Ratios in Algebra - GCSE Maths

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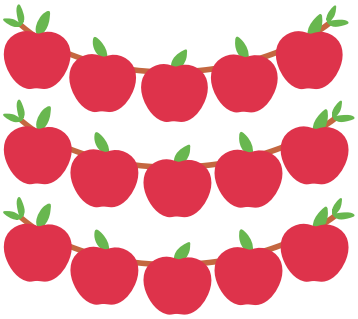
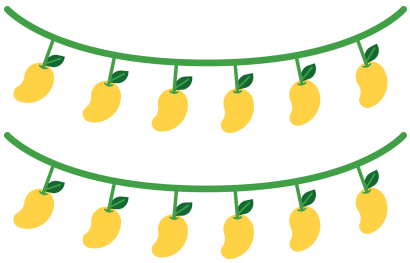
1.Introduction

Ratios are number of one thing compared to another thing

(how much one quantity is present with respect to other)





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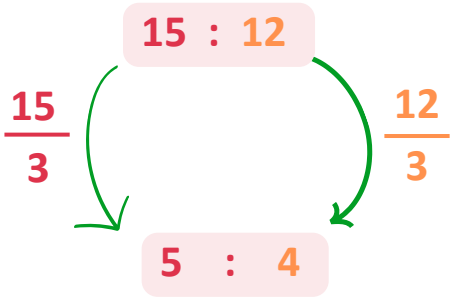
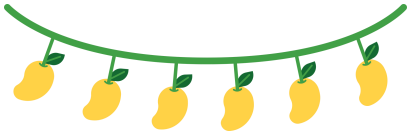
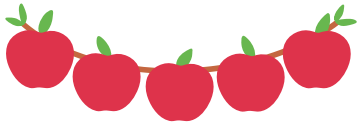
Simplification



(Common Factor : 3)

If we multiply or divide the ratio's numbers the ratios still remains the same

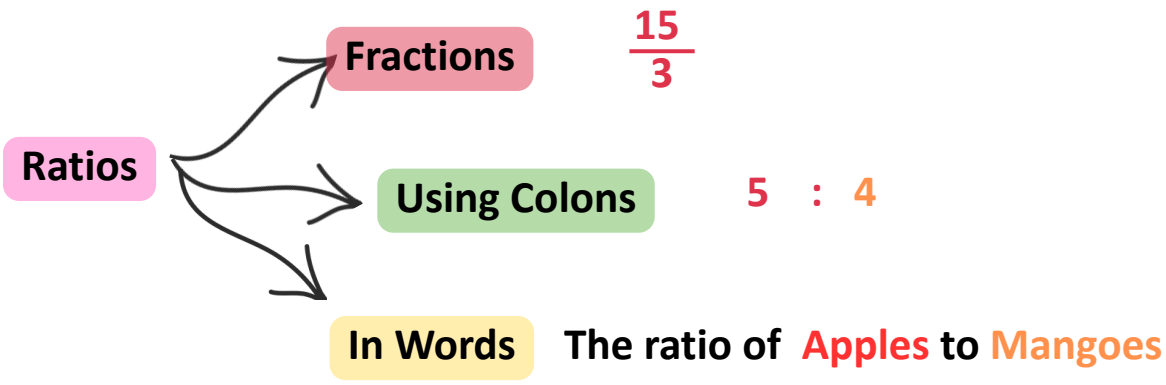




From this simplification using common factor we can say that there are 5 **Apples** for each 4 **Mangoes**

2. Ratios Representation

Ratios in Algebra are used to solve problem finding unknown quantities and understanding variables.



Types of Ratios-

Part to Part Compares two or more parts of whole

Part to Whole Compares parts to whole

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3. Divide in the Ratios

We can divide a quantity in some ratio by following these steps:

Example: Divide **120** in **2:3**

Step#1: Add the number present in the ratio -

$$2 + 3 = 5$$

Step#2: Divide the quantity by the sum -

$$\frac{120}{5}$$

This gives us value of one part.

Step#3: Multiply each ratio part by value of one part -

$$2 \times 24 = 48$$

$$3 \times 24 = 72$$

The quantity is divided into two parts 48, 72 in the ratio 2 : 3 .

