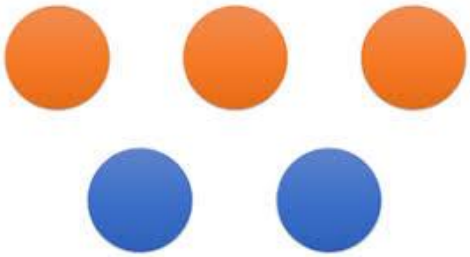
Week 9
Term 4
2024

HAWKER COLLEGE
Engage | Inspire | Achieve

EM2
Rates and ratios

Goals

Goals for this week:



- demonstrate an understanding of the elementary ideas and notation of ratio
- understand the relationship between fractions and ratio
- express a ratio in simplest form
- find the ratio of two quantities
- divide a quantity in a given ratio
- use ratio to describe simple scales

Theoretical Components

STEP 1

Resources:
PDF file: Week 9 Notes and Exercises

This week:
We will be learning:

- Writing and simplifying ratios
- Finding ratios
- Dividing a quantity into a given ratio

Check this out:

https://www.khanacademy.org/math/cc-sixth-grade-math/cc-6th-ratios-prop-topic/intro-to-ratios/v/ratios-intro

Practical Components

STEP 2
Read through Week 9 Notes and Exercises for instructions on what to do.

There are three Exercises in this booklet. Read any worked examples before you begin.

Remember to regularly check Google Classroom for messages.

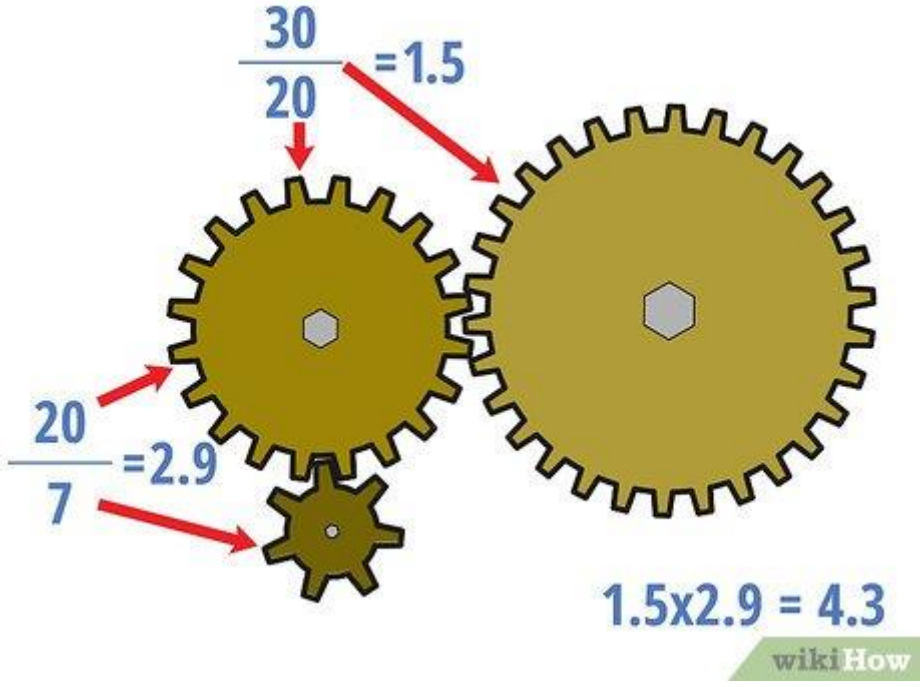
Portfolio Task

STEP 3

Complete the task at the end of the brief and submit your weekly work. 😊

Other

Remember to check Google Classroom or hawkermaths.com for each week's learning brief.


30
20
=1.5
20
7
=2.9
1.5x2.9 = 4.3
wikiHow

ESSENTIAL MATHEMATICS 2

WEEK 9 – RATES AND RATIOS

How are we ever going to use this?

- Mixing paint or other ingredients
- Mixing solutions
- Adjusting bike gears

Both rates and ratios are a comparison of two numbers. A ratio compares two numbers with the *same* unit, for example 20 mL of cordial to 200 mL of water. A rate is a specific type of ratio that compares two numbers with *different* units, for example 60 km per hour.

WRITING AND SIMPLIFYING RATIOS

A ratio is an ordered comparison of two or more quantities. It tells us how much there is of one thing compared to another. They are often used in everyday life, whether it's for dividing up money, mixing paint colours, cooking, or mixing cement.

The order that the words are written in the question corresponds to the order of the values in the ratio, so we need to be careful not to jumble them around.

Example:

Lara mixed 12 mL of white paint with 8 mL of red paint to make dark pink paint.
a. What is the ratio of red to white paint in the mixture?
b. What fraction of the mixture was red paint?

