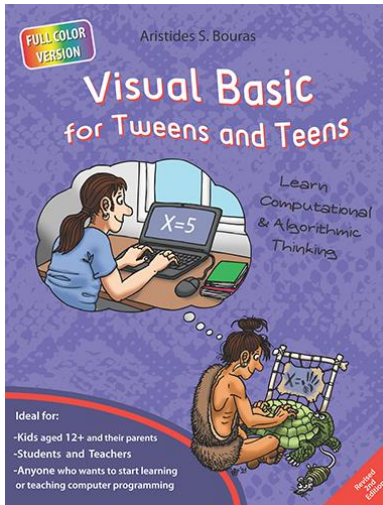
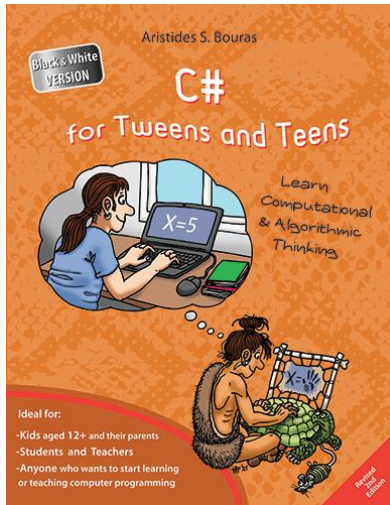
I hope you thoroughly enjoyed reading this book. I made every possible effort to ensure it is beneficial and comprehensible, even for people who may have no prior experience in programming.

If you found this book valuable, please consider visiting the web store where you purchased it, as well as [goodreads.com](https://www.goodreads.com), to show your appreciation by writing a positive review and awarding as many stars as you think appropriate. By doing so, you will motivate me to keep writing and, of course, you'll be assisting other readers in discovering my work.

And always remember: Learning is a lifelong, continuous process that begins at birth and extends throughout your lifetime!

Some of my Books





For more information about my books visit my website:

<https://www.bouraspape.com>

