Quantitative Reasoning (MEI) – Resources

Component 01 - Introduction to Quantitative Reasoning- CONTENT

USE OF TECHNOLOGY
Spreadsheets

	Content	Notes	Resources
q2	Be able to read information from a standard spreadsheet.		Integral Resources - OCR (MEI) Level 3 IQR: Reference: Spreadsheets 1 – formulae Reference: Spreadsheets 2 – graphs MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics for business and science: Student loans 1 Student loans 2 External Resources: Finding Averages Using Excel Using Excel For Simple Data Analysis Exponential growth Compound interest How Much Does It Cost to be Cool?
q3	Be able to enter formulae and data into a spreadsheet, knowing that a standard spreadsheet formula starts with =.	Formulae based on the 4 rules of arithmetic and other standard functions required by the rest of this specification, e.g. to the power of, square root. e.g. =B2*(C2+D2) =C3^4 =SQRT(A10)	
q4	Be able to interpret simple formulae on a spreadsheet given in terms of cell references.	Examples include money, number patterns and simple sequences. e.g. =AVERAGE(A1:A9)	
q5	Be able to copy a formula and to ensure that only the required cell addresses increment.	e.g. $A1, A1, A$1	
q6	Be able to use a spreadsheet to find a numerical solution of an equation.	Equations in one variable, involving powers and/or roots using trial and improvement.	
q7	Be able to use a spreadsheet to draw graphs and standard statistical diagrams and interpret graphs produced on spreadsheets.	Including awareness of when graphs produced by a spreadsheet are misleading or incorrect.	

MODELLING
The modelling cycle

	Content	Notes	Resources
p1	Be able to identify simplifying assumptions that allow a situation to be modelled.		Integral Resources - OCR (MEI) Level 3 IQR: [Representing the real world mathematically 3: Modelling](#)
p2	Be able to develop or choose a simple mathematical model for a real-world situation.	Model in words, numerically, algebraically, diagrammatically or in a spreadsheet.	MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of business and finance: [Statistical modelling](#)
p3	Be able to use a model to make predictions or get information about a situation.	For example, use a simple demand curve (e.g. a linear model) to predict the change in revenue following a given change in price.	
p4	Be able to compare the outcomes from a model with actual data, information, experience or common sense and comment on the appropriateness of the model.	For example, compare an exponential growth model with actual population figures. The information may be given in diagrammatic or graphical form.	External Resources: [Malthus](#) [Modelling With Spreadsheets - Planning a Festival](#) [Mathematics Assessment Project](#)
p5	Be able to appraise the assumptions underlying a model critically.		
p6	Understand that a simple model can give useful answers but may need to be improved.	Includes comparing outcomes from two models.	
p7	Be able to communicate mathematical results clearly and effectively.	Including to a person or audience unfamiliar with the underlying mathematics.	

MODELLING
Estimation

	Content	Notes	Resources
e1	Be able to make a rough estimate of a quantity from available information.	This includes financial estimates such as conversion from a foreign currency to pounds without a calculator.	Integral Resources - OCR (MEI) Level 3 IQR: Roughly Speaking
e2	Be able to use estimates when checking calculations.		External Resources: Estimation of population size based on a sample
e3	Be able to make and justify upper and lower bounds for a calculation.	Includes selecting and/or justifying an appropriate level of accuracy for an answer to a calculation. Maximum, minimum, upper bound, lower bound	Estimation of height from step length MathsIsFun Introduction to confidence intervals Mathematics Assessment Project
e4	Be able to interpret and present error bounds or tolerances on diagrams and in writing, understanding that different levels of tolerance are appropriate in different situations.	Error bounds may be required in percentage form.	