Solution:

a	The order is important. In the ratio of red : white, we need to write the quantity of red first.	red : white = 8 : 12
b	There is 20 mL of resulting paint and 8 mL came from red paint. That's 8 mL out of 20 mL.	Fraction of the paint that was red paint $= \frac{8}{20}$

Just like we can simplify fractions by multiplying or dividing both the numerator and the denominator by the same amount, we can simplify ratios by multiplying and dividing both numbers in the ratio by the same number.

Example:

Lara's red and white paint mixture is in a ratio of 8 : 12. Simplify the ratio 8 : 12.

Solution:

We can divide 8 and 12 by 4. $8 \div 4 = 2$ and $12 \div 4 = 3$.	$8 : 12 = 2 : 3$
Write the answer.	When Lara mixes 8 mL of red with 12 mL of white paint, she is mixing the paint in a ratio of 2 : 3.

We have to be careful with units. All quantities must be in the **same** unit before we can write the quantities in a ratio.

Exercise 1

1. Simplify each ratio.

   a. 4 : 10 b. 18 : 12 c. 100 : 20

   d. 36 : 20 e. 70 : 7000 f. 20 : 1000

2. Express the following quantities as ratios. Remember to make the units the same and simplify your answer if you can.

   a. 40 mL : 1 L b. 2 L : 500 mL c. 3 m : 60 cm

   d. 5 kg : 500 g e. 2 hrs: 40 mins f. 45 mins : ½ hr

3. Lara mixed 6 mL of green paint with 2 mL of blue to make a blue-green paint.

    a. What is the ratio of green : blue paint in the blue-green mixture?

    b. Simplify your answer to part a.

    c. What fraction of the blue-green mixture came from the green paint?

4. The number of students enrolled at a school is 1200. Of these, 625 are male.

    a. What is the ratio of the number of male students to the number of female students?

    b. What fraction of the school population is male?

5. A batch of concrete is made from 10 kg of sand, 2 kg of cement, 5 kg of water and 2 kg of gravel.

    a. Express the parts as a ratio.

    b. Express each ingredient as a fraction of the whole.

6. A mixture contains 6 parts of oil, 2 parts of insecticide and 10 parts of water by volume. Express the ratio of oil : insecticide : water in simplest form.

FINDING RATIOS

A proportion is a statement that two ratios are equal. To calculate the unknown multiply or divide as required.

Example:
Solve the equation $x : 8 = 9 : 2$

Solution:

To turn 2 into 8, we multiply by 4. We can multiply the ratio 9 : 2 by 4 to get the ratio $x : 8$.	$x : 8 = (9 : 2) \times 4$ $x : 8 = 36 : 8$ $x = 36$
Write the answer.	The solution to the equation $x : 8 = 9 : 2$ is $x = 36$.

Exercise 2

1. Determine the value of the unknown in each equation.

   a. ____ : 20 = 1 : 5 b. ____ : 30 = 1 : 3 c. ____ : 15 = 2 : 5

2. The ratio of kilograms to pounds is 1 : 2.2. How many pounds are equal to 20 kg?

3. The ratio of miles to kilometres is 1 : 1.6. If Charlie walks 500 miles, how many kilometres has he travelled?

4. Kara wants to make an orange-yellow by mixing yellow and orange in the ratio of 3 : 1. How much yellow should she add to 5 mL of orange paint?

5. The ratio of sultanas to nuts in a brand of trail mix is always 32 : 56. If a snack pack has 12 sultanas, how many nuts are there?

6. For a 2-stroke lawn mower, fuel and oil needs to be premixed in the ratio 50 : 1. If Bob wants to use 1 litre of fuel, how much oil will he need to add to the mixture?

DIVIDING A QUANTITY INTO A GIVEN RATIO

Often, we are given a total amount that needs to be divided into a given ratio.

We use a method called the unitary method to work out how much to allocate to each part of the ratio.

The Unitary Method

- Calculate the **total number of parts** (by adding all the numbers in the ratio).
- Calculate what **one part is worth** (by dividing the given value by the total number of parts)
- Calculate what **each share of the ratio is worth** (by multiplying what one part is worth with each number in the ratio)

Example:
Amir and Keira shared $720 in the ratio 4 : 5. How much did each person get?

Solution:

Think: There are $4 + 5 = 9$ parts in total, so we can find one part by dividing $\$720$ by 9 parts to get $\$80$. We can now use the knowledge that Amir gets 4 parts and Keira gets 5 parts to find each share of the money.

Do:

$$\begin{aligned} \text{Amir's share} &= 4 \times \$80 \\ &= \$320 \end{aligned}$$

$$\begin{aligned} \text{Keira's share} &= 5 \times \$80 \\ &= \$400 \end{aligned}$$

Check: The total of Amir's share and Keira's share should sum to the total amount:

$$\$320 + \$400 = \$720$$

Exercise 3

1. Find the total number of parts in the following ratios:

   a. 2 : 3 b. 7 : 17 c. 5 : 7 : 9

2. Tricia and Luigi invest money into a business in the ratio 4 : 9.

    a. How many parts has Tricia contributed?

    b. If Tricia has invested $2400, how much money does 1 part represent?

