Maths KS5

Cowes Enterprise College — Educate for Life

KEY — **C** Core | **M** Mechanics | **S** Statistics

YR12

Y12 UNIT 1
Can I set out a proof clearly?
Can I solve problems involving proofs?
What are the different kinds of proof?
EXAMPLE: How do I prove 1 is not prime?

Y12 UNIT 2
Can I apply the laws of indices to solve problems?
Do I know how to manipulate indices?
Do I know how to manipulate surds?

Y12 UNIT 3
Can I show the graphs of the transformations of functions?
Do I know how to show inequalities graphically?

Y12 UNIT 4
Can I solve simultaneous equations with linear and quadratic powers?
Do I know how to solve inequalities?

Y12 UNIT 5
Can I identify trigonometric identities and solve equations?
Can I use and apply the cosine and sine rule, and area of any triangle formula?

Y12 UNIT 6
Can I use and apply my understanding of straight line graphs?
Can I create an algebraic expression for a circle given certain information?

Y12 UNIT 7
Do I know how to show differentiation by first principles?
Can I differentiate to identify turning points?

Y12 UNIT 8
Can I differentiate a polynomial?
What are the different kinds of turning points and can I distinguish between them?
Can I find the tangent and normal to a curve at any point?

Y12 UNIT 9
Do I understand the factor and remainder theorem?
Can I divide a polynomial by a linear factor? Can I factorise a quartic into its linear factors?

Y12 UNIT 10
Do I know the definitions and units associated with kinematics?
Can I sketch graphs involving displacement, velocity and acceleration
Can I use calculus to solve kinematic problems?

Y12 UNIT 11
Do I know the laws of logarithms?
Can I graph the natural logarithm function and its inverse?
What is e and why is it important?
Can I model exponential growth and decay?

Y12 UNIT 12
Do I understand the use and application of vectors?
Can I remember how vectors work from GCSE? Can I extend the use of vectors to real-life situations?

Y12 UNIT 13
Do I know how to integrate functions with and without limits?
Can I work through a function to integrate efficiently and check the answer using the calculator if necessary?

Y12 UNIT 14
Do I know the difference between discrete and continuous data?
Can I use different sampling methods to answer problems?

Y12 UNIT 15
Do I know how to interpret and show information on graphs?
Can I find the mean, variance and standard deviation for a population and sample?
Can I identify an outlier?
Can I show data using:
1. Histograms
2. Box & whisker
3. Cumulative frequency
4. Correlation (including the use of correlation coefficient)

Y12 UNIT 16
Do I know how to expand a binomial in a given problem?
Do I know the rule involved in expanding a binomial function?

Y12 UNIT 17
Do I understand Newton's Laws of Motion?
Can I remember the formulae associated with constant acceleration?
Can I apply my understanding of gravity to problem solving?

Y12 UNIT 18
Do I know what mutually exclusive and independent events are?
How do I calculate the probabilities for a binomial distribution?

Y12 UNIT 18
Do I know the steps needed to test any type of hypothesis?
1. Can I formulate a hypothesis?
2. Can I state the null and alternative hypotheses?
3. Do I know how to calculate the test statistic?
4. Can I find the critical region(s) for a 1-tail or 2-tail test, supporting the choice of values in such regions with appropriate binomial probabilities?
5. Do I know when to accept or reject a hypothesis test, with appropriate reasoning?

Y12/13 UNIT 1
How do I decompose rational functions into partial fractions?
What are the different methods available to solve a partial fraction?
Can I use the results in the expression of partial fractions?

Y12/13 UNIT 2
Can I define and apply the use of conditional probability to problem solving?
Can I apply the conditional probability formula?
Can I use set notation, tree diagrams, Venn diagrams and two-way tables?
Can I identify whether an assumption is valid and the likely situations where it becomes invalid?

Y12/13 UNIT 3
Can I make logical deductions and prove statements?
Can I divide algebraic expressions?
Do I know how to manipulate and use algebraic fractions in all forms?
Can I prove a statement directly by exhaustion, or disprove it by counter example or by contradiction?

YR13

Y13 UNIT 1
Do I understand functions?
Can I determine the domain and range for any function, including composite functions?
Can I sketch the modulus of a function, give the sketch of the function?
Can I combine transformations?

Y13 UNIT 2
Can I use and apply radians in problems?
Can I show the graphs, range and domain for all trigonometric functions?
Do I know the identities associated with trigonometry?

