

Higher

Foundation

Autumn 1	Solving Quadratic Equations and Sketching Graphs How do I factorise quadratic expressions of the form $ax^2 + bx + c$? Can I recall the quadratic formula? What does a completed square look like? How do I identify roots from a graph? How do I recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, and the reciprocal function? Maritime: Naval architects use these same concepts when designing ships. Careers: A structural engineer uses all of these together when designing structures like bridges, arches, and roofs. Direct and Inverse proportion How do I solve problems involving direct and inverse proportion, including graphical and algebraic representations? Do I understand that X is inversely proportional to Y is equivalent to X is proportional to $1/Y$? Maritime: Ship fuel consumption vs speed and journey time Careers: Pharmacist (scaling dosages accurately) Equation of a Circle How do I Recognise and use the equation of a circle with centre at the origin? How do I find the equation of a tangent to a circle at a given point? Maritime: Radar systems detecting objects in circular ranges Careers: GPS / Satellite Engineer Numerical Methods How do I find approximate solutions to equations numerically using iteration including the use of suffix notation? Can I input an iterative formula into my calculator? Maritime: Navigation systems approximating ship positions Career: Software Developer (iterative algorithms)	Probability Can I apply ideas of randomness, fairness and equally likely events to calculate expected outcomes or multiple future experiments? Can I relate relative expected frequencies to theoretical probability, using appropriate language and the 0 to 1 probability scale? Can I enumerate sets and combinations of sets systematically using tables, grids, Venn diagrams and tree diagrams? Maritime: Assessing weather risks, route safety and shipping insurance. Eco Futures: Predicting environmental events and evaluating climate data uncertainty. Careers: Actuary, insurance analyst, risk assessor, data scientist. Volume Can you compare lengths, areas and volumes using ratio notation? Do you know how to apply formulae to calculate volume of: spheres, pyramids, cones and composite solids? Can you work out exact values with multiples of π? Maritime: Calculating cargo capacity of ships, tanks and storage containers. Eco Futures: Measuring water usage, fuel storage and material efficiency. Careers: Naval architect, engineer, surveyor, construction manager. Quadratics, rearranging formulae and identities Can I factorise quadratic expressions of the form $x^2 + bx + c$? How do I simplify expressions involving sums, products and powers, including the laws of indices? Maritime: Modelling vessel movements and engineering calculations. Eco Futures: Using formulae to model energy consumption and efficiency. Careers: Engineer, software developer, physicist, architect.
Autumn 2	Growth and Decay and Graphs Can I set up, solve and interpret the answers in growth and decay problems, including compound interest? Can I calculate missing coordinates on an exponential graph? Maritime: Predicting long-term maintenance costs or corrosion Careers: Financial Analyst (compound interest, investment growth) Volume Do I know how to apply formulae to calculate volume of: spheres, pyramids, cones and composite solids? Given the volume, can I find other missing measurements of 3D shapes? Maritime: Calculating cargo capacity and storage on ships Careers: Architect / Construction Engineer Simultaneous Equations How do I solve two simultaneous equations, where one is linear and the other quadratic? Maritime: Calculating where two ships' routes intersect Careers: Data Scientist Inequalities How do I represent an inequality (linear or quadratic) as a region on a set of axes? Maritime: Defining safe operating zones and shipping limits Careers: Operations Manager Sine and cosine rules Can I apply the Sine rule $a/\sin A=b/\sin B = c/\sin C$ to find unknown lengths and angles ? How do I apply the Cosine rule $a^2=b^2+c^2-2bc \cos A$ to find unknown lengths and angles ? What is the formula to find the area of a non-right angled triangle? Maritime: Navigation and triangulation at sea Careers: Surveyor Trig graphs What do the graphs of Sine, Cosine and Tangent look like? Can I use the symmetry of the graphs to find equivalent angles? Maritime: Modelling waves, tides, and oscillations Maritime: Modelling waves, tides, and oscillations Careers: Physicist / Sound Engineer Transforming graphs Can I sketch translations and reflections of a given function? What effect does a translation of (0;1) have on the equation of a function? Maritime: Adjusting navigation and simulation models Careers: Game Designer / Software Engineer Cumulative Frequency and Box plots Can I plot a cumulative frequency graph given a table of data? How do I estimate the median from a cumulative frequency graph? What are the five main values needed to draw a box plot? Maritime: Analysing shipping times and delays Careers: Statistician Histograms and Frequency Polygons What does the area of each bar of a histogram represent? How can I calculate frequency density? Can I draw a histogram from given data? Maritime: Studying wave height or cargo weight distributions Careers: Actuary / Data Analyst Functions Given a function, how could I calculate the inverse function? Which order should I substitute the functions to calculate $fg(x)$? Maritime: Multi-step navigation calculations and modelling Careers: Computer Scientist Vectors How do I describe a vector? Can I use vectors to construct geometric arguments and proofs? Maritime: Representing ship direction, speed, and currents Careers: Physicist / Engineer Circle theorems What do I know about the angle between a radius and a tangent? Can I draw a diagram to represent the alternate segment theorem? Maritime: Ship turning paths and radar geometry Careers: Architect Gradients and rate of change, area under a curve Can I interpret the gradient at a point on a curve as the instantaneous rate of change? How do I apply the concepts of average rate of change using a chord? What does the area under a velocity-time graph represent? Maritime: Speed, acceleration, and distance of ships over time Careers: Mechanical Engineer Algebraic fractions What is the first thing you should always do (if possible) when working with algebraic fractions? Why can't we simplify $(x+1)/(x-1)$? Maritime: Cost and efficiency calculations in shipping Careers: Accountant / Financial Analyst Proofs How can I express an odd number algebraically? Can I express a series of consecutive numbers algebraically? Maritime: Logical