| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Ratio and Scale** | **Year: 8** | **NC Strand: Proportion** |

| What should I already know? | |
|---|---|
| • How to represent sequences in tables and graphs<br>• How to find equivalent Fractions<br>• How to find simple fractions and percentages of amount<br>• How to convert mixed numbers and improper fractions | • How to use ratio language<br>• Know how to use the ratio symbol<br>• Hoe to solve problems involving unequal sharing and grouping using knowledge of fractions and multiples<br>• How to solve ratio and proportion problems |

| What will I know by the end of the unit? | |
|---|---|
| • How to represent a ratio using a diagram<br>• How to use ratio notation<br>• How to solve problems involving ratio's of the form 1:n (or n: 1)<br>• How to solve proportional problems involving the ratio m:n<br>• How to divide a value into a given ratio | • How to express ratios in their simplest integer form<br>• How to express ratios in the form 1:n<br>• How to compare ratios and related fractions<br>• Know that π is the ratio between diameter and circumference<br>• Understand the gradient of a line is a ratio |

| Vocabulary | | | |
|---|---|---|---|
| **Ratio** | is the comparison of two values of the same kind, which may be written as a to b, a:b or as a fraction a/b. | **Equivalent ratios** | ratios that are in proportion |
| | | **Scale** | A ratio between two measurements |
| **Proportion** | being in proportion means that two ratios or fractions are of equal value. | **Common Factors** | a whole number that divides two or more other numbers exactly |
| **Order** | arrangement according to size, amount or value. | **Denominator** | the bottom number in a fraction showing the number of parts the whole is divided into |
| **Divide** | to divide or division is sharing or grouping a number into equal parts | **Numerator** | number above the line of a fraction, showing the number of parts of the whole. |
| **Multiply** | a mathematical operation where a number is added to itself a number of times. | **Fraction** | any part of a group, number or whole. |
| | | **Share** | dividing into equal groups. |
| **Proportional** | being in proportion means that two ratios or fractions are of equal value. | **Perimeter** | distance around the outside of a shape, calculated by adding the length of all sides together. |
| **Place Holder** | the zero is called a placeholder. It's not worth anything on its own, but it changes the value of other digits | **Diameter** | a straight line passing through the centre of a circle to touch both sides of the circumference. |
| **Units** | standard amount or quantity. | **Circumference** | The perimeter of a circle |
| **Multiplier** | a mathematical operation where a number is added to itself a number of times. | **Regular** | regular polygons have all sides equal and all angles equal. |
| **Constant** | a quantity having a fixed value that does not change or vary, such as a number. | **Pi** | the ratio of the circumference of a circle to its diameter, which is approximately 3.14159. |
| **Factors** | a whole number that divides exactly into another number. | **Steep** | the rise or fall of a slope |

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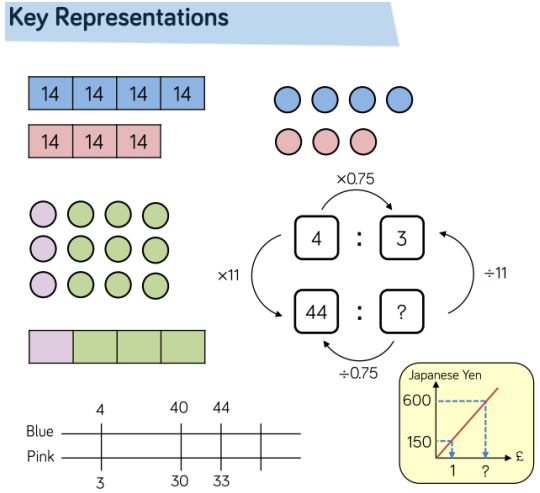
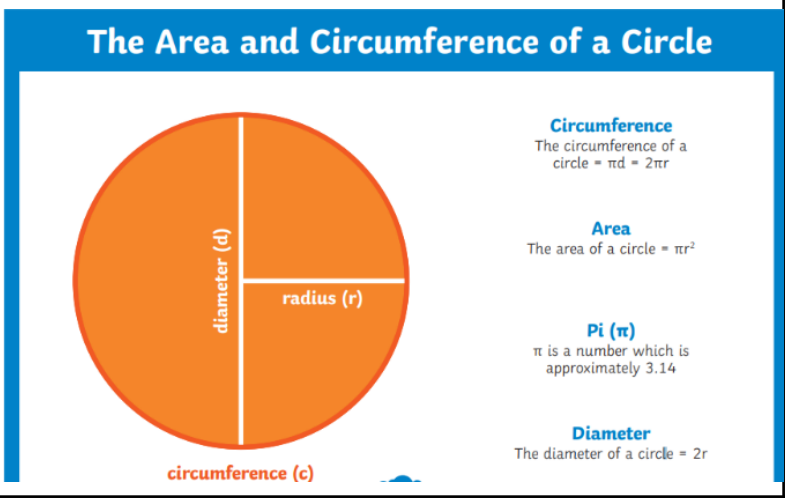
|---|---|---|
| **Topic: Ratio and Scale** | **Year: 8** | **NC Strand: Proportion** |

| | | | |
|---|---|---|---|
| **Simplify** | To simplify a ratio to its simplest form: to reduce the parts of a ratio the smallest numbers possible. | **Gradient**<br>**Slope** | is the steepness and direction of a line as read from left to right. |

## Diagram/Key Information




## Investigate/Homework tasks

- Homework will be set from the booklet issued by your teacher
- You should complete at least 30 minutes of maths tasks on Maths Whizz (not games). Please attend help sessions if you do not have access to the internet at home
- Additional work you could complete:
  - Find out more about the meaning of the vocabulary list using http://www.amathsdictionaryforkids.com/
- To challenge yourself:
  - Investigate the key questions typed in red text
  - Explain the key questions typed in purple text

## Key Questions

- What is the purpose of a ratio?
- Why should the blocks on a bar model be equal size when representing a ratio?
- Why is order important in ratio notation?
- What does 1:1 mean?
- Why are 2:1 and 2:1 different?
- In the ratio 1:n which is the bigger part?
- Can there be more than two amounts in a ratio?
- Does adding one to each part change the ratio?
- How do you set up a bar model for a ratio like 3:2? Does the size of the bars matter?
- What is the total number of parts?
- If a ratio is simplified to the form 1:n, will n always be an integer?
- Why is the ratio format 1:n useful for making comparisons?
- Which would be larger, a 1:200 scale model or a 1:300 scale model?
- What is the same and what is different when we look at a ratio and a fraction?
- What's the connection between the sum of the parts of a ratio and it's corresponding fraction?
- What the difference between the radius of a circle and it's diameter?

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|---|---|---|
| **Topic: Ratio and Scale** | **Year: 8** | **NC Strand: Proportion** |

| | |
|---|---|
| • Where should you label the question mark in your bar model?<br>• What other information does the bar model tell you?<br>• Why are factors used when simplifying ratio?<br>• What do we mean by common factors?<br>• When might you multiply to simplify a ratio? | • If I triple the diameter of a circle what will happen to it's circumference?<br>• What does gradient measure?<br>• What happens to the gradient as a line gets steeper?<br>• How is the gradient $\frac{3}{4}$ different to a gradient of $\frac{4}{3}$ ? |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Multiplicative Change** | **Year: 8** | **NC Strand: Proportion** |

| What should I already know? | |
|---|---|
| • How to represent sequences in tables and graphs<br>• Equivalent Fractions<br>• How to use ratio language<br>• Know how to use the ratio symbol<br>• Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples | • Solve ratio and proportion problems<br>• Represent functions graphically<br>• Recognise types of triangle, quadrilateral and polygons<br>• Draw and measure lines and angles accurately<br>• Construct triangles given SSS, SAS, ASA |

| What will I know by the end of the unit? | |
|---|---|
| • How to solve problems involving direct proportion<br>• How to draw and us conversion graphs to answer questions<br>• How to convert between currencies using different methods<br>• How to draw and use direct proportion graphs and understand where I might find direct proportion in real life<br>• How to explain if two shapes are similar | • How to write the scale factor of lengths using ratio<br>• How to draw scale diagrams<br>• How to interpret scale diagrams<br>• How to interpret maps using scale factors<br>• How to interpret maps using ratios |

| Vocabulary | | | |
|---|---|---|---|
| **Ratio** | is the comparison of two values of the same kind, which may be written as a to b, a:b or as a fraction a/b. | **Rate** | a ratio between two measurements using different units, for example, births per year, cost per person, words per minute. |
| **Proportion** | being in proportion means that two ratios or fractions are of equal value. | **Constant** | a quantity having a fixed value that does not change or vary, such as a number. |
| **Double** | multiplied by 2, twice as much | **Directly proportional** | the relationship between two quantities whose ratio remains constant. |
| **Triple** | three times. to multiply by three | | |
| **Linear** | an equation whose graph is a straight line. | **Origin** | the point of intersection of the x and y axis on a coordinate or Cartesian plane. The coordinates of the origin are (0, 0). |
| **Units** | standard amount or quantity. | | |
| **Axis /Axes** | real or imaginary reference line. (plural) | | |
| **Variable** | a quantity that can change or vary, taking on different values. | **Orientation** | the angle of an object compared to compass points or the axes of a Cartesian plane. |
| **Conversion** | a number or formula used to convert quantities to equivalent amounts in a different system. | **Similar** | having the same shape but not necessarily the same size. |
| | | **Corresponding** | In the same position |
| **Approximation** | to estimate a number, amount or total, often rounding it off to the nearest 10 or 100. | **Scale factor** | when comparing two similar geometric figures – the ratio of any two corresponding edge lengths. |
| **Exchange rate** | the value of one currency for the purpose of conversion to another | **Enlargement** | a transformation where a shape is made larger (or smaller if reversed) without changing its position or direction. |
| **Estimate** | to make an approximate calculation, often based on rounding. | **Object** | the shape before the enlargement |
| **Currency** | a system of money in general use in a particular country. | **Image** | the shape after the enlargement |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Multiplicative Change** | **Year: 8** | **NC Strand: Proportion** |

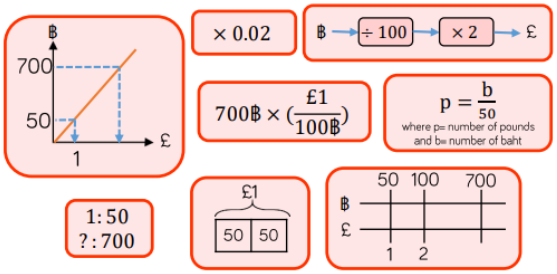
| | | | |
|---|---|---|---|
| **Sterling** | British money | **Length** | distance from one end to the other.How long something is. |
| **Distance** | the length between two points (or objects). | **Not to scale** | is drawn with no scale. |
| **Metric** | a decimal system of measurement | **Plan** | a drawing of something as viewed from above |

**Key Information**

Students will develop their skills to use multiple representations to solve problems that involve multiplicative change.

