

The Panda Math Tutor

www.thepandamathtutor.com

Ratio, Rate and Proportion

IGCSE Mathematics

Prepared by

Nikolas Agisilaou

Quality Mathematics Education for Students

Contents

1	Introduction to Ratio, Rate and Proportion	2
2	Ratio	2
2.1	Simplifying Ratios	3
2.2	Dividing a Quantity in a Given Ratio	4
2.3	The Ratio Bar Model	5
3	Rate	5
3.1	Unit Rate	6
3.2	Speed, Distance and Time	7
4	Kinematic Graphs	8
4.1	Distance–Time Graphs	8
4.2	Velocity–Time Graphs	10
4.3	Connecting the Two Graph Types	13
5	Direct Proportion	15
5.1	Recognising Direct Proportion	15
5.2	Other Forms of Direct Proportion	17
6	Inverse Proportion	17
7	Percentage as Proportion	19
8	Map Scales and Scale Drawings	21
9	Summary	22
10	Additional Resources	23
10.1	Tips for Success in IGCSE Exams	23
10.2	Common Exam Questions	24

1 Introduction to Ratio, Rate and Proportion

Note

Ratio, rate, and proportion are among the most widely used mathematical tools in everyday life — from cooking recipes and currency exchange to engineering, science, and finance. These concepts are closely related and build naturally on each other.

In this chapter, we will explore:

- Understanding and simplifying ratios
- Dividing quantities in a given ratio
- Rates and unit rates
- Direct proportion and its graph
- Inverse proportion and its graph
- Percentage as a proportional tool
- Applications to real-world problems

2 Ratio

Definition

A **ratio** is a comparison of two or more quantities of the same kind, written using a colon (:) or as a fraction.

$$a : b \quad \text{or} \quad \frac{a}{b}$$

Ratios have **no units** — the quantities being compared must be in the **same unit** before writing a ratio.

Example: If a bag contains 3 red and 5 blue balls, the ratio of red to blue is 3 : 5.

Warning

Units must match!

To find the ratio of 50 cm to 2 m, first convert to the same unit:

$$2 \text{ m} = 200 \text{ cm}$$

$$\text{Ratio} = 50 : 200 = 1 : 4$$

Never write $50 : 2$ — this gives a completely wrong answer!

2.1 Simplifying Ratios

Method

How to Simplify a Ratio

Step 1: Ensure all quantities are in the **same unit**

Step 2: Divide every part of the ratio by the **Highest Common Factor (HCF)**

Step 3: Check that the simplified ratio uses whole numbers (or integers)

For ratios involving fractions or decimals:

- **Decimals:** Multiply all parts by a suitable power of 10 to clear decimals, then simplify
- **Fractions:** Multiply all parts by the LCM of all denominators, then simplify

Example

Simplify the following ratios:

(a) $24 : 36$

(b) $1.5 : 4.5$

(c) $\frac{3}{4} : \frac{5}{8}$

Solution:

(a) $\text{HCF}(24, 36) = 12$

$$24 : 36 = (24 \div 12) : (36 \div 12) = \mathbf{2 : 3}$$

(b) Multiply both parts by 10 to remove decimals:

$$1.5 : 4.5 = 15 : 45$$

$\text{HCF}(15, 45) = 15$

$$15 : 45 = 1 : 3 \implies \mathbf{1 : 3}$$

(c) LCM of denominators 4 and 8 is 8. Multiply both parts by 8:

$$\frac{3}{4} : \frac{5}{8} = 6 : 5 \implies \mathbf{6 : 5}$$

Preview ends here

21 more pages are in the full pack.

Ratio, Rate and Proportion — Main Notes — €9.99

Buy the pack and the complete PDF lands in your inbox.

Personal study use only — please don't resell or share.