

Year 8 Term 1 Homework Worked Solutions

Student Name: _____	Grade: _____
Date: _____	Score: _____

Table of contents

1	Year 8 Term 1 Week 1 Worked Solutions	1
1.1	Topic 1 — Percentages	1
1.1.1	The Meaning of Percentages	1
1.1.2	Converting Between Fractions and Percentages	3
1.1.3	Converting Between Decimals and Percentages	6
1.1.4	Common Conversions	7
1.2	Topic 2 — Algebra	8
1.2.1	Adding and Subtracting Like Terms	8
1.2.2	Multiplying Algebraic Terms	9
1.2.3	Dividing Algebraic Terms	10
1.3	Topic 3 — Pythagoras’ Theorem	11
1.3.1	Pythagoras’ Theorem	11
1.3.2	The converse of Pythagoras’ Theorem	11
1.4	Miscellaneous Exercises	12

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1 Year 8 Term 1 Week 1 Worked Solutions

1.1 Topic 1 — Percentages

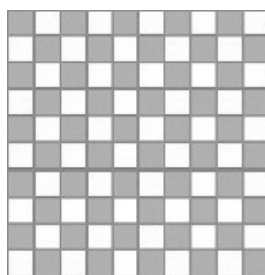
1.1.1 The Meaning of Percentages

Definition:

- The Term **per cent** means some thing out of one hundred.
- The Symbol for per cent is %

Example 1.1.1

1. 7% means $\frac{7}{100}$ or seven out of one hundred.
2. In the diagram shown, what percentage of the figure is:

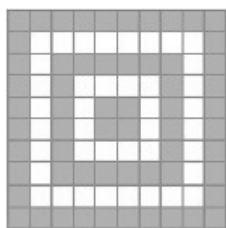


- (a) Shaded?
- (b) Unshaded?

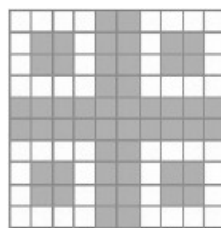
Solution:

- (a) 50 out of 100 squares are shaded or 50% of the figure is shaded.
- (b) 50 out of 100 squares are shaded or 50% of the figure is unshaded.

Exercise 1.1.1 Each of the following square has been divided into 100 squares. State the percentage of each figure that is shaded.

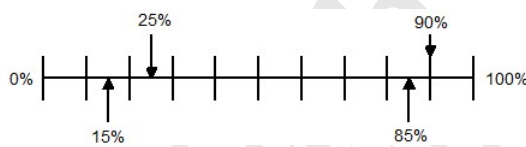


(1) 60%,



(2) 52%

Exercise 1.1.2 Place each of the percentages on the number line.



Exercise 1.1.3 The inflation rate in a certain country is quoted as begin 50%.

1. What does this mean?

Solution: *everything will be increasing by 50%.*

2. If a pen cost \$1.20 last year, how much would you expect it to cost this year?

Solution: $\$1.2 \times 150\% = \1.80

Exercise 1.1.4

1. If 25% of the people in a crowd are children, what percentage are adults?

Solution: $100\% - 25\% = 75\%$.

2. Charles got 76% of the words correct in a spelling test. What percentage of the words did he spell incorrectly?

Solution: $100\% - 76\% = 24\%$

3. If a man lost 82% of his money while gambling at the casino, what percentage of his money does he have left?

Solution: $100\% - 82\% = 18\%$

1.1.2 Converting Between Fractions and Percentages

To convert a percentage to a fraction:

- Write the number in front of the percentage sign as the numerator and 100 as the denominator.
- Simplify if it is possible.

Example 1.1.2 Express each of these percentages as a fraction in its simplest form

1. $17\% = \frac{17}{100}$

2. $25\% = \frac{25}{100} = \frac{1}{4}$

3. $120\% = \frac{120}{100} = 1\frac{20}{100} = 1\frac{1}{5}$

Method 1:

If the denominator is a factor of 10, 100, 1000 etc:

- Convert the fraction to one with a denominator of 100.
- Write the numerator followed by a percentage sign.

