

They should be able to

- 1. Describe how the input and output values of a function vary together by comparing function values.
- 2. Construct a graph representing two quantities that vary with respect to each other in a contextual scenario.
- 3. Compare the rates of change at two points using average rates of change near the points.
- 4. Describe how two quantities vary together at different points and over different intervals of a function.
- 5. Determine the average rates of change for sequences and functions, including linear, quadratic, and other function types.
- 6. Determine the change in the average rates of change for linear, quadratic, and other function types.
- 7. Identify key characteristics of polynomial functions related to rates of change.
- 8. Identify key characteristics of a polynomial function related to its zeros when suitable factorizations are available or with technology.
- 9. Determine if a polynomial function is even or odd.
- 10. Describe end behaviors of polynomial functions.
- 11. Describe end behaviors of rational functions.
- 12. Determine the zeros of rational functions.
- 13. Determine vertical asymptotes of graphs of rational functions.
- 14. Determine holes in graphs of rational functions.
- 15. Rewrite polynomial and rational expressions in equivalent forms.
- 16. Determine the quotient of two polynomial functions using long division.
- 17. Rewrite the repeated product of binomials using the binomial theorem.
- 18. Construct a function that is an additive and/or multiplicative transformation of another function.
- 19. Identify an appropriate function type to construct a function model for a given scenario.
- 20. Describe assumptions and restrictions related to building a function model.
- 21. Construct a linear, quadratic, cubic, quartic, polynomial of degree n , or related piecewise-defined function model.
- 22. Construct a rational function model based on a context.
- 23. Apply a function model to answer questions about a data set or contextual scenario.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 01 (10 questions, answers on sheet 2)	
Teach the new content	Handout 01 Slide deck 01 (+ notes handout, 6-up) Vocabulary list 01	
Practice guided then independent	Exercise sheets 1.1, 1.10, 1.11, 1.12, 1.13, 1.14, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9 Past-paper sheets 1.1, 1.13, 1.14, 1.2, 1.3, 1.5, 1.6	
Check before they leave	Topic test 1 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

They should be able to

- 1. Express arithmetic sequences found in mathematical and contextual scenarios as functions of the whole numbers.
- 2. Express geometric sequences found in mathematical and contextual scenarios as functions of the whole numbers.
- 3. Construct functions of the real numbers that are comparable to arithmetic and geometric sequences.
- 4. Identify key characteristics of exponential functions.
- 5. Rewrite exponential expressions in equivalent forms.
- 6. Construct a model for situations involving proportional output values over equal-length input-value intervals.
- 7. Construct linear, quadratic, and exponential models based on a data set.
- 8. Validate a model constructed from a data set.
- 9. Evaluate the composition of two or more functions for given values.
- 10. Construct a representation of the composition of two or more functions.
- 11. Rewrite a given function as a composition of two or more functions.
- 12. Determine the input-output pairs of the inverse of a function.
- 13. Determine the inverse of a function on an invertible domain.
- 14. Evaluate logarithmic expressions.
- 15. Construct representations of the inverse of an exponential function with an initial value of 1.
- 16. Identify key characteristics of logarithmic functions.
- 17. Rewrite logarithmic expressions in equivalent forms.
- 18. Solve exponential and logarithmic equations and inequalities.
- 19. Construct the inverse function for exponential and logarithmic functions.
- 20. Construct a logarithmic function model.
- 21. Determine if an exponential model is appropriate by examining a semi-log plot of a data set.
- 22. Construct the linearization of exponential data.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 02 (10 questions, answers on sheet 2)	
Teach the new content	Handout 02 Slide deck 02 (+ notes handout, 6-up) Vocabulary list 02	
Practice guided then independent	Exercise sheets 2.1, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9 Past-paper sheets 2.10, 2.11, 2.12, 2.13, 2.14, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8	
Check before they leave	Topic test 2 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

They should be able to

- 1. Construct graphs of periodic relationships based on verbal representations.
- 2. Describe key characteristics of a periodic function based on a verbal representation.
- 3. Determine the sine, cosine, and tangent of an angle using the unit circle.
- 4. Determine coordinates of points on a circle centered at the origin.
- 5. Construct representations of the sine and cosine functions using the unit circle.
- 6. Identify key characteristics of the sine and cosine functions.
- 7. Identify the amplitude, vertical shift, period, and phase shift of a sinusoidal function.
- 8. Construct sinusoidal function models of periodic phenomena.
- 9. Construct representations of the tangent function using the unit circle.
- 10. Describe key characteristics of the tangent function.
- 11. Construct analytical and graphical representations of the inverse of the sine, cosine, and tangent functions over a restricted domain.
- 12. Solve equations and inequalities involving trigonometric functions.
- 13. Identify key characteristics of functions that involve quotients of the sine and cosine functions.
- 14. Rewrite trigonometric expressions in equivalent forms with the Pythagorean identity.
- 15. Rewrite trigonometric expressions in equivalent forms with sine and cosine sum identities.
- 16. Solve equations using equivalent analytic representations of trigonometric functions.
- 17. Determine the location of a point in the plane using both rectangular and polar coordinates.
- 18. Construct graphs of polar functions.
- 19. Describe characteristics of the graph of a polar function.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 03 (10 questions, answers on sheet 2)	
Teach the new content	Handout 03 Slide deck 03 (+ notes handout, 6-up) Vocabulary list 03	
Practice guided then independent	Exercise sheets 3.1, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9 Past-paper sheets 3.10, 3.12, 3.4, 3.5, 3.6, 3.9	
Check before they leave	Topic test 3 (with mark scheme)	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	

涉及参数、向量与矩阵的函数

They should be able to

- Construct a graph or table of values for a parametric function represented analytically.
- Identify key characteristics of a parametric planar motion function that are related to position.
- Identify key characteristics of a parametric planar motion function that are related to direction and rate of change.
- Express motion around a circle or along a line segment parametrically.
- Construct a graph of an equation involving two variables.
- Determine how the two quantities related in an implicitly defined function vary together.
- Represent conic sections with horizontal or vertical symmetry analytically.
- Represent a curve in the plane parametrically.
- Represent conic sections parametrically.
- Identify characteristics of a vector.
- Determine sums and products involving vectors.
- Determine a unit vector for a given vector.
- Determine angle measures between vectors and magnitudes of vectors involved in vector addition.
- Represent planar motion in terms of vector-valued functions.
- Determine the product of two matrices.
- Determine the inverse of a 2×2 matrix.
- Apply the value of the determinant to invertibility and vectors.
- Determine the output vectors of a linear transformation using a 2×2 matrix.
- Determine the association between a linear transformation and a matrix.
- Determine the composition of two linear transformations.
- Determine the inverse of a linear transformation.
- Construct a model of a scenario involving transitions between two states using matrices.
- Apply matrix models to predict future and past states for n transition steps.

Stage	Use	Your notes
Starter 10 min · retrieval practice	Topic quiz 04 (10 questions, answers on sheet 2)	
Teach the new content	Handout 04 Slide deck 04 (+ notes handout, 6-up) Vocabulary list 04	
Practice guided then independent	Exercise sheets 4.1, 4.10, 4.11, 4.12, 4.13, 4.14, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9	
Check before they leave	<i>nothing in the Library for this stage yet</i>	
Homework set from the Library	Any unused exercise sheet above Holiday homework pack	