

BERWICKSHIRE HIGH SCHOOL

MATHEMATICS FACULTY



MATHS CURRICULUM

S1 CURRICULUM

Block 1: August-October

A. Estimating and Rounding with Whole Numbers

2nd Level:

- Round whole numbers to the nearest 1000, 10000 and 100000, e.g. $4500 = 5000$ to the nearest 1000.
- Use rounding to routinely estimate the answers to calculations, e.g. $3247 \times 89 = 3200 \times 100 = 320000$.

B. Four Operations on Whole Numbers

2nd Level:

- Read, write and order whole numbers to 1 000 000, starting from any number in this sequence.
- Explain the link between a digit, its place and its value for whole numbers to 1 000 000, e.g. the 5 in 659 is in the tens column and represents a value of 50.
- Add and subtract multiples of 10, 100 and 1000 to and from whole numbers, using efficient mental and written methods, e.g. $648 - 90 = 648 - 100 + 10$ (mental method).
- Add and subtract whole numbers within the number range 0 to 1 000 000.
- Solve addition and subtraction problems working with whole numbers, using efficient written and mental methods, e.g. $125 + 37 = 125 + 30 + 7$ or $125 + 40 - 3$.
- Use multiplication and division facts to the 10th multiplication table.
- Multiply and divide whole numbers by multiples of 10, 100 and 1000 using efficient mental and written methods, e.g. 42×300 .
- Solve multiplication and division problems working with whole numbers, using efficient written and mental methods, e.g. $94 \times 7 = 100 \times 7 - 6 \times 7$.
- Multiply whole numbers by 2 digit numbers, e.g. $47 \times 12 = 47 \times 4 \times 3$.
- Divide whole numbers by a single digit, e.g. $42 \div 6$.

3rd Level, in addition to 2nd Level:

- Use multiplication and division facts to the 12th multiplication table.
- Recall quickly multiplication and division facts to the 10th multiplication table.
- Dividing whole numbers by 2 digit numbers eg $52 \div 12 = 52 \div 4 \div 3$

C. Decimals: Estimating, Rounding and the Four Operations

2nd Level:

- Round decimal fractions to the nearest whole number and to 1 and 2 decimal places, e.g. $54.7 = 55$ to the nearest whole number, $159.95 = 160.0$ to 1 decimal place.

- Apply knowledge of rounding to give an estimate to a calculation appropriate to the context, e.g. $5.48 \times 13.92 = 5 \times 14 = 70$.
- Read, write and order sets of decimal fractions to 3 decimal places.
- Explain the link between a digit, its place and its value for numbers to 3 decimal places.
- Partition a wide range of whole numbers and decimal fractions to 3 decimal places, e.g. $3.6 = 3 \text{ ones and } 6 \text{ tenths} = 36 \text{ tenths}$.
- Add and subtract multiples of 10, 100 and 1000 to and from decimal fractions to 2 decimal places, e.g. $25.79 + 30$, $3270 - 400$.
- Add and subtract decimal fractions to 2 decimal places within the number range 0 to 1 000 000, including those requiring trailing zeros, e.g. $3.45 + 4.7$, $9.2 - 6.19$.
- Multiply and divide decimal fractions to 2 decimal places by 10, 100, 1000 using efficient mental methods by moving the digits the appropriate number of places to the left (multiplying) or to the right (dividing), e.g. 24.89×100 , $7.3 \div 10$.
- Multiply decimal fractions to 2 decimal places by a single digit using efficient written methods, e.g. 15.67×6 .
- Divide decimal fractions to 2 decimal places by a single digit using written methods, including answers expressed as decimal fractions, e.g. $43 \div 5 = 8.6$.

3rd Level, in addition to 2nd Level:

- Round decimal fractions to 3 decimal places, e.g. $45.69229 = 45.692 \text{ to } 3 \text{ d.p.}$
- Use rounding to routinely estimate the answer to calculations.
- Solve addition and subtraction problems working with decimal fractions to 3 decimal places, using efficient written methods.
- Solve multiplication and division problems working with decimal fractions to 3 decimal places, using efficient written methods.

D. Fractions

2nd Level:

- Understand the meaning of a fraction using the terms Numerator and Denominator.
- Find a simple fraction of an amount, 'divide by the bottom, times by the top', and use this to solve problems, e.g. $\frac{2}{3}$ of 15.
- Use knowledge of equivalent forms of common fractions and decimal fractions to solve problems, e.g. $0.75 = \frac{3}{4}$.
- Simplify fractions by cancelling common factors, e.g. $\frac{3}{6} = \frac{1}{2}$.
- Recognise and make equivalent fractions, e.g. $\frac{1}{3} = \frac{2}{6} = \frac{3}{9}$.
- Order a set of common fractions, e.g. $\frac{1}{10}, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}$.

3rd and 4th Level, in addition to 2nd Level:

- Convert between fractions and decimal fractions, e.g. $0.4 = \frac{2}{5}, \frac{7}{50} = \frac{14}{100} = 0.14$.
- Solve problems by carrying out calculations, both with and without a calculator, involving a wide range of fractions and decimal fractions, e.g. If I buy 40 pencils and sell $\frac{4}{5}$ of these, how many do I have left?
- Convert between whole or mixed numbers (made up of a whole number and a fraction), improper ('top heavy') fractions and decimal fractions, e.g. $2\frac{1}{3} = \frac{7}{3}$ and vice versa, $2\frac{2}{5} = 2.4$ and vice versa.

