🏫 IGCSE Mathematics – Ratio and Proportion Notes

1. Understanding Ratios

A **ratio** compares quantities of the same kind using division. It shows how many times one value contains or is contained within the other.

Example:

If there are 2 apples and 3 oranges, the ratio of apples to oranges is

$2 : 3$

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2. Simplifying Ratios

To simplify a ratio:

- Express both terms in the **same units.**
- Divide both terms by their **highest common factor (HCF).**

Example 1:

Simplify the ratio 10 : 15

→ HCF of 10 and 15 is 5

→ $\frac{10}{5} : \frac{15}{5} = 2 : 3$

Example 2 (Different units):

Simplify 500g : 2kg

→ Convert 2kg to 2000g

→ 500g : 2000g = 500 : 2000

→ Divide by 500 → 1 : 4

3. Dividing a Quantity in a Given Ratio

To divide a quantity in a given ratio:

1. Add the parts of the ratio.

2. Divide the total quantity by the total number of parts.

3. Multiply each part by the result.

Example:

Divide $60 in the ratio 2 : 3

→ Total parts = 2 + 3 = 5

→ Each part = 60 ÷ 5 = 12

→ Share 1 = 2 × 12 = **$24**

→ Share 2 = 3 × 12 = **$36**

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4. Using Ratios in Real-Life Contexts

Ratios are used in recipes, maps, models, mixing solutions, etc.

Example:

A recipe for cake uses flour and sugar in the ratio 4 : 1.

If you have 250g of flour, how much sugar is needed?

→ Flour : Sugar = 4 : 1

→ Each "part" of flour = 250g ÷ 4 = 62.5g

→ Sugar = 1 × 62.5g = **62.5g**

5. Proportion and Proportional Reasoning

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

Direct Proportion:

If one value increases, the other increases **in the same ratio.**

Formula:

If $x \propto y$, then $\frac{x}{y} = \text{constant}$

Example:

If 5 pencils cost $10, how much do 8 pencils cost?

→ Cost per pencil = $10 ÷ 5 = $2
→ 8 pencils = 8 × $2 = **$16**

Inverse Proportion:

If one value increases, the other decreases **in the same ratio.**

Formula:

If $x \propto \frac{1}{y}$, then $x \times y = \text{constant}$

Example:

If 4 workers take 6 days to complete a job, how many days will 6 workers take?

→ Total work = 4 × 6 = 24 worker-days
→ 6 workers → 24 ÷ 6 = **4 days**

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6. Word Problems involving Ratio & Proportion

Example 1:

The ratio of boys to girls in a class is 3:5. If there are 24 girls, how many boys?

→ 3 : 5 = boys : girls

→ 1 part = 24 ÷ 5 = 4.8

→ Boys = 3 × 4.8 = **14.4** → **Not possible**

(So probably we need to adjust or the data should be a multiple of 5.)

Better Example:

Boys : Girls = 3 : 5

Total students = 40

→ Total parts = 3 + 5 = 8

→ Each part = 40 ÷ 8 = 5

→ Boys = 3 × 5 = **15**, Girls = 5 × 5 = **25**