A guide to use GeoGebra when teaching AS and A level Mathematics

Below you can find links to GeoGebra files designed to help you teach the content of AS and A level Mathematics qualifications with the aid of GeoGebra.

These can be used for teaching, or as students’ aided or independent learning materials with Pearson Textbooks.

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**AS Mathematics – Pure Mathematics**

**Quadratics (Chapter 2)**

Explore how the graph of \( y = (x + p)^2 + q \) changes as the values of \( p \) and \( q \) change. (Page 28)
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Explore how the value of the discriminant changes with \( k \). (Page 31)
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Explore the trajectory of the spear. (Page 33)
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**Equations and inequalities (Chapter 3)**

Find the point of intersection graphically. (Page 43)
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Plot the curve and the line to find the two points of intersection. (Page 43)
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Explore how the value of \( k \) affects the line and the curve. (Page 44)
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Explore which regions on the graph satisfy which inequalities. (Page 54)
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AS Mathematics – Pure Mathematics (Cont’d)

Graphs and transformations (Chapter 4)

Explore the graph of \( y = (x - p)(x - q)(x - r) \) where \( p, q \) and \( r \) are constants. (Page 60)
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Explore the graph of \( y = (x - p)(x - q)(x - r)(x - s) \) where \( p, q, r \) and \( s \) are constants. (Page 64)
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Explore the graph of \( y = \frac{a}{x} \) for different values of \( a \). (Page 67)
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Explore translations of the graph of \( y = x^3 \). (Page 72)
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Explore stretches of the graph of \( y = x(x - 2)(x + 1) \). (Page 77)
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Straight line graphs (Chapter 5)

Explore the gradient formula. (Page 90)
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Explore lines of a given gradient passing through a given point. (Page 94)
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Plot the solution of a straight line graphs problem on a graph. (Page 95)
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Explore changes in the solution of a straight line graphs problem when the original line and point are varied. (Page 98)
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Draw both straight lines and the triangle \( AOB \) on a graph. (Page 101)
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AS Mathematics – Pure Mathematics (Cont’d)

Circles (Chapter 6)

Explore the general form of the equation of a circle. (Page 117)
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Explore intersections of straight lines and circles. (Page 121)
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Explore the circle theorems. (Page 123)
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Explore triangles and their circumcircles.
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The binomial expansion (Chapter 8)

Find the values of x for which the first four terms of this expansion give a good approximation to the value of the function. (Page 130)
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Trigonometric ratios (Chapter 9)

Explore the cosine rule. (Page 174)
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Explore the sine rule. (Page 179)
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Explore the area of a triangle. (Page 186)
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Explore the solution of a trigonometric ratios problem step-by-step. (Page 189)
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Plot transformations of trigonometric graphs. (Page 197)
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AS Mathematics – Pure Mathematics (Cont’d)

Trigonometric identities and equations (Chapter 10)

Explore the values of $\sin \theta$, $\cos \theta$ and $\tan \theta$ for any angle $\theta$ in a unit circle. (Page 203)
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Vectors (Chapter 11)

Explore vector addition. (Page 321)
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Explore this solution as a vector diagram on a coordinate grid. (Page 237)
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Explore the magnitude of a vector. (Page 239)
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Use GeoGebra to show that diagonals of a parallelogram bisect each other. (Page 245)
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Differentiation (Chapter 12)

Explore the gradient of the chord on a graph to introduce the gradient of a tangent. (Page 257)
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Explore the tangent and normal to the curve. (Page 269)
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Explore increasing and decreasing functions using GeoGebra. (Page 271)
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Explore the solution of a differentiation stationary point problem. (Page 274)
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Explore the key features linking $y = f(x)$ and $y = f'(x)$. (Page 277)
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AS Mathematics – Pure Mathematics (Cont’d)

Integration (Chapter 13)

Explore how the value of \( c \) affects a curve. (Page 294)
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Exponentials and logarithms (Chapter 14)

Explore the relationship between exponential functions and their derivatives. (Page 314)
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Use GeoGebra to draw transformations of \( y = e^x \). (Page 316)
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AS Mathematics – Statistics

Representations of data (Chapter 3)

Explore box plots and outliers. (Page 44)
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Explore the regression line and analysis. (Page 64)
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Explore the cumulative probabilities for the binomial distribution. (Page 93)
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Explore the locations of the critical values for each tail in a hypothesis testing. (Page 103)
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AS Mathematics – Mechanics

Modelling in mechanics (Chapter 8)

Explore how the area of the trapezium changes as the value of \( t \) changes in a velocity-time graph.
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A level Mathematics – Pure Mathematics

Functions and graphs (Chapter 2)