Example 1.1.3 Convert each of these fractions to a percentage using method 1

1. $\frac{12}{100} = 12\%$

2. $\frac{8}{10} = \frac{8 \times 10}{10 \times 10} = \frac{80}{100} = 80\%$

3. $2\frac{3}{20} = \frac{3 \times 5}{20 \times 5} = \frac{215}{100} = 215\%$

Method 2:

If the denominator is not a factor of 10, 100 or 1000, multiply the fraction by $\frac{100}{1}\%$

Example 1.1.4 convert each of these fractions to a percentage using method 2

1. $\frac{1}{6} = \frac{1}{6} \times \frac{100}{1}\% = \frac{100}{6}\% = 16\frac{2}{3}\%$

2. $\frac{3}{7} = \frac{3}{7} \times \frac{100}{1}\% = \frac{300}{7}\% = 42\frac{6}{7}\%$

3. $3\frac{3}{8} = \frac{27}{8} \times \frac{100}{1}\% = \frac{2700}{8}\% = 337\frac{1}{2}\%$

Exercise 1.1.5 Express each of these percentages as a fraction.

1. $12\% = \frac{3}{25}$

2. $45\% = \frac{9}{20}$

3. $87\% = \frac{87}{100}$

4. $112\% = 1\frac{3}{25}$

5. $15.5\% = \frac{31}{200}$

Exercise 1.1.6 Express each of these fractions as a percentage.

1. $\frac{23}{100} = 23\%$

2. $\frac{12}{50} = 24\%$

3. $\frac{7}{20} = 35\%$

4. $\frac{123}{100} = 123\%$

5. $\frac{204}{200} = 102\%$

Exercise 1.1.7 Convert each of these percentages to a fraction in its simplest form.

1. $2\% = \frac{1}{50}$

2. $24\% = \frac{6}{25}$

3. $38\% = \frac{19}{50}$

4. $85\% = \frac{17}{20}$

5. $24.2\% = \frac{121}{500}$

Exercise 1.1.8 Convert each of these fractions to a percentage.

1. $\frac{7}{20} = 35\%$

2. $\frac{3}{25} = 12\%$

3. $\frac{27}{50} = 54\%$

4. $\frac{1}{4} = 25\%$

5. $\frac{42}{125} = 33.6\%$

Exercise 1.1.9 Express each integer as a percentage.

1. $2 =$ 200%

2. $12 =$ 1200%

3. $22 =$ 2200%

Exercise 1.1.10 Express each of these percentages as an integer

1. $500\% =$ 5

2. $800\% =$ 8

3. $1000\% =$ 10

Exercise 1.1.11 Convert these percentages to mixed numerals.

1. $125\% =$ $1\frac{1}{4}$

2. $205\% =$ $2\frac{1}{20}$

3. $624\% =$ $6\frac{6}{25}$

4. $560\% =$ $5\frac{3}{5}$

5. $108\% =$ $1\frac{2}{25}$

Exercise 1.1.12 Convert these mixed numerals to percentages.

1. $2\frac{7}{10} =$ 270%

2. $1\frac{13}{20} =$ 165%

3. $2\frac{1}{4} =$ 225%

4. $3\frac{4}{5} =$ 380%

5. $5\frac{24}{25} =$ 596%

6. $24\frac{5}{8} =$ 2462.5%

1.1.3 Converting Between Decimals and Percentages

To convert a percentage to a decimal:

- convert the percentage to a fraction with a denominator of 100.
- divide the numerator by 100 by moving the decimal point two places to the left.

Example 1.1.5 Convert each of these percentages to a decimal.

$$1. 15\% = \frac{15}{100} = 0.15$$

$$2. 80.5\% = \frac{80.5}{100} = 0.805$$

$$3. 123\% = \frac{123}{100} = 1.23$$

Exercise 1.1.13 Convert each of these percentages to a decimal.

$$1. 8\% = \underline{\hspace{2cm}0.08\hspace{2cm}}$$

$$2. 2.8\% = \underline{\hspace{2cm}0.028\hspace{2cm}}$$

$$3. 108\% = \underline{\hspace{2cm}1.08\hspace{2cm}}$$

To convert a decimal to a percentage:

- convert the decimal to a fraction with a denominator of 100.
- write the numerator followed by a percentage sign (%).

