

Applying Ratio and Proportion

ratio

- a comparison of quantities measured in the same units

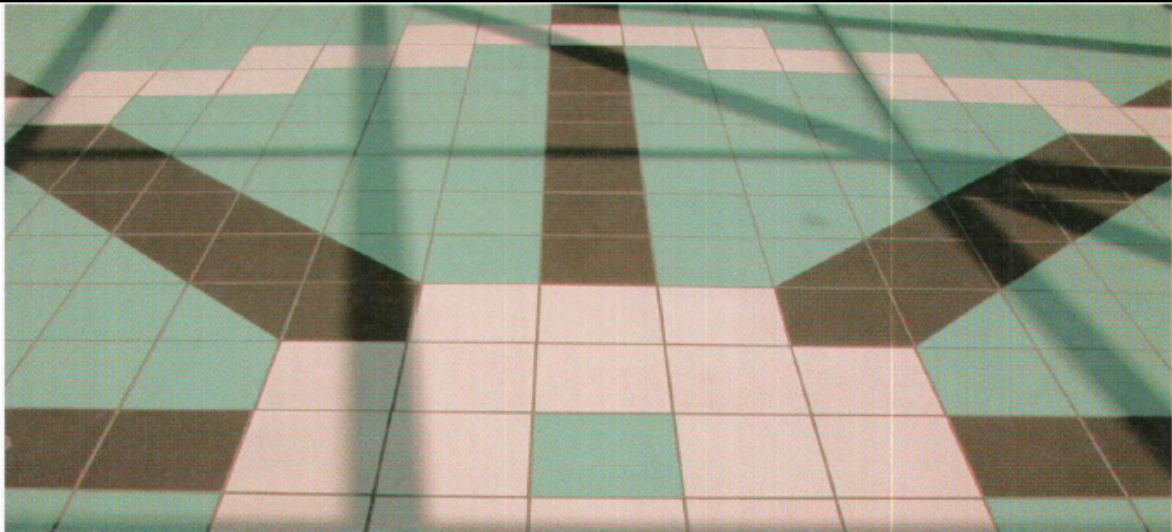
A *part-to-part* ratio compares different parts of a group to each other.

A *part-to-whole* ratio compares one part of a group to the whole group.

A ratio is in *simplest form* when its terms have no common factors. This is the same concept as expressing a fraction in *lowest terms*.

proportion

- a statement that says two ratios are equal
- can be written in ratio form:
 $4:16 = 1:4$
 or in fraction form:
 $\frac{4}{16} = \frac{1}{4}$

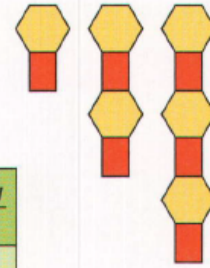


Imagine you are choosing tiles to renovate a bathroom. You decide to combine several different-coloured square tiles to create a pattern and then repeat the pattern to cover a floor or wall. How many of each colour tile will you need?

You can use **ratios** to solve this kind of problem.

How can you use ratios to describe and extend patterns?

1. Imagine you created a border pattern using pattern blocks, as shown. Look at the steps of the pattern. Copy and complete the table to find the ratios at each step of the pattern.



Step	Number of Yellow Blocks	Number of Red Blocks	Total Number of Blocks	Yellow Red	Yellow Total
1	1	1	2	$\frac{1}{1}$	$\frac{1}{2}$
2	2	2	4	$\frac{2}{2}$	$\frac{2}{4}$
3	3	3	6	$\frac{3}{3}$	$\frac{3}{6}$

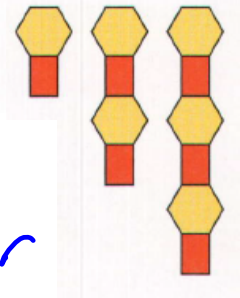
2. a) What is the ratio of the number of yellow blocks to the number of red blocks?
b) Why do you think this is called a *part-to-part* ratio?

a) yellow : red
1 : 1

b) comparing one colour to another colour.

3. a) What is the ratio of the number of yellow blocks to the total number of blocks?

- b) Why do you think this is called a *part-to-whole* ratio?

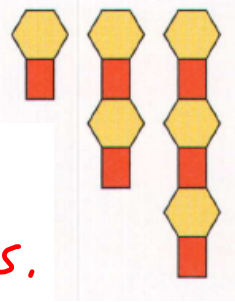


a) yellow : total
1 : 2

b) comparing a colour to the total.

4. a) If you extend the pattern to use 8 red blocks, how many yellow blocks will you use? Explain your reasoning.

b) How many blocks of each colour would you need to make a pattern that has a total of 30 blocks? Explain your reasoning.



a) 8 yellows.
The ratio is 1:1, so
8 reds need 8 yellows.

b) 15 red and 15 yellow.
ratio for part : whole
is $1:2 \rightarrow \times 15$
 $\Rightarrow 15:30$

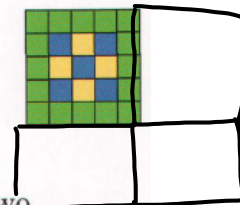
Example 1: Apply Ratios to Tiling

Look at the square tile pattern.

a) Compare the number of yellow tiles to the number of green tiles. Write the ratio in simplest form.

b) Compare the number of blue tiles to the total number of tiles. Write the ratio in simplest form.

c) How many of each colour tile are needed to make a two-by-two repeat of the pattern?



a) yellow : green
 $4:16 \rightarrow \div 4$
 $1:4$

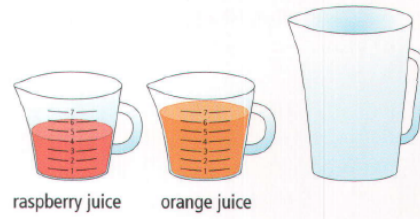
b) blue : total
 $5:25 \rightarrow \div 5$
 $1:5$

c) Green = $16 \times 4 = 64$
Yellow = $4 \times 4 = 16$
Blue = $5 \times 4 = 20$

Example 2: Apply Ratios to Recipes

Lena has a recipe for a fruit punch that calls for 4 cups of raspberry juice and 6 cups of orange juice.

- a) How much orange juice should Lena use if she only uses 2 cups of raspberry juice?
 b) Suppose Lena wants to make 50 cups of punch for a family gathering. How much of each type of juice should she use?



a) raspberry : orange
 $4 : 6 \xrightarrow{\div 2} 2 : 3 \Rightarrow 3 \text{ cups of OJ}$

b) $\frac{\text{raspberry}}{\text{total}} = \frac{4}{10} \xrightarrow{\times 5} \frac{20}{50}$
 $\Rightarrow 20 \text{ cups of RJ}$

$\frac{\text{orange}}{\text{total}} = \frac{6}{10} \xrightarrow{\times 5} \frac{30}{50}$
 $\Rightarrow 30 \text{ cups of OJ}$

Key Ideas

- A part-to-part ratio compares two parts of a group.
The ratio of red beads to yellow beads is 4:3.
- A part-to-whole ratio compares a part of a group to the whole group.
The ratio of red beads to the total number of beads is 4:7.
- A proportion is a statement that two ratios are equal.

$$4:3 = 8:6 \text{ or } \frac{4}{3} = \frac{8}{6}$$

