



Year 12 Mathematics – Data Collection

Learning about this topic is important because:

If you are working towards an EPQ alongside your a-levels, the ability to criticise and reflect on the limitations of your own data collection is highly important. Businesses depend highly on learning about their products and consumers. Scientists and researchers in any field need to make sure they are collecting data in a responsible manner to ensure that they obtain accurate results. For example, Meteorologists collect and analyse weather data to help them predict weather patterns. Selecting weather data from specific dates and places is an example of sampling

This builds on: GCSE: Mean, Median and Mode, commenting on questionnaires and using frequency tables etc

This leads to: Measures of Location and Spread Y12

We will learn:

- Understand 'population', 'sample' and 'census', and comment on the advantages and disadvantages of each
- Understand the advantages and disadvantages of simple random sampling, systematic sampling, stratified sampling, quota sampling and opportunity sampling
- Define qualitative, quantitative discrete and continuous data, and understand grouped data
- Understand the large data set

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Sample, population, census, sampling units, sampling frame, systematic sampling, stratified sampling, quota sampling, opportunity sampling, quantitative, qualitative, data, continuous, discrete, class interval, large data set

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Data Collection



West Kirby
Grammar School

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.	



Year 12 Mathematics – Measures of Location and Spread

Learning about this topic is important because:

Wildlife biologists use statistics such as mean wingspan and standard deviation to compare populations of endangered birds in different habitats.

This builds on: Data Collection: Types of variable, discrete and continuous data, GCSE: Finding mean, median, mode and range from frequency tables

This leads to: Probability Y12, Representations of Data Y12

We will learn:

- Calculate measures of central tendency such as the mean, median and mode
- Calculate measures of location such as percentiles and deciles
- Calculate measures of spread such as range, interquartile range and interpercentile range
- Calculate variance and standard deviation
- Understand and use coding

We will develop/practise skills including:

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- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Mode, modal class, median, mean, lower quartile, upper quartile, range, interquartile range, interpercentile range, variance, standard deviation, coded data

You could learn more about this topic by:

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Year 12 Mathematics – Measures of Location and Spread



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Year 12 Mathematics – Representations of Data

Learning about this topic is important because:

Visual representations can help to illustrate the key features of a data set without the need for complicated calculations. Graphs and charts appear all the time in newspapers and magazines, often stylised to suit the nature of the article.

This builds on: GCSE: Bar charts, pie charts, Measures of Location and Spread: Interquartile range, mean and standard deviation

This leads to: Correlation Y12

We will learn:

- Identify outliers in data sets
- Draw and interpret boxplots
- Draw and interpret cumulative frequency diagrams
- Draw and interpret histograms
- Compare two data sets

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Outlier, anomalies, cleaning data, histogram, frequency density, frequency polygon, measure of location, measure of spread

You could learn more about this topic by:

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Year 12 Mathematics – Representations of Data



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Year 12 Mathematics – Correlation

Learning about this topic is important because:

Climate scientists have demonstrated a strong correlation between greenhouse gas emissions and rising atmospheric temperatures.

This builds on: GCSE: Scatter diagrams, Straight line graphs

This leads to: Regression, Correlation and Hypothesis Testing Y13

We will learn:

- Draw and interpret scatter diagrams for bivariate data
- Interpret correlation and understand that it does not imply causation
- Interpret the coefficients of a regression line equation for bivariate data
- Understand when you can use a regression line to make predictions

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Bivariate data, Correlation, Causation, Regression Line, Prediction

You could learn more about this topic by:

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Year 12 Mathematics – Correlation



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Year 12 Mathematics – Probability

Learning about this topic is important because:

Sports teams use past performance to estimate probabilities and strategies. In softball and baseball, a player's batting average is an estimate of the probability that they will make a hit. The outcome of one event can affect the probability for another event. If a football team scores a goal, the probability that they will win the match will increase.

This builds on: GCSE: Probability, sample space diagrams, independent events etc

This leads to: Statistical Distributions Y12

We will learn:

- Calculate probabilities for single events
- Draw and interpret Venn Diagrams
- Understand mutually exclusive and independent events, and determine whether two events are independent
- Use and understand tree diagrams
- Understand set notation in probability
- Understand conditional probability
- Solve conditional probability problems using two-way tables and Venn diagrams

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Venn Diagram, Mutually exclusive events, Independent events, Tree diagram, Intersection, Union, Complement, Set Notation

You could learn more about this topic by:

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Year 12 Mathematics – Probability



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Year 12 Mathematics – Statistical Distributions



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Learning about this topic is important because:

You can use probability to model real-life events. If an archer fires a set of arrows at a target, the number of bullseyes can be modelled using a binomial distribution.

