GCSE Maths – Ratio, Proportion and Rates of Change

Ratio

Notes

WORKSHEET

Ratio

Writing Ratios as Fractions

A **ratio** is a way of expressing one thing compared to another by using **parts**.

For example, suppose **red** and **green** counters are in a bag in the ratio **3:2**.

We can write each part as a fraction of the total number of parts. So, if our parts are **3** and **2**, the total number of parts is 5. This means **3/5 of the counters are red** and **2/5 of the counters are yellow.**

Example: In a school, the ratio of the number of students with blonde hair to the number of students with brown hair is 5:8.

What fraction of students have brown hair?

We need to find the total number of parts of the ratio by adding 5 and 8 together.

$$5 + 8 = 13$$

Now we need to look at the value of the ratio that represents brown hair, which is 8.

The fraction of students with brown hair is the number of parts of brown hair divided by the total number of parts:

$$Fraction\ of\ students\ with\ brown\ hair\ =\ 8/13$$

$$Answer: 8/13$$

Simplifying Ratios

Ratios can be **fully simplified**, just like fractions can be.

When we **simplify** a ratio, we have to identify a **common factor.** Once we have identified a common factor of the ratio parts, we divide all parts of the ratio by this common factor.

Example: Write the ratio $18 : 36 : 27$ in its simplest form

We need to find the highest common factor because this is the number that we want to divide by to give us the ratio in its simplest form.
If you look at the factors of 18, 36 and 27, you can identify that the highest common factor is 9.

Highest common factor of 18, 36 and 27 is 9.

Now divide each number by 9:

$$18 : 36 : 27$$
$÷9 \qquad$ **2 : 4 : 3** $\qquad ÷9$

We cannot simplify 2:4:3 any further because there are no common factors of 2, 4 and 3. Therefore, this ratio is in its simplest form.

Scaling Ratios

To **scale** a ratio, we multiply by a **common factor**.

Example: Meringue is made by mixing cups of egg whites and cups of sugar in the ratio 2:5. How many cups of sugar are needed if 6 cups of egg whites are used in the mixture?

We know that $6 = 2 \times 3$, so we need to multiply the ratio by 3:

$$2 : 5$$
$\times 3 \qquad$ **6 : 15** $\qquad \times 3$

*So, when 6 cups of egg whites are used, **15 cups of sugar** are needed in the mixture.*

Dividing Amounts into a Ratio

You need to know how to split a total amount into a ratio.

Example: Laila, John and Emma split £4000 in the ratio 1:3:4. How much money does John receive?

1. *Find the total number of parts in the ratio:*
   $$1 + 3 + 4 = \mathbf{8\ parts}$$

2. *Divide the total amount, which is £4000, by the total number of parts, which is 8. This will give you the value of 1 part.*
   $$£4000 ÷ 8 = £500 = \mathbf{1\ part}$$

3. *Multiply the value of 1 part by the number of parts John has:*
   $$\mathbf{£500 \times 3 = £1500}$$

1. If 100 grams of one ingredient is used in a cake recipe, which calls for a ratio of 3: 7 with a second ingredient, how much of the second ingredient is needed?

2. A recipe for 10 cupcakes needs 300 g flour. How much flour is needed for 15 cupcakes?

3. In a class of 21 students, the ratio of male students to female students is 3 : 4. How many female students are there?

4. Ben, Luke and Jess save their money in a ratio of $1: 3: 6$. If Luke saves £20 a week, how much do they save in total?

5. There is £500 in a prize fund which is shared between 3 people. Daisy gets £150, Carol gets £250 and Joe gets £100. What ratio of the money does each person receive?

6. In a classroom, 125 sweets are shared out in a ratio of $13 : 7 : 5$ to groups Red, Orange and Blue. How many sweets does each group receive?

Worked solutions for the practice questions can be found amongst the worked solutions for the corresponding worksheet file.