Example 1.1.6 Convert each of these decimals to a percentage.

$$1. 0.24 = \frac{24}{100} = 24\%$$

$$2. 2.62 = 2 \frac{62}{100} = 262\%$$

$$3. 0.345 = \frac{345}{1000} = \frac{34.5}{100} = 34.5\%$$

Exercise 1.1.14 Convert each of these decimals to a percentage.

$$1. 1.18 = \underline{\hspace{2cm}118\%\hspace{2cm}}$$

$$2. 2.02 = \underline{\hspace{2cm}202\%\hspace{2cm}}$$

$$3. 0.27 = \underline{\hspace{2cm}27\%\hspace{2cm}}$$

Exercise 1.1.15 Convert each of these decimals to a percentage.

1. $0.005 =$ 0.5%

2. $0.126 =$ 12.6%

3. $12.5 =$ 1250%

4. $0.305 =$ 30.5%

5. $0.028 =$ 2.8%

6. $123.456 =$ 12345.6%

Exercise 1.1.16 Convert each of these percentages to a decimal.

1. $5\frac{1}{2}\% =$ 0.055

2. $35\frac{3}{4}\% =$ 0.3575

3. $52\frac{3}{5}\% =$ 0.526

4. $18\frac{1}{10}\% =$ 0.181

5. $66\frac{4}{25}\% =$ 0.6616

6. $74\frac{4}{5}\% =$ 0.748

1.1.4 Common Conversions

The following conversions between fractions, decimal and percentages should be memorised for use in later problems.

Fractions	Decimals	Percentages	Fractions	Decimals	Percentages
$\frac{1}{10}$	0.1	10%	$\frac{1}{5}$	0.2	20%
$\frac{1}{8}$	0.125	12.5%	$\frac{2}{5}$	0.4	40%
$\frac{1}{4}$	0.25	25%	$\frac{3}{5}$	0.6	60%
$\frac{1}{3}$	$0.\dot{3}$	$33\frac{1}{3}\%$	$\frac{4}{5}$	0.8	80%
$\frac{1}{2}$	0.5	50%			
$\frac{2}{3}$	$0.\dot{6}$	$66\frac{2}{3}\%$			
$\frac{3}{4}$	0.75	75%			

1.2 Topic 2 — Algebra

Algebra terms with identical pronumerals are called **like terms**. Only like terms can be added or subtracted.

To combine the like terms in an algebra expression:

- add or subtract the co-efficients
- keep the same pronumeral(s).

1.2.1 Adding and Subtracting Like Terms

Example 1.2.1

- $12b + 3b = 15b$
- $12ab - 6ab = 6ab$
- $2x + 5x - 3x = 4x$
- $x^2 - y - 4x^2 + 6 = -3x^2 - y + 6$

Exercise 1.2.1

- $6pq + 2p - 2pq + 3q =$ $4pq + 2p + 3q$
- $2x^2 + 5x + 3x^2 - 6x =$ $5x^2 - x$
- $7k - 3 + 3k + 2 =$ $10k - 1$
- $3m - 2n + 6m - n =$ $9m - 3n$
- $-2pq + 5 + 4pq - 9pq =$ $-7pq + 5$
- $6xy + 4 - 4xy - 7y =$ $2xy - 7y + 4$
- $-2x^2 - y - 4x^2 + 5y =$ $-6x^2 + 4y$
- A rectangle has length $3x$ cm and width $5y$ cm. Find:
 - its area in terms of x and y $15xy$ cm²
 - its perimeter in terms of x and y $6x + 10y$ cm
 - the area of the rectangle if $x = 4.2$ cm and $y = 6.5$ cm 409.5 cm²

1.2.2 Multiplying Algebraic Terms

To multiply algebraic terms:

- multiply the co-efficients
- multiply the pronumeral(s).

