



Maths: Year 11F- Topic 4 Overview



Multiplicative Reasoning

Students develop their multiplicative reasoning in a variety of contexts, from simple scale factors through to complex equations involving direct and inverse proportion. They link inverse proportion with the formulae for pressure and density. There is also the opportunity to review ratio problems.

Key questions:

If an object is enlarged, does it always get bigger?

How can you work out the scale factor? Is there more than one method?

When are two shapes similar?

List as many examples as you can of relationships that are in direct proportion to one another.

When is appropriate to use the equation $y = kx$?

How can we work out k ?

If we compare two solids on a table which apply the same force, how can we tell which one will apply a greater pressure?

What is the same and what is different about direct and inverse proportion?

Will it take less time for more people to complete a task?

How can we use the bar model to represent the problem?

What does the bar model(s) tell us about our problem?

How can we find a percentage/fraction of a quantity using a calculator? Without a calculator?

Assessment / Topic Reviews:

1. Use scale factors
2. Understand direct proportion
3. Speed, Distance & Time
4. Calculate with pressure and density
5. Understand inverse proportion
6. Ratio problems

Specialist key terms for this unit:

Enlargement, Scale factor, Multiplier, Similar, Direct Proportion, Equation, Origin, Constant ratio, Straight line, Linear, Density, Mass, Volume, Pressure, Force, Area, Inverse Proportion, Equation, Smooth curve, Constant of proportionality, Proportion, Fraction. Percentage, Bar model, Two-way table, LCM, Varies directly, Varies inversely, Substitute

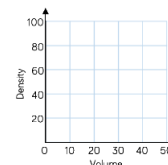
Practise makes perfect

- <https://www.mathsgenie.co.uk/similar-shapes-length.html>
- <https://www.mathsgenie.co.uk/proportion.html>
- <https://www.mathsgenie.co.uk/ratio.html>
- <https://www.mathsgenie.co.uk/speed-and-density.html>

Exemplar Questions

Complete the table.

Mass	Volume	Density
100 kg	1 cm ³	
100 kg	10 cm ³	
100 kg	20 cm ³	
100 kg	50 cm ³	



- What happens to the density of an object as the volume increases?
- Sketch a graph of volume versus density on a copy of the axis shown. What are the key features of the graph? How does this differ from direct proportion?

Suggested enrichment activities:

Which Route is Best?

Three cyclists are travelling 30 km to a sports event.

- Cyclist A travels at 10 km/h
- Cyclist B travels at 12 km/h
- Cyclist C travels at 15 km/h

Tasks:

1. Calculate how long each cyclist will take.
2. Who arrives first?
3. How much earlier do they arrive than the slowest cyclist?
4. If the event starts in 2 hours, which cyclists will arrive on time?

Challenge ★ A fourth cyclist completes the journey in 1.5 hours. What was their average speed?



Maths: Year 11F- Topic 5 Overview



Graphs: Gradients and lines

This unit builds on students' previous learning of **straight-line graphs** and develops their understanding of linear relationships. Students will plot and interpret graphs, explore the meaning of gradients and intercepts, and find equations of lines from graphs, coordinates and gradients. They will also determine whether points lie on a line and use graphical methods to solve simultaneous equations. Throughout the unit, students will strengthen the links between algebra and graphical representations, applying these skills to a range of mathematical problems.

Key questions

What is the equation of the x-axis?

What is the equation of the y-axis?

What is the minimum number of points needed to plot a straight line graph?

In $y = mx + c$, what do m and c represent?

What does it mean when two lines have the same gradient?

What does it mean when two lines have the same y-intercept?

What is the scale on each axis? How does the scale affect the gradient?

How many solutions do a pair of simultaneous equations have?

When two lines are perpendicular, why must one gradient be positive and one be negative?

Assessment / Topic Reviews

1. Parallel lines to the axis $x=a$ and $y=a$
2. Plot straight line graphs
3. Interpret $y=mx + c$
4. Find the equation from a straight line from a graph
5. Find the equation of a straight-line graph given one point and a gradient
6. Find the equation of a straight-line graph given two points
7. Determine whether a point is on a line
8. Solve linear simultaneous equations graphically

Key words

Angle, Adjacent, Vertically opposite, Point, Full turn, Straight line, Parallel, Corresponding, Alternate, Bearing, Co-interior, Polygon, Regular, Interior, Exterior, Equilateral, Isosceles, Right-angle, Trapezium, Vector, Column, Horizontal, Vertical, Position, Triangle, Opposite, Adjacent, Hypotenuse, Ratio, Inverse, Circle, Segment, Circumference, Centre, Right-angle, Cyclic quadrilateral, Radius, Chord, Bisects, Tangent, Length, Equal

Practise makes perfect

<https://www.mathsgenie.co.uk/lineargraphs.html>

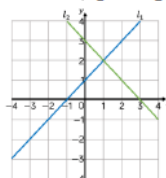
<https://www.mathsgenie.co.uk/gradient-of-a-line.html>

<https://www.mathsgenie.co.uk/equation-of-a-line.html>

<https://www.mathsgenie.co.uk/parallel-and-perpendicular-lines.html>

Exemplar Questions

Two lines, l_1 and l_2 are shown on the graph.



What is the equation of l_1 ?

What is the equation of l_2 ?

What are the coordinates of the point of intersection?

Suggested enrichment activities

House hunting with straight lines

An estate agent charges a fixed fee plus a commission. The total cost can be modelled by the equation:
Cost (£) = 500 + 0.02 × House Price (£)

Tasks:

1. What does the gradient (0.02) represent in this situation?
2. What does the y-intercept (500) represent?
3. Calculate the total cost for a house worth £200,000.
4. Calculate the total cost for a house worth £350,000.

Challenge ★ Another estate agent charges:

Cost (£) = 1000 + 0.015 × House Price (£)

Which estate agent would be cheaper for a £300,000 house?

Thinking Question: Why might a company choose a higher fixed fee but a lower gradient (commission rate)?