Example - Quantity : 200 divide it in the **Ratio : 4 : 6**

Step#1: Addition $4 + 6 = 10$

Step#2: Division $\frac{200}{10} = 20$

Step#3: Multiplication $4 \times 20 = 80$

$6 \times 20 = 120$

The quantity 200 is divided into two parts 80, 120 in the ratio 4 : 6

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Example - Quantity: 1080 divide it in the **Ratio:** 4 : 8

Step#1: Addition $4 + 8 = 12$

Step#2: Division $\frac{1080}{12} = 90$

Step#3: Multiplication $4 \times 90 = 360$

$8 \times 90 = 720$

The quantity 1080 is divided into two parts 360, 720 in the ratio 4 : 8

Key Point: When one of the parts in the ratio is 1 it is called Unit Ratio.

Example : Quantity: 900 Divide it in the **Ratio:** 1 : 3 : 5

Step#1: Addition $1 + 3 + 5 = 9$

Step#2: Division $\frac{900}{9} = 100$

Step#3: Multiplication $1 \times 100 = 100$

$2 \times 100 = 200$

$3 \times 100 = 300$

The quantity 900 is divided into two parts 100, 200, 300 in the ratio 1 : 3 : 5

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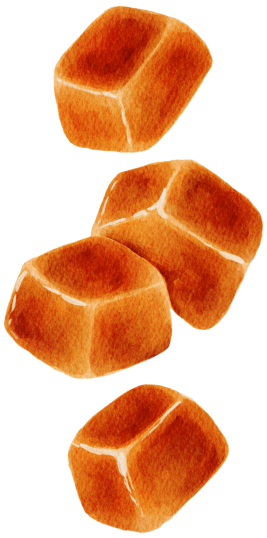
4. Reasoning Solved problems

Example: Suppose you and your friend have 51 toffees and you want to share it with him in 1 : 2 . Then how will you divide the quantity?



Solution: The quantity is 51 and we need to divide it in 1 : 2 -

Step#1 Adding the parts -

$$1 + 2 = 3$$

Step#2 Finding value of one part -

$$\frac{51}{3} = 17$$

Step#3 Finding value of each part of the ratio -

$$1 \times 17 = 17$$

$$2 \times 17 = 34$$

Now, 51 toffees are divided into 17, 34 in the ratio 1 : 2

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Example: Suppose there are 540 crayons to be divide into the ratio 4 : 5 for distribution between two children. How will you divide the crayons that the ratio is satisfies with the parts.

Solution: The quantity is 540 and we need to divide it in 4 : 5 -

Step#1 Adding the parts -

$$4 + 5 = 9$$

Step#2 Finding value of one part -

$$\frac{540}{9} = 60$$

Step#3 Finding value of each part of the ratio -

$$4 \times 60 = 240$$

$$5 \times 60 = 300$$

Now, 540 crayons are divided into 240, 300 in the ratio 4 : 5

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Example: Suppose there are 12 classes in a school. each class contains 40 students and the ratio of girls to the boys is 4 : 5, then find how many girls and boys are there in the school?

Solution: The quantity is $12 \times 40 = 480$ and the ratio of girls to the boys is $5 : 7$ -

Step#1 Addition- $5 + 7 = 9$

Step#2 Division - $\frac{480}{12} = 40$

Step#3 Finding value of each part of the ratio -

$5 \times 40 = 200$

$7 \times 40 = 280$

Now, 480 crayons are divided into 200, 280 in the ratio 5 : 7

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Example: If James and Jason divided the money they got in the ratio 6 : 8 and James got £150 then how much Jason got ? and what was the total amount?

Solution:

Step#1: Find the value of one part -

$$\frac{£150}{6} = 25$$

Step#2: Thus, one part values 25 and using it we can find the value of second part -

$$8 \times 25 = 200$$

Step#3: Now we know how much money James and Jason got, So the total amount was -

$$£150 + £200 = £350$$

Verification add the parts and divide with total amount -

$$6 + 8 = 14$$

$$\frac{£350}{14} = 25$$