CHAPTER 2

2.1 RATIO

A **ratio** is a comparison between two or more quantities. The symbol used to show ratio is "a : b". The example below shows how 750 metres and 2 kilometres can be compared by writing them as a ratio.

750 m to 2 km = 750 m : 2 km

= 750 m : 2 000 m

= 750 : 2000

= 3 : 8

A ratio can also be written in fractional form. For example, the ratio 3 : 8 can be written as $\frac{3}{8}$. The numbers 3 and 8 are called the **terms** of the ratio. Sometimes three quantities are compared using a three-term ratio.

Example 1
Line XZ is 56 cm long. If XY : YZ is 2 : 5, find the length of YZ.

Example 2
Three girls share $ 120 in the ratio 3:4:5. Find the smallest share.

Example 3
The lengths of the three sides of a triangle XYZ are such that XY : YZ : XZ is 2 : 3 : 5. If XZ is 20 cm, find the length of XY.

Example 4
A sum of money is divided between Iris, Jimmy and Karen in the ratio 3 : 5 : 6. Jimmy receives $60.
(a) How much does Karen receive?
(b) What is the total sum of money?

Example 5
The perimeter of a rectangular piece of land is 96 m. The ratio of its length to breadth is 7 : 5. Find the length and breadth of the piece of land.

2.2 PROPORTION

A proportion is an expression showing that two ratios are equal such as 3 : 7 = 6 : 14. Many mathematical problems can be solved by using proportion in the form comparing and equating equivalent ratios. The following examples illustrate the use of proportion in problem solving.

Consider the proportion p : q = r : s. It can be written in two other forms, $\frac{p}{q} = \frac{r}{s}$ and ps = qr.Either of these forms can be used when finding the unknown value in a proportion

Example 6
Find the value of y in the proportion 48 : 7 = 12 : y.

Example 7
4 men take 6 hours to paint a house. How long will it take 3 men to paint the house, if they work at the same rate?

Example 8
32 out of every 40 students travel to College East by bus. How many students out of every 100 travel to College by bus?

Example 9
A picture measuring 10 cm by 7 cm is enlarged to make a copy 16 cm long. What is the width of the copy?

Direct and Inverse Proportion

Quantities which increase in the same ratio are in **direct proportion**.

If one quantity increases in the same ratio as the other decreases, then they re in **inverse proportion.**

Example 10
10 writing pads cost $ 11. Find the cost of 3 writing pads.

Example 11
If an emergency pack of food can last 10 men for 4 days, how long would the food last 8 men?

Example 12
If 10 chocolate bars cost $ 7.50, find the cost of 2 chocolate bars.

Example 13
A length of 4 cm on a map represents a distance of 10 km.
(a) What distance is represented by a length of 7 cm on the map?
(b) What length on the map represents a bridge of length 500 m?

2.3 RATE

Many problems in rate may be solved by using the unitary method. Study the following examples carefully.

Example 14

A man earns $7.80 in 1 hour. How much does he earn in

a) 20 minutes, b) 72 hours?

Example 15

Robert drives 120 km in 2 hours. How far will he drive in 45 mins at the same speed?

TUTORIAL 2

1 The ratio of the breadth to the length of the Singapore flag is 2 : 3. The flag is 360 cm long. Find its breadth.

2 A soccer team played 32 games. The ratio of the number of games won to the number of games lost was 11 : 5. How many games did the team win?

3 Three numbers are in the ratio 2 : 4 : 7. If their sum is 325, find the largest number.

4 Alex Tan, Mary Chee and David Lim share $60 in the ratio 7 : 5 : 3. How much does Mary Chee receive?

5 The lengths of the sides of triangle ABC are such that AB : BC : CA = 6 : 5 : 4.
If AB = 9 cm, calculate the length of the perimeter of triangle ABC.

6 Find the unknown term in each proportion

a) $\frac{x}{15} = \frac{3}{5}$ b) $27 : y = 9 : 8$

c) $x : 24 = 7 : 8$ d) $63 : y = 7 : 4$

e) $4 : 5 = x : 10$ f) $26 : 9 = 52 : y$

7 5 workers take 12 days to build a concrete fence around a housing estate. If all workers work at the same rate,

a) how long will it take 4 workers to build the fence?

b) how many workers are required to build the fence in 10 days?

8 A typist types at the rate of 40 words per minute. She has now typed 760 words.

a) For how many minutes has she been typing?

b) How many words had she typed 7 minutes ago?

c) In how many more minutes will she have typed a total of 1 000 words?

9 a) Mr Liang drove 17 km at 30 km/h. How many minutes did his journey take?

b) Mrs Chong drove 150 km in 2.5 hours. What was her average speed?

c) Mr Loh drove at an average speed of 50 km/h for 2 hours 12 minutes. How far did he drive?

10 A car uses 25 litres of petrol to travel 300 km. Calculate

a) the distance the car travels on 12 litres of petrol,

b) the number of litres of petrol needed to travel 240 km.

CHALLENGING EXERCISES

1 Mr. Eng traveled to Japan on a business trip,

(a) He changed S$2000 into Japanese yen when the exchange rate was S$ 1 to 75 yen. Calculate the amount he received.

(b) On his return, he had 16000 yen which he changed into Singapore dollars. The exchanged rate then was S$1 to 80 yen. How many Singapore dollars did he receive?

2 If 5 men take 6 days to complete a task,

(a) How many days would 3 men take?

(b) How many men would be needed to complete the task in 2 days?

3 A length of 4 cm on the map represents a distance of 10 km.

(a) What distance is represented by a length of 7 cm on the map?

(b) What length on the map represents a bridge of length 500m?

4 The ratio of the sides of a triangle is 2 : 3: 4, If the perimeter of the triangle is 22.5 cm, find the length of each side.

5 On a particular day, Deming worked 2 hours and Ganesh worked 2½ hours. They divided their total earning in the ratio of the number of hours which they had worked.

(a) Find the ratio of Deming's earning to Ganesh's earnings. Give your answer in its simplest, integer form.

(b) They earned a total of $27.00. Find how much Deming received.

6 (a) p is proportional to q^3.
It is known that p=24 for a particular value of q.
Find the value of p when this value of q is halved.

(b) y is inversely proportional to x^2.
$y = 4$ when $x = 3$.
Find y when $x = 10$.