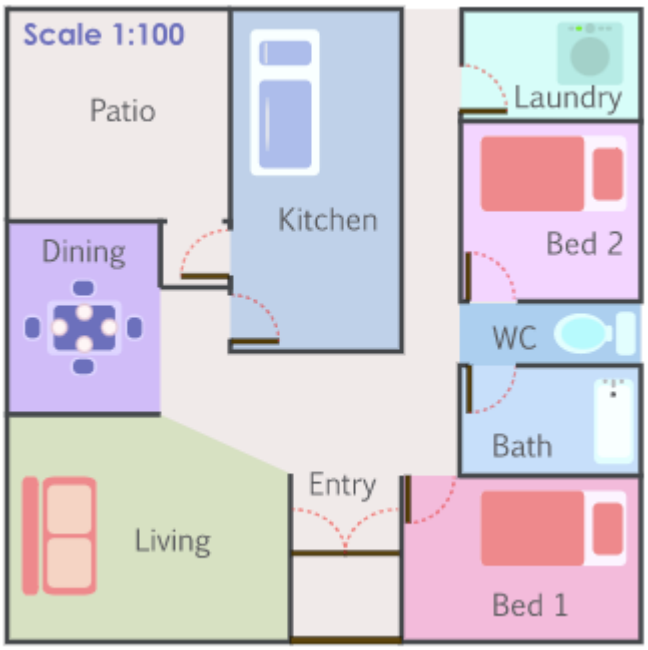
    c. How much has Luigi invested?

3. The number of red, blue, green and white jelly beans in a sweet bag are found to be in the ratio of 4 : 2 : 5 : 2. There are 65 jelly beans in the sweet bag. What is the number of red jelly beans?

4. Cordial is to be mixed in the ratio 1 part cordial concentrate to 9 parts water. If Sandra wants to make 5 Litres of mixed cordial, how much concentrate will she need?

Week 9 Portfolio Task Name:

Use the diagram to answer the following questions.



a. According to the scale of the diagram, 1 cm on the diagram represents how many metres in the house?

b. Using a ruler, Neville measures the length of the kitchen on the plan and finds it to be 6 cm. How many metres does this represent?

c. Using a ruler, Neville measures the width of the kitchen on the plan and finds it to be 3 cm. How many metres does this represent?

d. Neville wants to tile the floor of the kitchen. If each tile is 50 cm by 50 cm, how many tiles will Neville need?

e. It costs $45 for a box of 8 tiles.
   i. How many boxes will Neville have to buy?

   ii. How much will the tiles cost to purchase?

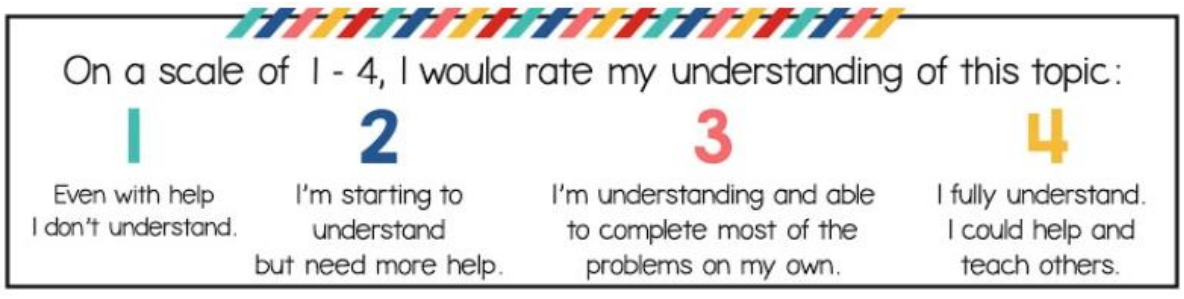
f. A tiler charges $60 per square metre to lay tiles. How much will Neville have to pay the tiler to lay the tiles?

g. How much will it cost in total to tile the kitchen floor?

MARKING RUBRIC

CRITERIA	EXPECTATIONS	MARKS
Practical	Student completes practical work of the brief to an acceptable standard set by the teacher.	
*Completion of practical work is a **prerequisite** to submitting your portfolio task.* Your teacher reserves the right not to accept submission of your weekly/fortnightly task if the supporting work is incomplete.		
Portfolio Task	Student response is correct.	**/2**
	Student response shows clear and logical working out.	**/2**
	Student response includes appropriate units and correct rounding, where relevant.	**/2**
	Student response states a conclusion which answers the question. • *Check:* Does your answer make sense in the given context?	**/2**
	Submission Guidelines	
Timeliness	Student submits the exercises and assessable task by the set deadline.	**/2**
	TOTAL	**/10**

Student Reflection:



Written reflection (optional): What was interesting? What did you find easy? What do you need to work on? Any other comments?