MODELLING
Algebra

	Content	Notes	Resources
a1	Be able to represent a situation mathematically using a formula or equation.	Using both traditional algebra and spreadsheet notation.	Integral Resources - OCR (MEI) Level 3 IQR: [Representing the real world mathematically 1: Algebra](#)
a2	Be able to substitute values into a formula given in symbols, words or as a flow chart.	Formulae will be confined to the following cases (or simple combinations of these): •polynomials •simple rational expressions •exponential growth and decay •trigonometric functions (sin and cos).	External Resources: [Improving learning in mathematics: mostly algebra](#) [Formulas used in nursing calculations](#) [Mathematics Assessment Project](#)
a3	Be able to solve equations and change the subject of a formula.	In simple cases using the four operations, powers and roots. Solve more complex equations using trial and improvement or a graphical method.	

MODELLING
Geometry & measures

	Content	Notes	Resources
m1	Be able to recognise and use relationships between lengths, areas, weights and volumes of similar figures to model real-world situations.		Integral Resources - OCR (MEI) Level 3 IQR: Measures and scaling 1: 2D and 3D shapes
m2	Be able to work with time, length, area and volume to meet given regulations.	e.g. In the context of meeting health and safety requirements. Regulations to be met will be given to learners.	MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of chemistry: Concentrations The mathematics of biology: The microscope
m3	Be able to work with commonly used units and know that quantities being compared should have the same units; this includes compound units.	e.g. Units of time, speed. e.g. Units of speed are units of distance divided by units of time. e.g. Understanding that the units of quantities arise from the way they are calculated. Where appropriate, conversion factors between metric and imperial units will be given.	External Resources: Nuffield: Costing the Job Nuffield: Points of View
m4	Be able to interpret diagrams, maps and scale drawings and be able to use them in problem solving.		MAP: Developing a Sense of Scale MAP: A Golden Crown MAP: Developing a Sense of Scale
m5	Be able to work with representations of 3-D objects in 2-D.	Representations include plans and elevations, sketches and isometric drawings.	Mathematics Assessment Project
m6	Understand the terms displacement, distance, velocity, speed and acceleration; perform associated calculations.	Displacement as directed distance from a starting point; velocity as directed speed.	

MODELLING
Number

	Content	Notes	Resources
n1	Be able to use ratio and proportionality in realistic contexts.		

STATISTICS
The statistics cycle

	Content	Notes	Resources
s1	Be able to decide what data need to be collected in order to answer a question requiring statistical evidence.		Integral Resources - OCR (MEI) Level 3 IQR: Statistics 1: Introduction & collecting data Statistics 4: Bringing it all together
s2	Be able to use a suitable method for collecting data, taking ethical considerations into account, and judge whether data are of sufficient quality.	The data may be primary or secondary, and may be read off a graph or diagram.	MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of business and finance: Statistical modelling
s3	Be able to process and present the data and so provide an answer to the original question.		External Resources: 200 countries, 200 years, 4 minutes KS4 statistics statements: true or false Relevant and engaging stats: teaching through statistical investigations
s4	Be able to interpret the answer to the question and decide whether it is realistic.		Getting To School Sample Handling Data Unit

STATISTICS
Data

	Content	Notes	Resources
s5	Understand and use the language describing types of data.	Primary, secondary; categorical, numerical; continuous, discrete.	Integral Resources - OCR (MEI) Level 3 IQR: Statistics 1: Introduction & collecting data
s6	Be able to recognise values in primary or secondary data which are unlikely to be accurate.		External Resources: 200 countries, 200 years, 4 minutes
s7	Be able to read information from a table and to construct a table to present information.	Includes grouping data using suitable class intervals.	Relevant and engaging stats: using spreadsheets
s8	Understand the meaning of the terms sample and population.	The idea of random sampling.	KS4 statistics statements: true or false Ugly data visualisation
s9	Be able to interpret sample data in terms of possible properties of the parent population.	e.g. Sample mean as an estimate of population mean.	Census at School: graph it!
s10	Understand about the variability of data and be able to describe the main features of a distribution.	Includes understanding that the average from a sample will generally be different from the population average. The main features include the central tendency (average) and spread.	Relevant and engaging stats: teaching through statistical investigations Data types resources

