Ratios and Proportions - GCSE Maths

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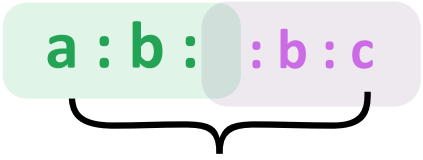
1.Introduction

- When we compare **two quantities** or numbers using division, then it is called Ratio and Whenever we **compare ratios** , then it is called Proportion.
- In the following example we are equating two ratios and it is called Proportion.

$$a : b = c : d$$

$$a : b :: c : d$$



a is to b AS b is to c

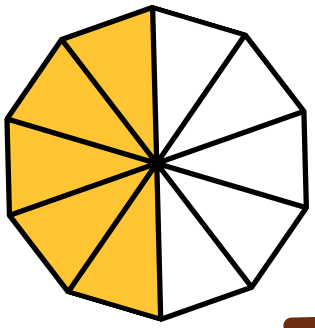
2. Ratios and Proportions

- Ratios allows us to compare two quantities by showing how much of one quantity is contained by the other.
- Proportions on the other hand tells us that the ratios are equal. There can be two or more ratios in proportion to each other.

Ratio 1 :

5 : 10

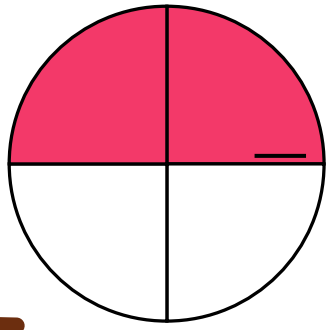
$$\frac{5}{10} = \frac{1}{2}$$



Ratio 2 :

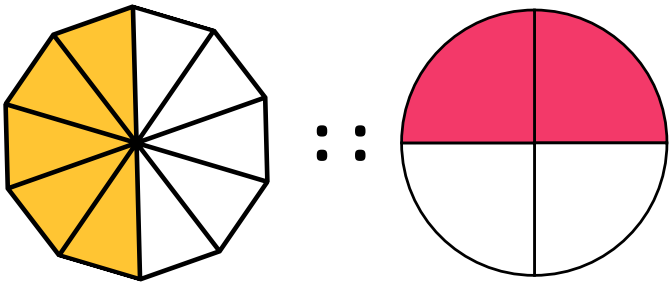
2 : 4

$$\frac{2}{4} = \frac{1}{2}$$



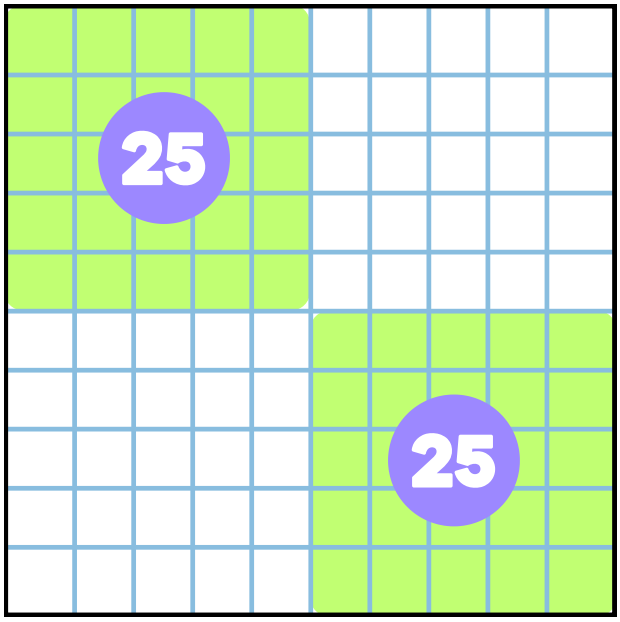
Both are equal thus are in Proportion

5 : 10 : : 2 : 4

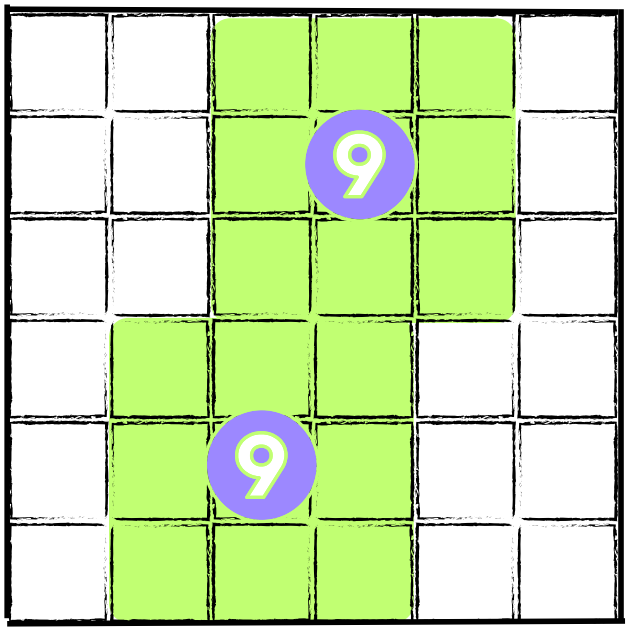


3. Solved Examples

Example: Find the ratio of the shaded portion to unshaded for both the diagrams check whether they are in proportion or not ?