Y13 UNIT 3
Do I know how to use the double angle formulae and their respective geometric proofs?
Can I construct proofs involving trigonometric functions and identities?

Y13 UNIT 5
Do I know how to use the Binomial expansion formula?
Can I use a binomial expansion to express surds as estimated fractions?
Can I find the limit of a periodic sequence?
Can I identify and determine whether a term appears in either an increasing or decreasing sequence?
Do I know how to find, without using a calculator, the exact value of the sum of a function?

Y13 UNIT 4
Do I know how to find trigonometric derivatives?
Can I determine the convex or concave sections of curves?
Can I use the product, quotient and chain rules?
Can I find the derivative of natural logs?
Can I apply my knowledge of differentiation to rates of change and inverse functions?

Y13 UNIT 6
Do I know what arithmetic and geometric sequences are?
Can I identify the conditions necessary for a geometric series to be convergent?
Can I prove the formulae for the sums of arithmetic and geometric sequences?
What are the conditions for a sum to infinity for a geometric sequence?
Can I model the distance travelled by a dropped ball in terms of a sequence?

Y13 UNIT 7
Can I create a Cartesian equation from a parametric equation?
Do I know what a parametric equation is?

Y13 UNIT 8
Can I differentiate simple functions and relations defined parametrically?
Do I know what it means when we use the term parametric?

Y13 UNIT 11
Can I use vectors and trigonometric functions to solve kinematics problems?
Can I use the formulae for constant acceleration using vectors?
Can I use calculus in kinematics in two dimensional motion?
Can I model motion under gravity using vectors for projectiles?

Y13 UNIT 10
Do I know how to solve trigonometric integrals?
Can I use integration to find the area between two curves?
Can I use integration by substitution and integration by parts?
Can I inverse the process of the chain and product rules?

Y13 UNIT 9
Can I integrate partial fractions that have a linear denominator?
Can I apply my knowledge of partial fractions to other situations?

Y13 UNIT 12
Can I construct simple differential equations?
Can I evaluate differential equations to find their solutions?
Can I apply differential equations?
I can use differential equations:
- Within problem solving
- To identity limitations
I understand the link to kinematics for differential equations.

Y13 UNIT 13
Do I know the difference between a discrete and a continuous random variable?
Can I identify and apply my knowledge of a normal distribution?
Do I know how to identify when a binomial distribution can be approximated from a normal distribution?
Do I know how to model distributions and know the characteristics?
Can I find percentage points and calculate values?
Can I find the mean and variance?
Can I identify points of inflection?
What is a z-score and where is it used?
Can I use my calculator to find the values of probabilities?
Do I know the necessary conditions?
Can I calculate the expected number, mean and variance?

Y13 UNIT 14
Do I know how to use forces to determine dynamics for motion on a plane?
Can I identify the model for friction and apply it to problems?

Y13 UNIT 15
Can I use a hypothesis test to detect the strength of any correlation between two variables?
Do I understand the use of the population correlation coefficient?
Can I use and apply Pearson's Product Moment Correlation Coefficient (PMCC)?

Y13 UNIT 16
Can I test a hypothesis for a normal distribution?
Can I carry out a hypothesis test using the mean of a normal distribution?
Given a known or assumed variance, can I use a sample to carry out a hypothesis test to see if it is a suitable estimate for the mean?
Can I apply the test statistic formula (z-values) for a normal distribution?
Can I decide when to accept a null hypothesis, if it has been developed from a binomial model?
Can I use a hypothesis test to determine the critical region?

Y13 UNIT 17
Do I understand how to use moments in simple static contexts?
Can I draw a moment and show the relevant forces applicable?

Y13 UNIT 18
Can I locate the roots of an equation?
What are staircase and cobweb diagrams used to illustrate?
Under what conditions will the Newton-Raphson method fail?
How would I use a calculator to prove iterative operations?
Can I use the trapezium rule to approximate the area under a curve?
Why do we need to be careful with a function that has a discontinuity, when looking for a root?
Can I define the term ordinate?
Explain and would happen to the value obtained by the trapezium rule if the number of ordinates were increased for an increasing function.

Y13 UNIT 19
Exam preparation
How can I make sure I am revising effectively for this subject?
How do I memorise and recall knowledge I need for the exam?
How do I maximise marks in this subject's exam?
What are the gaps in my knowledge and how can I address them?
How do I approach exam questions in this subject to ensure I reach the highest grade?
What do I need to do to prepare myself for university courses?
What do I need to do to prepare myself for employment?