

## Year 8 Term 1 Math Homework

<b>Student Name:</b> _____	<b>Grade:</b> _____
<b>Date:</b> _____	<b>Score:</b> _____

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## 2 Year 8 Term 1 Week 2 Homework

### 2.1 Percentages

#### 2.1.1 Percentage of a Quantity

**To find a percentage of a quantity:**

- convert the percentage to a fraction or a decimal
- multiply this value by the quantity.

**Example 2.1.1** Evaluate each of the following changing:

1. 25% of \$30 =  $\frac{1}{4} \times \$30 = \$7.50$
2. 35% of \$130 =  $0.35 \times \$130 = \$45.50$
3. 125% of \$28 =  $1.25 \times \$28 = \$35$
4. 14.6% of 80 kg =  $0.146 \times 80\text{kg} = 11.68\text{kg}$

**Exercise 2.1.1** In each of the following, convert the percentage to a fraction, then evaluate it without the use of a calculator.

1. 27% of 600 m = \_\_\_\_\_
2. 15% of 160 kg = \_\_\_\_\_
3. 30% of 810 cm = \_\_\_\_\_
4. 70% of 420 mL = \_\_\_\_\_
5.  $12\frac{1}{2}\%$  of 96 = \_\_\_\_\_

**Exercise 2.1.2** In each of the following, convert the percentage to a decimal, then evaluate it without the use of a calculator.

1. 6% of 650 mL = \_\_\_\_\_
2. 36% of 190 cm = \_\_\_\_\_
3. 24% of 60 m = \_\_\_\_\_
4. 104% of 950 g = \_\_\_\_\_
5. 132% of 180 mL = \_\_\_\_\_

**Exercise 2.1.3 Evaluate each of these with the use of a calculator**

1. 8.2% of 160 g = \_\_\_\_\_
2. 14.5% of 840 mL = \_\_\_\_\_
3. 0.25% of 5000 m = \_\_\_\_\_
4. 215% of 600 mL = \_\_\_\_\_
5. 21.85% of 2345 cm = \_\_\_\_\_
6.  $8\frac{1}{2}\%$  of \$860 = \_\_\_\_\_
7.  $15\frac{3}{4}\%$  of 50 ha = \_\_\_\_\_
8.  $15\frac{2}{3}\%$  of \$960 = \_\_\_\_\_

**Exercise 2.1.4 Consolidation**

1. A car salesmen was paid a 5% bonus on his annual salary of \$46,500. How much was his bonus?  
\_\_\_\_\_  
\_\_\_\_\_
2. In a survey of 800 university students, 48% said that there was not enough on-campus parking. How many students is this?  
\_\_\_\_\_  
\_\_\_\_\_
3. If 17.25% of 1600 sheep in a paddock were sheared on last week, find the number of sheep that were shorn.  
\_\_\_\_\_  
\_\_\_\_\_
4. Last year, City council levies was \$220 each quarter for council rate. At the end of the year the council announced that the rates would increase by 6%. By how much will City's rates increase over the next year?  
\_\_\_\_\_  
\_\_\_\_\_

**2.1.2 Expressing one Quantity as a Percentage of Another**

**To express one quantity as a percentage of another:**

- rewrite the question, if necessary, in the form ‘What percentage is x of y?’
- express the question in the same units.
- write  $\frac{x}{y} \times \frac{100}{1}\%$  and evaluate.

**Example 2.1.2**

1. What percentage is 125 mL of 2 L?

**Solution:**

$$\begin{aligned} &= \frac{x}{y} \times \frac{100}{1}\% \\ &= \frac{125 \text{ mL}}{2000 \text{ mL}} \times \frac{100}{1}\% \\ &= 6.25\% \end{aligned}$$

2. What percentage of \$80 is \$30?

**Solution:**

rearrange the question into the form ‘What percentage is \$30 of \$80?’

$$\begin{aligned} &= \frac{x}{y} \times \frac{100}{1}\% \\ &= \frac{30}{80} \times \frac{100}{1}\% \\ &= 37.5\% \end{aligned}$$

**Exercise 2.1.5 Evaluate each of the following. What percentage:**

1. is 12 of 16? = \_\_\_\_\_
2. is 10 of 5? = \_\_\_\_\_
3. of 7 is 28? = \_\_\_\_\_
4. of 15 g is 21 g? = \_\_\_\_\_
5. is 25 cm of 2 m? = \_\_\_\_\_
6. of 3 kg is 60 g? = \_\_\_\_\_
7. is 900 g of 1.2 kg? = \_\_\_\_\_
8. of 3 t is 1650 kg? = \_\_\_\_\_

**Exercise 2.1.6 Consolidation**

1. *There are 26 boys and 24 girls in a class. What percentage of the class is girls?*

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2. *A real-estate agent was paid a commission of \$6012.50 on the sale of a house valued at \$240,500. What percentage of the sale price did the agent charge as commission?*