100 boxes



36 boxes

Solution: In the first box **50** out of **100** boxes are shaded. Therefore, the ratio -

$$\frac{50}{100} = \frac{1}{2}$$

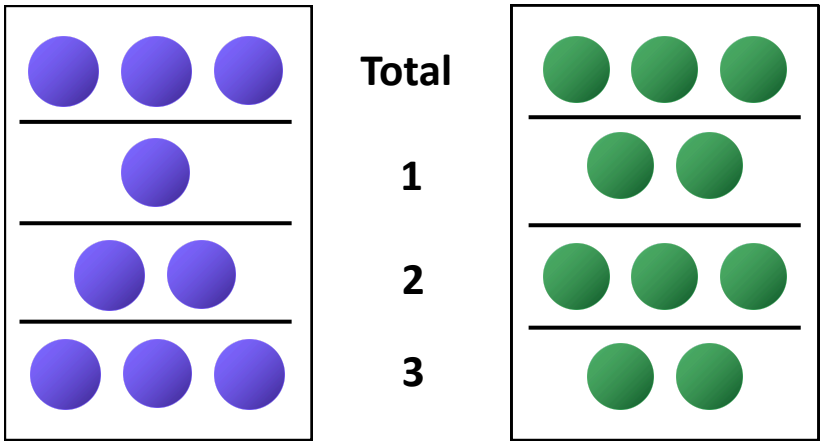
In the second box **18** out of **36** boxes are shaded, thus the ratio -

$$\frac{18}{36} = \frac{1}{2}$$

We can clearly see that both the ratios are equal thus they are in proportion, so can be represented by -

$$50 : 100 :: 18 : 36$$

Example: Find out the ratios of blue balls and green balls differently and also check if they are in proportion or not ?



Solution: In the first row the total blue balls are 3 and green balls are also 3.

In the 2nd row there is single **blue** ball with 2 **green** balls-

$\frac{1}{2}$

In the 3rd row there are 2 **blue** balls and 3 **green** balls-

$\frac{2}{3}$

In the 4th row there are 3 **blue** and 2 **green** balls. ratio-

$\frac{3}{2}$

We can conclude the ratios do not represent a common ratio, hence they are not in proportion.

4. Reasoning Examples

Example: Suppose in a school there are total 130 students in which there are 50 girls and 80 boys. If one day 25 out of 50 girls and 40 out of 80 boys were present that day then check whether these ratios (present girls and boys to the total) are in proportion or not?


Solution: Total = 130,

Girls = 50, Girls present = 25,

Boys = 80, Boys present = 40

Ratio of the present girls to the total no. of girls -

$$25 : 50$$

$$\frac{25}{50} = \frac{1}{2}$$

Ratio of the present boys to the total no. of boys -

$$40 : 80$$

$$\frac{40}{80} = \frac{1}{2}$$

Both the ratios are equivalent, thus they are in proportion so we can write them as -

$$25 : 50 :: 40 : 80$$

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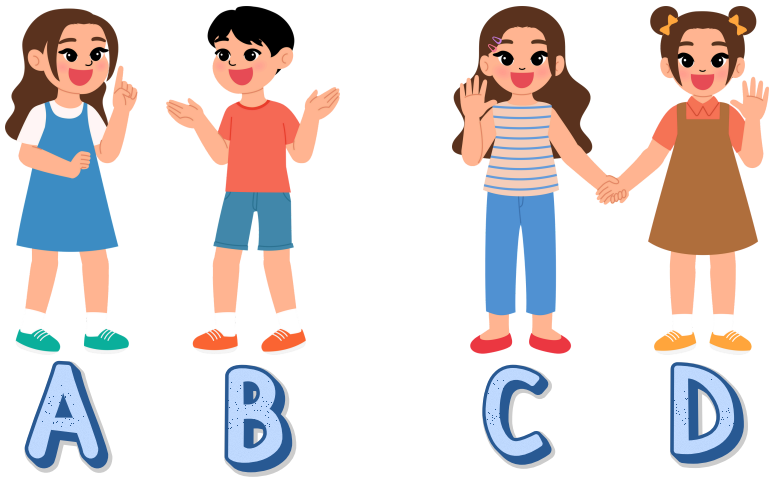
Example: If there are four friends A, B, C and D. A and B have a total of £50, they share it so that A got £20 and B got £30.
Similarly C and d share the total amount of £100 such that C got £40 and D got £60. Find the ratios of sharing and compare them that they are in proportion or not ?



Solution: They distribution of 50 in A and B -

$$A = 20 , B = 30$$

Ratio : $20 : 30$

$$\frac{20}{30} = \frac{2}{3}$$

They distribution of 100 in A and B -

$$A = 40 , B = 60$$

Ratio : $40 : 60$

$$\frac{40}{60} = \frac{2}{3}$$

The ratios are equal and are in proportion

Example: Olivia is going to make some ice cream. She needs to mix Custard powder, Milk and sugar in the ratio - **1 : 4 : 20**

If she has 25g of Custard
100g of Sugar
500g of Milk

Does Olivia has enough Custard, Sugar and Milk to make ice cream?

Solution: The three ingredients should be in the ratio - 1 : 4 : 20

Then, 25g of Custard, 100g of sugar, 500g of Milk are in the ratio -

$$25 : 100 : 500$$

Dividing these with 25 -

$$\frac{25}{25} : \frac{100}{25} : \frac{500}{25}$$

We get the ratio - $1 : 4 : 20$