## Diagram

1 British pound (£) is approximately 50 Thai Baht (฿)
Explain how each of these representations could be used to convert 700฿ into pounds. Why do they all work?




## Investigate/Homework tasks

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Multiplicative Change** | **Year: 8** | **NC Strand: Proportion** |

- Homework will be set from the booklet issued by your teacher
- You should complete at least 30 minutes of maths tasks on Maths Whizz (not games). Please attend help sessions if you do not have access to the internet at home
- Additional work you could complete:
  - Find out more about the meaning of the vocabulary list using http://www.amathsdictionaryforkids.com/
- To challenge yourself:
  - Investigate the key questions typed in blue text
  - Explain the key questions typed in purple text

**Key Questions**

- How is direct proportion similar to direct proportion?
- If two variable quantities are in direct proportion, what happens if you halve the value of one variable?
- What happens if you triple the value of one variable?
- Is direct proportion liked to ratio?
- Do all conversion graphs start at the origin?
- Is it important to label axis on conversion graphs?
- What should the limits of your axes be?
- How is the conversion of pounds to dollars different to pounds to dollars?
- How do conversion rates relate to ratios?
- Is converting a currency an example of direct proportion?
- Do all direct proportion graphs start at the origin?
- How might we use the graph to answer questions that use values beyond those on the axes?
- Would a map with a scale of 1: 25,000 need to be bigger or smaller than a map with scale of 1: 1250 showing the same features?
- Why is important to label the axes?
- What do you notice about the angles in a pair of similar shapes?
- If shapes are not drawn to scale how can we show they are similar?
- How can labelling the vertices be useful with similar shapes?
- How does a scale factor compare to a ratio?
- What range of scale factors would make an image smaller?
- If the lengths of a shape have tripled, what is the scale factor?
- Are scale diagrams always smaller versions of the original?
- Why is a scale diagram useful?
- Describe a method for finding an appropriate scale?
- What does the scale 1:25,000 mean on a map? Can you express it as a ration in mixed units?

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Multiplication and Division of Fractions** | **Year: 8** | **NC Strand: Number** |

| What should I already know? | |
|---|---|
| ● Represent tenths and hundredths on diagrams and number lines<br>● Interchange between fractions, decimals and percentages for multiples of one<br>● Equivalent fractions<br>● Converting between any fractions, decimals and percentages<br>● Convert mixed numbers and improper fractions<br>● Adding and subtracting fractions and decimals with<br>  ○ The same denominator | ○ One denominator a multiple of another<br>○ Different denominators<br>● Add and subtract decimals and fractions<br>● Use and interpret algebraic notation<br>● Understand and use inverse operations<br>● Understand equivalence of algebraic expressions |

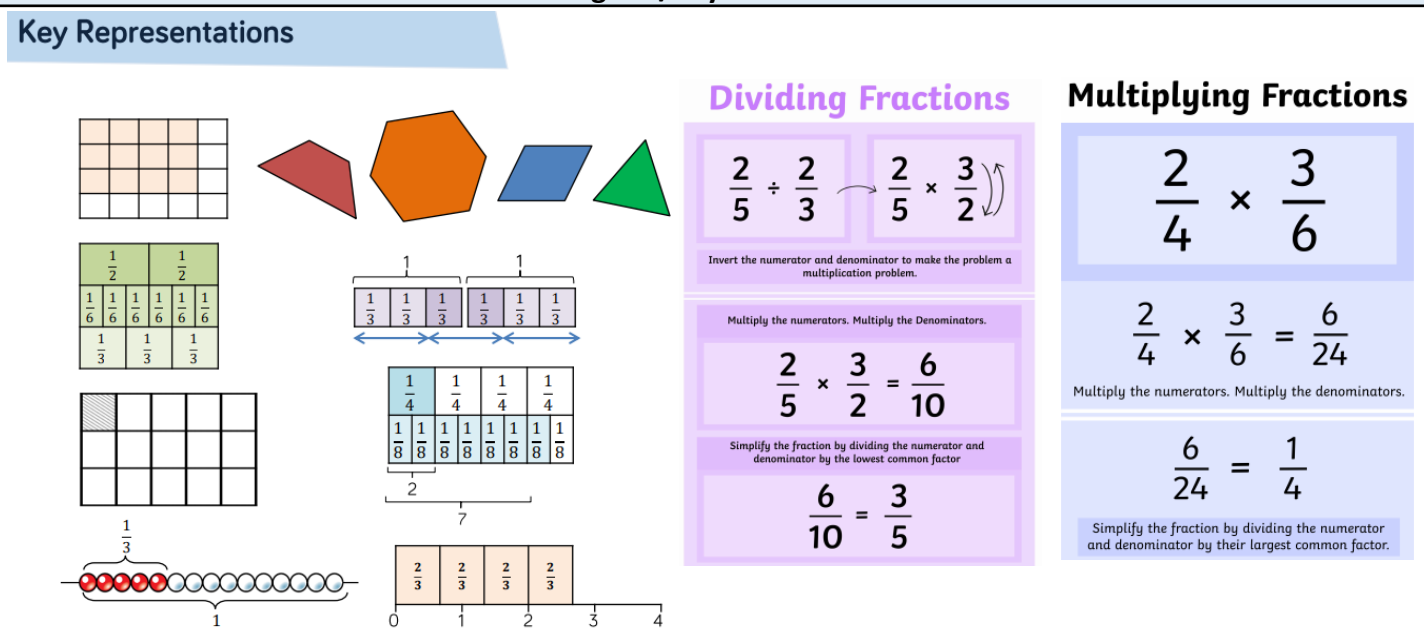
| What will I know by the end of the unit? | |
|---|---|
| ● How to represent multiplication of fractions in different ways<br>● How to multiply a fraction by an integer<br>● How to find the product of a pair of unit fractions<br>● How to find the product of any pair of fractions<br>● How to divide an integer by a fraction | ● How to divide a fraction by a unit fraction<br>● How to find the reciprocal of a fraction and a decimal and use this to answer division questions<br>● How to divide a pair of fractions<br>● How to multiply and divide improper and mixed fractions<br>● How to multiply and divide algebraic fractions |

| Vocabulary | | | |
|---|---|---|---|
| **Unit fraction** | a fraction with a numerator of 1. | **Divide** | is sharing or grouping a number into equal parts. |
| **Numerator** | number above the line of a fraction, showing the number of parts of the whole. | **Reciprocal** | also called the multiplicative inverse. One of two numbers whose product is 1, n x 1/n = 1. to get the reciprocal of a number, divide 1 by the number. |
| **Denominator** | the bottom number in a fraction showing the number of parts the whole is divided into. | **Simplify** | To simplify a fraction to its simplest form |
| | | **Factors** | a whole number that divides exactly into another number. |
| **Product** | the result when two numbers are multiplied. | **Generalise** | make a general statement by inferring from specific cases |
| **Repeated addition** | the process of repeatedly adding the same number. | **Expression** | an expression is one or a group of terms and may include variables, constants, operators and grouping symbols. |
| **Square** | a number that results from multiplying an integer by itself. | **Cancel** | reducing a fraction to an equivalent fraction with the lowest possible numbers in both the numerator and denominator. This is achieved by dividing both the top and bottom of the fraction by the same number. |
| **Whole** | a counting number from zero to infinity, no fractions, decimal fractions or negative numbers | **Simplest form (Fractions)** | to reduce the numerator and denominator in a fraction to the smallest numbers possible |
| **Commutative** | in addition and multiplication, numbers may be added or multiplied together in any order. | **Term** | one of the numbers in a ratio, e.g. 1:2:3 |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Multiplication and Division of Fractions** | **Year: 8** | **NC Strand: Number** |

| | | | |
|---|---|---|---|
| **Estimate** | to make an approximate calculation, often based on rounding | **Quotient** | the number resulting from dividing one number by another, the answer. |

## Diagram/Key Information




## Investigate/Homework tasks

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  - Explain the key questions typed in purple text
  - Challenge yourself by answering the key questions in green

## Key skills/Timeline/Topic Questions

- When making a representation of a fraction why is it important that each part is equal?
- How is addition related to multiplication?
- How is finding the fraction of an amount the same as multiplying a fraction?
- Does multiplying by a fraction always give a result which is less than 1?
- Does multiplying always make numbers larger?
- Why will the product of two unit fractions always have one as a numerator?
- When we divide the quotient is always smaller than the dividend. True or false?
- How would you find the reciprocal of a decimal?
- Can we find the reciprocal of zero?
- What do you notice about $\frac{1}{5}$ x 5? Try multiplying another number by it's reciprocal. Is this true for all numbers?
- Why is a common denominator useful when dividing fractions?
- Can there be a remainder when dividing by fractions?

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|---|---|---|
| **Topic: Multiplication and Division of Fractions** | **Year: 8** | **NC Strand: Number** |

- How can multiplying by a fraction be expressed as a multiplication and a division?
- Is it always, sometimes, or never appropriate to convert fractions to decimals before multiplying?
- How many unit fractions make a whole?
- Shade in three quarters of a square. Count the number of quarters. How does this show $\frac{3}{4} \div \frac{1}{4}$?

