Maths: Year 11H - Topic 1 Overview

Delving into Data: Collecting, representing and interpreting data

This block builds on KS3 work on the collection, representation and use of summary statistics to describe data. Much of the content is familiar, both from previous study within and beyond mathematics (including Geography and Science) and from everyday life. The steps have been chosen to balance consolidation of existing knowledge with extending and deepening, particularly in terms of interpretation of results and evaluating and criticising statistical methods and diagrams. For students following Higher tier, there is additional content relating to continuous data including histograms, cumulative frequency diagrams, box plots and associated measures such as quartiles and the interquartile range. Again, the emphasis with these topics should be on interpretation (particularly in making comparisons) and not just construction.

Key questions

- Why do statisticians take sample rather than interview the whole population?
- How can we ensure the stratified samples is random?
- What's the difference between a midpoint and a endpoint?
- Does it matter what order we present the data ina pie chart?
- What do you notice about the scales of the axis/axes?

Assessment / Topic Reviews:

1. Construct histograms - H
2. Interpret histograms - H
3. Find and interpret averages from a list – R
4. Find and interpret averages from a table – R
5. Construct and interpret time series graphs – R
6. Construct and interpret stem-and-leaf diagrams
7. Construct and interpret cumulative frequency diagrams – H
8. Use cumulative frequency diagrams to find measures – H
9. Construct and interpret box plots - H
10. Compare distributions using charts and measures
11. Compare distributions suing complex charts and measures – H
12. Construct and interpret scatter graphs – R
13. Draw and use a line of best fit – R
14. Understand extrapolation

Specialist key terms for this unit

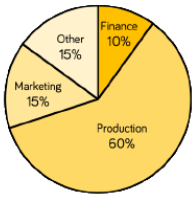
Population, Sample, Representative, Biased, Random, Proportion, Stratified, primary, secondary, source, data, questionnaire, experiment, frequency polygon, midpoint, endpoint, class, interval, table, row, column, total difference, line/bar chart, dual/multiple, composite, angle, sector, radius, subtend, scale, bias, misleading, broken axis, histogram, area, frequency density, class interval, class width, distribution, mean, median, mode, outlier, average, modal class, subtotal, estimate, time series, quarter, trend, steam, leaf, cumulative, polygon, upper/lower quartile, interquartile range, linear, positive/negative correlation, line of best fit, interpolate, extrapolate

Practise makes perfect

https://www.mathsgenie.co.uk/scatter-graphs.php
https://www.mathsgenie.co.uk/bar-charts.php
https://www.mathsgenie.co.uk/pie-charts.php
https://www.mathsgenie.co.uk/mean-tables.php
https://www.mathsgenie.co.uk/frequency-polygons.php
https://www.mathsgenie.co.uk/cumulative.php
https://www.mathsgenie.co.uk/histograms.php

The pie chart shows the percentage of employees of a firm who work for each department.

- What angle represents Production?
- 24 people work in the Marketing department.
  How many work in Production or Other?



Suggested enrichment

Reasoning with data Below resources designed to get you thinking about data handing.

https://nrich.maths.org/reasoning-data-0

Maths: Year 11H- Topic 2 Overview

Trigonometry

In this topic, students will be introduced to trigonometry as a special case of similarity withing right-angled triangles. Emphasis is placed throughout the steps on linking the trig functions to ratios, rather than just functions. This key topic is introduced early in Year 10 to allow regular revisiting e.g. when looking at bearings.
For the Higher tier, calculation with trigonometry is covered now and graphical representation is covered in Year 11.

Key words

Enlarge, Scale factor, Ratio, Corresponding, Constant, Adjacent, Opposite, Hypotenuse, Right-angle, Tangent, Formula, Rearrange, Subject, Subject of a formula, Sine, Cosine, Complement, Angle, Obtuse, Acute, Inverse, $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$, Area, Square, Square Root, Pythagora's Theorem, Similar, Surds, Exact value, Simplifying, Infinity, Approaching, Increasing, Decreasing, Limit

Key questions

Will the ratio remain constant if the given angle gets bigger/smaller? Why/why not?

Why can the same side on a right-angled triangle be labelled the 'opposite' on some occasions, and the 'adjacent' on others?

How do we know which trigonometric ratio to use?

What is an inverse trigonometry function?

In this problem, is it more efficient to use Pythagoras' Theorem or trigonometry? Which has least steps?

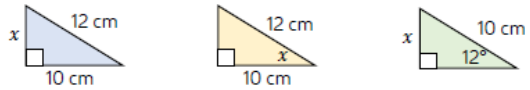
How do we know when to use the sine rule?

