Kettlethorpe
HIGH SCHOOL

Kettlethorpe High School
Progression Steps
Maths

9

Performance and knowledge over and above the Step 8 descriptors.

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Number:

1. Convert large and small numbers from ordinary numbers into standard form.
2. Convert large and small numbers from standard form into ordinary numbers.
3. Use the index laws with a power of a power.
4. Identify the upper and lower bounds of a measurement.
5. Solve problems involving division of fractions and whole numbers.
6. Given a number written as a product of it prime factors, use this to write a multiple of the number as a product of its prime factors.

Algebra:

1. Expand double brackets with negative terms and simplify.
2. Combine the gradient and y-intercept to use y = mx + c to find the equation of a straight-line graph.
3. Identify parallel and perpendicular lines.
4. Plot graphs of harder quadratic equations.
5. Use the index laws in algebraic calculations and expressions with a power of a power.
6. Simplify expressions involving powers and brackets, e.g. $x(x^2+x+4)$, $3(a + 2b) – 2(a + b)$.
7. Simplify more complex expressions involving index notation. E.g. 3a4b2 x 5a3b-1, (3a4)2.
8. Factorise to one bracket by taking out the highest common factors for all terms e.g. $2x^2y + 6xy^2 = 2xy(x + 3y)$.
9. Change the subject of simple formulae up to 2 step including with a square or square root.

Probability:

1. Complete a probability tree diagram for dependent events understanding replacement and non replacement.
2. Use tree diagrams to calculate the probability of two independent events.
3. Decide whether 2 events are independent.
4. Understand and use set notation.

Statistics:

1. Identify a random sample.

2. Calculate possible values of the set of data given summary statistics.
3. Compare the mean, median, mode and range as appropriate of two distributions.
4. Identify the best average to use for a set of data.
5. Find the missing value given the mean and other data values.

Geometry:

1. Calculate the surface area of a cylinder.
2. Use Pythagoras' theorem in right-angled triangles to find a shorter side.
3. Use Pythagoras' theorem in right-angled triangles to decide if a triangle has a right angle.
4. Use and apply Pythagoras' theorem to solve problems in 2D.
5. Solve loci problems.
6. Solve two or more step angle problems using angle facts for parallel lines including the use of bearings.
7. Use two or more step angle problems by finding interior or exterior angles in regular polygons.
8. Transform 2D shapes by a combination of rotations, reflections and translations, e.g. a reflection, followed by a rotation etc.
9. Enlarge a 2D shape given a negative scale factor about a centre (0,0).
10. Use similarity to solve problems in 2D shapes.

Ratio and rates of change:

1. Interpret and write ratios to describe a situation.
2. Solve a ratio problem in context.
3. Calculate percentage change.
4. Calculate the effect of repeat standard change.
5. Use calculators for reverse percentage calculations by doing an appropriate division.
6. Use graphs showing cost e.g. taxi journey.
7. Use conversion graphs for real-life scenarios.
8. Interpret real-life graphs.

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Number:

1. Calculate in standard form with and without a calculator.
2. Divide a fraction by an integer and a fraction.
3. Work with negative and zero powers.
4. Convert between currencies.
5. Find HCF and LCM using the product of prime factorisation.

Algebra:

1. Form and solve equations with brackets and unknowns on both sides.
2. Expand double brackets and simplify.
3. Identify, expression, equation, formula, identity.
4. Substitute positive and negative values into expressions with small powers.
5. Form and solve equations using geometrical information such as angles, area, perimeter.
6. Interpret graphs including rate of change.
7. Plot graphs of quadratic functions.
8. Work with gradient and y intercept from $y = mx + c$.
9. Solve linear inequalities and represent solution on a number line.

Probability:

1. Use Venn diagrams to find probabilities.

Statistics:

1. Estimate the mean and median average from group data.
2. Find mean, medina, mode and range from a stem and leaf diagram.
3. Understand random sampling of best fit and use to make predictions.
4. Interpret correlation, draw line.

Geometry:

1. Construct angles of 60°, 90°, 30°, 45.
2. Produce shapes and paths by using loci descriptions.
3. Use accurate drawing to solve bearings problems.

4. Use Pythagoras' Theorem to justify if a triangle is right-angled given its three lengths.
5. Use Pythagoras Theorem to find a side length.
6. Use the information given about the length of sides and sizes of angles to determine whether triangles are congruent, or similar.
7. Describe a transformation.
8. Use vector notation for translations.
9. Find volumes of prisms and cylinders.
10. Find perimeters and areas of semicircles and quarter circles.

Ratio and rates of change.

1. Use and find ratios in the form 1:n or n:1.
2. Simplify a ratio expressed in different units.
3. Use reverse percentages.
4. Find compound interest.
5. Use algebraic methods to solve problems involving variables in direct proportion.

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Number:

1. Round to 1 significant figure in order to estimate.
2. Multiply and divide fractions and mixed numbers.
3. Use BIDMAS with brackets and roots, with and without a calculator.
4. Use index laws for multiplication and division.
5. Divide by decimals.

Algebra:

1. Solve linear equations where the unknown appears on one or both sides of the equation.
2. Substitute positive values into expressions with small powers.
3. Expand and factorise single brackets.
4. Change the subject of a formula.
5. Begin to consider the features of graphs such as its steepness and its y intercept.
6. Draw distance and velocity graphs.
7. Find the coordinates of a midpoint of a line segment.
8. Plot graphs in the form y = mx + c in all four quadrants.

9. Show inequalities on a number line, write down integer values which satisfy an equation.
10. Find and use nth term of linear sequences.