Example 1.2.2 Evaluate the following expressions:

1. $3a \times 4b = 12ab$

2. $\frac{1}{4} \times 16pq = 4pq$

3. $(-3x) \times (-6y) = 18xy$

4. $\frac{3x}{4} \times \frac{y}{12} = \frac{xy}{16}$

Exercise 1.2.2 Simplify these expressions:

1. $3a \times 4b \times 5c =$ 60abc

2. $12x \times 7y =$ 84xy

3. $20x \times \frac{1}{4} =$ 5x

4. $(-2a) \times (-3b) \times (-4c) =$ -24abc

5. $3mn \times 5mp =$ 15m²np

6. $6ab \times 7bc \times 4ac =$ 168a²b²c²

7. $(-2a) \times (-3ab) \times (-5bc) =$ -30a²b²c

8. $12 \times (-3xy) \times 2y =$ -72xy²

1.2.3 Dividing Algebraic Terms**To divide algebraic terms:**

- express the division in fraction form
- divide the co-efficients
- divide the pronumerals.

Example 1.2.3 Simplify the following expressions:

1. $\frac{25mn}{5m} = 5n$

2. $\frac{21p^2q}{7p} = 3pq$

3. $\frac{36xy}{6y} = 6x$

4. $42xy \div 7x = \frac{42xy}{7x} = 6y$

5. $32abc \div (-8ac) = \frac{32abc}{(-8ac)} = -4b$

Exercise 1.2.3

1. $\frac{5a}{5} =$ a

2. $\frac{4b}{b} =$ 4

3. $\frac{35xy}{y} =$ $35x$

4. $\frac{32xyz}{8xz} =$ $4y$

5. $\frac{24pq^2}{6q} =$ $4pq$

6. $28abc^2 \div 7ac =$ $4bc$

7. $56k^2 \div 8k =$ $7k$

8. $-15p^2 \div (-3p) =$ $5p$

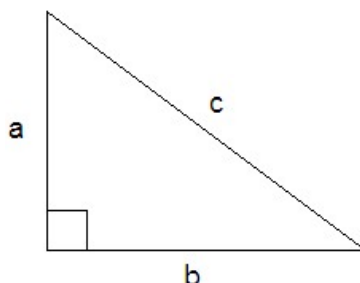
9. $x^2y \div xy^2 =$ $\frac{x}{y}$

10. $25mn^2 \div 5m^2n =$ $\frac{5n}{m}$

1.3 Topic 3 — Pythagoras' Theorem

1.3.1 Pythagoras' Theorem

The longest side on a right-angle triangle is called the **hypotenuse**.



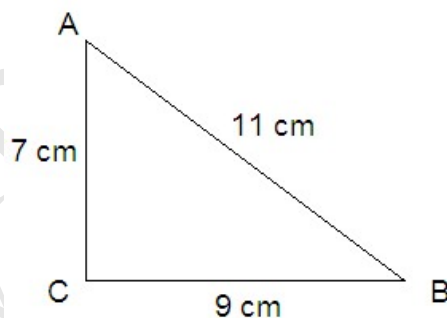
In any right-angle triangle, the square on the hypotenuse is equal to the sum of the squares on the other two sides.

This can be written as: $c^2 = a^2 + b^2$

1.3.2 The converse of Pythagoras' Theorem

If the square on one side of a triangle to the sum of the squares on the other sides, then the angle between the two short sides is a right angle.

Example 1.3.1 Determine whether this triangle is right-angled.



Solution: $11^2 = 7^2 + 9^2$
 $121 = 49 + 81$

which is not true,

$\therefore \triangle ABC$ is not right-angled

1.4 Miscellaneous Exercises**Exercise 1.4.1 Convert each percentage to a fraction in its simplest form.**

1. $0.7\% = \frac{7}{1000}$

2. $2.4\% = \frac{3}{125}$

3. $28.5\% = \frac{57}{200}$

4. $86.2\% = \frac{431}{500}$

5. $\frac{3}{4}\% = \frac{3}{400}$

6. $2\frac{1}{3}\% = \frac{7}{300}$

7. $6\frac{4}{5}\% = \frac{17}{250}$

8. $11\frac{1}{4}\% = \frac{9}{80}$

Exercise 1.4.2 Convert each of these decimals to a percentage.