- Count up in thirds starting from 0. Did you count up in mixed numbers or improper fractions?
- Is it easier to multiply and divide fractions as improper or mixed?
- How many different ways can you write a quarter of x?
- Can you have an improper algebraic fraction?
- Can we use repeated addition for multiplying algebraic fractions?

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Working in the cartisan plane** | **Year: 8** | **NC Strand: Algebra** |

| What should I already know? |
|---|
| • How to describe and continue a sequence given diagrammatically<br>• How to predict and check the next term(s) of a sequence<br>• How to represent sequences in tables and graphs<br>• How to recognise the difference between a linear and non-linear sequence |

| What will I know by the end of the unit? |
|---|
| • How to work with coordinates in all four quadrants<br>• How to identify and draw lines that are parallel to the axis<br>• How to recognise and use the line y=x<br>• How to recognise and use lines of the form y=kx<br>• How to link y = kx to direct proportion<br>• How to explain the effect of changing the value of k to the gradient of the line y=kx<br>• How to recognise and use lines of the form y = x + a<br>• How to recognise and explain if a graph will have a negative gradient from it's equation<br>• How to explain the connection between graphs and linear sequences<br>• How to recognise non linear graphs<br>• How to explain how to find the midpoint of a line |

| Vocabulary | | | |
|---|---|---|---|
| Quadrants | Equation | Table | Steepness |
| Coordinates | Graph | Slope | Difference |
| Horizontal | Diagonal | Axes | Gradient |
| Vertical | Scale | Linear | Input |
| Axis | Multiple | Proportion | Output |
| Origin | Steep | Unitary | Intercept |
| Parallel | Linear | Multiplier | Straight line |
| Straight line | Substitute | Direct | Negative |
| Ratio | Slope | Sequence | Incline |
| Descending | Ascending | Integer | Substitution |
| Table of values | Curve | Non-linear | Symmetrical |
| Midpoint | Equidistant | Segment | Mean |

| Investigate/Homework tasks |
|---|
| ● Homework will be set by your teacher using google classroom<br>● You should complete at least 30 minutes of maths tasks using the website and log in provided by your teacher. Please attend help sessions if you do not have access to the internet at home<br>● Additional work you could complete:<br>○ Find out more about the meaning of the vocabulary list using http://www.amathsdictionaryforkids.com/<br>● To challenge yourself: Answer the key questions to deepen your knowledge |
| **Key Information/Diagrams** |

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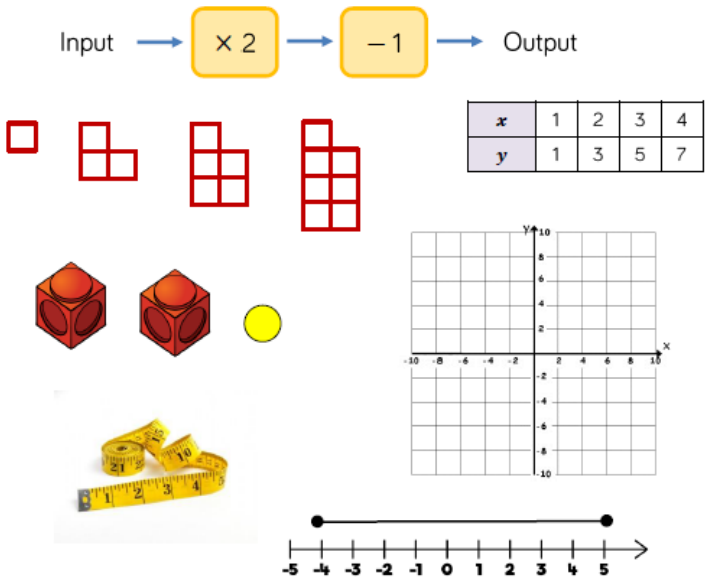
| **Topic: Working in the cartisan plane** | **Year: 8** | **NC Strand: Algebra** |

## Key Representations




## Key Questions

What is the same and what is different about the points with coordinates $(a, 0)$ and $(-a, 0)$?
Why are coordinates $(a, 0)$ and $(0, a)$ different?
Why do the order of the numbers in a coordinate matter?
Describe how you read and plot a coordinate.
Where is the origin?

Give an example of an equation of a line that is parallel to the $x$-axis/$y$-axis.
Is the line $3 = x$ the same as the line $x = 3$? What about the line $x - 3 = 0$?
Why is the line $x = 0$ different from the $x$-axis?
Will the lines $x = \cdots$ and $y = \cdots$ ever meet? Why or why not?

How can you recognise a line of the form $y = kx$?
What's the same and what is different about the lines $y = kx$ and $y = x$?
What effect does increasing or decreasing the value of $k$ have on lines with equations in the form $y = kx$?
Do all lines with equations in the form $y = kx$ form a straight line and go through the origin? Why or why not?

Is the graph $y = x$ the same as the graph $x = y$?

How many points lie on the line $y = x$? Why?

Why are the scales of the axes important when plotting graphs?

What's the same and what's different about the straight lines represented by the equations $y = kx$ and $y = -kx$?
How can you identify whether a straight line, plotted on a graph, has a negative or positive gradient?
How can you identify the type of gradient (positive or negative) of a line by just looking at the equation of the line?

What does the gradient of a line represent?
How do we know if one line is steeper than another?
Does it matter which right-angled triangle we choose on the straight line when we are calculating the gradient?
What does a gradient of zero mean?
How can working out the gradient of a line help in direct proportion calculations?

Describe the differences between a linear and a non-linear graph.
How can you use the equation of the graph to determine whether it is linear?
How do we work out the scale for our axes?

What is the same and what is different about the line $y = x$ and the line $y = x - a$?
What is the gradient of the line $y = a + x$?
What about $y = x + a$?
Is $a - x = y$ the same line as $x + y = a$? Explain.
Explain how you could check that you have plotted the line $y = x + a$ correctly. What could you look for?

How would you know if a straight line or a table of values represents direct proportion? What are the key features?
What is a conversion graph and how can information be obtained from it to answer questions?
Why do direct proportion graphs always start at $(0, 0)$?

What's the same and what's different about linear graphs and linear sequences? How could we label the axis on a the graph to show the position of a term in the sequence?
Will the gradient of the straight line representing a descending linear sequence be positive or negative? Explain your answer.

Why is it a good idea to use three coordinates when plotting a straight line graph?
Can you use non-integer $x$ values in your table to generate your set of coordinates?
Can you extend your straight line outside of the range of values in your table? Explain your answer.

What does the word equidistant mean?
How can you work out a midpoint? Is there more than one way?
If given the coordinates of the midpoint, and of the starting point of the line, how can you work out the coordinates of the endpoint of the line?

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Representing Data** | **Year: 8** | **NC Strand: Statistics** |

## What should I already know?

- How to solve problems involving timetables and tables
- How to solve problems with frequency trees
- How to solve problems with bar charts and line charts
- How to plot coordinates in all four quadrants

## What will I know by the end of the unit?

- How to draw and interpret scatter graphs
- How to understand and describe linear correlation
- How to draw and use a line of best fit
- How to identify non-linear relationships
- How to identify different types of data
- How to read and interpret ungrouped frequency tables
- How to read and interpret grouped frequency tables
- How to represent grouped discrete data
- How to represent continuous data grouped into equal classes
- How to represent data in two way tables

## Vocabulary

| | | | |
|---|---|---|---|
| Variable | Positive | Discrete | Group |
| Scale | Weak | Counted | Tally |
| Increase | Line of best fit | Continuous | Frequency |
| Decrease | Origin | Qualitative | Range |
| Relationship | Estimate | Measured | Equal |
| Coordinate | Straight | Quantitative | Class |
| Origin | Extrapolate | Frequency | Class boundary |
| Axis | Estimate | Total | Fraction |
| Relationship | Outlier | Ungrouped | Percentage |
| Correlation | Non-linear | Subtotal | Ratio |
| Strong | Variable | Grouped | |

## Homework tasks

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- To challenge yourself: Answer the key questions to deepen your knowledge

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Representing Data** | **Year: 8** | **NC Strand: Statistics** |

## Diagram and Key Information

**Scatter Diagrams/ Scatter Graphs/Scatter Plots**


## Key Questions

How do we use the data to generate coordinates?
Does it matter if the data points are not in size order?
How do we know how long to draw our axes?
How do we know what scale to use on our axes?
Which labels do we need to place on our graph?

How can you tell if correlation is positive or negative?
How is correlation useful to us? Can you give some real-life examples?
What's the same and what's different about positive and negative correlation? Can you give some real-life examples for each?

What does 'extrapolate' mean?

Why might it be a risk to make an estimate outside of the range of your data?

What does non-linear mean?

Draw different representations of non-linear scatter graphs and add on possible labels for the axes.

How can we recognise discrete, continuous and qualitative data? Give me examples of each type.

Why do we need to know about different types of data?

Why do we sometimes have a gap between bars on a bar chart?