- Add and subtract whole numbers and fractions including when requiring a common denominator, e.g. $\frac{2}{3} + \frac{4}{5}$, $1\frac{3}{5} - \frac{5}{7}$. Show all 'Smile and Kiss'.
- Multiply fractions using 'Top times Top, Bottom times Bottom' e.g. $\frac{3}{4} \times 1\frac{2}{3}$
Divide fractions using Keep, Change, Flip eg $\frac{5}{6} \div \frac{1}{2}$.

E. Percentages

2nd Level:

- Understand simple percentages as a quantity out of 100, e.g. 10%, 20%, 25%, 50%, 75%, 100%.
- Convert between simple fractions, decimals and percentages, e.g. $50\% = \frac{1}{2} = 0.5$.
- Find a simple percentage of an amount (with or without calculator),
e.g. $10\% \text{ of } 250 = \frac{1}{10} \text{ of } 250 = 25$.
- Calculate simple percentages of a quantity and uses this knowledge to solve problems in everyday contexts, e.g. calculate the sale price of a £40 jumper that is reduced by 15%.

3rd Level, in addition to 2nd Level:

- Convert between fractions, decimal fractions and percentages,
e.g. $24\% = \frac{24}{100} = \frac{6}{25} = 0.24$.
- Use this knowledge to put a list in ascending order, e.g. $0.1, \frac{1}{8}, 20\%, 0.6, \frac{3}{4}$.
- Solve problems by carrying out calculations with a wide range of fractions, decimals and percentages with and without a calculator,
e.g. Find 23% of £245. *A coat priced at £95 is reduced by 35% in a sale. How much will you save?*

Block 2: Nov - Mid Jan

F. Negative Numbers.

2nd Level:

- Know numbers less than zero (negative numbers) in familiar contexts such as temperature, e.g. the lowest temperature recorded on Earth was -89.2°C .
- Order numbers less than zero and locate them on a number line, e.g. put the following numbers in order, lowest to highest: 12, -14, -5, 0, 2.
- Know how to use these numbers in simple calculations, e.g. $-3 + 5 = 2$,
 $4 - 7 = -3$.

3rd Level, in addition to 2nd Level:

- Solve addition and subtraction problems working with integers, e.g. $-3 - (-4) = 1$, $4 + (-2) = 2$
- Solve multiplication and division problems working with integers,
e.g. $15 \div (-3) = (-5)$, $(-4) \times (-2) = 8$

G. Money and Foreign Exchange.

2nd Level:

- Carry out money calculations involving all four operations, e.g. $\pounds 1.45 + \pounds 16.20$, $4 \times \pounds 5.95$.
- Calculate Profit and Loss, where Profit = Sale price - Cost price.

3rd Level, in addition to 2nd Level:

- Demonstrate an understanding of best value when comparing products, choose best value and justify choice, e.g. £4.25 for 3 litres or £ 7.25 for 5 litres.
- Knowledge of currency used in different countries and the Exchange Rates.
- Use this knowledge to convert between different currencies and solve problems involving purchases in different countries, e.g. $£45 \times 1.2 = €54$,
 $€126 \div 1.2 = £105$.

H. Order Of Operations: BIDMAS.

2nd Level:

- Recognise BIDMAS as Brackets, Indices, Divide, Multiply, Add, Subtract.
- Display knowledge and understanding of BIDMAS as the rule for the order of operations in number calculations.
- Apply the correct order of operations in number calculations when solving simple multi-step problems, e.g. $3 + 5 \times 4 = 3 + 20 = 23$.

3rd and 4th Level, in addition to 2nd Level:

- Interpret and solve multi step problems using the four operations,
e.g. $\frac{1}{2} + 3 \times 2.5 = 8$.
- Apply the correct order of operations in all calculations, including those with brackets, e.g.
 $\frac{1}{2} \text{ of } (15 \div 4) = 1.875$.

I. Multiples, Factors and Primes.

2nd Level:

- Understand the term Multiples and can identify multiples of whole numbers, e.g. the 1st 3 multiples of 4 are 4, 8 and 12.
- Understand the term Factors and can identify factors of whole numbers, e.g. the factors of 15 are 1, 3, 5 and 15.
- Apply the knowledge and understanding of these when solving relevant problems in number, money and measurement.

3rd Level, in addition to 2nd Level:

- Identify the common multiples of 2 or more whole numbers including the Lowest Common Multiple (LCM), e.g. the LCM of 3 and 5 is 15.
- Identify the common factors of 2 or more whole numbers including the Highest Common Factor (HCF), e.g. the common factors of 24 and 16 are 1, 2, 4 and 8. The HCF is 8.
- Solve problems involving multiples and factors, LCM and HCF.
- Understand that a Prime Number is one with only two factors; itself and 1.
- Identify prime numbers up to 100.

J. Time

2nd Level:

- Read and record time in both 12 hour and 24 hour notation.
- Convert between 12 and 24 hour notation, e.g. 2pm = 14 00 and vice versa.
- Know common units of time and carry out simple conversion calculations,
e.g. 1 hour = 60 minutes, 1 day = 24 hours, 1 minute = 60 seconds,
 $1 \frac{3}{4}$ hours = 105 minutes.

