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9 Year 8 Term 3 Week 9 Homework

9.1 Equations

9.1.1 Number problems

Exercise 9.1.1

1. *The sum of two numbers is 49. The large number is six times the smaller number. What are the numbers?*

2. *The sum of three numbers is 26. The largest number is five times the smallest and the smallest is five less than the middle number. Find the numbers.*

3. *One number is 2 more than another number. The sum of eight times the larger number and three times the smaller is 71. What are the numbers?*

4. *Two-thirds of a number decreased by 1 is 3. Find the number.*

5. *The sum of three numbers is 44. The largest number is six times the smallest, and the smallest is four less than the middle number. Find the numbers.*

6. *Three-fifths of a number diminished by 4 is 2. Find the number.*

9.2 Ratio and Rate

9.2.1 Dividing a quantity in given ratio

To divide a quantity Q in the ratio $a:b$:

- Find the fraction into which the quantity is to be divided.
- Multiply each fraction by the quantity Q .
- When a quantity Q is divided in the ratio $a:b$ the resulting amounts are:

$$\frac{a}{a+b} \times Q \quad \text{and} \quad \frac{b}{a+b} \times Q$$

Example 9.2.1 Linda and Joyce scored goals in their netball game in the ratio 3:4. If between them they scored 21 goals, find the number of goals that each girl scored.

Solution: the scores are to be divided into 3 parts and 4 parts, making 7 parts in total.

Therefore Linda's scores = $\frac{3}{7} \times 21 = 9$, Joyce's scores = $\frac{4}{7} \times 21 = 12$

Exercise 9.2.1

1. A certain metal alloy is made up of tin and zinc in the ratio 3:5. What mass of each metal is needed to make 104 kg of this alloy?

2. Two supplementary angles are in the ratio of 21: 24. Find the sizes of these angles.

3. The angles in a triangle are in the ratio 2:6:1. Find the sizes of these angles.

4. The perimeter of a triangle is 108 cm and the side of lengths are in the ratio 4:3:2. Find the length of the shortest and longest sides.

Exercise 9.2.2 Further applications

1. Three friends Tony, Mike and David decided to share the driving on a trip of 552 km. If Tony drove for 276 km and Mike drove only half that distance, find:

(a) the distance that David drove to complete to trip.

(b) in simplest form, the ratio in which the driving was divided.

2. The length and width of a rectangle are in the ratio 4:3 and the perimeter is 196 cm. Find:

(a) the lengths of the diagonals

(b) the area of the rectangle.

3. Ken, Sam and Ben contribute \$40,000, \$55,000 and \$65,000, respectively, towards setting up a small business. After 1 year, they decided to share the annual profit of \$96,000 in the same ratio as their investment. How much should each person receive?

4. \$d is shared between Raymond and his sister Jessica in the ratio $x:y$, where $x > y$. Find how much each person receives?

9.2.2 Increasing and decreasing in a ratio

The fraction equivalent of a ratio can be used to increase or decrease a quantity:

- To increase or decrease a quantity Q in the ratio $a:b$, multiply the quantity by the value of the ratio.
- When a quantity Q is increased or decreased in the ratio $a:b$, the new value is $\frac{a}{b} \times Q$
- To solve a problem using the unitary method:
 - find the value of 1 part
 - use this answer to find the value of the required number of parts.

Example 9.2.2

1. Increase 24 cm in the ratio 3:2.

Solution: $\frac{3}{2} \times 24 = 36 \text{ cm}$

2. Decreased 56 kg in the ratio 5:8.

Solution: $\frac{5}{8} \times 56 = 35 \text{ kg}$

Exercise 9.2.3

1. The ratio of width to length in a rectangle is 3 : 7. If the length is 49 cm, find the perimeter of the rectangle.

2. Jane, Anna and Christian share a box of chocolates in the ratio of 5:3:4. If Anna receives 6 less than Jane, find the number of chocolates that each girl receives.