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|---|---|---|
| **Topic: Representing Data** | **Year: 8** | **NC Strand: Statistics** |

| | |
|---|---|
| True or false:<br>• The line of best fit has to go through the origin<br>• The line of best fit goes through as many points as possible<br>• The line of best fit extends across the whole graph<br>Why do you need the line of best fit in order to make a good estimate? How can you show your method for estimating on the graph? | What does the word frequency mean?<br>What type of data is best represented by ungrouped frequency tables?<br>How can I calculate subtotals in my frequency table?<br>Do I still need the row if the frequency is 0? |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Tables and Probability** | **Year: 8** | **NC Strand: Statistics** |

| What should I already know? |
|---|
| • How to identify and represent sets<br>• How to interpret and create Venn diagrams<br>• How to understand and use the intersections of sets<br>• How to understand and use the union of sets<br>• How to understand and use the compliment of a set<br>• Know and use the vocabulary of probability<br>• How to generate sample spaces for single events<br>• How to calculate the probability for a single event<br>• How to understand and use the probability scale<br>• Know that the sum of probabilities for all possible outcomes is 1 |

| What will I know by the end of the unit? |
|---|
| • How to construct sample spaces for one or more events<br>• How to find probabilities from a sample space diagram<br>• How to find probabilities from two-way tables<br>• How to find probabilities from venn diagrams<br>• How to use the product rules for finding the total number of possible outcomes |

| Vocabulary | | | |
|---|---|---|---|
| Outcomes | Event | Denominator | Region |
| Sample space | Equally likely | Set | Total |
| Sets | Unbiased | And | Possibilities |
| Probability | P(event) | Or | Product |
| Systematic | Two-way table | Intersection | Table |
| Chance | Sample | Union | Order |

| Investigate/Homework tasks |
|---|
| ● Homework will be set by your teacher using google classroom<br>● You should complete at least 30 minutes of maths tasks using the website and log in provided by your teacher. Please attend help sessions if you do not have access to the internet at home<br>● Additional work you could complete:<br>○ Find out more about the meaning of the vocabulary list using http://www.amathsdictionaryforkids.com/<br>● To challenge yourself: Answer the key questions to deepen your knowledge |
| **Key Information/Diagrams** |
| |

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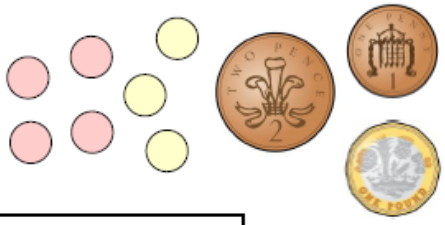
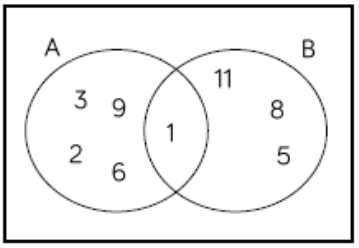
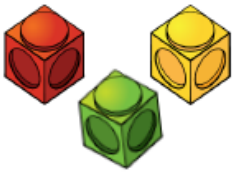
|---|---|---|
| **Topic: Tables and Probability** | **Year: 8** | **NC Strand: Statistics** |

## Key Representations

| | Boys | Girls | Total |
|---|---|---|---|
| Year 8 | | | |
| Year 9 | | | |
| Total | | | |





| | H | T |
|---|---|---|
| H | HH | HT |
| T | TH | TT |

## Key Questions

What is a sample space and how can you ensure you have listed all possible outcomes in your sample space?
Why is being systematic important when listing outcomes?
How can you determine what method or type of sample space diagram to use?

What does P(event) mean?
Is it possible to write a probability as 'out of' or as a ratio? Why not?
What are the equivalent different ways of writing a probability?
Can probabilities be simplified? Why/Why not?

How can a two-way table be used to calculate a probability?

How do you decide which row or column to look at?

How do you design a two-way table?

How do the words 'and/or' relate to set notation and regions on a Venn diagram?

Why do we start with the intersection of sets when adding information to a Venn diagram?

How can you find the total number of arrangements without listing each one?
Is commutativity important when working out the total number of arrangements? Why/Why not?
How can factors help when finding lists that have a specified number of arrangements?

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|---|---|---|
| **Topic: Brackets, Equalities and Inequalities** | **Year: 8** | **NC Strand: Algebra** |

| What should I already know? |
|---|
| • How to write equations correctly<br>• How to explain if an equation is true<br>• How to write and use fact families numerically<br>• How to write and use fact families algebraically<br>• How to solve one-step linear equations involving addition and subtraction by using inverse operations<br>• How to solve one-step linear equations involving multiplication and division by using inverse operations<br>• How to recognise and explain if terms are like terms or unlike terms<br>• How to recognise equivalent expressions and demonstrate they are equivalent<br>• How to collect like terms and use the symbol for equivalence |

| What will I know by the end of the unit? |
|---|
| • How to form algebraic expressions<br>• How to use directed numbers with algebra<br>• How to multiply out a single brackets<br>• How to factorise into a single bracket<br>• How to expand multiple single brackets and simplify<br>• How to expand a pair of binomials<br>• How to solve equations, including with brackets<br>• How to form and solve equations with brackets<br>• How to solve simple inequalities<br>• How to form and solve inequalities<br>• How to solve equations and inequalities with unknowns on both sides<br>• How to form and solve equations and inequalities with unknowns on both sides<br>• How to identify and use formulae, expressions, identities and equations |

| Vocabulary | | | |
|---|---|---|---|
| Expression | Simplify | Factorise Fully | Side |
| Substitute | Expand | HCF | Check |
| Simplify | Bracket | Expression | Form |
| Coefficient | Multiply out | Unlike Terms | Inequality |
| Term | Identify | Like Terms | Satisfy |
| Equivalent | Coefficient | Binomial | Solution set |
| Positive | Product | Quadratic | Greater/Less than (or equal) |
| Substitute | Factor | Solve | balance |
| Negative | Common | Equation | Identify |
| Solve | Factorise | Unknown | Formula |
| Directed | Common Factor | Solution | Variable |

| Investigate/Homework tasks |
|---|

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|---|---|---|
| **Topic: Brackets, Equalities and Inequalities** | **Year: 8** | **NC Strand: Algebra** |

- Homework will be set by your teacher using google classroom
- You should complete at least 30 minutes of maths tasks on Maths Whizz (not games). Please attend help sessions if you do not have access to the internet at home
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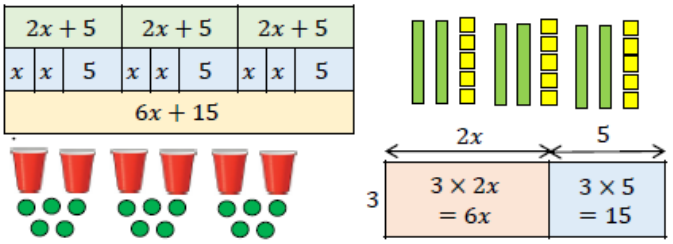
## Diagram/ Key Information

Explain how these representations show that $3(2x + 5) = 6x + 15$




Here is Tommy's method for working out $62 \times 43$ by thinking of the calculation as $(60 + 2) \times (40 + 3)$

| × | 60 | 2 |
|---|---|---|
| 40 | 2400 | 80 |
| 3 | 180 | 6 |

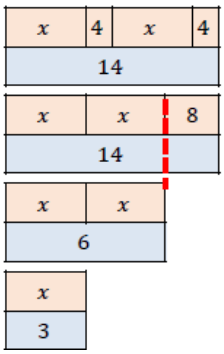
$2400 + 180 + 80 + 6 = 2666$

Complete this adaptation of Tommy's method to work out $(a + 3)(b + 4)$

| × | $a$ | 3 |
|---|---|---|
| $b$ | $ab$ | $3b$ |
| 4 | ___ | ___ |

$ab + 3b + \ldots$

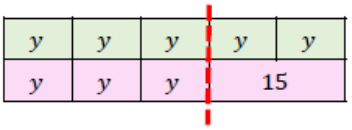
Whitney uses bar models to solve $2(x + 4) = 14$
She explains her steps on the right hand side.




$2(x + 4) = 14$
Expand brackets
$2x + 8 = 14$
$-8 \quad -8$
$2x = 6$
$\div 2 \quad \div 2$
$x = 3$

Use the bar model to help you complete the workings to find the value of $y$.

$5y = 3y + 15$
$-3y \quad -3y$
$2y = 15$
etc.




Which of the inequalities does the number 7.5 satisfy?

$x > 7$ | $7 < x$ | $7 \leq x$ | $x < 8$ | $x \geq 8$

What's the same and what's different about the inequalities?

## Key Questions

What is the difference between a term and an expression?
When can/can't an expression be simplified?
Spot the mistake(s) in this expression e.g. $6ff, 3a4b$.
Why are e.g. $q - 4$ and $4 - q$ not equivalent?

What is different about $2x + 3$ and $2(x + 3)$?
What is the first step you need to think about when forming an equation from a worded problem?
How can we check if the answer to the equation is correct?

How can we check our solution to an equation is correct?
When solving a four-term equation, why is it better to deal with the letters before the numbers?
Do we always start solving equations by subtracting something from both sides? Why or why not?

What does expand mean when we are working with brackets?

Why do you get four terms when you multiply two binomials?
Why can you simplify some quadratic expressions to three or fewer terms, but not others?
Do simplified quadratics always have three terms?

What's the same and what's different about solving an equation or an inequality?
How many solutions does an inequality have?
How can we check our solution to an inequality is correct?
What values would be useful to test with?

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| **Topic: Brackets, Equalities and Inequalities** | **Year: 8** | **NC Strand: Algebra** |

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|---|---|---|
| **Topic: Sequences** | **Year: 8** | **NC Strand: Algebra** |

| What should I already know? |
|---|
| • I can describe and continue a sequence given diagrammatically<br>• I can predict and check the next term(s) of a sequence<br>• I can represent sequences in tables and graphs<br>• I can recognise the difference between a linear and non-linear sequence<br>• I can continue numerical sequences<br>• I can continue non-numerical sequences<br>• I can explain the term to term rule of numerical sequences in words<br>• I can find missing numbers within sequences |

| What will I know by the end of the unit? |
|---|
| • How to generate sequences given a rule in words<br>• How to generate sequences given a simple algebraic rule<br>• How to generate sequences given a complex algebraic rule<br>• How to find the rule for an nth term of a linear sequence |

| Vocabulary | | | |
|---|---|---|---|
| Sequence | Fibonacci | Integer | Rule |
| Position | Difference | Non-integer | Position to term |
| Term | Constant | Substitute | Coefficient |
| Linear | Term to Term | Bracket | |
| Non-linear | Algebraic | Expand | |

| Investigate/Homework tasks |
|---|
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|---|---|---|
| **Topic: Sequences** | **Year: 8** | **NC Strand: Algebra** |

## Key Information/Diagrams

Write the first five terms of the sequence that has an *n*th term of $6n + 7$

Step 1: Build a table

| Position | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Term | | | | | |

### Step 2

Fill in the table using the position numbers.

| Position | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Term | 13 | | | | |

To find the *first* term in the sequence, substitute 1 for *n*.