1. $1.2 = 120\%$

2. $1.24 = 124\%$

3. $3.\dot{3} = 333\frac{1}{3}\%$

4. $8.\dot{6} = 867\% \text{ or } 866\frac{2}{3}\%$

5. $2.125 = 212.5\%$

Exercise 1.4.3 Convert each of the following percentages to a decimal.

1. $125\frac{1}{2}\% = 1.255$

2. $185\% = 1.85$

3. $126\frac{2}{3}\% = 1.2\dot{6}$

4. $475\% = 4.75$

5. $225\% = 2.25$

Exercise 1.4.4 Simplify the following expressions:

1. $3a^2 - 4bc - 2a - a^2 + 2bc + 6b =$ $2a^2 - 2bc - 2a + 6b$

2. $32u^2v \div 4uvw =$ $\frac{8u}{w}$

3. $x^2yz \div xy^2z =$ $\frac{x}{y}$

4. $6ab \times 3ac \div 2ac =$ $9ab$

5. $49pk \div 7p^2 =$ $\frac{7k}{p}$

6. $\frac{5u}{21} \times 7uv =$ $\frac{5u^2v}{3}$

7. $\frac{x}{3} \times \frac{y}{6} =$ $\frac{xy}{18}$

Exercise 1.4.5

1. Emma has $3m$ pencils. Alice has 4 times as many pencils as Emma. How many pencils do they have altogether?

Solution: $3m + 4 \times 3m = 3m + 12m = 15m$ pencils.

2. Addison went shopping with $\$p$. She brought 5 T-shirts which cost $\$q$ each. How much money had she left?

Solution: $\$(p - 5q)$.

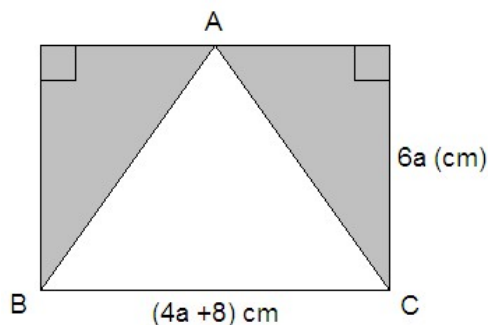
3. Nicholas earns $\$61.60$ for working 8 hours. How much would Nicholas earn if he worked 35 hours at this wage rate?

Solution: $\$61.60 \div 8 \times 35 = \269.50

4. 15 years ago, Bob was $8m$ years old. How old was Bob 3m years ago?

Solution: $8m + 15 - 3m = 5m + 15$ years.

Exercise 1.4.6 The $\triangle ABC$ is a isosceles triangle in the figure shown below. Find the area of the shaded region in terms of a . Express your answer in its simplest form.



Solution:

$$A = \frac{1}{2} \times 6a \times (4a + 8) = 12a^2 + 24a \text{ cm}^2.$$

Exercise 1.4.7 Adam has \$ x . Bob has \$ $12y$ more than Adam. Cathy has \$ $4z$ less than Bob.

1. Find Cathy's money in terms of x , y and z .

Solution:

$$$(x + 12y - 4z)$$$

2. Find the total amount of money they have altogether in terms of x , y and z .

Solution:

$$$(3x + 24y - 4z).$$$

3. If $x = 100$, $y = 4$ and $z = 6$, who has the most?

Solution:

$$\begin{cases} \text{Adam has } \$100 \\ \text{Bob has } 100 + 12 \times 4 = \$148 & \Rightarrow \text{Bob has the most} \\ \text{Cathy has } 148 - 4 \times 6 = \$124 \end{cases}$$

4. Find the difference between the most amount and the least.

Solution:

$$\$148 - \$100 = \$48$$