Ratio

- A ratio is a **comparison between similar** quantities. The quantities must be in the same units.

Ration Checklist

- A colon (:) is used to separate the ratios, e.g. 7:5
- The quantities must be in the same units, e.g. cm or minutes
- Unit does not write on the ratio.
- The ratio must be written in the correct order (as given in the question).

Example:

i. In a clothes shop, there is a rail of T-shirt. There are 7 purple ones, 3 red ones and 9 pink ones. What is the ration of the number of purple T-shirts to the number of red T-shirts to the number of pink T-shirts?

- 7:3:9

[since they are all T-shirts, all you need to do is just write their quantity and separating them by a colon]

ii. Sione's little finger measures 7cm and Ele's measures 50mm. Compare these lengths as a ration.

- 50mm = 5cm

[first change mm into cm in order for them to have the same unit]

- 7:5

[now they have the same unit, write down their quantity and separating by a colon]

Activity 5.1

1. 'Olivia is 7 years old and her brother Fotu is 10 years old. Write the ratio of 'Olivia's age to Fotu's age.

2. Bella is 60cm tall and Henry is 173cm tall. Write the ratio of Bells's height to Henry's height.

3. Kuini weighs 4kg and Moli weighs 57kg. Write the ration of Kuini's weight to Moli's weight.

4. Write the following ration. Remember to check the units are the same.

a) 80cents to $1.50
b) 175mm to 35cm
c) 32mm to 1.6cm
d) 50mins to 2hrs
e) 450g to 2kg
f) 100m to 1km

5. In the petrol station there are 4 red cars, 7 blue cars and 3 silver cars. Write the ration of the numbers of:

a) red cars to blue cars
b) blue cars to silver cars
c) red cars to silver cars
d) silver cars to blue cars

Equivalent Ratios

- Equivalent ratio is formed by **multiplying the numbers** in the ratio by the **same amount.**

Example:

- 1:4 is the same as the ratio 2:8 [by multiplying 1 and 4 by '2']
- 1:4 can also the same as 3:12 [by multiplying 1 and 4 by '3']

- A ratio can be expressed in its **simpliest** form by **dividing the numbers** in the ratio by the **same amount**.
- Also find the highest common factor **(HCF)** of all the numbers in the ratio and **divide** each number by it.

Example:
i. Simplify 20:25
- 20:25 = 4:5 [HCF of 20 and 25 is 5, divide both sides by 5]

ii. Simplify 300g to 4 kg
- 4kg = 4, 000g
[first change 4kg into g in order for them to have the same unit].
- 300:4,000 = **3:40**
[HCF of 300 and 4,000 is '100', divide both sides by 100]

Activity 5.2

1. Simplify each ratio as far as possible.

a. 4:12	b. 5:20	c. 7:35	d. 2:24
e. 9:63	f. 30:10	g. 25:15	h. 72:150
i. 18:14	j. 9:15:18	k. 12:6:24	l. 8:12:16

Sharing in a given ration or proportion
- There are many situations where something like money or food has to be shared in a ratio or proportion.

Example:
Jessie works in a pet shop every Saturday. She divides her wages into **saving** and **spending** in the ratio **2:3.** If she earns **$50** then how much does she save and how much does she spend?

2:3 $50

Step 1: Add both parts of the ration together
- 2 + 3 = 5 [5 parts]
Step 2: Divide the total quantity given by the number of parts
- 50 ÷ 5 = 10 [$10 in each part]
Step 3: Multiply the number of parts by the amount in each part
- Saving = $10 x 2 = **$20**
- Spending = $10 x 3 = **$30**
; Check $20 + $30 = $50 [will end added up to get the quantity given]

Activity 5.3

1. Share the following amounts into the given ratio.
a) Share $20 between Adam and Miles in the ratio 1:3
b) Share $64 between Logan and Witti in the ratio 3:5
c) Share $120 between Cathy and Clare in the ratio 3:7
d) Share $77 in the proportion 1:2:3:5

2. $60 is to be divided among Luke and Quasar and Sam in the proportions 1:4:5. How much money will they each receive?

3. A recipe for shortbread uses butter, sugar and flour in the proportions 2:1:3.
a) If 100 g of butter are used, how much sugar and flour are needed?
b) If 450 g of flour are used, how much butter and sugar are needed?

Rates

- A rate **compares quantities** in **different units.**

A common rate used every day is speed. Speed is a comparison between distance travelled and time taken. This can be kilometers per hour or meters per second. These can be written as km/h, km h-1 or m/s, ms-1.

Example:

i. A medium-size car on a long journey uses 9 litres of petrol for every 100 km travelled.

-The rate is **9 litres per 100 km or 9 L/100 km.**

ii. When you go up a mountain the temperature falls at a rate of 0.4 °C for every 80 meters climbed.

- The rate of temperature fall is **0.4 °C/80 m.**

Activity 5.4

1. Write the following as rates:

a. A car travel a distance of 50 km in 1 hour.
b. A car travel a distance of 96 km in 3 hours.
c. A car travel a distance of 15 km in $\frac{1}{2}$ hour.
d. A person walks 800 m in 20 minutes.
e. A person runs 1 500 m in 6 minutes.
f. A pool fills 200 litres in 20 hours.
g. A person scores 20 goals over 5 games.
h. A person scores 95 runs in 5 games.

Comparing Products using rates

- Products are often **sold at different quantities** for **different amounts**. It is difficult to compare prices when there are **different amounts** involved. It is easier to find the unit cost for each product so that a comparison can be made.

Example:

i. Mele is trying to decide which toothpaste is better value for money.

Toothpaste1: Coolbreeze $6.50, 300mL
Toothpast2: Minties $4.50, 200mL

Coolbreeze: 300mL for $6.50, so 600mL for $6.50 x 2 = $13.00
[300mL x 2 = 600mL]
Minties: 200mL for $4.50, so 600mL for $4.50 x 3 = $13.50
[200mL x 3 = 600mL] , Now they have the same amount of toothpaste
Therefore, Coolbreeze offers better value for money.

Activity 5.5

1. Compare the following products to find out which product offers the better value for money.

a) Phone Plans

Great value phone plans!

Plan A	Plan B
3000 texts - $20!	1800 texts - $15!

b) Hot Drinks

Milk Hot Drink
250g
$4.50

Choco Drink
450g
$8.30

2. Dishwashing liquid can be bought at $8.50 for 950 mL or $4.25 for 500 mL. Which one is better to buy?

3. Wood logs are advertised as a 'best buy' at 500 logs for $953. They would normally sell at 75 logs for $125. Check that buying 500 really is the 'best buy'.