

MULTIPLICATIVE THINKING — SET 9 — PART 1

A Can solve rate problems

James can write 328 words in 8 minutes. How many words can he write in 18 minutes?

$$328 \div 8 = 41 \text{ words per minute}$$

$$41 \times 18 = 738 \text{ words in 18 minute}$$

Important that answers are given in context

Natasha has sold \$123,100 worth of jewellery in the last 2 years and Alfie has sold \$520,800 in the last 8 years. Who has sold the most per year?

$$\text{Natasha: } \$123,100 \div 2 = \$61,500 \text{ per year}$$

$$\text{Alfie: } \$520,800 \div 8 = \$65,100 \text{ per year}$$

Alfie has sold more per year than Natasha.

Important that answers are given in context

B Can solve ratio problems

When Jessica makes a cake she uses 180g of sugar for every 880g of other ingredients.

When she makes muffins she uses 200g of sugar and 450g of other ingredients. Which is sweeter, the cake or the muffins?

$$\text{Cake: } 180 : 880 = 1 : 4.89$$

$$\text{Muffins: } 200 : 450 = 1 : 2.25$$

The muffins are sweeter than the cake

Important that answers are given in context

C Form one- and two-step algebraic equations to solve for an unknown for rates

This section shows how the same concept for a question can have varying in levels of difficulty

Harriet leaves Auckland travelling south at 80km an hour on a train. How long does it take for Harriet to travel 140km?

$$80x = 140$$

$$x = 1.75$$

Harriet takes 1 hour and 45 minutes to travel 140 km

Harriet leaves Auckland travelling south at 80km an hour on a train. After 45 minutes the train stops for 10 minutes before starting again at the same speed. How long does it take for Harriet to travel 140km?

If x = time travelling then

$$80x = 140$$

$$x = 1.75 \text{ hours} = 1 \text{ hour and } 45 \text{ minutes.}$$

Also stops for 10 minutes

Harriet takes 1 hour and 55 minutes to travel 140 km

Harriet leaves Auckland travelling south at 80km an hour on a train. After 45 minutes the train speeds up to 100km an hour. How long does it take for Harriet to travel 140km?

In the first 45 mins Harriet travels

$$80 \times 45 \div 60 = \underline{60\text{km}}$$

$$\text{Harriet} = 100x + \underline{60}$$

$$100x + 60 = 140$$

$$100x = 80$$

$$x = 0.8 \text{ hours} = 48 \text{ minutes}$$

$$48 \text{ minutes} + 45 \text{ minutes} = 93 \text{ min}$$

= 1 hour and 33 min
Harriet takes 1 hour and 33 minutes to travel 140 km

MULTIPLICATIVE THINKING – SET 9 – PART 2

D Form one- and two-step algebraic equations to solve for an unknown for percentages

This section shows how the same concept for a question can have varying levels of difficulty

Ben bought a calculator from a shop for \$17.60. The original price was \$20. What was the percentage discount?

$$\text{Discount} = \$2.40$$

$$20x = 17.60$$

$$x = 17.60 \div 20 = 0.88 = 88\%$$

$$100\% - 88\% = 12\%$$

There was a 12% discount.

Ben bought a calculator from a shop for \$17.60. The shop had a 12% discount. What was the full price of the item?

$$100\% - 12\% = 88\% = 0.88$$

$$0.88x = 17.60$$

$$17.60 \div 0.88 = 20$$

The calculator was originally \$20.

Ben bought a calculator and 3 pens from a shop for \$22.88. The shop had a 12% discount. If the pens were \$2 before the discount, how much does the calculator normally cost?

$$100\% - 12\% = 88\% = 0.88$$

$$(3 \times 2 + x) \times 0.88 = 22.88$$

$$6 + x = 22.88 \div 0.88$$

$$6 + x = 26$$

$$x = 20$$

The calculator is normally \$20.

E Form one- and two-step algebraic equations to solve for an unknown for ratios

This section shows how the same concept for a question can have varying levels of difficulty

Sarah has a bag of pink and blue marbles, the ratio pink marbles to blue marbles is 2:3. If the bag contains 90 blue marbles, how many pink marbles does Sarah have?

Let x = number of pink marbles

$$\frac{2}{3} = \frac{x}{90}$$

Times both sides by 90

$$\frac{2}{3} \times 90 = x$$

$$x = 60$$

There are 60 pink marbles in the bag.

Sarah has 150 marbles, 60 of them are pink and 90 of them are blue. Emerald has 50 marbles, all of them pink or blue. The ratio of pink to blue is the same for Sarah and Emerald. How many more blue marbles does Sarah have than Emerald?

Let x = blue marbles for Emerald

$$\frac{90}{150} = \frac{x}{50}$$

Times both sides by 150

$$90 = 3x$$

Divide both sides by 3

$$x = 30$$

Emerald has 30 blue marbles which means Sarah has 60 more.

The ratio of marbles between Sarah and Emerald was originally 3:1. Sarah gives 30 marbles to Emerald and the ratio is now 3:2. How many marbles did Emerald have originally?

Let x = Emerald's marbles

$3x$ = Sarah's marbles

$$\frac{3x - 30}{x + 30} = \frac{3}{2}$$

Times both sides by 2 and $x+30$

$$2(3x - 30) = 3(x + 30)$$

Expand

$$6x - 60 = 3x + 90$$

Subtract $3x$ from both sides

$$3x - 60 = 90$$

Add 60 to both sides

$$3x = 150$$

Divide both sides by 3

$$x = 50$$

Emerald originally had 50 marbles.