- Use both electronic and paper based timetables and calendars to plan events and solve real life problems.
- Calculate the duration of activities including those across several hours and parts of hours using both 12 and 24 hour notation, e.g. I went to the shops at 0950 and got home at 1310, how long was I gone?
- Select the most appropriate unit of time, e.g. I would measure the time for Usain Bolt to run 100m in seconds.

3rd and 4th Level, in addition to 2nd Level:

- Calculate time durations across hours and days, e.g. I left my house on Monday at 2.15 pm and arrived at my destination at 5.30 am on Wednesday. How long did my journey take?
- Knowledge of the relationship between speed, distance and time, e.g. $D = S \times T$, $T = D \div S$, $S = D \div T$.
- Apply this knowledge to find one of the variables when given the other two, e.g. calculate the average speed of a car that covers 120 miles in 3 hours.

Block 3: Mid-Jan - March

K. Angles

2nd Level:

- Describe and classify a range of angles identified within shapes in the environment using mathematical vocabulary including acute, obtuse, straight and reflex.
- Measure and draw angles accurately to within $\pm 2^\circ$.
- Know that complementary angles add up to 90° , and supplementary angles add up to 180° and use this knowledge to calculate complementary and supplementary angles.

3rd Level, in addition to 2nd Level:

- Name angles using mathematical notation using 3 letters, e.g. Angle ABC.
- Know that angles around a point total 360° , and use this to calculate missing angles.
- Know that vertically opposite angles are equal and use this to calculate missing angles.
- Identify Alternate (Z Angles) and Corresponding (F angles) and can apply this knowledge to calculate missing angles.
- Know the angle properties of triangles (the 3 angles total 180° , Isosceles triangles have 2 equal sides and 2 equal angles, Equilateral triangles have 3 equal sides and 3 equal angles) and can apply this knowledge to find missing angles.

L. Algebra 1

2nd Level:

- Collect like terms to 'tidy up' simple algebraic expressions, e.g. $3x + 2x = 5x$.
- Evaluate simple expressions, e.g. If $x = 3$ then $4x = 4 \times 3 = 12$.

3rd Level:

- Collect like terms, including squared terms, to simplify an algebraic expression, e.g. $3x + 2y + 5x - 4y = 8x - 2y$.
- Evaluate expressions involving two variables using both positive and negative numbers, e.g. if $x = 3$ and $y = -2$ then find the value of $2x + 4y$.
- Create and evaluate a simple formula, e.g. can find the value of C given by $C = 0.05m + 75$ when $m = 400$.

M. Coordinates

2nd Level:

- Construct a 1st quadrant coordinate diagram, recognising the origin (with coordinates (0,0)) and the x (horizontal) and y (vertical) axes.
- Describe, plot and record the location of a point, in the first quadrant, using coordinate notation, e.g. A(3, 5) to describe the position of point A, 3 along the x- axis and 5 up the y- axis.
- Draw sides to complete 2D shapes on a coordinate diagram.

3rd Level, in addition to 2nd Level:

- Construct a 4 quadrant coordinate diagram.
- Use coordinates in all 4 quadrants to read and plot specified points, e.g. B(-3, 5) to plot point B, 3 units to the left on the x-axis then 5 units up the y-axis.
- Construct the diagonals on 2D shapes and identify the point of intersection, where the 2 diagonals meet.

Block 4: Mid April to End May

N. Measurement 1

2nd level:

- Use the comparative sizes of familiar objects to make reasonable estimations of length and area, eg length of kitchen table, area of garden.
- Estimate to the nearest appropriate unit, then measure accurately: length, height and distance in millimetres (mm), centimetres (cm), metres (m) and kilometres (km)
- Calculate the perimeter (the distance around a shape) of a simple straight sided 2D shape in mm's, cm's and m's eg a triangle or a rectangle
- Know the formula to calculate the area of squares and rectangles as Area = Length x Breadth ($A = l \times b$) and can calculate this in square millimetres (mm^2), square centimetres (cm^2), and square metres (m^2)
- Know the formula to calculate the area of a right angled triangle as Area = $\frac{1}{2} \times \text{Base} \times \text{Height}$ ($A = \frac{1}{2} \times b \times h$) and can calculate this in square millimetres (mm^2), square centimetres (cm^2), and square metres (m^2)
- Convert between common units of measurement using decimal notation eg 550cm = 5.5m
- Read a variety of scales accurately eg ruler, protractor
- Draw squares and rectangles accurately with a given perimeter or area
- Demonstrate understanding of the conservation of measurement eg draw 3 rectangles with an area of 24cm^2
- Identify and describe quadrilaterals (shapes with 4 sides) using specific vocabulary including vertices (corners) and diagonals eg kite, parallelogram, rhombus
- Know the 8-compass points, e.g. North (N), South East (SE).
- Understand the link between compass points and angles, e.g. the angle between N and SE in a clockwise direction is 225° .
- Describe, follow and record directions, routes and journeys using appropriate vocabulary.
- Interpret maps, models or plans with simple scales eg 1 cm = 2 km

3rd level, in addition to 2nd level:

- Choose appropriate units for length and area when solving practical problems
- Convert between standard units to 3 decimal places and apply this when solving calculations of length and area eg $40\text{mm} = 4\text{cm} = 0.04\text{m}$
- Calculate the area of 2D shapes where the units are inconsistent eg if a rectangle has a length of 50cm and a breadth of 2m