reasoning in navigation systems and safety protocols Careers: Mathematician / Cryptographer	Scatter Graphs Can I draw estimated lines of best fit? Can I interpolate and extrapolate apparent trends whilst knowing the dangers of doing so? Maritime: Analysing relationships between sea conditions and travel times. Eco Futures: Investigating links between pollution levels and environmental factors. Careers: Data analyst, environmental scientist, researcher. Inequalities How do I solve linear inequalities in one variable? How do I represent the solution set on a number line? Maritime: Applying safe operating limits for ships and cargo loads. Eco Futures: Setting environmental thresholds for emissions and resource use. Careers: Logistics planner, engineer, quality assurance technician. Pythagoras Theorem Do I know the formula for Pythagoras' Theorem ² ? How do I apply it to find lengths in right angled triangles in two dimensional figures? Maritime: Calculating distances and navigation routes at sea. Eco Futures: Measuring land areas and planning sustainable developments. Careers: Surveyor, navigator, architect, civil engineer.
Spring 1	Sketching Graphs How do I recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, and the reciprocal function? Direct and Inverse proportion How do I solve problems involving direct and inverse proportion, including graphical and algebraic representations? Do I understand that X is inversely proportional to Y is equivalent to X is proportional to $1/y$? Inequalities How do I solve linear inequalities in one or two variable(s) and quadratic inequalities in one variable? How do I represent the solution set on a number line, using set notation and on a graph? Pythagoras Theorem and Basic Trigonometry Do I know the formula for Pythagoras' Theorem and the trigonometric ratios ? Do I know the exact values of $\sin$ and $\cos$ for $= 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° Do I know the exact value of $\tan$ for $0^\circ, 30^\circ, 45^\circ, 60^\circ$ Maritime: Calculating shortest routes and distances at sea Careers: Engineer / Builder	Simultaneous Equations How do I solve two simultaneous equations in two variables (linear/linear algebraically? How do I derive an equation (or two simultaneous equations), solve the equations and interpret the solution? Maritime: Solving problems involving speed, distance and shipping costs. Eco Futures: Modelling the balance between resource use and sustainability targets. Careers: Economist, engineer, operations manager. Algebra and Graphs How do I solve linear equations in one unknown algebraically? How do I solve equations with unknown on both sides of the equation? How do I translate simple situations or procedures into algebraic expressions or formulae? Maritime: Interpreting shipping data and voyage performance trends. Eco Futures: Modelling carbon emissions and renewable energy outputs. Careers: Data analyst, accountant, scientist. Sketching Graphs How do I recognise, sketch and interpret graphs of linear functions, quadratic functions? Maritime: Predicting changes in tides, fuel use and travel times. Eco Futures: Visualising climate and energy trends over time. Careers: Statistician, meteorologist, environmental consultant.
Spring 2	Growth and Decay Can I set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes? Maritime: Modelling long-term shipping costs or fuel usage Careers: Economist Vectors Can I apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors? Can I use vectors to construct geometric arguments and proofs? Transforming Functions Can I sketch translations and reflections of a given function? Maritime: Simulation software for ship movement Careers: Software Engineer Sine and Cosine Rules Can I apply the Sine rule $a/\sin A=b/\sin B = c/\sin C$ and cosine rule $a^2=b^2+c^2-2bc \cos A$ to find unknown lengths and angles ? Can I apply Area= $1/2 \sin C$ to calculate the area, sides or angles of any triangle ? Circle Theorems Can I apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results?	Direct and Inverse proportion How do I solve problems involving direct and inverse proportion, including graphical and algebraic representations? Do I understand that X is inversely proportional to Y is equivalent to X is proportional to $1/y$? Maritime: Understanding speed, fuel consumption and journey times. Eco Futures: Exploring relationships between resource consumption and efficiency. Careers: Engineer, transport planner, energy analyst. Trigonometry Do I know the trigonometric ratios? Maritime: Navigation, positioning and coastal surveying. Eco Futures: Designing efficient renewable energy structures and monitoring landscapes. Careers: Surveyor, pilot, engineer, geospatial technician.
Summer 1	Gradients and rate of change Can I interpret the gradient at a point on a curve as the instantaneous rate of change? Can I apply the concepts of average and instantaneous rates of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts? Can I interpret the gradient of a straight-line graph as a rate of change? Pre-calculus and area under a curve How do I calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs)? How do interpret the results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts? Maritime: Calculating total distance or fuel consumption over a journey Careers: Data Analyst Algebraic Fractions How do I simplify and manipulate algebraic expressions involving algebraic fractions?	Solving Quadratic Equations How do I solve quadratic equations algebraically by factorising? How do I find approximate solutions using a graph? Maritime: Calculating trajectories and engineering design constraints. Eco Futures: Modelling environmental growth patterns and optimisation problems. Careers: Engineer, programmer, scientific researcher Quadratic Graphs How do I recognise, sketch and interpret graphs of quadratic functions? Maritime: Modelling vessel performance and engineering systems. Eco Futures: Analysing changing rates in environmental data. Careers: Mechanical engineer, analyst, physicist.
Summer 2	<i>Exams</i>	Growth and Decay How do I set up, solve and interpret the answers in growth and decay problems, including compound interest? Maritime: Predicting maintenance schedules and depreciation of vessels. Eco Futures: Modelling population growth, recycling rates and carbon reduction. Careers: Financial analyst, environmental scientist, economist. Vectors How do I apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors? Maritime: Navigation, course plotting and tracking vessel movement. Eco Futures: Mapping environmental changes and geographical movement. Careers: Navigator, aerospace engineer, GIS specialist.