PROBLEM-SOLVING AND DATA ANALYSIS / 01 UNDERSTAND

Ratios and rates

An illustrated lesson ▪ Theory, reasoning and worked examples

Ratios describe relative size

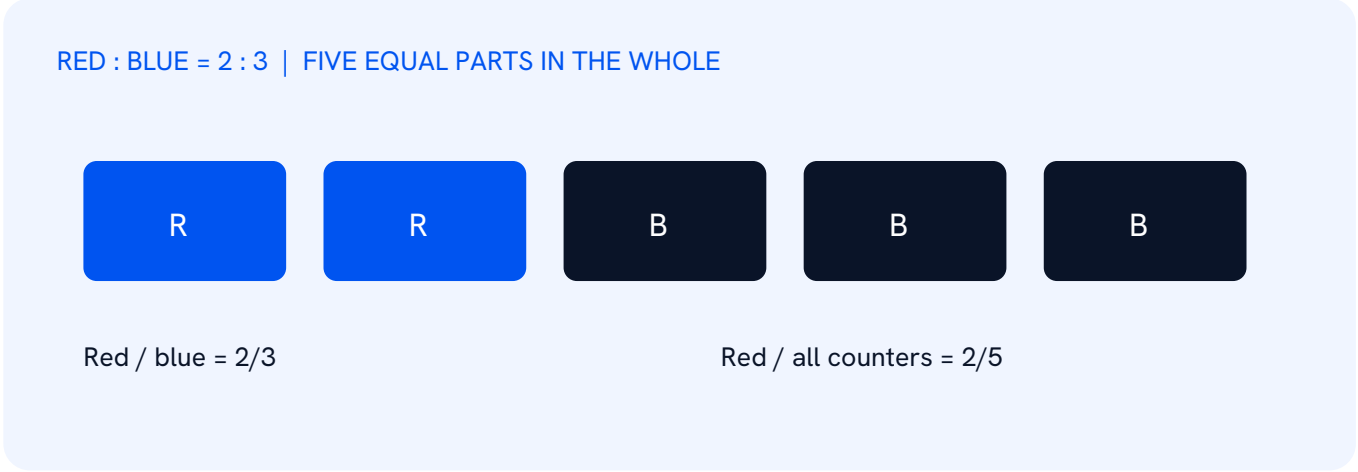
A ratio of red to blue counters of 2:3 means every complete group contains two red and three blue counters. It does not mean there are only five counters in total. The counts can be 2 and 3, 4 and 6, or any other common multiple. A shared scale factor connects the ratio parts to actual quantities.

Part-to-part is not part-to-whole

With a red-to-blue ratio of 2:3, red counters make up 2/(2 + 3) = 2/5 of the total. The fraction 2/3 compares red with blue alone. Label each quantity before choosing the denominator; otherwise a correct ratio can be used to answer the wrong comparison.

Rates carry units

A rate compares quantities with different units, such as dollars per notebook or kilometres per hour. A unit rate has one unit in the denominator. Units behave like factors in multiplication and division, so tracking them shows whether you should multiply by a rate or take its reciprocal.



Illustrative teaching diagram. Values and examples are explained in the lesson.

THE ESSENTIAL IDEA

A ratio gives relative amounts; a rate includes units.

PROBLEM-SOLVING AND DATA ANALYSIS / 02 BUILD THE METHOD

From idea to method

Scale all parts together

For a 2:3 ratio with 35 items altogether, the five ratio parts represent 35 items. One part is 7 items, giving 14 and 21. Scaling only one part changes the ratio. A ratio equation can be written as red = 2k and blue = 3k with the same k.

Convert units by cancellation

To convert 72 kilometres per hour to metres per second, multiply by 1000 metres per kilometre and divide by 3600 seconds per hour. The result is 20 metres per second. Write the conversion fractions so unwanted units cancel before calculating.

Distinguish direct and inverse relationships

At a fixed price per item, buying twice as many items costs twice as much: a direct proportion. For a fixed distance, travelling twice as fast takes half as long: an inverse relationship. Do not assume that every pair of related quantities has a constant ratio.

WORKED EXAMPLE / RECOVER QUANTITIES FROM A TOTAL

A mixture contains concentrate and water in the ratio 1:4. How much concentrate is in 30 litres?

01 Set up the reasoning

There are 1 + 4 = 5 equal ratio parts in the whole mixture.

02 Apply the relationship

Each part represents 30/5 = 6 litres.

03 Interpret and check

Concentrate is one part, or 6 litres; water is four parts, or 24 litres. Their sum and ratio both check.

Keep these distinctions handy

Part to whole	For a:b, the first share of the total is a/(a + b).
Unit rate	Divide the quantity by the number of units.
Overall average rate	Total quantity / total time, with consistent units.

PROBLEM-SOLVING AND DATA ANALYSIS / 03 CONNECT & REMEMBER

See the deeper pattern

Average rates need weighting

Travelling 60 kilometres at 30 km/h takes 2 hours; another 60 kilometres at 60 km/h takes 1 hour. The overall average speed is total distance divided by total time: 120/3 = 40 km/h. The arithmetic mean of 30 and 60 is not appropriate because the time spent at each speed differs.

ONE MORE WORKED APPLICATION

6 identical notebooks cost $36. At the same rate, how many dollars do 6 notebooks cost?

1. Unit price = 36 / 6 = 6 dollars.

2. For 6 notebooks: 6 × 6 = 36.

Answer: 36

Mistakes to recognize

- Use the total number of ratio parts for a part-to-whole fraction.
- Check whether the rate is dollars per item or items per dollar.
- Keep consistent units before comparing two rates.

A quick understanding check

If A:B = 3:5, what fraction of A + B is A?

Explanation: 3/8, because the whole contains eight equal ratio parts.

MORE PRACTICE IN YOUR DASHBOARD

Open prepvora.com/app/ and use the SAT question bank. Work on Problem-Solving and Data Analysis, then look for ratios and rates questions. Solve independently before reviewing the explanation. Use this guide for the theory; use the dashboard for a longer practice session.

Open your dashboard → | Explore the resource library →

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