$6n + 7$
$6(1) + 7$
$6 + 7 = 13$

### Step 2 (continued)

Fill in the table using the position numbers.

| Position | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Term | 13 | 19 | | | |

To find the *second* term in the sequence, substitute 2 for *n*.

$6n + 7$
$6(2) + 7$
$12 + 7 = 19$

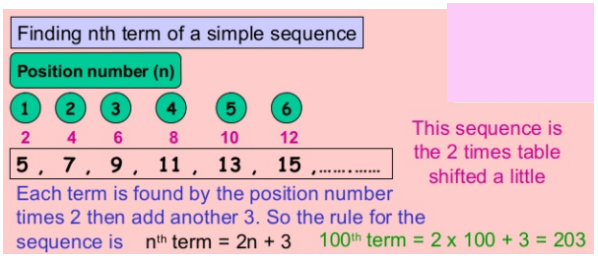
### Step 2 (continued)

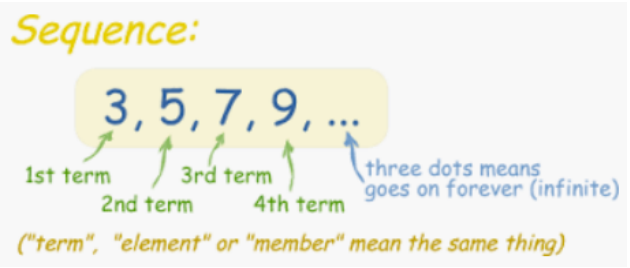
Fill in the table using the position numbers.

| Position | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Term | 13 | 19 | 25 | 31 | 37 |

To find the *fifth* term in the sequence, substitute 5 for *n*.

$6n + 7$
$6(5) + 7$
$30 + 7 = 37$




## Key Questions

What's the name for a sequence where there is a constant difference between successive terms?
What would the graph of such a sequence look like?
What information do you need to give to fully describe a sequence? Why is e.g. 'it goes up in 3s' not enough?

How can you tell by looking at the rule for the nth term of a sequence whether it is linear or not?
Is it possible for $n$ to take non-integer values? Why or why not?
How can we form an equation to see if the number is in the sequence?

What is the difference between how we work out e.g. $3n^2$ and $(3n)^2$? How do you know?

Do we need to expand the brackets first in order to

What does $n$ represent here?
How can you tell the sequence is linear?
What is the constant difference in this sequence?
How does this relate to the coefficient of $n$?

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|---|---|---|
| **Topic: Sequences** | **Year: 8** | **NC Strand: Algebra** |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Indices** | **Year: 8** | **NC Strand: Algebra** |

## What should I already know?

- I can use diagrams and letters to generalise number operations
- I can use diagrams and letters with single function machines
- I can find the function machine given a simple expression
- I can use diagrams and letters with a series of of two function machines

## What will I know by the end of the unit?

- How to add and subtract expressions with indices
- How to simplify algebraic expressions by multiplying indices
- How to simplify algebraic expressions by dividing indices
- How to use the addition law for indices
- How to use the subtraction law for indices
- How to use the addition and subtraction laws for indices
- How to explore powers of powers

## Key Information/Diagrams

### Index notation

We use index notation to show repeated multiplication by the same number.

For example,

we can use index notation to write $2 \times 2 \times 2 \times 2 \times 2$ as

$2^5$ — 5: Index or power; 2: base

This number is read as 'two to the power of five'.

$2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$

### Index notation

Evaluate the following:

$6^2 = 6 \times 6 = 36$

$3^4 = 3 \times 3 \times 3 \times 3 = 81$

$(-5)^3 = -5 \times -5 \times -5 = -125$

When we raise a negative number to an odd power the answer is negative.

$2^7 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$

$(-1)^5 = -1 \times -1 \times -1 \times -1 \times -1 = -1$

$(-4)^4 = -4 \times -4 \times -4 \times -4 = 64$

When we raise a negative number to an even power the answer is positive.

### The first index law

When we multiply two numbers written in index form and with the same base we can see an interesting result.

For example,

$3^4 \times 3^2 = (3 \times 3 \times 3 \times 3) \times (3 \times 3)$
$= 3 \times 3 \times 3 \times 3 \times 3 \times 3$
$= 3^6 \quad = 3^{(4+2)}$

$7^3 \times 7^5 = (7 \times 7 \times 7) \times (7 \times 7 \times 7 \times 7 \times 7)$
$= 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7 \times 7$
$= 7^8 \quad = 7^{(3+5)}$

When we **multiply** two numbers with the **same base** the indices are **added**.

### The second index law

When we divide two numbers written in index form and with the same base we can see another interesting result.

For example,

$4^5 \div 4^2 = \frac{\cancel{4} \times \cancel{4} \times 4 \times 4 \times 4}{\cancel{4} \times \cancel{4}} = 4 \times 4 \times 4 = 4^3 \quad = 4^{(5-2)}$

$5^6 \div 5^4 = \frac{\cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5} \times 5 \times 5}{\cancel{5} \times \cancel{5} \times \cancel{5} \times \cancel{5}} = 5 \times 5 = 5^2 \quad = 5^{(6-4)}$

When we **divide** two numbers with the **same base** the indices are **subtracted**.

### Zero indices

Look at the following division:

$6^4 \div 6^4 = 1$

Using the second index law

$6^4 \div 6^4 = 6^{(4-4)} = 6^0$

That means that

$6^0 = 1$

In fact, *any* number raised to the power of 0 is equal to 1.

For example,

$10^0 = 1 \qquad 3.452^0 = 1 \qquad 723\,538\,592^0 = 1$

### Negative indices

Look at the following division:

$3^2 \div 3^4 = \frac{\cancel{3} \times \cancel{3}}{\cancel{3} \times \cancel{3} \times 3 \times 3} = \frac{1}{3 \times 3} = \frac{1}{3^2}$

Using the second index law

$3^2 \div 3^4 = 3^{(2-4)} = 3^{-2}$

That means that

$3^{-2} = \frac{1}{3^2}$

Similarly, $6^{-1} = \frac{1}{6}$ $7^{-4} = \frac{1}{7^4}$ and $5^{-3} = \frac{1}{5^3}$

### Using algebra

We can write all of these results algebraically.

$$a^m \times a^n = a^{(m+n)}$$

$$a^m \div a^n = a^{(m-n)}$$

$$a^0 = 1$$

$$a^{-1} = \frac{1}{a}$$

$$a^{-n} = \frac{1}{a^n}$$

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Indices** | **Year: 8** | **NC Strand: Algebra** |

| **Key Questions** | |
|---|---|
| What is the difference between a term and an expression?<br><br>When are terms 'like terms'?<br><br>When can/can't an expression be simplified?<br><br>Why don't we usually write '$1x$' or '$0x$'? | What is the difference between a base and an index?<br>How can you simplify the multiplication of two terms involving indices if they have the same base?<br>Can you use the same rule if the bases are different?<br>Why is e.g. $a^6 \times a = a^7$ when there is no index on the second term? |
| What does the word 'index' mean?<br>What is the result of multiplying $x^2$ by $x$? And then multiplying by $x$ again? And again?<br>What is your strategy for multiplying e.g. $3a^2b$ and $5ab^3$?<br>What do you look at first? Then what? | What is the difference between a base and an index?<br>How can you simplify the multiplication of two terms involving indices if they have the same base?<br>Can you use the same rule if the bases are different?<br>Why is (e.g.) $a^6 \div a = a^5$ when there is no index on the second term? |
| What is the difference between a term and an expression?<br><br>When can/can't an expression be simplified? | How would you start solving an index question that involves more than one operation?<br>Will $(a^b)^c$ be the same as, or different from $(a^c)^b$? Why?<br>Why do we need to be careful with expressions like $(5x^4)^3$? |

| **Vocabulary** | | | |
|---|---|---|---|
| Expression | Term | Simplify | Simplify |
| Simplify | Power | Numerator | Base |
| Term | Multiply | Denominator | Power |
| Coefficient | Product | Factor | Exponent |
| Index | Power | Common factor | |
| Indices | Expand | Coefficient | |

**Investigate/Homework tasks**

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|---|---|---|
| **Topic: Indices** | **Year: 8** | **NC Strand: Algebra** |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Fractions and Percentages** | **Year: 8** | **NC Strand: Number** |

## What should I already know?

- How to represent tenths and hundredths as diagrams
- How to represent tenths and hundredths on a number line
- How to interchange between fractional and decimal number lines
- How to convert fractions to decimals and vice versa ( tenths and hundredths)
- How to convert fractions to decimals and vice versa (fifths and quarters)
- How to convert fractions to decimals and vice versa (eighths and thousandths)
- How to use a number square to understand what percentage means
- How to represent any fraction as a diagram
- How to represent fractions on a number line
- How to identify and use simple equivalent fractions
- How to understand fractions as division
- I How to convert fluently between fractions, decimals and percentages
- How to explore fractions above one, decimals and percentages

## What will I know by the end of the unit?

- How to convert fluently between key fractions, decimals and percentages
- How to calculate key fractions, decimals and percentages of an amount without a calculator
- How to calculate fractions, decimals and percentage of amounts using calculator methods
- How to convert between decimals and percentages greater than 100%
- How to calculate a percentage decrease with a multiplier
- How to calculate percentage increase and decrease with a multiplier
- How to express a number as a fraction or percentage of another without a calculator
- How to express a number as a fraction or percentage of another using calculator methods
- How to solve problems involving percentage change
- How to choose an appropriate method to solve percentage problems
- How to find the original amount given the percentage less than 100%
- How to find the original amount given the percentage greater than 100%
- How to choose an appropriate method to solve complex percentage problems