- Calculate the area of compound 2D shapes constructed from a combination of squares, rectangles and triangles
- Know the angle properties of quadrilaterals (the 4 angles total 360°) and can apply this knowledge to find missing angles.
- Understand a 3-figure bearing as an angle measured from North in a clockwise direction. If the angle is less than 100° then we put a 0 at the front, eg 095°
- Apply knowledge and understanding of scale to enlarge and reduce objects in size, demonstrating an understanding of linear scale factor, eg if the object has doubled in size the scale factor is 2, but if the object has halved in size the scale factor is $1/2$
- Use bearings and scale to interpret and create accurate plans and scale drawings of routes and journeys, eg when the scale of a map is 1:25000

O. Statistics 1

2nd Level:

- Collect, organise and display data accurately using line graphs, bar graphs, frequency tables and simple pie charts choosing suitable scales
- Analyse, interpret and draw conclusions from this data

3rd Level:

- Describe trends in data using appropriate language eg increasing trend
- Discuss if the information is robust, vague or misleading by considering the validity of the source, scale used, sample size, method of presentation and appropriateness of how the sample was selected
- Organise and display data appropriately using compound bar and line graphs and pie charts

P. Symmetry

2nd Level:

- Identify and illustrate line symmetry on a wide range of 2D shapes and apply this understanding to complete a range of symmetrical patterns

3rd/4th Levels, in addition to 2nd Level:

- Identify all lines of symmetry in 2D shapes
- Create symmetrical patterns and pictures

BERWICKSHIRE HIGH SCHOOL

MATHEMATICS FACULTY



MATHS CURRICULUM

S2 CURRICULUM

Block 5: Mid June - Mid Oct

Q. Number 5- Ratio and Proportion

3rd/4th Levels:

- Express quantities as a ratio and where appropriate simplify, eg If there are 6 teachers and 60 students in a school find the ratio of the number of teachers to the total number of people
- Share quantities in a given ratio, eg Bill & Ben share a prize of £400 in the ratio 3:5, how much will each receive?
- Use the terms Direct and Inverse proportion to describe the relationship between 2 quantities
- Show how quantities that are related can be increased or decreased proportionally
- Use knowledge of proportion to solve problems in everyday contexts, eg If 3 men take 6 hours to paint a house, how long would 4 men take?

R. Algebra 2

2nd Level:

- Solve simple algebraic equations with one variable, eg $a - 30 = 40$ and $4b = 20$

3rd/ 4th Levels, in addition to 2nd Level:

- Express problems or statements using algebraic language to construct and solve a range of equations, eg If Tim is 5 years older than Bill and their combined age is 19 years then we can write $x + x - 5 = 19$
- Solve linear equations, eg $2x + 3 = 12$
- Solve more complex linear equations, eg $2x + 3 = x + 7$
- Solve linear inequalities, eg $4x - 5 \geq 21$
- Evaluate a simple linear formula from a diagram, problem or statement, eg If $C = 0.05m + 75$, evaluate C when $m = 600$

S. Speed, Distance and Time

2nd Level:

- Calculate the duration of a journey, using simple time periods, based on knowledge of the link between speed, distance and time, eg If I drive at 40km/hr, how long would I take to cover 120km?

3rd/4th Levels, in addition to 2nd Level:

- Knowledge of the 3 formulae: $S = D \div T$, $D = S \times T$, $T = D \div S$
- Apply this knowledge of the 3 formulae to calculate how long a journey will take, the speed travelled at or the distance covered, using only simple decimal fraction hours, eg 3.5 hours = 3 hours 30 minutes
- Carry out calculations involving speed, distance and time involving more complex decimal fraction hours, eg calculate the distance travelled over 3 hours 18 minutes at a speed of 45mph

T. Measurement 2 - The Circle

2nd Level:

- Knowledge of the terms radius, diameter and circumference
- Knows that $r = \frac{1}{2}d, d = 2r$

3rd/4th Level, in addition to 2nd Level:

- Calculate the circumference of a circle using the formula $C = \pi D$
- Calculate the area of a circle using the formula $A = \pi r^2$
- Calculate the diameter and radius of a circle when given the area or the circumference.
- Calculate the area and perimeter of compound 2D shapes constructed from squares, rectangles and parts of circles eg semi-circle, quarter circle, three quarters of a circle.

Block 6: Mid Oct- Mid Dec

U. Probability

2nd Level:

- Use mathematical vocabulary to describe the likelihood of events occurring in everyday situation including likely, unlikely, possible, impossible, even chance, certain.
- Use the language of probability accurately to describe the likelihood of simple events occurring eg when throwing a die, the probability of getting a 5 is $\frac{1}{6}$, or 1 out of 6
- Use data to predict the outcome of a simple experiment eg if I throw a die 60 times, how many 5's would I expect to get?

3rd Level:

- Understand the relationship between the frequency of an event happening and the probability of it happening.
- Use the probability scale of 0 (impossible) to 1 (certain) showing probability as a fraction or decimal fraction eg when tossing a coin the probability of getting a head, $P(\text{Head}) = \frac{1}{2} = 0.5$
- Know to calculate probability as *Number of favourable outcomes* $\div$ *number of possible outcomes*
- Use the previous formula to calculate the probability of a simple event happening eg the probability of throwing a prime number on a 12-sided die.
- Use a given probability to calculate an expected outcome eg the probability of rain in June is 0.25, so how many days do we expect it to rain?

