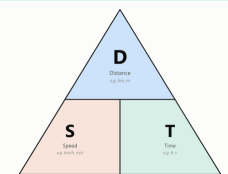


Helping Your Child with Ratios, Rates & Proportions

Number · Year 7 to Year 10 · Australian Curriculum Mathematics

Ratios, rates and proportions help us compare quantities and describe relationships. **Ratios** compare parts to parts (like the mix of cordial to water). **Rates** compare different units (like kilometres per hour or dollars per kilogram). **Proportions** describe when two ratios are equal. These ideas appear in cooking, shopping, maps, science, and finance — every day of our lives.

Year	What your child learns	What this looks like at home
Year 7	Ratios and dividing a quantity in a ratio ratio — compares two quantities of the same type: 2:3 (two parts to three parts) Dividing a quantity in a given ratio: Share \$50 in ratio 2:3 → total parts = 5 Each part = $\$50 \div 5 = \10 First share = $2 \times \$10 = \20 , Second share = $3 \times \$10 = \30 OR First share is $\frac{2}{5} \times \$50 = \20 , second share is $\$50 - \$20 = \$30$	'There are 12 girls and 8 boys. What is the ratio of girls to boys?' (12:8 = 3:2) 'We need to share \$90 between us in ratio 1:2. How much do you get?'
Year 8	Percentages, rates, profit, loss and percentage change rate — compares two different units: 60 km/h, \$4.50/kg unit rate — a rate with denominator 1: \$2.25 per kg percentage increase/decrease — how much something grows or shrinks: $\% \text{ change} = \frac{\text{change}}{\text{original}} \times 100$ profit — money earned above cost: profit = selling price – cost price loss — when selling price is less than cost price Your child solves problems involving percentage profit and loss on items bought and sold: Percentage increases — e.g. wages rising 3.5% Percentage decreases — e.g. a car losing 15% of its value per year Finding the original price before a percentage change was applied Finding the best buy using unit rates: \$3.60 for 400g vs \$5.00 for 600g → \$0.009/g vs \$0.0083/g → 600g is better value Speed, distance and time relationships 	'Mum buys a second-hand phone for \$200 and sells it for \$260. What is the percentage profit?' (Profit = \$60, $\% = \frac{60}{200} \times 100 = 30\%$) 'Wages went up 4%. If you earned \$800 per week, what's the new wage?' ($800 \times 1.04 = \\$832$) Look at a receipt together — discuss the GST component (10%). Supermarket: compare price per 100g for two sizes of the same product. 'If you can walk 5 km in 1 hour, how long to walk 12 km?' ($12 \div 5 = 2.4 \text{ hours} = 2 \text{ hours } 24 \text{ minutes}$) D = S × T cover D – S and T sit side by side S = D ÷ T cover S – D sits above T T = D ÷ S cover T – D sits above S Worked example: a car travels 150 km in 3 hours. Cover S → Speed = $D \div T = 150 \div 3 = 50 \text{ km/h}$ Keep units consistent – e.g. km with km/h and hours, or m with m/s and seconds.
Year 9	Proportional reasoning, scale and similar figures proportion — a statement that two ratios are equal: 1:2 = 3:6 scale factor — the ratio used to enlarge or reduce a shape similar figures — same shape, different size; corresponding angles equal, corresponding sides in the same ratio Your child uses proportional reasoning with: Scale drawings: if 1 cm = 5 km, a 3 cm distance = 15 km Enlarging/reducing shapes while keeping them similar Direct proportion ($y = kx$): doubling x doubles y	'A map scale is 1:50,000. Two towns are 4 cm apart on the map. How far apart are they really?' ($4 \times 50,000 = 200,000 \text{ cm} = 2 \text{ km}$) Look at a house plan or map with a scale — measure and calculate.

Year 10 on next page

Year 10	Consumer mathematics — interest, growth and decay simple interest — earned on the original amount only: $I = P \times r \times t$ (Principal $\times$ rate $\times$ time) compound interest — interest earned on the interest too: $A = P(1 + r)^n$ (grows faster over time) depreciation — a value decreasing over time (car, phone, equipment) Your child compares simple vs compound interest: \$1,000 at 5% simple for 3 years: $I = 1000 \times 0.05 \times 3 = \\150 \$1,000 at 5% compound for 3 years: $A = 1000 \times 1.05^3 \approx \\$1,157.63$. Compound earns \$7.63 more — the difference grows with time. They also solve problems on pay rates, taxation, and budgeting.	'If we put \$500 in a savings account at 3% p.a. for 2 years, how much interest do we earn?' (Simple interest: $500 \times 0.03 \times 2 = \\30) 'The bank offers compound interest. Use a calculator: $500 \times 1.03^2 = ?$' (\$530.45 — compound is better!) Look at a credit card statement. 'What would happen if we only pay the minimum?'
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★ Ratios, Rates & Proportions — quick reference

Ratio	Example	Rate	Example
Part : Part	Girls to boys 2 : 3	km per hour	Car travels at 60 km/h
Part : Whole	Girls in class: 25 out of 40 simplifies to 5:8	\$ per kg	Apples cost \$4.20/kg
Simplified	12:8 = 3:2 (divide both by 4)	Unit rate	Best buy: $\$3.60 \div 400$ = \$0.009 per gram

Key proportion idea: if two ratios are equal, they are in proportion. Example: $1:2 = 3:6$. To solve: "If 3 kg of apples costs \$9, how much do 5 kg cost?" $\rightarrow \$9 \div 3 = \$3/\text{kg} \rightarrow 5 \times \$3 = \$15$.