How do we know when to use the cosine rule?

How do we know which numbers to substitute into the formula?

Exemplar Questions

Find each value of x.



What's the same and what's different about each question?

Practise makes perfect

https://www.mathsgenie.co.uk/sohcahtoa.html

https://www.mathsgenie.co.uk/pythagoras.html

https://www.mathsgenie.co.uk/3d-pythagoras.html

https://www.mathsgenie.co.uk/sine-rule.html

https://www.mathsgenie.co.uk/cosine-rule.html

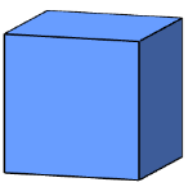
https://www.mathsgenie.co.uk/area-of-any-triangle.html

Assessment / Topic Reviews:

1. Identify and work fluently with the hypotenuse, opposite and adjacent sides.
2. Use sine, cosine and tangent ratios to find missing side lengths
3. Use sine, cosine and tangent ratios to find missing angles
4. Calculate missing sides in right-angled triangles using Pythagoras' Theorem
5. Be able to choose appropriate method to solve right-angled triangle problems
6. Key angles
7. Use trigonometry in 3-D shapes (H)
8. Area of any triangle (H)
9. Use sine rule to find missing lengths and angles (H)
10. Use cosine rule to find missing lengths and angles (H)

Suggested enrichment activities:

1. The distance between centres of two adjacent faces of a cube is 8cm. What is the side length of the cube?
2. I can make an equilateral triangle by cutting off the corner of a cube.
   If the area of the largest equilateral triangle I can create in this way is 140cm², what is the side length of this cube?



Maths: Year 11H- Topic 3 Overview

Circle Theorems

This unit focuses on circle theorems and how they can be used to solve geometrical problems involving angles and shapes. Students will learn and apply all the key circle theorems, while also using Pythagoras' Theorem and trigonometry to find unknown lengths and angles. The unit develops reasoning, problem-solving, and mathematical communication skills.

Key questions

- How can circle theorems help us find angles that cannot be measured directly?
- What patterns and relationships can you spot between angles in a circle?
- How do we know when a particular circle theorem applies?
- Can a problem be solved in more than one way using different circle theorems?
- How are Pythagoras' Theorem and trigonometry connected to circles?
- What mathematical evidence can you use to justify your answer?
- How can we use known facts to solve unfamiliar geometric problems?
- Why do circle theorems always work?
- How can diagrams help us identify the information we need to solve a problem?
- What strategies can you use when you get stuck on a geometry problem?

Assessment / Topic Reviews

1. Circle theorem: Angles at the centre and circumference
2. Circle theorem: Angles in a semicircle
3. Circle theorem: Angles in the same segment
4. Circle theorem: Angles in a cyclic quadrilateral
5. Circle theorem: Angle between radius and chord
6. Circle theorem1: Angle between radius and tangent
7. Circle theorem: Two tangents from a point
8. Circle theorem: Alternate segment theorem
9. Review Pythagoras' theorem and using trig ratios

Specialist key terms for this unit

Circle, circumference, radius, diameter, chord, arc, sector, segment, centre, tangent, point of contact, cyclic quadrilateral, angle at the centre, angle at the circumference, same segment, alternate segment theorem, perpendicular, isosceles triangle, right angle, opposite angles, proof, reasoning, geometric property, Pythagoras' Theorem, hypotenuse, trigonometry, sine (sin), cosine (cos), tangent (tan), length, angle, solve, justify, deduce.

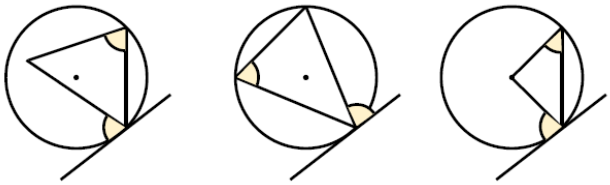
Practise makes perfect

[Circle Theorems - Edexcel GCSE Maths Questions | MathsGenie]

[Proof of the Circle Theorems - Questions | MathsGenie]

Exemplar Questions

In which diagram are the pair of marked angles equal?



Suggested enrichment activities

Designing a circular park

A local council wants to build a new circular park with a circular flower bed in the centre. As a landscape designer, your job is to help plan the layout.

Task:

- Draw a scale diagram of the park.
- Use **circle theorems** to calculate unknown angles needed for pathways and seating areas.
- Use **Pythagoras' Theorem** to find the lengths of paths across sections of the park.
- Use **trigonometry** to calculate distances and angles for features such as viewing points or entrances.
- Justify all calculations using correct mathematical reasoning.