V. Algebra 3

2nd Level:

- Explain and use a rule to extend well known number sequences including square numbers, triangular numbers and the Fibonacci sequence.
- Apply knowledge of multiples, square numbers and triangular numbers to generate number patterns.

3rd/4th Levels:

- Generate number sequences from a given rule eg for $T = 4n + 6$; 1st term $= 4 \times 1 + 6 = 10$
- Extend a given pattern and describe the rule.
- Express sequence rules in algebraic notation eg the cost, C, of hiring a car is £75 plus a charge of £0.12 per mile, 'm', driven so $C = 0.12m + 75$
- Determine a general formula for the nth term to describe a sequence and use this to solve related problems eg Find the 7th term if the nth term is given by $4n - 6$

W. Pythagoras

4th Level:

- Explore the relationship that exists between the sides of any right-angled triangle, referring to the longest side as the Hypotenuse.
- Calculate the length of any side of a right-angled triangle using the Theorem of Pythagoras.
- Use an appropriate strategy to solve related problems, interpreting the answer for the context eg creating a right-angled triangle from an isosceles triangle then finding the length of a missing side.

X. Statistics 2

4th Level:

- Calculate the mean (sum of terms $\div$ number of terms), mode (most popular term), median (middle term of an ordered list) and range (highest term - lowest term) of a set of data.
- Decide which type of average is most appropriate to use and discuss how using an alternative type of average could be misleading.

Block 7: Mid Dec - Mid March

Y. Number 6

2nd Level:

- Recap on Rounding work covered in S1, Block 1.

3rd and 4th Level, in addition to 2nd Level:

- Understand that the context of the question needs to be considered when rounding, or choosing the required degree of accuracy, to make real life calculations.
- Demonstrate the impact of inaccuracy and error, e.g. the impact of rounding an answer before the final step in a multi-step calculation.
- Explain the notation and use associated vocabulary for powers and roots, e.g. index, exponent and power.
- Evaluate whole number powers, e.g. $2^4 = 16$.
- Express whole numbers as powers, e.g. $27 = 3^3$.
- Show an understanding that square roots of whole numbers have positive and negative values, e.g. $\sqrt{9} = 3$ or -3 .
- Use knowledge of the inverse relationship between powers and roots to evaluate whole number roots of any appropriate number, e.g. $4^2 = 16$ and $\sqrt{16} = 4$.
- Recap on BIDMAS work covered in Block 2, also now including powers and roots, e.g. $4.5 + 3^2 \times \sqrt{25}$.
- Express large and small numbers in Scientific Notation and understand and work with numbers written in this form, e.g. $345000 = 3.45 \times 10^5$.

Z. Algebra 4

2nd and 3rd Level:

- Review of Algebra 1 Block 3 and Algebra 2 Block 5.

3rd and 4th Level:

- Expand brackets using the distributive law, e.g. $3(2x + 5) = 6x + 15$ and $5x(x - 4y) = 5x^2 - 20xy$.

- Simplify algebraic terms involving a bracket using knowledge of BIDMAS, e.g. $2 + 3(4x - 1) = 2 + 12x - 3 = 12x - 1$
- Solve equations involving brackets, e.g. Find the value of x when $3(2x - 6) = 12$.
- Evaluate algebraic expressions involving a bracket, e.g. Find the value of $2(6 + 2x)$ when $x = 4$.
- Factorise expressions with a common factor, e.g. $4y - 12 = 4(y - 3)$ and $15x + 3xy = 3x(5 + y)$.

AA.Measurement 3 - 3D Shape

2nd Level:

- Use mathematical language including faces, edges, vertices, regular and irregular to identify and describe 3D objects, e.g. sphere, cylinder, cuboid and triangular prism.
- Read a variety of scales accurately.
- Convert between common units of measurement using decimal notation, e.g. $550\text{cm} = 5.5\text{m}$ and $3.009\text{kg} = 3009\text{g}$.
- Calculate the volume of cubes and cuboids in cubic centimetres (cm^3) and cubic metres (m^3), using the formulae $V = l \times b \times h$ (cuboid) or $V = l^3$ (cube).

3rd and 4th Level, in addition to 2nd Level:

- Identify where units are not consistent and choose appropriate units for volume when solving practical problems, e.g. cm^3 , m^3 , ml and l.
- Convert between standard units to 3 decimal places and apply this when solving calculations of capacity and volume, e.g. $2360 \text{ cm}^3 = 2360 \text{ ml} = 2.36 \text{ l}$.
- Find the volume of compound 3D objects constructed from cubes and cuboids.
- Calculate the volume of triangular prisms and cylinders using the formula: *Volume of prism* = *Area of cross section* $\times$ *height* or $V = A_{cs} \times h$.
- Extension: Solve problems involving the volume of a prism, using a formula to make related calculations when required, e.g. If I know the volume and the area of the cross section, I can calculate the height of the prism.
- Use appropriate formulae to calculate the surface area (total area of all faces) of cylinders, cuboids and triangular prisms.

Block 8: Mid March - Mid May

BB.Statistics 3

2nd Level:

- A review and development of Statistics 1 and Statistics 2.

3rd and 4th Level, in addition to 2nd Level:

- Interpret raw and graphical data using a variety of methods.
- Produce scatter diagrams and use statistical language to describe identified relationships, e.g. positive, negative or no correlation.
- Produce and read information from a stem and leaf diagram and a back to back stem and leaf diagram.
- Select and justify the most appropriate statistical diagram to display a given data set, e.g. pie chart, stem and leaf or scatter graph.

