RATIOS

A DEFINITION

Definition Ratio

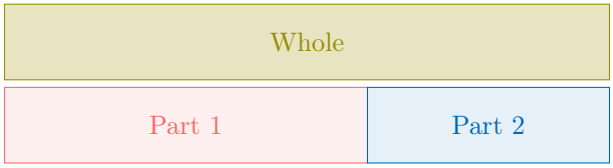
A **ratio** is a comparison of two quantities. The ratio 3 to 2 can be expressed as $3:2$ or $\frac{3}{2}$.

B PART-PART AND PART-WHOLE RATIOS

Definition Part-part Ratio

A **part-part ratio** compares two distinct parts of a whole.

Part 1 : Part 2



Ex: For one bowl of fruit juice, there are 3 cherries and 2 apples.

The ratio of cherries to apples is $3:2$.

Definition Part-whole Ratio

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

Part 1 : Whole or Part 2 : Whole

Ex: If a juice is made with 1 lemon and 2 oranges, find the ratio of oranges to the total number of fruits.

Answer:

- The total number of fruits is $1+2=3$.
- The ratio of oranges to the total number of fruits is $\frac{2}{3}$.

C EQUAL RATIOS

Definition Equal Ratios

Two ratios are **equal** if one can be expressed as a multiple of the other.

Method Using Fractions

To show that two ratios are equal, we can compare their related fractions. If the fractions are equal, then the ratios are equal.

Ex:

As $\frac{1}{2} = \frac{2}{4}$, $1:2 = 2:4$

D PROPORTION

Definition Proportion

A **proportion** states that two ratios are equal.

Ex: To make 1 chocolate cake, 4 eggs are needed. How many eggs are needed to make 2 cakes?

Answer: For 1 cake, it takes 4 eggs. Therefore, to maintain this proportion for 2 cakes, multiply both the number of cakes and the number of eggs by 2:

$$\frac{4}{1} \overset{\times 2}{=} \frac{8}{2}$$

Thus, to make 2 chocolate cakes, you need 8 eggs.

E UNITARY METHOD

Method Unitary Method

5 apples cost \$10. To calculate the cost of 8 apples, follow these steps:

- **To the unit:** Find the cost of 1 apple by dividing the total cost by the initial number of apples 5:

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

  So, 1 apple costs 2 dollars.

- **From the unit:** Find the cost of 8 apples by multiplying the unit ratio by the final number of apples 8:

$$\frac{2}{1} \overset{\times 8}{=} \frac{16}{8}$$

  So, 8 apples cost 16 dollars.

- $\frac{10}{5} \overset{\div 5}{=} \frac{2}{1} \overset{\times 8}{=} \frac{16}{8}$

F CROSS-MULTIPLICATION METHOD

Method Cross-Multiplication in Table

5 apples cost \$10. To calculate the cost of 8 apples, follow these steps:

- **Step 1: Set up the Table**

Price	10	
Number of Apples	5	8

- **Step 2: Apply the Cross-Multiplication**

Price	$\underset{\div}{10}$	$\frac{8\times10}{5} = 16$
Number of Apples	5	$\times$ 8

- So, 8 apples would cost 16 dollars.

Method **Cross-Multiplication**

5 apples cost \$10. To calculate the cost of 8 apples, follow these steps:

- **Step 1 : Set up the Proportion**
  Write the proportion where the cost of 5 apples is to 10 dollars as the cost of 8 apples is to x dollars:

$$\frac{10}{5} = \frac{x}{8}$$

- **Step 2: Solve for x**

$$\begin{aligned} \frac{10}{5} &= \frac{x}{8} \\ 5\times x &= 10\times 8 \quad \text{(cross mutiplication)} \\ x &= 10\times 8\div 5 \quad \text{(dividing both sides by 5)} \\ x &= 16 \end{aligned}$$

- So, 8 apples would cost 16 dollars.