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3. *If 112 people applied for a job and 28 were interviewed, what percentage of applicants were interviewed?*

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4. *David entered a marathon that was to be run over a distance of 42 km. What percentage of the distance does he still have to complete after having run 27.3 km?*

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5. *Last year, Bonnie saved \$600 monthly. This year, she increased her monthly savings by 15%. How much more money will she be able to save this year compared to last year?*

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6. *Ken earned \$3200 each month in 2006. In 2007, he was given a pay rise of 5%. How much more did he earn in 2007 than in 2006?*

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7. *Lucy purchased 12 roses, 18 carnations and 10 ferns for her garden. Find the percentage composition of her garden.*

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**2.1.3 Percentage Increase and Decrease****Method 1:**

- To increase a quantity  $Q$  by  $x\%$ , find  $Q + (Q \times x\%)$
- To decrease a quantity  $Q$  by  $x\%$ , find  $Q - (Q \times x\%)$

**Method 2:**

- To increase a quantity  $Q$  by  $x\%$ , find  $Q \times (100 + x)\%$
- To decrease a quantity  $Q$  by  $x\%$ , find  $Q \times (100 - x)\%$

**Example 2.1.3 Using method 1 to evaluate the following:**

1. Increase \$50 by 12% .

**Solution:**

$$\begin{aligned} \text{Find } & \$50 + (\$50 \times 12\%) \\ & = \$50 + \$6 \\ & = \$56 \end{aligned}$$

2. Decrease \$120 by 20%.

**Solution:**

$$\begin{aligned} \text{Find } & \$120 - (\$120 \times 20\%) \\ & = \$120 - \$24 \\ & = \$96 \end{aligned}$$

**Example 2.1.4 Using method 2 to evaluate the following:**

1. Increase \$200 by 15%.

**Solution:**

$$\begin{aligned} \text{Find } & \$200 \times (100 + 15)\% \\ & = \$200 \times 115\% \\ & = \$230 \end{aligned}$$

2. Decrease \$60 by 15%.

**Solution:**

$$\begin{aligned} \text{Find } & \$60 \times (100 - 15)\% \\ & = \$60 \times 85\% \\ & = \$51 \end{aligned}$$

**Exercise 2.1.7 Use method 1 to find the following:**

1. Increase \$65 by 12% = \_\_\_\_\_
2. Decrease \$24 by 75% = \_\_\_\_\_
3. Decrease \$15 by  $66\frac{2}{3}\%$  = \_\_\_\_\_
4. Increase \$32 by  $12\frac{1}{2}\%$  = \_\_\_\_\_

**Exercise 2.1.8 Use method 2 to find the following:**

1. Increase \$120 by 25% = \_\_\_\_\_
2. Decrease \$80 by 15% = \_\_\_\_\_
3. Decrease \$30 by  $33\frac{1}{3}\%$  = \_\_\_\_\_
4. Increase \$32 by  $24\frac{1}{4}\%$  = \_\_\_\_\_

**Exercise 2.1.9 Consolidation**

1. Find the retail price of a \$128 leather wallet if a 20% discount is given.

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2. Crystal earns \$2000 per month. She saves 20% of her salary monthly.

(a) How much is her monthly savings?

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(b) If Crystal increases her monthly savings by 25%, how much will her monthly savings be?

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3. In 2006, the monthly salaries of Carol and Bob were \$2000 and \$1800 respectively. In 2007, each of them received a pay rise of 15% and 12% respectively. How much more did Carol earn than Bob in 2007?

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**2.1.4 The Unitary Method**

**To find the whole quantity by using the unitary method:**

- Find 1% of the quantity.
- Find 100% of the quantity.

**Example 2.1.5 Find the number if 12% of its value is 28.80.**

**Solution:**

*If 12% of the number is 28.8, then 1% of the number is 2.4 (dividing 28.8 by 12)*

*so 100% of the number is 240 (multiplying 2.4 by 100).*

*Therefore the number is 240.*

**Exercise 2.1.10 Find the number if:**

1.  $\frac{1}{4}$  of the number is 20 = \_\_\_\_\_
2. 9% of the number is 45 = \_\_\_\_\_
3. 15% of the number is 7.2 = \_\_\_\_\_
4. If 13% of a number is 78, find 21% of the number = \_\_\_\_\_

**Exercise 2.1.11 Consolidation**

1. Linda was charged interest of \$24.50 on her credit card debt for the month of December. If a monthly interest rate of 2% is charged on the balance owing, calculate the amount owing on Linda's card.  
\_\_\_\_\_  
\_\_\_\_\_

2. Cable Internet has been connected to 35% of the houses in Sydney. How many houses are there in a street of 105 houses have cable internet connections?  
\_\_\_\_\_  
\_\_\_\_\_