Explore graphs of $f(x)$ and $|f(x)|$. (Page 24)
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Explore intersections of straight lines and modulus graphs. (Page 25)
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Explore graphs of functions on a given domain. (Page 29)
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Explore functions and their inverses. (Page 37)
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Explore graphs of modulus functions $y = |f(x)|$ and $y = f(|x|)$. (Page 40)
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Explore combinations of transformations of the function $f(x) = \ln x$. (Page 46)
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Explore the solution to an inequality of a modulus function problem. (Page 51)
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Binomial expansion (Chapter 4)

Explore why the expansions of are only valid for certain values of $x$. (Page 93)
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A level Mathematics – Pure Mathematics (Cont’d)

Radians (Chapter 5)

Explore the arc length of a sector. (Page 129)
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Explore the area of a sector. (Page 120)
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Explore the area of a segment. (Page 123)
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Explore approximate values of \( \sin \theta \), \( \cos \theta \) and \( \tan \theta \) for values of \( \theta \) close to 0. (Page 133)
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Explore transformations of the graphs of reciprocal trigonometric functions. (Page 147)
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Trigonometry and modelling (Chapter 7)

Explore the proof step-by-step of the addition formulae using a geometric construction. (Page 168)
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Explore how you can transform the graphs of \( y = \sin x \) and \( y = \cos x \) to obtain the graph of \( y = 3 \sin x + 4 \cos x \). (Page 182)
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Explore maximums and minimums of curves in the form \( R \cos (\theta - \alpha) \). (Page 184)
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Explore the solution to a modelling problem graphically modelling cabin pressure against time spent at cruising altitude. (Page 189)
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A level Mathematics – Pure Mathematics (Cont’d)

Parametric equations (Chapter 8)

Explore a parametric curve and the cartesian equivalent. (Page 199)
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Graphing parametric equations using trigonometric identities. (Page 203)
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Graphing parametric equations using trigonometric identities. (Page 204)
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Graphing parametric equations. (Page 207)
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Explore parametric equations with a variable coefficient. (Page 209)
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Explore the motion of a figure skater over time by modelling with parametric equations. (Page 217)
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Differentiation (Chapter 9)

Explore the relationship between sin and cos and their derivatives. (Page 232)
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Explore the function $a^x$ and its derivative. (Page 235)
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Explore the graph of $y = e^{\sin x}$. (Page 243)
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Explore the graph of a curve with parametric equations and the normal at a point. (Page 250)
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Explore whether a cubic curve is concave or convex on a given interval and find the point of inflection. (Page 259)
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A level Mathematics – Pure Mathematics (Cont’d)

Differentiation (Chapter 9) (Cont’d)

Locate the root of \( f(x) = \ln x - \frac{1}{x}. \) (Page 276)
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Explore the use of iteration to find the roots of an equation. (Page 280)
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Explore how the Newton–Raphson method works graphically and algebraically. (Page 284)
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Integration (Chapter 11)

Explore the area between two curves. (Page 314)
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Explore under- and over- estimation when using the trapezium rule. (Page 319)
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Explore the relationship between the general solution, the possible boundary conditions, the value of \( k \), and the particular solution. (Page 323)
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Explore the general and particular solutions to a differential equation. (Page 326)
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Explore the solution to a 3D problem visually, showing the vectors, magnitude and triangle. (Page 342)
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Explore the solution to a 3D problem visually, showing the vectors, lines and quadrilateral. (Page 345)
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A level Mathematics – Statistics

Regression, correlation and hypothesis testing (Chapter 1)

Explore the original and coded data graphically. (Page 3)
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Conditional probability (Chapter 2)

Explore set notation on a Venn diagram. (Page 17)
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The normal distribution (Chapter 3)

Explore the normal distribution curve. (Page 40)
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A level Mathematics – Mechanics

Moments (Chapter 4)

Explore the moment of a force acting about a point. (Page 71)
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Explore the moment acting about pivot M. (Page 80)
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Explore the moment acting about pivot M. (Page 83)
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Forces and friction (Chapter 5)

Explore the resultant of two forces. (Page 94)
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Explore a problem with different masses, slopes and frictional coefficients. (Page 102)
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A level Mathematics – Mechanics (Cont’d)

Projectiles (Chapter 6)

Explore the parametric equations for the path of the particle and their Cartesian form, both algebraically and graphically. (Page 120)
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Application of forces (Chapter 7)

Explore the forces in a ladder problem in a more detailed diagram. (Page 143)
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Further kinematics (Chapter 8)

Explore the solution to a further kinematics problem. (Page 160)
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Explore the solution to a skater further kinematics problem. (Page 162)
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