CC. Trigonometry

3rd and 4th Level:

- Identify and name the sides of a right angled triangle: Hypotenuse, Opposite and Adjacent.
- Using knowledge of the relationship that exists between the sides, or sides and angles in a right angled triangle to select and use appropriately Sine, Cosine or Tangent ratio to find a missing side or a missing angle in a right angled triangle.
- Knowledge of SOHCAHTOA as a memory aid to help select the appropriate ratio, e.g. $\sin x^\circ = \text{opposite} \div \text{adjacent}$, $\cos x^\circ = \text{adjacent} \div \text{hypotenuse}$, $\tan x^\circ = \text{opposite} \div \text{adjacent}$. Use SOH triangle as you would SDT triangle to get the correct formulae.
- Solve related problems, interpreting the answer for the context, e.g. calculating the missing side or angle in an isosceles triangle or identifying whether the slope of a roof would meet building regulations.

BERWICKSHIRE HIGH SCHOOL

MATHEMATICS FACULTY



MATHS CURRICULUM

S3 CURRICULUM

N3 route: June to November

2nd and 3rd Level

Calculations:

- Demonstrate understanding of place value, eg In 35.7, the underlined figure stands for 5 units
- Add and subtract whole numbers up to 4 digits using written methods and mental strategies such as number facts, partitioning, doubling, halving and adding on, eg $435 + 267 = 400 + 200 + 30 + 60 + 5 + 7$
- Add and subtract decimal fractions to 2 decimal places including those requiring trailing zeros eg. $3.45 + 4.7$, $9.2 - 6.19$.
- Order numbers less than zero and locate them on a number line, e.g. put the following numbers in order, lowest to highest: 12, -14, -5, 0, 2.
- Know how to use these numbers in simple calculations, e.g. $-3 + 5 = 2$, $4 - 7 = -3$.
- Multiply whole numbers by a single digit, e.g. $437 \times 2 = 874$.
- Divide whole numbers by a single digit, e.g. $42 \div 6 = 7$.
- Multiply decimal fractions to 2 decimal places by a single digit using efficient written methods, e.g. 15.67×6 .
- Divide decimal fractions to 2 decimal places by a single digit using written methods, including answers expressed as decimal fractions, e.g. $43 \div 5 = 8.6$.
- Multiply and divide whole numbers by 10, 100 and 1000 and by multiples of 10, 100 and 1000 using efficient mental and written methods, e.g. $42 \times 300 = 42 \times 3 \times 100$.
- Round whole numbers to the nearest 1000, 10000 and 100000, e.g. $4500 = 5000$ to the nearest 1000.
- Round decimal fractions to the nearest whole number and to 1 and 2 decimal places, e.g. $54.7 = 55$ to the nearest whole number, $159.95 = 160.0$ to 1 decimal place.
- Recognise BIDMAS as Brackets, Indices, Divide, Multiply, Add, Subtract.
- Display knowledge and understanding of BIDMAS as the rule for the order of operations in number calculations.
- Apply the correct order of operations in number calculations when solving simple multi-step problems, e.g. $3 + 5 \times 4 = 3 + 20 = 23$.
- Understand the meaning of a fraction using the terms Numerator and Denominator.
- Find a simple fraction of an amount, 'divide by the bottom, times by the top', and use this to solve problems, e.g. $\frac{2}{3}$ of 15.
- Solve problems by carrying out calculations, both with and without a calculator, involving a wide range of fractions and decimal fractions, e.g. If I buy 40 pencils and sell $\frac{4}{5}$ of these, how many do I have left?

- Understand simple percentages as a quantity out of 100, e.g. 10%, 20%, 25% $33\frac{1}{3}$, 50%, $66\frac{2}{3}$ 75%, 100%.
- Convert between simple fractions, decimals and percentages, e.g. $50\% = \frac{1}{2} = 0.5$.
- Find a simple percentage of an amount without a calculator, e.g. $10\% \text{ of } 250 = \frac{1}{10} \text{ of } 250 = 25$.
- Find a simple percentage of an amount with a calculator, eg $9\% \text{ of } £65 = 9 \div 100 \times 65 = £5.85$
- Solve problems involving percentage increase and decrease in everyday contexts, e.g. calculate the sale price of a £40 jumper that is reduced by 15%.

Managing Money:

- Understand the terms Hourly Pay, Monthly Pay, Annual Salary, Per Annum (p.a), Gross Pay (including any Bonus or Overtime Pay), Deductions (Income Tax, National Insurance, Pension), Net Pay (Gross Pay - Deductions).
- Calculate Income tax as a percentage of Monthly Pay
- Calculate National Insurance as a percentage of Monthly Pay
- Calculate Pension contributions as a percentage of Monthly Pay
- Calculate Bonus Pay as a percentage of Monthly Pay
- Understand Overtime Rates of either double time or time and a half
- Calculate Overtime at a different rate eg I earn £15 per hour, how much will I get paid for 5 hours overtime at time and a half?
- Complete Payslips using this information.
- Solve problems involving money, eg Ed has £30 and buys 2 CD's at £12.95 each. How much money does he have left?