## Vocabulary

| | | | |
|---|---|---|---|
| Fraction | Estimate | Reduce | Factor |
| Decimal | Rounding | Decrease | Round |
| Percentage | Conversion | Multiplier | Integer |
| Equivalent | Equivalent | Increase | Profit |
| Denominator | Hundredth | Growth | Loss |
| Numerator | Tenth | Express | Interest |
| Increase | Decrease | Reverse | Change |
| Multiple | Express | Invest | Original |

## Investigate/Homework tasks

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Fractions and Percentages** | **Year: 8** | **NC Strand: Number** |

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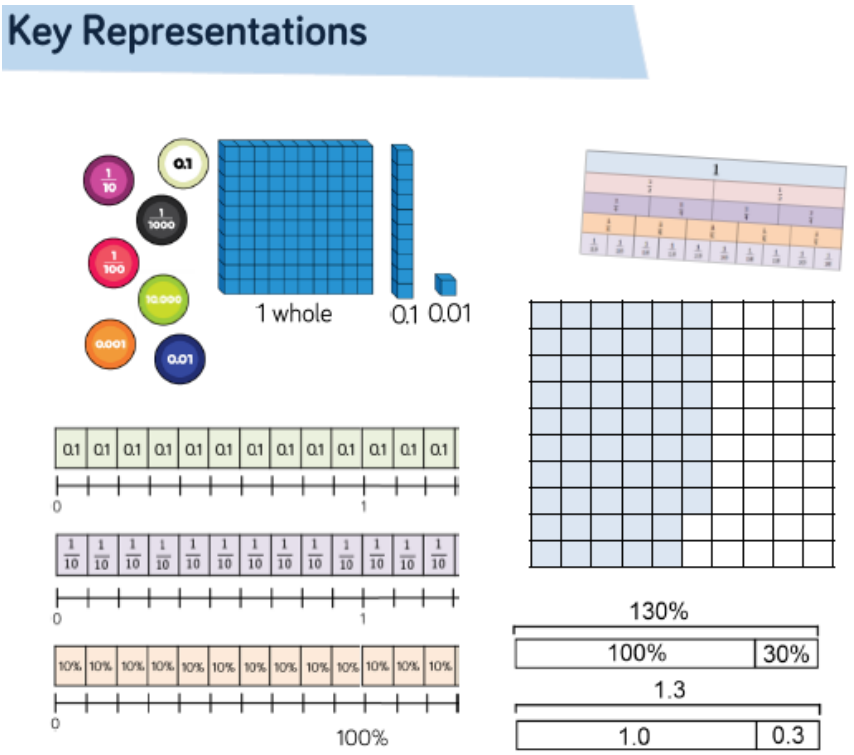
## Key Information/Diagrams




## Key Questions

Why do we use all three representations of fractions, decimals and percentages?
Explain why one third is not the same as 0.3 or 30%
Can you draw a diagram to show the meaning of 0.7?
Which is greater in value 0.5 or 50%?

Explain how to find $\frac{3}{7}$ of an amount.
Is it possible to find $\frac{6}{5}$ of a number? If so, how?
Explain why is it that when we divide an amount by 10 it gives 10%, but if you divide by 20 it does not give 20%?
Is it true that 45% of 60 is equal to 60% of 45?
Does this work for other pairs of numbers?

How do you use the percentage key on your calculator?
How does this compare to using decimal equivalents?

How do you use the fraction key on your calculator?

What keys could you press to find 23% of 45?

Why can we convert quarters, fifths and tenths easily to a percentage but not thirds?
Why can't we compare a mark out of 20 and a mark out of 25 directly? What are the factors of 100?
Is it possible to convert fortieths to hundredths?

Why is 0.3 the same as 30% and not 3%?
Is it possible to have a percentage greater than 100?
How might 140% look like as a decimal multiplier?
Why does multiplying a decimal by 100 give you an equivalent percentage?
How can you order mixed decimals and percentages?

Why is decreasing by 46% the same as finding 54%?
If I am multiplying by 0.2 why is this an 80% decrease?
What mistakes might happen if we are decreasing by 1.5%?
What happens if I decrease an amount by 0%?
What does the word 'discount' mean?

When increasing an amount by a given percentage, how do we calculate the multiplier?
What is the percentage increase if you double a number?
Will a number always get bigger if we increase it by a given percentage?
Can you represent this question with a bar model?

Why might we need a calculator to calculate the percentage of a test mark out of 30, but not for a mark out of 50?
How do we use a calculator to convert a fraction to a

How can you represent this problem using a bar model?
How can you tell if a question involves finding an amount before a percentage change? How does this affect your approach to the question?

Is the original value greater than or less than the given amount? What percentage is the original amount?
How can we represent this using a bar model?
From the percentage given, what other percentages can we easily work out?
How can we build on these to find 100%?

What's the difference between profit and loss?
How can you represent this percentage change question on a bar model?
Why is it important to identify the original amount before doing the calculation for percentage change questions?

Is the amount given more or less than the new amount?

How can we represent this on a bar model?

What is the same and what is different between these two bar models?

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|---|---|---|
| **Topic: Fractions and Percentages** | **Year: 8** | **NC Strand: Number** |

Why is 0.3 the same as 30% and not 3%?
Is it possible to have a percentage greater than 100?
How might 140% look like as a decimal multiplier?
Why does multiplying a decimal by 100 give you an equivalent percentage?
How can you order mixed decimals and percentages?

Describe the different calculation processes involved in these questions.
How can you represent this on a bar model?
What is the same and what is different in these questions?
What type of percentage question is this problem?
How can you tell?

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|---|---|---|
| **Topic: Standard index form** | **Year: 8** | **NC Strand: Number** |

| What should I already know? |
|---|
| • How to write 1, 10, 100, 1000, etc as powers of ten<br>• How to write positive integers in the form A X ⟦10⟧^n<br>• How to write negative powers of ten<br>• How to write decimals in the form A X ⟦10⟧^n<br>• **How to add and subtract numbers given in standard form** |

| What will I know by the end of the unit? |
|---|
| • How to write positive powers of ten<br>• How to work with numbers greater than 1 in standard form<br>• How to write negative powers of ten<br>• How to work with numbers between 0 and 1 in standard form<br>• How to compare and order numbers in standard form<br>• How to mentally calculate with numbers in standard form<br>• How to add and subtract numbers in standard form<br>• How to multiply and divide numbers in standard form<br>• How to use a calculator to work with numbers in standard form<br>• How to use negative indices<br>• How to use fractional indices |

| Vocabulary | | | |
|---|---|---|---|
| Base | Exponent | Place value | Reciprocal |
| Index | Standard form | Commutative | Zero |
| Indices | Base | Scientific notation | Root |
| Power | Negative | SCI/EXP | |

| Investigate/Homework tasks |
|---|
| • Homework will be set by your teacher using google classroom<br>• You should complete at least 30 minutes of maths tasks using the website and log in provided by your teacher. Please attend help sessions if you do not have access to the internet at home<br>• Additional work you could complete:<br>  ○ Find out more about the meaning of the vocabulary list using http://www.amathsdictionaryforkids.com/<br>• To challenge yourself: Answer the key questions to deepen your knowledge |
| **Key Information/Diagrams** |
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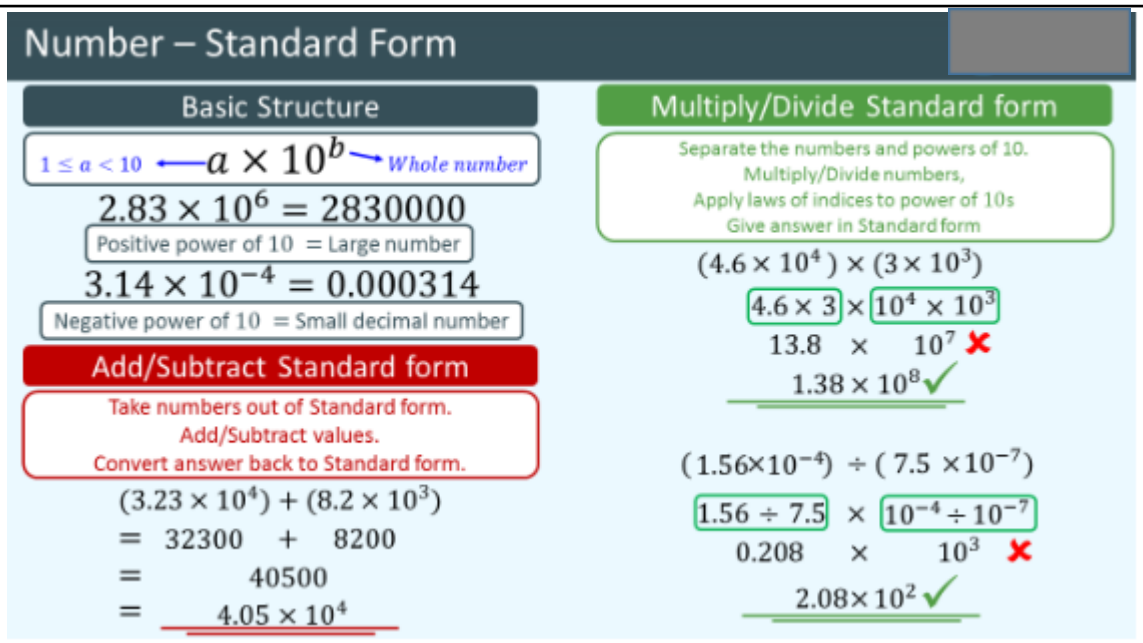
| **Topic: Standard index form** | **Year: 8** | **NC Strand: Number** |




## Key Questions

How many times bigger than 1000 is $10^8$?
Why are (e.g.) $(10^2)^3$ and $10^2 \times 3$ different?
Is there a simpler way to write (e.g.) $10000 \times 100000$?
What calculations could give an answer of (e.g.) $10^{12}$?