Percentage change: $\% \text{ change} = \frac{\text{change}}{\text{original}} \times 100$

Increase: multiply by $1 + \text{rate}$ (in decimal form), eg 35% increase multiply by 1.35 (100% + 35%);

Decrease: multiply by $1 - \text{rate}$ (in decimal form) eg 40% decrease multiply by 0.60 (100% - 40%)

Example: 20% increase on \$50 = $50 \times 1.20 = \$60$

10% decrease on \$120 = $120 \times 0.90 = \$108$

Helping at Home — Ratios, Rates & Proportions

Worked examples and questions to ask · Year 7 to Year 10

How it works — worked examples

Year 7 — Dividing a quantity in a ratio

Jake and Mia share prize money of \$120 in the ratio 2:3. How much does each person get?

Total parts	$2 + 3 = 5$ parts
Value of 1 part	$\$120 \div 5 = \24 per part
Jake (2 parts)	$2 \times \$24 = \48 OR $\frac{2}{5} \times \$120 = \48
Mia (3 parts)	$3 \times \$24 = \72 ✓ OR $\frac{3}{5} \times \$120 = \72 (\$48 + \$72 = \$120)

Year 8 — Percentage profit and loss

A phone is bought for \$400 and sold for \$340. Find the percentage loss.

Amount lost	$\$400 - \$340 = \$60$
% loss	$\frac{60}{400} \times 100 = 15\%$
Answer	The phone was sold at a 15% loss.

Year 9 — Proportion/Scale

A model fighter jet is built using a scale of 1:48. If the wing span on the model is 25cm, what is the actual wingspan of the jet in metres?

Proportion	Write the proportion and include any given information; Model Actual 1 : 48 25cm : ?
Think	What do I multiply one by to get 25? The answer is 25
Answer	Wingspan of the actual jet fighter is $48 \times 25 = 1200$ cm or 12m

Year 10 — Compound interest

\$2,000 is invested at 4% per year compound interest for 3 years. What is the final amount?

Year 1	$2000 \times 1.04 = \$2,080.00$
Year 2	$2,080 \times 1.04 = \$2,163.20$
Year 3	$2,163.20 \times 1.04 = \$2,249.73$
Formula	$A = 2000 \times (1.04)^3 = \$2,249.73$

Questions to ask your child

You don't need to solve these. Ask them and let your child explain their thinking!

7 Year 7

- Orange juice is mixed with water in ratio 1:4. For 500 mL, how much OJ do we use?
- Share \$80 between two people in ratio 3:5.

8 Year 8

- A jumper costs \$80. It goes on sale for \$60. What is the percentage discount?
- Your wages increase by 5%. If you earn \$750/week, what's the new amount?
- If you buy for \$50 and sell for \$65, what's the percentage profit?
- Find the original price if a \$90 item is after a 10% increase.
- Which is better value — 500g for \$3.50 or 750g for \$4.80?
- A car travels at 80 km/h. How far does it travel in $2\frac{1}{2}$ hours?

9 Year 9

- A map has scale 1:25,000. Two points are 6 cm apart. How far is that in real life?
- A recipe needs 2 cups of flour for 12 biscuits. How many cups for 30 biscuits?
- Is the relationship 'cost of apples' to 'number of apples' a proportion? Why?
- A photo is 10 cm × 15 cm. It is enlarged with scale factor 3. What are the new dimensions?

10 Year 10

- \$5,000 is invested at 3% compound interest for 4 years. What is the final amount?
- Compare: simple interest of 5% vs compound interest of 5% on \$1,000 over 5 years. Which is better?
- A car depreciates 12% per year. If it costs \$20,000 now, what is it worth after 3 years?
- If you borrow \$10,000 at 8% p.a. compound and don't repay for 5 years, how much do you owe?

Things to try at home

Year 8: Shopping: compare unit prices on different sized packets — which size is the best value?	Year 7: Cooking: if a recipe serves 4 and we need to serve 6, scale up all the ingredients together.
Year 8: Find a sale item. Calculate the original price if the current price is after a 20% discount.	Year 8: Look at a pay slip or mock pay slip. Identify the gross pay, tax, and net pay as percentages.
Year 9: Print a map with a scale. Measure the distance between two places and calculate the real distance.	Year 10: Use a bank's online savings calculator to compare simple and compound interest on a \$1,000 deposit.

Key words to learn together

ratio: a comparison of two quantities by division: 2:3 means 2 parts to every 3 parts	rate: a comparison of two different units: 60 km per hour, \$4.50 per kg
unit rate: a rate with a denominator of 1: \$2.25 per kg, 15 m per second	proportion: a statement that two ratios are equal: 1:2 = 3:6
scale factor: the number you multiply measurements by to enlarge or reduce a shape	similar figures: shapes that are the same shape but different sizes — sides are in proportion
percentage increase: the new value after adding a percentage: multiply original by $(1 + \text{rate})$	percentage decrease: the new value after subtracting a percentage: multiply original by $(1 - \text{rate})$
profit: selling price minus cost price when selling price is higher	loss: cost price minus selling price when selling price is lower
simple interest: interest earned only on the original amount: $I = P \times r \times t$	compound interest: interest earned on the principal AND on previous interest: $A = P(1 + r)^n$
depreciation: a decrease in value over time — e.g. a car losing value each year	GST: Goods and Services Tax — 10% tax added to most Australian prices