Probability:

11. Draw and use frequency trees and probability trees for two events.
12. Recognise whether a game is fair or not.

Statistics:

1. Extract data from two-way tables.
2. Construct stem and leaf diagrams.
3. Use angles in pie charts to determine frequencies.
4. Calculate the mean average from frequency tables, use the mid-point of a group interval to estimate the mean.
5. Draw and interpret frequency polygons.
6. Recognise when it's appropriate to use mean, median or mode.
7. Use language of sampling, sample, population, primary, secondary, qualitative, quantitative, sources of bias and how to avoid it.

Geometry:

1. Draw and use plans and elevations.
2. Construct triangles given different angles and sides. Construct line and angle bisectors.
3. Find reverse bearings and use map scales.
4. Draw and label part of circles, know and use formulae for area and circumference of circles.
5. Enlarge 2D shapes from centre by a scale factor.
6. Find area of trapezia.
7. Find surface area of cubes and cuboids.

Ratio and rates of change:

1. Use a multiplier for percentage increase or decrease.
2. Use percentages for VAT, profit, loss, taxation, simple interest.
3. Calculate speed, distance, time

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Number:

1. Add, subtract, multiply and divide positive and negative integers and decimals.
2. Use equivalence of fractions, decimals and percentages to compare proportions.
3. Use division to convert between fractions and decimals (both terminating and recurring).
4. Find exact and estimated squares, cubes and their roots.
5. Use BIDMAS with brackets and indices.
6. Use highest common factor and lowest common multiple to solve problems.
7. Find a fraction or decimal of a quantity by multiplication.
8. Divide decimals.
9. Add/subtract mixed numbers.
10. Express a number less than 100 as a product of prime factors.

Algebra:

1. Form expressions and equations from worded descriptions.
2. Solve two step equations.
3. Substitute positive and negative integers into formulae.
4. Generate coordinates and plot graphs of straight lines.
5. Find and use the nth term of a linear sequence.
6. Draw the next term in a pattern sequence.

Probability:

1. Write probabilities as fractions, decimals and percentages.
2. Use sample space diagrams for listing outcomes of two events.
3. Find probabilities from frequency tables two - way tables.
4. Use relative frequencies to predict outcomes, compare experimental and theoretical probabilities.

Statistics:

1. Represent and interpret continuous in tables and charts.
2. Interpret and draw comparative bar charts.
3. Draw and interpret scatter diagrams.

Geometry:

1. Use angle theorems to find angles in parallel lines and intersecting lines.
2. Know and use the exterior angle sum in polygons.
3. Translate, rotate, reflect and enlarge shapes.

4. Calculate areas of triangles, rectangles, parallelograms and simple compound shapes.
5. Find the volume of cubes and cuboids.

Ratio and rates of change.

1. Simplify and share in given ratios.
2. Find the outcome after percentage increase or decrease.
3. Express a quantity as a percentage of another.
4. Use the unitary method and proportional reasoning to solve problems.

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Number:

1. Order decimal numbers.
2. Order fractions, fractions, decimals and percentages.
3. Round values to significant figures.
4. Approximate, in order to estimate.
5. Calculate fraction and percentage of a quantity.
6. Use index notation for powers.
7. Add/subtract positive and negative integers and fractions.
8. Convert between mixed numbers and improper fractions.
9. Multiply and divide three digit numbers by two digit numbers, including with decimals.
10. Use the correct order of operations BIDMAS.
11. Find highest common factor and lowest common multiple.

Algebra:

1. Form expressions.
2. Simplify expressions by multiplying, dividing and expanding brackets.
3. Substitute into algebraic formulae.
4. Plot a graph from a table of values.
5. Plot a simple distance time graph.
6. Plot and draw graphs which are parallel to lines of the grid.
7. Use term to term relationships in sequences.

Probability:

1. Find and justify probabilities based on equally likely outcomes.
2. Express experimental probabilities as relative frequencies.

Statistics:

1. Extract data from graphs, tables and charts.
2. Construct simple pie charts.
3. Complete a two - way table.
4. Find the mean from a frequency table.
5. Compare distributions using an average and the range.

Geometry:

1. Use plan and elevation.
2. Use bearings to specify direction.
3. Calculate angles around a point and in vertically opposite angles.
4. Know and use properties of special triangles and quadrilaterals.

Ratio and rates of change.

1. Use equivalence of ratio and fractions.
2. Express a number as a fraction or percentage of another.
3. Use percentages to compare simple proportions.
4. Convert between metric units.

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Number:

1. Round to decimal places.
2. Calculate simple percentages
3. Know square numbers and their roots.
4. Multiply a two digit number by a two digit number.
5. Divide a three digit number by one digit.
6. Multiply and divide by 10,100,1000
7. Add and subtract decimal values in columns.

8. Find multiples, factors and prime numbers.

Algebra:

1. Simply simple expressions by collecting like terms.
2. Substitute positive integers into worded formulae.
3. Use function machines to generate coordinates.
4. Plot and read coordinates in four quadrants.
5. Read values from straight line graphs.
6. Find the next term in a sequence.

Probability:

1. Use a probability scale from 0 to 1.
2. Know simple language of probability.

Statistics:

1. Construct and interpret simple bar charts and line graphs.
2. Find the mode from lists and charts.
3. Calculate the mean, median, mode and range.
4. Construct pictograms.
5. Interpret simple pie charts.

Geometry:

1. Estimate the size of angles, draw and measure angles.
2. Identify nets of cuboids.
3. Calculate angles in a triangle.
4. Know symmetry properties of triangles and quadrilaterals.
5. Find area and perimeter of simple shapes.
6. Find surface area of cubes.
7. Use formulae for area of rectangles.

Ratio and rates of change.

1. Know how many unit fractions are in a whole.
2. Know percentages are parts of a hundred.
3. Recognise equivalence of simple fractions, decimals and percentages.
4. Use a variety of scales and units of measure.