What is one gigabyte (1 GB) written in standard form?
What is the same and what is different about how 75 000 and 70 000 are written in standard form?
Why is it more efficient to write $4 \times 10^{50}$ in standard form rather than as an ordinary number?

How many different ways can you write 0.001?
How could you show $10^{-2}$ on a place value grid?
What is the value of $10^0$? What is the value of $8^0$?
What is $x^0$ for any value of $x$?

What is the same and what is different about (e.g.) $3 \times 10^{-4}$ and $3 \times 10^4$?
Explain why (e.g.) $4 \times 10^{-3}$ is greater than $5 \times 10^{-4}$.
Are negative powers of 10 always, sometimes or never negative numbers?

How can we compare a fraction, a decimal and a number written in standard form? What could you do to make it easier?
What do you look at first when comparing numbers written in standard form? Why?

Why isn't (e.g.) $200 \times 10^6$ in standard form? How could rewriting 200 help us?
Explain how $0.2 \times 10^4$ and $0.2 \times 10^{-4}$ can be written in standard form. What is the same and what is different?
Why is $6 \times (5 \times 10^3)$ more difficult than $4 \times (2 \times 10^3)$?

Is it easier to add the numbers as they are or convert them to ordinary numbers first?
What do we do if the total isn't in standard form?
What is (e.g.) $10^{-3} + 10^3$ as an ordinary number?

How many different ways can you write (e.g.) $(3 \times 10^4) \times (2 \times 10^4)$?
Describe the steps you need to take to multiply/divide a pair of numbers in standard form.
When can we write a division as a fraction?

Explain how to input (e.g.) $2.4 \times 10^5$ on a calculator. What would be different inputting $2.4 \times 10^{-5}$?
What button on your calculator converts an answer into standard form.
How do you round a number in standard form to 1/2/3 significant figures?

Will a number raised to a negative power always, sometimes or never have a negative value?
How does working out negative powers relate to the subtraction law for dividing indices?
How do you enter negative powers on a calculator?

How does the addition law for indices help us work out the meaning of "to the power half"?
Give an example to show "to the power half" is not the same as "divide by 2"?

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|---|---|---|
| **Topic: Number Sense** | **Year: 8** | **NC Strand: Number** |

| What should I already know? |
|---|
| • How to use the properties of addition and subtraction<br>• How to use mental strategies to solve addition and subtraction problems<br>• How to apply the properties of multiplication and division<br>• How to understand and use multiples<br>• How to understand and use factors<br>• How to multiply and divide integers and decimals by powers of ten<br>• How to multiply by 0.1 and 0.01<br>• How to convert metric units |

| What will I know by the end of the unit? |
|---|
| • How to round numbers to powers of 10, and 1 significant figure<br>• How to round numbers to a given number of decimal places<br>• How to estimate the answer to a calculation<br>• How to understand and use error interval notation<br>• How to calculate using the order of operations<br>• How to calculate with money<br>• How to convert metric measures of length<br>• How to convert metric units of weight and capacity<br>• How to convert metric units of area<br>• How to convert metric units of volume<br>• How to solve problems involving time and the calendar |

| Vocabulary | | | |
|---|---|---|---|
| Round | Estimate | Priority | Metric |
| Significant | Over estimate | Index | Metre |
| Power | Under estimate | Indices | Prefix |
| Nearest | Root | Change | Kilo |
| Integer | Discrete | Deposit | Milli |
| Number line | Continuous | Interest | Centi |
| Decimal point | Bound | Debit | Area |
| Decimal place | Operation | Credit | Perpendicular |
| Significant figure | Order | Balance | Units |
| Square unit | Dimensions | Cubic units | 12-hour clock |
| 24-hour clock | Week | Year | Leap year |

| Investigate/Homework tasks |
|---|
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| **Key Information/Diagrams** |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Number Sense** | **Year: 8** | **NC Strand: Number** |

## Key Questions

How can you tell how many significant figures a number has? How do you identify the most significant?
What's the same and what's different about rounding to the nearest (e.g.) hundred or thousand?
Can 0 be an answer when rounding a number?

How many figures does (e.g.) 36.514 have after the decimal point? To how many decimal places is it given?
What's the same and what's different about rounding (e.g.) 31.57 to 1 significant figure and rounding it to 1 decimal place?

Why is it useful to make an estimate before doing a calculation?
If both numbers you use when estimating the answer to a calculation are larger than the original numbers, will your estimate be an overestimate or underestimate?

What is the smallest number that rounds to (e.g.) 16 to the nearest integer? Why isn't 16.4 the largest number that rounds to 16 to the nearest integer?
What's the difference between $<$ and $\leq$? How does this affect how we write error intervals?

Why do (e.g.) $11 + 7 - 4$ and $11 - 4 + 7$ have the same answer?
Which pairs of operations have equal priority in calculations?
Will (e.g.) $\sqrt{9} + \sqrt{16}$ and $\sqrt{9 + 16}$ have the same answer? Why or why not?

How do you use a calculator to find a percentage of an amount?
What's the difference between credit and debit?
How many decimal places should I round to when doing a calculation with money in pounds? What if the calculator shows an answer like 6.7 pounds?

What is the difference between the prefixes kilo and milli?
Why do we need two prefixes that both mean 1 000?
How do you know whether to multiply or divide when converting metric units?
Why is (e.g.) 6.4 cm not equal to 6.40 mm?

What is the difference between multiplying an integer and a number with decimal places by 10/100/1 000?
What's the difference between a kilogram and a kilometre
How do you know whether to multiply or divide when converting metric units?

Why is it that (e.g.) $1\ \text{cm}^2 \neq 10\ \text{mm}^2$?
How do we find the area of a...? What happens to all the dimensions if we change them from (e.g.) m to cm?
Why can't we multiply 30 cm by 5 m without converting first?

How do you calculate the volume of a cuboid/cube?
What happens to all the dimensions if we change them from (e.g.) m to cm?
Is there a connection between volume and cube numbers?

To find the amount of time between (e.g.) 9:40 and 11:25, why can't you just do 11.25 – 9.40 on a calculator?
Which months have 30 days? How can you remember these?
How can you tell if a time is given in 12 or 24 hour clock?

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|---|---|---|
| **Topic: Angles in parallel lines and polygons** | **Year: 8** | **NC Strand: Geometry** |

## What should I already know?

- How to use the sum of angles at a point to solve problems
- How to solve the sum of angles on a straight line to solve problems
- How to use the equality of vertically opposite angles to solve problems
- Know and apply the sum of angles in a triangle
- Know and apply the sum of angles in a quadrilateral
- How to solve angle problems using properties of triangles and quadrilaterals
- How to solve complex angle problems
- How to find and solve the angle sum of any polygon
- How to investigate angles in parallel lines
- How to use parallel lines angle rules
- How to use known facts to obtain simple proofs

## What will I know by the end of the unit?

- How to understand and use the properties of diagonals of quadrilaterals
- How to understand and use the sum of exterior angles of any polygon
- How to calculate and use the sum of interior angles in any polygon
- How to calculate missing interior angles in a regular polygon
- How to prove simple geometric facts
- How to construct an angle bisector
- How to construct a perpendicular bisector of a line segment

## Vocabulary

| | | | |
|---|---|---|---|
| Adjacent | Parallel | Co-interior | Parallelogram |
| Angles at a point | Transversal | Alternate | Square |
| Vertically opposite | Alternate | Corresponding | Trapezium |
| Straight | Corresponding | Isosceles | Rectangle |
| Acute | Angle | Equilateral | Kite |
| Obtuse | Line | Scalene | Bisect |
| Reflex | Supplementary | Right angled | Delta |
| Right angle | Points | Rhombus | Exterior |
| Interior | Regular | polygon | sum |
| Total | Pentagon | Hexagon | Demonstration |
| Justify | Proof | Bisector | Compasses |
| Line | Line segment | Perpendicular | |

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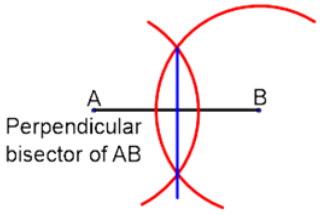
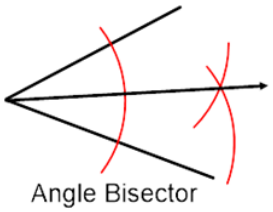
|---|---|---|
| **Topic: Angles in parallel lines and polygons** | **Year: 8** | **NC Strand: Geometry** |

## Key Information/Diagrams

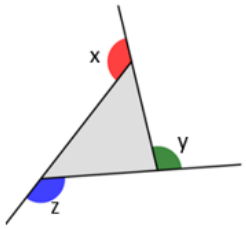


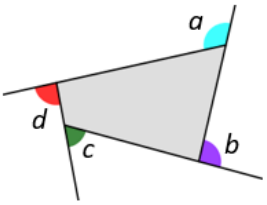

### Exterior Angles

The sum of the exterior angles of any polygon is 360°.

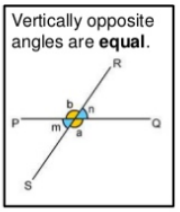
The exterior angle of a regular n-sided polygon is $\frac{360°}{n}$

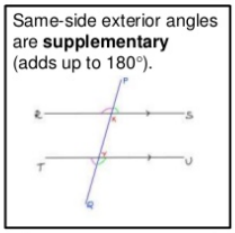


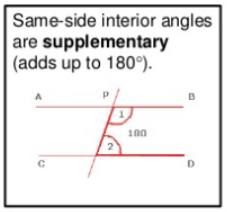

$x + y + z = 360°$

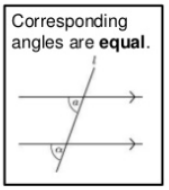


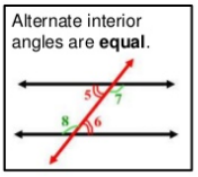

$a + b + c + d = 360°$

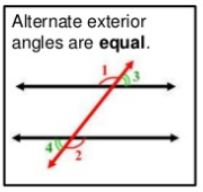


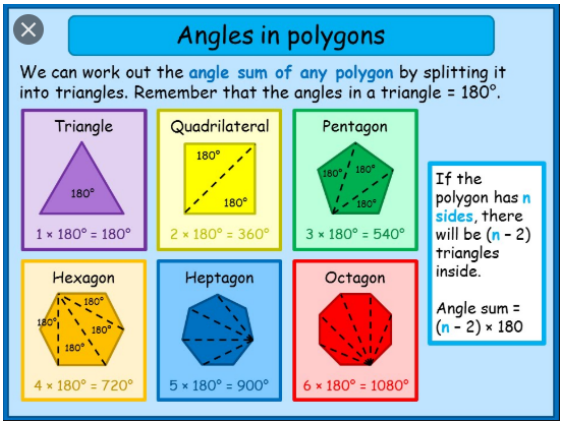




## Key Questions

How is a right angle shown on diagrams?