3. Keith paid a deposit of \$120 on a computer. If this deposit represents 15% of the sale price, find the balance he owes.  
\_\_\_\_\_  
\_\_\_\_\_



## 2.2 Algebra

### 2.2.1 The Four Operations with Algebraic Expressions

**Example 2.2.1** Simplify each of the following expressions:

1.  $28mn \div 4m \times 3n = \frac{28mn}{4m} \times 3n = 21n^2$

2.  $8x + (3 \times 5x) - 2x = 21x$

3.  $\frac{6xy \times 3y}{6y+3y} = \frac{18xy^2}{9y} = 2xy$

**Exercise 2.2.1** Simplify each expression by working from left to right.

1.  $36xy \div 3x \div 6y =$  \_\_\_\_\_

2.  $72abc \div 9a \div 2b \times 5c =$  \_\_\_\_\_

3.  $8p \times 5q \div 20pq =$  \_\_\_\_\_

4.  $60ab \div 12bc \times 3ac =$  \_\_\_\_\_

**Exercise 2.2.2** Simplify each of the following expressions.

1.  $(8a + 2a) \times 12b =$  \_\_\_\_\_

2.  $20xy \div (7x - 2x) =$  \_\_\_\_\_

3.  $(30pq - 6pq) \times 2p \div 3q =$  \_\_\_\_\_

4.  $(-2x \times 12y) - (5xy + 4xy) =$  \_\_\_\_\_

**Exercise 2.2.3** Simplify the following algebraic fractions:

1.  $\frac{8a+12a}{2a \times 5}$  \_\_\_\_\_

2.  $\frac{5ab \times 12b}{9ab - 3ab}$  \_\_\_\_\_

3.  $\frac{9mn \times 6m}{(3m)^2}$  \_\_\_\_\_

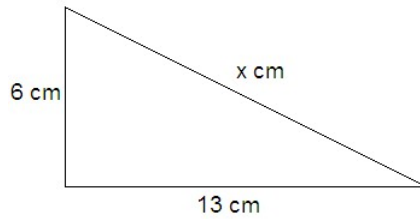
4.  $\frac{49x^2y \div 7x}{4xy + 3xy}$  \_\_\_\_\_

## 2.3 Pythagoras' Theorem

### 2.3.1 Finding the length of the hypotenuse

Pythagoras' Theorem can be used to find the length of the hypotenuse in a right-angled triangle if the lengths of the two shorter sides are given. To find the exact length of a side, give your answer as a surd ( $\sqrt{n}$ ).

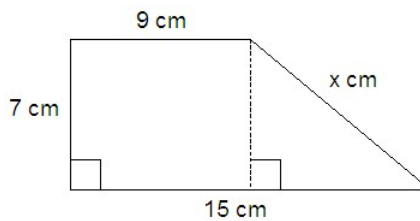
**Example 2.3.1** Find the length of the hypotenuse in the figure shown below:



**solution:**

$$\begin{aligned} x^2 &= 6^2 + 13^2 \\ &= 36 + 169 \\ \therefore x &= \sqrt{205} \text{ (in the surd form)} \\ &= 14.3 \text{ (to 1 decimal place)} \end{aligned}$$

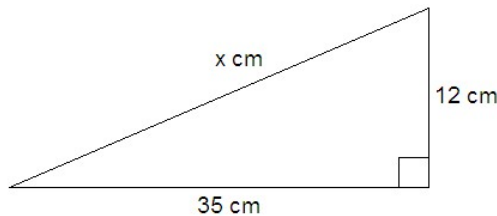
**Exercise 2.3.1** Find the value of x in each of these figures:




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## 2.4 Miscellaneous Exercises

### Exercise 2.4.1

1. Express  $1\frac{7}{21}$  as a percentage \_\_\_\_\_
2. Express 215% as a mixed numeral \_\_\_\_\_
3. Express 149% as a decimal \_\_\_\_\_
4. Find 37% of \$120 \_\_\_\_\_
5. Find 160% of 18 m \_\_\_\_\_
6. Find  $33\frac{1}{3}\%$  of 8 hours \_\_\_\_\_

### Exercise 2.4.2 Consolidation

1. A local council found that 12.5% of the material that is collected for recycling is made up of either cans or bottles. If on a certain day the council collects 27 tonnes of material for recycling, find the weight of the recycled cans and bottles.  
\_\_\_\_\_  
\_\_\_\_\_

2. A telephone poll of 4000 men and 4000 women was conducted to determine the number of people who intended to vote the Labor Party during the upcoming federal election. The results shown that 53.4% of the men and 51.9% of the women indicated their intended to vote Labor. How many more men than women is this?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. 64% of the fruits at a stall are oranges. The rest are apples and pears in the ration 5:4. There are 880 more oranges than apples. How many fruits are there at the stall altogether?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Exercise 2.4.3 Consolidation**

1. 32% of the people in a cinema are adults. The rest are boys and girls in the ratio of 9 : 8. There are 12 more boys than adults. How many people are there in the cinema altogether?