STATISTICS
Statistical diagrams and measures

	Content	Notes	Resources
s11	Be able to use and interpret statistical diagrams appropriate to a variety of types of data.	Diagrams include: box and whisker plots, dot plots, scatter diagrams, bar charts, pie charts, histograms, frequency charts, cumulative frequency diagrams. Learners may be asked to complete these diagrams in the examination. A frequency chart resembles a histogram with equal width bars but its vertical axis is frequency. A dot plot is similar to a bar chart but with stacks of dots in lines to represent frequency.	Integral Resources - OCR (MEI) Level 3 IQR: Statistics 2: Statistical techniques External Resources: 200 countries, 200 years, 4 minutes Standards Unit S4 Understanding mean, median, mode and range Standards Unit S5 Interpreting bar charts, pie charts, box and whisker plots
s12	Be able to identify when a statistical diagram is misleading and explain how it could be improved.	e.g. Improvement by clearer labelling or a better scale.	Standards Unit S6 Interpreting frequency graphs, cumulative frequency graphs, box and whisker plots
s13	Be able to identify skewness from a histogram, frequency chart or box and whisker plot.	In appropriate contexts. Positive and negative skewness.	Relevant and engaging stats: teaching through statistical investigations
s14	Be able to interpret a scatter diagram for bivariate data, draw a line of best fit by eye when it is appropriate to do so and understand that extrapolation might not be justified.	Including the terms association, correlation, line of best fit.	Graphing U.S. Presidential Elections How Safe Is My Town?

MEI Innovators in Mathematics Education

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STATISTICS
Statistical diagrams and measures

	Content	Notes	Resources
s15	Be able to select and calculate appropriate measures of central tendency and to interpret them.	Mean, median, mode. Includes grouped data and calculation or estimation for data in a statistical diagram.	Integral Resources - OCR (MEI) Level 3 IQR: Statistics 2: Statistical techniques

External Resources: Fundamentals of Statistics 1: Basic Concepts Tutorial

200 countries, 200 years, 4 minutes |
| s16 | Be able to use appropriate measures of spread and to interpret them. | Calculate range, inter-quartile range, semi inter-quartile range. Includes grouped data and calculation or estimation for data in a statistical diagram.

Know that standard deviation is a measure of spread. | Standards Unit S4 Understanding mean, median, mode and range

Relevant and engaging stats: using spreadsheets |
| | Be able to calculate a weighted mean and recognise when it is appropriate to do so. | | KS4 statistics statements: true or false

Ugly data visualisation

Census at School: graph it!
Relevant and engaging stats: teaching through statistical investigations
To Invest or Not to Invest
The Standard Deviation Tutorial |

STATISTICS
The Normal distribution

	Content	Notes	Resources
s18	Know that the Normal distribution is a model which can be used for real data and recognise a Normal curve.	Know that the distribution is symmetrical about the mean for the population but understand that histograms for samples will usually not be exactly symmetrical.	Integral Resources - OCR (MEI) Level 3 IQR: Statistics 3: The Normal distribution

MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of business and finance: Modelling the market (part 1)

External Resources: Fundamentals of Statistics 2: The Normal Distribution Tutorial

Census at School: Is our height Normal?

Census at School Data Tool |
s19	Know that, for a Normal distribution, values more than three standard deviations from the mean are very unusual; know that approximately 95% of the data lie within two standard deviations of the mean and that 68% (just over two thirds) lie within one standard deviation of the mean.	Learners may be asked to estimate mean and standard deviation from a Normal curve.	
s20	Be able to use mean and standard deviation to calculate a z-score and use z-scores for comparison or quality control.	Includes interpreting z-score as number of standard deviations away from the mean.	
s21	Be able to interpret a Normal probability plot from statistical software.	A straight line indicates a Normal distribution.	

FINANCE
The financial cycle

	Content	Notes	Resources
f1	Be able to decide what information is needed to address a financial situation.		Integral Resources - OCR (MEI) Level 3 IQR: [Financial problem solving 3: Costing and problem solving](#)
f2	Know how to obtain the necessary information.	The information may be presented in a graph or diagram.	MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of business and finance: [Student loans (part 1)](#) [Student loans (part 2)](#) [Modelling the market (part 0)](#)
f3	Be able to process the information to provide one or more possible solutions.		External Resources: [To Invest or Not to Invest](#)
f4	Be able to decide which, if any, of the solutions are appropriate.		