This builds on: Probability: Independent events, calculating probabilities

This leads to: Hypothesis Testing Y12

We will learn:

- Understand and use simple discrete probability distributions including the discrete uniform distribution
- Understand the binomial distribution as a model and comment on appropriateness
- Calculate individual probabilities for the binomial distribution
- Calculate cumulative probabilities for the binomial distribution

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Probability distribution, sample space, binomial distribution, trials, outcomes, success, failure, independent, random variable

You could learn more about this topic by:

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Year 12 Mathematics – Statistical Distributions



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Year 12 Mathematics – Hypothesis Testing

Learning about this topic is important because:

Polling organisations use small samples to make inferences about a population. Hypothesis testing can help them assess the accuracy of their predictions.

This builds on: Statistical Distributions: Binomial Distribution, modelling assumptions

This leads to: Further Hypothesis Testing in Y13 Statistics (e.g. Normal Distribution)

We will learn:

- Understand the language and concept of hypothesis testing
- Understand that a sample is used to make an inference about a population
- Find critical values of a binomial distribution using tables
- Carry out a one-tailed test for the proportion of the binomial distribution and interpret the results
- Carry out a two-tailed test for the proportion of the binomial distribution and interpret the results

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Null hypothesis, Alternative hypothesis, one-tailed, two-tailed, critical region, test statistic, significance level, actual significance level

You could learn more about this topic by:

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Year 12 Mathematics – Hypothesis Testing



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Year 12 Mathematics – Modelling in Mechanics



West Kirby
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Learning about this topic is important because:

Mathematical models can be used to find solutions to real-world problems in many everyday situations. If you model a firework as a particle you can ignore the effects of wind and air resistance.

This builds on: GCSE: Solving quadratic equations, trigonometry, compound units, standard form

This leads to: Constant Acceleration Y12, Underpins all KS5 Mechanics

We will learn:

- Understand how the concept of a mathematical model applies to mechanics
- Understand and be able to apply some of the common assumptions used in mechanical models
- Know SI units for quantities and derived quantities used in mechanics
- Know the difference between a scalar and vector quantities

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Particle, Rod, Lamina, Uniform body, Light object, Inextensible string, Smooth surface, Rough surface, Wire, Smooth and light pulley, Bead, Peg, Air Resistance, Gravity, Centre of Mass, Weight, Normal reaction, Friction, Tension, Compression, Thrust/compression, Buoyancy, Vector, Magnitude, Direction, Scalar, Distance, Speed, Time, Mass, Displacement, Velocity, SI units

You could learn more about this topic by:

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Year 12 Mathematics – Modelling in Mechanics



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Year 12 Mathematics – Constant Acceleration



West Kirby
Grammar School

Learning about this topic is important because:

A body falling freely under gravity can be modelled as having constant acceleration. You can use this to estimate the time it will take a cliff diver to reach the water.

This builds on: GCSE: Finding areas under straight lines, finding gradient of lines, Speed, Solving simultaneous equations

This leads to: Forces and Motion (Problems involving forces and application of $F = ma$)

We will learn:

- Understand and interpret displacement-time graphs
- Understand and interpret velocity-time graphs
- Derive the constant acceleration formulae and use them to solve problems
- Use the constant acceleration formulae to solve problems involving vertical motion under gravity

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Rate of Change, Gradient, Displacement-time graph, Acceleration, Velocity, Velocity-time graph, gravity, direction

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Year 12 Mathematics – Forces and Motion



West Kirby
Grammar School

Learning about this topic is important because:

The weight of an air-sea rescue crew man is balanced by the tension

This builds on: Modelling in Mechanics: Vector addition, GCSE: Trigonometry, Constant Acceleration

This leads to: Moments Y13, Forces and Friction Y13

We will learn:

- Draw force diagrams and calculate resultant forces
- Understand and use Newton's first law
- Calculate resultant forces by adding vectors
- Understand and use Newton's second law, $F = ma$
- Apply Newton's second law to vector forces and acceleration
- Understand and use Newton's third law
- Solve problems involving connected particles

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Newton's first law, Resultant, Direction, Newton's second law, Weight, Equation of Motion ($F = ma$), Newton's third law,

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Year 12 Mathematics – Forces and Motion



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Year 12 Mathematics – Variable Acceleration



West Kirby
Grammar School

Learning about this topic is important because:

Space rocket experiences variable acceleration during launch. The rate of change of velocity increases to enable the rocket to escape the gravitational pull of the Earth.

This builds on: Differentiation, Integration

This leads to: Further Kinematics Y13,

We will learn:

- Understand that displacement, velocity and acceleration may be given as functions of time
- Use differentiation to solve kinematics problems
- Use calculus to solve problems involving maxima and minima
- Use integration to solve kinematics problems
- Use calculus to derive constant acceleration formulae

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Displacement, Velocity, Acceleration, Differentiate, Integrate, Maxima, Minima

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Year 12 Mathematics – Variable Acceleration



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