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2. 28% of the people in a shopping mall are men. The rest are boys, girls and women in the ratio 2 : 3 : 4. The number of adults is 222 more than the number of children. How many people are there in the shopping mall?

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3. A travel agent charges a cancelation fee of 5.5% to those people who cancel their holiday booking after the 15th of December. Find the fee that would be charged to a couple who had to cancel their \$1250 holiday to Hong Kong on the 20th of December.

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4. Adam gave 60% of his salary to his wife. He spent 10% of it and saved the remaining \$120. How much did he give to his wife?

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**Exercise 2.4.4 Find the missing terms in the following equations:**

1.  $3k \times \boxed{?} + 3k = 24k$  \_\_\_\_\_

2.  $2ab \times \boxed{?} = 8ab^2c$  \_\_\_\_\_

3.  $\boxed{?} \times 3xy = -27x^2yz^2$  \_\_\_\_\_

4.  $4pq \div \boxed{?} \times 2p^2 = 6p^2$  \_\_\_\_\_

**Exercise 2.4.5 Further Applications**

1. A pen costs \$ $x$ , a dictionary costs \$12 more than the pen. A pencil case costs \$8 less than the dictionary. Find the total cost of the 3 items.

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2. John paid \$ $n$  for an apple which cost  $m$  cents. How much change did he receive? (Give your answer in cents.)

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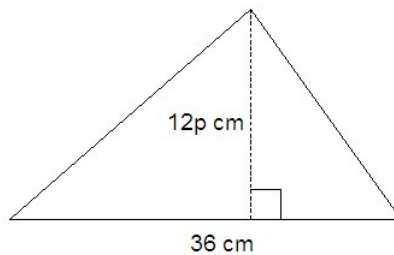
3. Find the value of  $4a + 6b^2 - 5c$  where  $a = 12$ ,  $b = 4$  and  $c = 8$ .

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4. Find the area of the following triangle in terms of  $p$  (cm).



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**Exercise 2.4.6** Draw a diagram to describe the locus of a point given the condition that the point is:

1. *A constant distance from a fixed point on a plane.*

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2. *A constant distance from a fixed straight line in a plane.*

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3. *Equidistant from two parallel lines.*

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4. *Equidistant from two intersecting straight lines.*

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5. *The mid-point of a chord of a constant length in a circle on a plane.*

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6. A constant distance from the circumference of a given circle.

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7. A constant distance from the sides of a inside of a rectangle.

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8. The centre of all circles which touch the arms of an acute angle on a plane.

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9. The centres of all circles whose circumferences all pass through two fixed points on a plane.

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10. The centres of all circles which touch two parallel straight lines.

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**Exercise 2.4.7**

1. In a plane,  $A$  and  $B$  are two fixed points.  $C$  is any point such that  $\triangle ABC$  is isosceles. Describe the locus of  $C$ .

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2. In a plane,  $A$  and  $B$  are two fixed points.  $C$  is any point such that  $\angle ACB = 90^\circ$ . Describe the locus of  $C$ .

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3.  $A$  and  $B$  are two fixed points on a plane,  $C$  is a variable point. The perpendicular bisectors of  $AB$  and  $AC$  meet in a point  $Q$ . Describe the locus of  $C$ .

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4. Describe the locus of the mid-points of all parallel chords of a circle.

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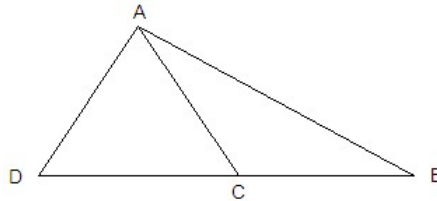
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### 2.5 Math challenge

#### Exercise 2.5.1

1. In the figure shown below the lengths AC, CB and CD are the equal and the  $\angle ABD$  is  $x^\circ$ . What is the size of the  $\angle DAB$ ?

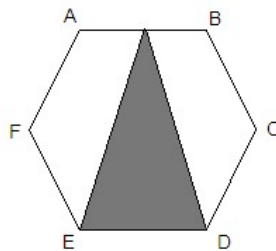



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2. The diagram shown below is a regular hexagon. What fraction of the area has been shaded?




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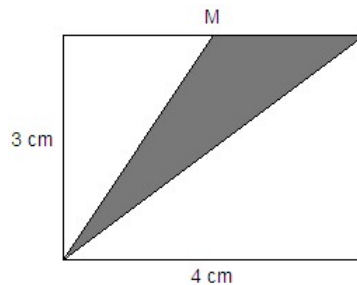


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3. M is the midpoint of the side of the rectangle. What is the area of the shaded part?




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