FINANCE
Percentages

	Content	Notes	Resources
f5	Be able to do calculations involving percentages in context; the use of an index number to compare a number or value to that in a base year.	Contexts include those outside finance. Examples of financial contexts include VAT, inflation and compound interest for savings or loans. Expected calculations include forward and reverse percentage increase and decrease, repeated and combined percentage change and finding a percentage change.	Integral Resources - OCR (MEI) Level 3 IQR: Financial problem solving 1: Working with percentages MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of business and finance: Compound interest Inflation The mathematics of economics: Real terms
f6	Know how to use percentages to work with appreciation or depreciation.	Including comparison of an annual percentage depreciation (or appreciation) model with actual values over time.	External Resources: Standards Unit N7 Using percentages to increase quantities MyMoneyWeek Forsooth
f7	Be able to work out an average annual percentage growth (or reduction) rate for a given change over a period.	Contexts include those outside finance.	Car depreciation from what car? BBC inflation tracker World Bank inflation rates

FINANCE
Foreign exchange

	Content	Notes	Resources
f8	Be able to use foreign exchange rate information to make calculations, including calculations for currency exchange with commission or a fee.	In the UK, "sell at 1.54, buy at 1.69" means that when converting from pounds to the currency, a customer gets 1.54 of the currency for £1, but when changing the currency to pounds, 1.69 of the currency is needed for £1.	Integral Resources - OCR (MEI) Level 3 IQR: Financial problem solving 2: Foreign exchange External Resources: Compare currency exchange rates
f9	Be able to decide which foreign exchange rate is most advantageous for a particular exchange without doing the calculations.	Deciding and justifying which exchange rate is most advantageous to the customer.	

FINANCE
Costing

	Content	Notes	Resources
f10	Be able to work out the regular outgoing cost for a financial decision.	Examples include the monthly cost of buying and running a car or renting and running a home.	Integral Resources - OCR (MEI) Level 3 IQR: [Financial problem solving 3: Costing and problem solving](#)
f11	Be able to find relevant information from tables.		
f12	Be able to use a spreadsheet to cost a project or business proposal, recognising that some costs are more predictable than others over time.	Learners may be asked to monitor whether a budget is being followed over time, and to calculate projected costs from the budget.	MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of business and finance: [Inflation](#)
f13	Be able to use a demand curve as a model for the relationship between price and demand.		
f14	Understand and use the language of finance.	Words such as income, expenditure, budget, profit, loss, investment, tax, revenue, inflation, APR and AER.	

WORKING WITH EXPONENTIALS
Standard form

	Content	Notes	Resources
I1	Be able to interpret large or small numbers in standard form, including the use of a spreadsheet or calculator.	Standard form is sometimes called scientific notation.	Integral Resources - OCR (MEI) Level 3 IQR: Working with exponentials 1: Standard form MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of chemistry: Moles External Resources: Improving learning in mathematics: estimating length using standard form
I2	Be able to calculate with numbers in standard form.	e.g. Contexts such as astronomy, wavelengths, atoms or cells.	

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WORKING WITH EXPONENTIALS
Exponentials

	Content	Notes	Resources
I3	Be able to explore exponential growth and decay, including interpreting output from a spreadsheet.	Contexts include borrowing and saving money, bacterial growth and radioactive decay.	Integral Resources - OCR (MEI) Level 3 IQR: [Working with exponentials 2: Exponential growth and decay](#) MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of biology: [Exponential growth](#) The mathematics of business and finance: [Compound interest](#) External Resources: [Phet radioactive dating game](#) [World income distribution](#) [Population Explosion Using an Exponential Function](#)
I4	Be able to represent and interpret exponential growth or decay in a graph.	Learners may be asked to plot or sketch exponential graphs.	
I5	Be able to solve equations of the forms $x^5 = 35$ and $1.05^x = 8.2$.	Trial and improvement for equations of form $1.05^x = 8.2$.	