N4 route: June to November

3rd level

Calculations:

- Add and subtract whole numbers including negative numbers, eg $3 + (-2) = 3 - 2 = 1$, $9 - (-2) = 9 + 2 = 11$.
- Multiply whole numbers up to four digits by a single digit whole number, eg 7560×4 .
- Multiply whole numbers of any size by 10 and 100, eg $359 \times 10 = 3590$
- Divide whole numbers of any size by a single digit whole number, eg $4224 \div 6$.
- Divide whole numbers of any size by 10 or 100, eg $2560 \div 10 = 256$, $278 \div 100 = 2.78$.
- Round answers to a specified number of significant figures (s.f), eg $3250 = 3300$ to 2 sf.
- Round answers to a specified number of decimal places (dp), eg $3.487 = 3.5$ to 1d.p.
- Convert between simple percentages and fractions, eg $10\% = 1/10$, $20\% = 1/5$, $25\% = 1/4$, $33\frac{1}{3}\% = 1/3$.
- Use this knowledge to find simple percentages and fractions of shapes and quantities including 50%, 10%, 20%, 25%, $33\frac{1}{3}\%$; $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $1/10$, $1/5$, eg $10\% \text{ of } 45 = \frac{1}{10} \text{ of } 45 = 4.5$, $20\% \text{ of } 15 = \frac{1}{5} \text{ of } 15 = 3$.
- Calculate a percentage of an amount without a calculator, eg 15% of £35: find 10% of £35, find 5% as $10\% \div 2$, then find $10\% + 5\%$ to finish.
- Calculate percentage increase and decrease, e.g. increase £35 by 15%: find 15% of £35 (see above), then add on to £35.
- Convert equivalences between common fractions, decimal fractions and percentages, e.g. $\frac{1}{5} = 0.2 = 20\%$.
- Calculate rate, e.g. miles per hour or number of texts per month.

- Calculate distance given speed and time using the formula $D = S \times T$.
- Calculate time intervals using the 12-hour and 24-hour clock, e.g. how much time has passed between 0830 and 1415?
- Calculate the area of rectangles using $A = l \times b$ and squares using $A = l^2$, eg calculate the area of a rectangle with length of 5cm and breadth of 8 cm.
- Know that units must be consistent when calculating area and that the answer will be in mm^2, cm^2, m^2 .
- Calculate the volume of cuboids using $V = l \times b \times h$ and cubes using $V = l^3$, e.g. calculate the volume of a cube with sides 3cm.
- Know that units must be consistent when calculating volume and that the answer will be in mm^3, cm^3, m^3
- Calculate the perimeter (the total distance around a shape) of various shapes with straight sides by adding up the length of all the sides.
- Solve problems by sharing in a given ratio, e.g. share £30 in the ratio 1:5.
- Solve problems involving direct proportion, e.g. If 5 bars of chocolate cost £2.80, work out the cost of 3 bars.

Data:

- Know how to extract and interpret data from a table with at least four categories of information.
- Know how to extract and interpret data from a chart where the values are given or where the scale is obvious, e.g. a pie chart.
- Know how to extract and interpret data from a graph where the scale is obvious, e.g. bar, scatter or line graph.
- Know how to extract and interpret data from a diagram, e.g. stem and leaf, map or plan.
- Know about patterns and trends in data, e.g. the older the child, the greater the height.
- Explain the effect of bias and sample size on data reliability.

Measurement:

- Measure length, weight, volume and temperature using measuring instruments with straightforward scales, e.g. ruler, scale, jug and thermometer.
- Read scales to the nearest marked, unnumbered division with a functional degree of accuracy.
- Knowledge of appropriate checking methods, e.g. check sums and estimation.
- Explain and interpret the results of measurements involving time, length, weight, volume and temperature.
- Know that 10 mm = 1cm, 100cm = 1m, 1000g = 1kg, 1000ml = 1l.
- Use this knowledge to convert between mm/cm, cm/m, g/kg, and ml/l, e.g. 144cm=1.44m.

Probability:

- Use mathematical vocabulary to describe the likelihood of an event occurring in everyday situations including likely, unlikely, possible, impossible, even chance and certain.
- Use the probability scale of 0 (impossible) to 1 (certain) and be able to place common events on this scale eg where on the scale would you place the probability of it snowing in December, the probability of winning the lottery.
- Calculate the probability of an event occurring as
Number of favourable outcomes ÷ number of possible outcomes
- Use this to calculate the probability of a simple event happening, e.g. the probability of throwing a prime number on a 12-sided die, when tossing a coin the probability of getting a head, $P(\text{Head}) = 1/2=0.5$.

- Calculate probability using percentages, decimal fractions and fractions.
- Use a given probability to calculate an expected outcome, e.g. the probability of rain in June is 0.25, so how many days do we expect it to rain?

N5 route: June to November

4th Level

Calculations:

- Add and subtract whole numbers, e.g. $456 + 557 = 1013$, $65 - 29 = 36$.
- Multiply whole numbers of any size, with up to six-digit whole numbers, e.g. $36 \times 45 = 1620$.
- Divide whole numbers of any size, by a single digit whole number or by 10 or 100, e.g. $69 \div 3 = 23$.
- Round answers to up to 3 significant figures (sf) or up to 3 decimal places(dp), e.g. $4.3325 = 4.332$ to 3 decimal places, and $5.7425 = 5.74$ to 3 significant figures.
- Add and subtract negative numbers, e.g. $3 - 7 = -4$ and $-8 + (-9) = -17$,
- Add and subtract decimals, e.g. $3.22 + 5.71 = 8.93$ and $9 - 2.475 = 6.525$.
- Multiply and divide decimals by a single digit, e.g. $4.25 \times 5 = 21.25$, $13.4 \div 5 = 2.68$
- Multiply and divide decimals by 10, 100, 1000 and multiples of 10, 100, 1000, e.g. $7.47 \div 100 = 0.074$, $4.7 \times 300 = 1410$
- Find percentages and fractions of quantities, e.g. 50%, 10%, 20%, 25%, $33\frac{1}{3}\%$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{10}$, $\frac{1}{5}$ without a calculator. Eg 50% of 36 = $\frac{1}{2}$ of 36 = 18
- Find percentages of quantities with a calculator eg 17% of £350 = $\frac{17}{100} \times 350 = £59.50$
- Convert equivalences between fractions, decimal fractions and percentages and use this to express one number as a percentage of another, e.g. express 5kg as a percentage of 80kg by calculating $\frac{5}{80} \times 100$
- Calculate compound interest eg If I deposit £2000 in a bank for 3 years gaining 5% interest per annum (pa), how much will I have at the end of the 3 years? Total in account = $1.05^3 \times 2000 = £2315.25$
- Calculate percentage appreciation as $\frac{\text{appreciation}}{\text{original amount}} \times 100$ and percentage depreciation as $\frac{\text{depreciation}}{\text{original}} \times 100$ using a calculator, e.g. Jan's house was worth £110000 when he bought it, it is now worth £135000. What is the percentage appreciation?
- Convert between mixed fractions and improper fractions, e.g. $2\frac{3}{11} = \frac{25}{11}$.
- Add and subtract mixed fractions with different denominators using 'Smile and Kiss' or by finding a common denominator e.g. $3\frac{4}{5} + 5\frac{1}{2} = 9\frac{3}{10}$.
- Multiply fractions, including mixed numbers, by first converting to improper (top heavy) fractions then using 'top x top, bottom x bottom', e.g. $1\frac{2}{3} \times 3\frac{2}{5} = \frac{5}{3} \times \frac{17}{5} = 5\frac{2}{3}$.
- Calculate rate, e.g. miles per hour or number of texts per month.
- Know the formulae for calculating speed, distance or time: $s = \frac{d}{t}$, $t = \frac{d}{s}$, $d = s \times t$
- Use the formulae to complete calculations including those involving decimal parts of an hour, e.g. Harry cycles 8 km in 30 minutes. Calculate his speed.
- Understand perimeter as the total distance around a shape and be able to calculate the perimeter of composite shapes made from rectangles and parts of circles (semi-circles and quarter circles).
- Calculate the area of triangles using $A = \frac{1}{2} \times b \times h$
- Calculate the area of circles using $A = \pi r^2$, when told either the radius or the diameter.

- Calculate the area of common quadrilaterals using formulae eg Area of a square = l^2 , Area of a rectangle = $l \times b$, Area of a rhombus = $\frac{1}{2} \times \text{diagonal 1} \times \text{diagonal 2}$, Area of a kite = $\frac{1}{2} \times d1 \times d2$ and Area of a parallelogram = $b \times h$.
- Calculate composite areas made from rectangles, triangles and parts of circles (semi-circles and quarter circles).
- Calculate volume of cubes using $V = l^3$.
- Calculate volume of cuboids using $V = l \times b \times h$.
- Calculate volume of prisms using $V = Acs \times h$, where Acs = Area of Cross Section.
- Calculate volume of cylinders using $V = \pi r^2 h$.
- Know that 1ml = 1cm³ and that 1000ml = 1l and be able to convert between cm³ and litres eg 4700cm³ = 4.7l.
- Solve problems involving liquid capacity of 3D solids, e.g. how many millilitres of water can a cube with side 11 cm hold?
- Use ratio to calculate new proportions of quantities and share a quantity in a given ratio, e.g. share 50 sweets between Paul and Jim in the ratio 3:7.
- Understand and is able to solve direct proportion problems eg Find the cost of 5 oranges if 3 oranges cost £1.20.
- Understand and is able to solve simple inverse proportion problems, e.g. if it takes 4 men 3 days to build a wall, how long would it take 3 men?

Measurement:

- Measure length, weight, volume and temperature using measuring instruments with a variety of scales.
- Read scales to the nearest marked, unnumbered division with a functional degree of accuracy.
- Knowledge of appropriate checking methods, e.g. check sums and estimation.
- Explain, interpret and compare the results of measurements involving time, length, weight, volume and temperature.
- Know that 10 mm = 1cm, 100cm = 1m, 1000g = 1kg, 1000ml = 1l and can convert between mm/cm, cm/m, g/kg, and ml/l

Data:

- Able to extract and interpret data from a table with at least four categories of information.
- Able to extract and interpret data from a chart where the values can be calculated, e.g. pie charts using angles or percentages.
- Able to extract and interpret data from a graph where the scale is obvious, e.g. bar graph, scatter or line graph.
- Able to extract and interpret data from a diagram, e.g. stem and leaf, map or plan.
- Identify patterns and trends in data.

Probability:

- Calculate probability of events happening (P(event)) using $\frac{\text{number of favourable outcomes}}{\text{total number of outcomes}}$ and interpret these results in context, e.g. If one lottery has 5 winning tickets out of 65 tickets and another has 4 winning tickets out of a total of 50 tickets, which lottery am I most likely to win?
- Know how to use the results of probability calculations to make future predictions and make justifiable decisions.