3. Increase \$80 in the ratio 9:4, then decrease the result in the ratio 4:5.

4. The area of a square and a rectangle are in the ratio 6:7. If the area of the rectangle is 35 cm², find the area of the square.

9.2.3 Speed, distance and time

A rate is a comparison of two unlike quantities. In particular it is a measure of how one quantity is changed with respect to another.

Exercise 9.2.4 Express each of these rates in simplest form:

1. $200 \text{ m in } 25 \text{ s}$ _____

2. $420 \text{ km on } 60 \text{ L}$ _____

3. $45 \text{ km in } 3 \text{ hours}$ _____

4. $\$270 \text{ in } 3 \text{ weeks}$ _____

5. $18 \text{ degrees in } 6 \text{ min}$ _____

Exercise 9.2.5 Convert:

1. 3 m/s to m/min _____

2. 8L/min to L/h _____

3. 2500 m/s to km/h _____

4. $0.06 \text{ kg/m}^2 \text{ to kg/ha}$ _____

5. $\$5.5/\text{kg to } \$/\text{t}$ _____

Exercise 9.2.6 Complete each of the following equivalent rates:

1. $250 \text{ m/min} =$ _____ km/h

2. $10 \text{ m/s} =$ _____ km/h

3. $0.05 \text{ g/mL} =$ _____ kg/kL

4. $45 \text{ g/m}^2 =$ _____ kg/ha

5. $8.4 \text{ km/L} =$ _____ m/mL

6. $2.4 \text{ kl/min} =$ _____ L/s

9.3 Problem Solving 1

Exercise 9.3.1

1. The sides of a triangle are in the ratio 3:4:5.

(a) Find the length of the shortest side if the longest side is 35 cm.

(b) Find the perimeter of the triangle.

2. The ratio of water to cordial in a certain fruit drink is 12:3. How much cordial should be added to make 3 L of drink?

3. In a fruit juice mixture, the amount of orange juice, apple juice and pineapple juice is 9:4:7. If there is 250 mL more orange juice than pineapple juice, find the volume of each juice in the mixture.

4. The ratio of apples to pears is 2:3 and the ratio of pears to mangos is 9:7. If there are 35 mangos, find the number of apples.

9.4 Problem Solving 2

Exercise 9.4.1

1. Human hair grows at the rate of about 15 cm per year. By how much would a person's hair grow in 6 years at this rate if it was not cut?

2. A mechanic's gross weekly pay is \$860 for a 40-hours week. How much is he paid per hour?

3. Water is leaking out through a valve in a tank at the constant rate of 13.2L/h. How many mL of water are leaking out each minute?

4. An athlete ran 400 m in 41.2 seconds. Find the average distance run per second. Give your answer correct to 1 decimal place.

5. Mike drives for 380 km from Sydney to Canberra. The petrol consumption of his car is 11.5 L/100 km and the price of petrol is \$1.49 per litre.

(a) How much petrol would Mike use in this trip?

(b) Calculate the cost of the petrol for this trip.

9.5 Maths Challenge

Exercise 9.5.1

1. Anna went shopping with some \$5 notes and 108 \$10 notes. The ratio of \$10 notes to \$5 notes was 9:7. After spending some \$5 notes, the ratio of her \$10 notes to \$5 notes becomes 6:1. How much did she spend?

2. $\frac{3}{8}$ of the passengers on board a plane were children. There were 248 more adults than children. The ratio of men to women was 13:7. How many more men than children were on board the plane?

3. $\frac{3}{8}$ of the fruit in a shop are apples. The rest are oranges and pears in the ratio 17:13. There are 35 more apples than pears. What is the total number of fruits in the shop?

4. Last year, the ratio of boys to girls in a school's computer club was 4:7. This year, 71 new members joined the club. As a result, the ratio of boys to girls in the club becomes 4:3. There are 72 boys in the club this year. How many of the new members are girls?