WORKING WITH EXPONENTIALS
Logarithmic scales

	Content	Notes	Resources
I6	Be able to use and interpret a logarithmic scale on a graph.	Learners should know that the value equidistant between *a* and *b* on a linear scale is the arithmetic mean but for a logarithmic scale it is the geometric mean .	Integral Resources - OCR (MEI) Level 3 IQR: Working with exponentials 3: Logarithmic scales MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of biology: Exponential growth The mathematics of chemistry: pH External Resources: Gapminder world World income distribution

WORKING WITH GRAPHS AND GRADIENTS
Graphs

	Content	Notes	Resources
g1	Know that the independent variable is plotted on the horizontal axis of a graph.		Integral Resources - OCR (MEI) Level 3 IQR: [Representing the real world mathematically 2: Graphs and gradients](#)
g2	Be able to construct a table of values for a graph from a simple formula and use it to plot the graph.	Includes trigonometric graphs (sin and cos) for angles in degrees.	MEI Free Resources – Integrating Mathematical Problem Solving: The mathematics of economics: [Real terms](#)
g3	Be able to use a graph to construct a table of values.		
g4	Be able to work with graphs drawn from a variety of contexts.	Includes graphs representing motion along a straight line, time series graphs, step graphs, periodic graphs, graphs of exponential growth and decay and piecewise graphs.	External Resources: [Improving learning in mathematics: mostly algebra](#) [The moving man](#)
g5	Recognise graphs of direct and inverse proportion.		
g6	Be able to linearise the graph of a relationship where the dependent variable is directly proportional to some function of the independent variable.	e.g. Plot y against to investigate a relationship of the form .	
g7	Understand the relationship between a straight line graph and the formula connecting the variables graphed.		

WORKING WITH GRAPHS AND GRADIENTS
Gradients

	Content	Notes	Resources
g8	Be able to find the gradient of a straight line graph and interpret it in context, taking account of the scales on the axes and using appropriate units.	Includes finding units for the gradient from units on the axes.	Integral Resources - OCR (MEI) Level 3 IQR: [Representing the real world mathematically 2: Graphs and gradients](#) External Resources: [Improving learning in mathematics: mostly algebra](#) [The moving man](#)
g9	Be able to estimate the gradient of a curve at a point by drawing a tangent and interpret it as a rate of change.	Includes e.g. kinematics graphs and growth curves.	

RISK
Probability

	Content	Notes	Resources
u1	Be able to identify relevant equally likely outcomes in appropriate contexts.	Includes understanding when outcomes are not equally likely.	Integral Resources - OCR (MEI) Level 3 IQR: Probability and risk 2: Probability Probability and risk 3: Probability trees External Resources: Gerd Gigerenzer on risk Screening tests from Understanding Uncertainty
u2	Be able to count equally likely outcomes in appropriate contexts and hence estimate a probability.	Includes listing and use of tree diagrams to find number of outcomes.	
u3	Be able to estimate probability from long-run relative frequency.		
u4	Be able to interpret two-way tables and use them to calculate or estimate probability.		
u5	Understand the difference between dependent and independent events and be able to calculate probability in simple cases.	Contexts include games of chance and risk of suffering from diseases.	
u6	Be able to work with a tree diagram when calculating or estimating a probability, including conditional probability.	Learners can choose to work with either frequencies or probabilities in tree diagrams.	

RISK
Risk

	Content	Notes	Resources
u7	Understand risk given as a probability or as 1 in *n* or as a description such as "once in *n* years".	Includes moving between these forms.	Integral Resources - OCR (MEI) Level 3 IQR: [Probability and risk 1: Risk](#) External Resources: [2845 ways of spinning risk](#)
u8	Be able to interpret a risk assessment, understanding that it involves measures of both likelihood and impact.		[Paling perspective scale: a logarithmic scale for risk](#) [How risky is life?](#)

Component 02 - Critical Maths - CONTENT

PROBLEM SOLVING
Strategies; Communicating solutions to problems

	Content	Notes	Resources
p1	Be able to decide what information is needed to address a problem.		Integral Resources - OCR (MEI) Level 3 CM: Product prices Business and risk Making estimates with limited data. Voting and decision making systems
p2	Be able to make, and justify, simplifying assumptions in order to solve a problem.		
p3	Be able to recognise when a problem is similar to one which has already been solved.	Learners may be asked to give examples related to problems which they have solved during the course.	External Resources: Fermi questions Boomerangs Taxi fares Buying Cars Estimations and Approximations: The Money Munchers Modeling: Having Kittens Counting Trees Solving Real-Life Problems: Baseball Jerseys Optimizing: Security Cameras Sharing Costs: Travelling to School Louis ice cream stall Chapter 1 of Commonsense Mathematics Teaching Quantitative Reasoning with the News
p4	Evaluate different strategies for problem solving.		
p5	Be able to compare two quantities by reasoning, without working out the value of either.	Contexts include finance, area, volume, speed, probability.	
p6	Be able to use data to make and justify a decision.	e.g. Contexts include using data to produce a rank order.	
p7	Be able to communicate the solution to someone who understands the problem.		
p8	Be able to interpret the solution to a problem effectively in terms of the original problem.		

PROBLEM SOLVING
Reflecting on solutions to problems

	Content	Notes	Resources
p9	Be able to identify and comment on possible sources of bias or error when solving a problem.		Integral Resources - OCR (MEI) Level 3 CM: [Making estimates with limited data](#) [Guessing the answers](#) [Regression to the mean](#) [Scams](#) External Resources: [Estimations and Approximations: The Money Munchers](#) [Modeling: Having Kittens](#) [Counting Trees](#) [Solving Real-Life Problems: Baseball Jerseys](#) [Optimizing: Security Cameras](#) [Sharing Costs: Travelling to School](#) [Chapter 1 of Commonsense Mathematics](#) [Teaching Quantitative Reasoning with the News](#)
p10	Be able to evaluate critically information in public statements such as news reports and political comments.	e.g. Proportions and percentages.	
p11	Be able to evaluate a decision by referring to data.		
p12	Recognise that a "good enough" solution to a problem can save time and money compared to a more accurate solution.		
p13	Be able to criticise or refine a proposed solution to a problem.		
p14	Be able to use numerical values to decide whether a general statement is realistic.	Includes the consideration of extreme values.	

SOURCES OF INFORMATION
Quantitative understanding of the world

	Content	Notes	Resources
e1	Be able to make reasonable estimate of quantities typically encountered in everyday life.	Quantities such as the following: • lengths, areas, volumes • estimates of adult height, weight and other body measurements • the time an adult would take to perform an everyday task.	Integral Resources - OCR (MEI) Level 3 CM: Making estimates with limited data. Fermi estimates External Resources: Modeling: Making Matchsticks Estimating: Counting Trees Designing: Candy Cartons Finding Shortest Routes: The Schoolyard Problem Optimizing: Packing It In Estimating and Sampling: Jellybeans Chapter 1 of Commonsense Mathematics Teaching Quantitative Reasoning with the News
e2	Know the rough size of the population of a large UK city, the UK and the world.	About a million, about 65 million, 7 billion respectively.	
e3	Know the rough size and seating capacity of common means of transport such as cars, buses, trains, and know typical speed limits on UK roads.	Speed limits in miles per hour.	

SOURCES OF INFORMATION
Fermi estimation; Probability estimation

	Content	Notes	Resources
e4	Be able to calculate an estimate with limited information (a Fermi estimate) using quantitative understanding of the world.	e.g. Estimate how many dentists there are in Birmingham. Assumptions and reasoning should be communicated clearly.	Integral Resources - OCR (MEI) Level 3 CM: Business and risk Making estimates with limited data. Fermi estimates Scams Making decisions involving risk External Resources: Mathematics Assessment Project Louis ice cream stall Chapter 1 of Commonsense Mathematics Fermi Questions Library
e5	Recognise when the order of magnitude of an answer is reasonable.		
e6	Be able to estimate the probability of an event.	e.g. What is the probability that a person you meet in Birmingham is a dentist?	
e7	Understand expected number as the average number of occurrences in the long run.	Includes being able to estimate expected return from a game or investment.	

MATHEMATICAL AND STATISTICAL TECHNIQUES AND KNOWLEDGE
Fallacies in statistics and probability

	Content	Notes	Resources
s1	Understand that an event with small probability is not surprising in a sufficiently large population.		Integral Resources - OCR (MEI) Level 3 CM: Is this a valid argument Regression to the mean Scams Making decisions involving risk
s2	Recognise common examples of incorrect reasoning in probability and be able to explain the errors.	Recognise and explain the following: • the prosecutor's fallacy and the defendant's fallacy • the gambler's fallacy.	External Resources: The Standard Deviation Tutorial Making Sense of Probability: Fallacies, Myths and Puzzles Did the Prosecutor get it right? Did the Defendant get it right? Amanda Knox and bad maths in court The Gambler's Fallacy Goalkeepers 'gambler's fallacy' impacts penalty shoot-outs
s3	Recognise and explain when statistical diagrams are misleading and when statistical summary measures are being misinterpreted.		Spurious correlations Interpreting Statistics: A Case of Muddying the Waters Regression towards the mean or why was terminator 3 such a disappointment
s4	Understand that neither correlation nor association implies causation.	Including being able to suggest possible alternative explanations.	Discover Heredity Article BBC story on sacking football managers Research on when should you sack your manager?
s5	Recognise situations where regression to the mean might occur.	e.g. The children of tall parents are, on average, shorter than their parents and vice versa.	

MATHEMATICAL AND STATISTICAL TECHNIQUES AND KNOWLEDGE
Statistical experiments

	Content	Notes	Resources
s6	Know what randomised controlled trials are and understand their importance in trying to establish causation.		Integral Resources - OCR (MEI) Level 3 CM: Randomised Controlled Trials Guessing the answers How convincing is the information?
s7	Understand the concepts and importance of "blind" and "double blind" in statistical trials.		External Resources: Interpreting Statistics: A Case of Muddying the Waters Testing a New Product
s8	Know that, for large samples of a fixed size, sums of independent observations are distributed approximately Normally.	e.g. The distribution of the number of successes in 100 Bernouilli trials. e.g. The distribution of the total score obtained when 50 dice are thrown.	Video and PPt introduction to clinical trials Randomise me What Does Random Look Like? Capture recapture
s9	Know that, for an experiment which can be modelled by the toss of a fair coin, for *n* repetitions of the experiment, on average occurrences will happen and that the standard deviation is .	Learners should recognise when this is an appropriate model and be able to use it to decide what kinds of results are unusual in the context.	Opening scene of Rosencrantz and Guildenstern are dead Binomial distribution applet Distribution maker: Data matching
s10	Understand that proportions from small samples are more variable than those from large samples.		

MATHEMATICAL AND STATISTICAL TECHNIQUES AND KNOWLEDGE
Understanding conditional probability in context
Working with percentages

	Content	Notes	Resources
u1	Know that a conditional probability of event A given event B is different from the conditional probability of event B given event A in relevant contexts.	Questions will be asked in words in context. e.g. Recognising that the probability of testing positive for a disease given that the patient has the disease may not be the same as the probability of the patient having the disease given that he/she tests positive.	Integral Resources - OCR (MEI) Level 3 CM: Medical screening Percentage use and abuse External Resources: Medical Testing Modeling Conditional Probabilities 1: Lucky Dip Modeling Conditional Probabilities 2 Who is cheating? Conditional probability is important to all students Forsooth Percentages in context Simpson's paradox
u2	Interpret statements about population proportions in terms of probability and use them to make further deductions.		
n1	Learners should have a correct and critical understanding of the use of percentages including use of percentage change in a probability.	e.g. The risk of an adverse event increases from 1% to 2%. This might be described as either an increase of 1 percentage point or an increase of 100%.	

Do you have any questions and want to talk to us?

If you need specialist advice, guidance or support, get in touch by:

📞 **01223 553998**

✉ **maths@ocr.org.uk**

🐦 **@OCR_Maths**