How do you draw an angle of 180°?

What's the difference between an acute angle and an obtuse angle?

What angle rules do you know? How could they be applied to this diagram?

How do you know when two or more lines are parallel?

Name a pair of alternate/corresponding angles on the diagram. Which line(s) is/are transversal?

What relationships can you see between the angles? Will this work if you move the transversal line?

How do you identify a pair of corresponding angles or a pair of alternate angles?

Which angle(s) can you work out directly from the information given on the diagram? What other angle(s) can you then work out?

Why are co-interior angles different to corresponding and alternate angles?

Explain, using understanding of alternate/corresponding angles, why the sum of co-interior angles equal 180°

Can you have co-interior angles in a pair of lines which are not parallel?

What other information do we know that we can add to the diagram?

What tells us if the lines are parallel?

What angle facts do we need to use for this question?

Why don't you need a protractor to draw an equilateral triangle?

How much information do you need to draw an isosceles triangle?

How is a rhombus different from a parallelogram?

I am a four-sided shape with two pairs of parallel lines, what might I be?

Draw a standard example and a peculiar example of a quadrilateral. Compare your shapes with a partner's.

Which quadrilaterals are regular and which are not?

What properties does a rhombus have that a parallelogram does not? What similar properties do they have?

Give me an example of a quadrilateral which only has one obtuse angle/two obtuse angles.

What makes a trapezium an isosceles trapezium?

Is it possible for the diagonals of a quadrilateral to be horizontal or vertical?

What types of quadrilateral have diagonals that are equal in length? Why can't this be the case for the other special quadrilaterals?

Is it possible for a diagonal to be outside the shape?

What are the two conditions that make a polygon regular?

What is the sum of the external angles of a polygon? If the polygon is regular, what is the size of each external angle?

If a polygon is regular, what do we know about its angles?

Will the interior angles of a 20-sided shape be greater than or less than those of a 19-sided shape? What about the exterior angles?

Is it possible to have a reflex interior angle in a polygon? Give me an example.

Will the interior angles of a regular polygon be different from those of an irregular polygon?

Explain why neither a rectangle nor a rhombus are regular.

What's the connection between the interior and the exterior angles of a polygon?

What's the difference between a proof and a demonstration?

How do we know the result will always be true?

What can we find out first?

What does bisect mean? What does the stem "bi" tell us?

Describe the steps to construct the bisector of an angle without using a protractor.

Tell me what perpendicular means?

What does bisect mean? What does the stem "bi" tell us?

What's the connection between the method for constructing a perpendicular bisector and what we know about the diagonals of a rhombus?

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|---|---|---|
| **Topic: Angles in parallel lines and polygons** | **Year: 8** | **NC Strand: Geometry** |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Area of trapezia and circles** | **Year: 8** | **NC Strand: Measures** |

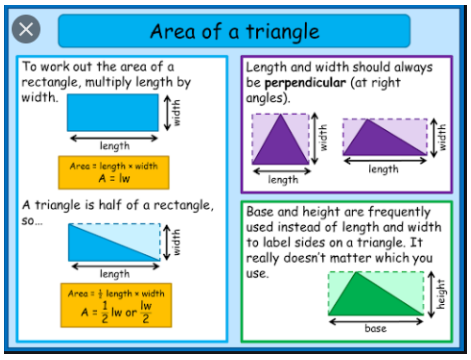
## What should I already know?

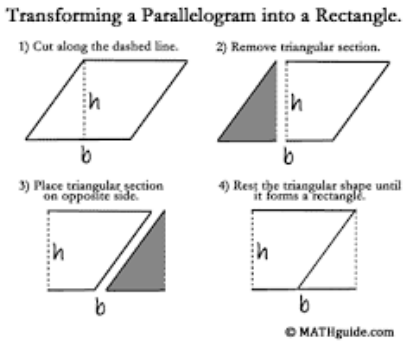
- How to solve problems using area of rectangles and parallelograms
- How to solve problems using area of triangles
- How to solve problems using area of trapezia

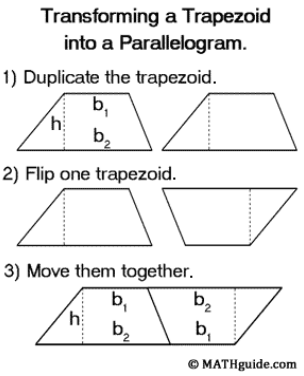
## What will I know by the end of the unit?

- How to calculate the area of triangles, rectangles and parallelograms
- How to calculate the area of a trapezium
- How to calculate the perimeter and area of compound shapes
- How to investigate the area of a circle
- How to calculate the area of a circle and parts of a circle without a calculator
- How to calculate the area of a circle and parts of a circle with a calculator
- How to calculate the perimeter and area of compound shapes (including circles)

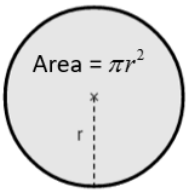
## Key Information/Diagrams

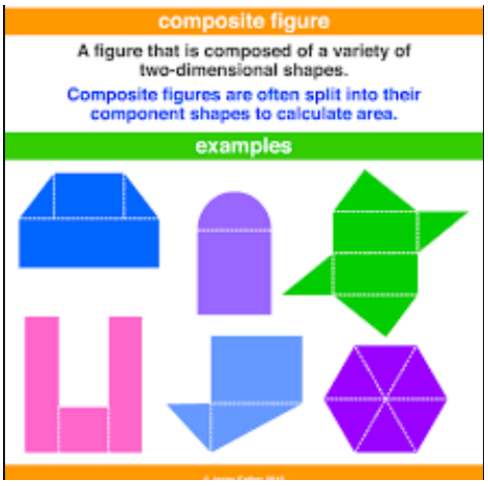



**Area of Circle**



| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Area of trapezia and circles** | **Year: 8** | **NC Strand: Measures** |

| Vocabulary | | | |
|---|---|---|---|
| Formula | Trapezia | Sector | Diameter |
| Area | Parallel | Rectangle | Radius |
| Triangle | Perpendicular height | Estimate | In terms of π |
| Square | Compound | Infinity | Decimal place |
| Parallelogram | Component shapes | Radius | Calculate |
| Rhombus | Parallelogram | Approximately | Substitute |
| Trapezium | Perpendicular | Estimate | Significant figures |

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## Key Questions

Why is the formula to find the area of a rectangle the same as the formula to find the area of a parallelogram?

Why do we use the perpendicular height when finding the area of a triangle and not the sloping height?

How can you find the area of a rhombus? How do you know?

Compare a rectangle, parallelogram and trapezium. What's the same and what's different?

Why does the formula for the area of a trapezium also work if it is applied to parallelograms, rectangles and squares?

Are the parallel sides of a trapezium always horizontal?

How can you divide this compound shape up into shapes we know how to find the area of? Name each of these shapes.

What length(s) do you need to substitute into your formula? Is this length given, or do you need to calculate it first? What is your strategy for find the missing length(s)?

Where is the radius of the circle?

How do we find the circumference of a circle?

How do we find the area of a parallelogram?

As the number of sectors increases, is our estimate for the area more or less accurate? Explain why.

What does this tell you about the area of a circle?

How do you round a number to 1 significant figure?

Use a calculator to change $\frac{22}{7}$ into a decimal. What do you notice when you compare this to $\pi$?

How do I know whether to substitute the radius or the diameter? What mistake do you think people often make?

Where is the $\pi$ key on your calculator? How do you enter e.g. $3^2$ into your calculator? Is there more than one way of doing this?

Why is it useful to firstly calculate an estimate of the area?

How many decimal places or significant figures should you round your answer to? Why?

Do we need to work out the area/arc length of each semi-circle separately? Why or why not?

Which standard shapes can you identify in the compound shape?

Identify the dimensions you need to be able to calculate the area. How can you work out the missing ones?

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| **Topic: Area of trapezia and circles** | **Year: 8** | **NC Strand: Measures** |

| Edward Peake Church of England Middle School | | |
|---|---|---|
| **Topic: Line symmetry and reflection** | **Year: 8** | **NC Strand: Geometry** |

| What should I already know? |
|---|
| • How to read and plot coordinates in all four quadrants<br>• How to draw shapes in all four quadrants from given coordinates<br>• How to find the length of a line from the coordinates of it's two endpoints<br>• How to use instructions to translate shapes in all four quadrants<br>• How to describe translations in all four quadrants<br>• How to reflect shapes in the x-axis and the y-axis |

| What will I know by the end of the unit? |
|---|
| • How to recognise line symmetry<br>• How to reflect a shape in a horizontal or vertical line using tracing paper<br>• How to reflect a shape in a horizontal or vertical line<br>• How to reflect a shape in a diagonal line using tracing paper<br>• How to reflect a shape in a diagonal line |

| Vocabulary | | | |
|---|---|---|---|
| Line symmetry | Equilateral | Object | Horizontal |
| Regular | Rhombus | Image | Vertex |
| Polygon | Reflect | Vertical | Perpendicular distance |
| Isosceles | Congruent | | |

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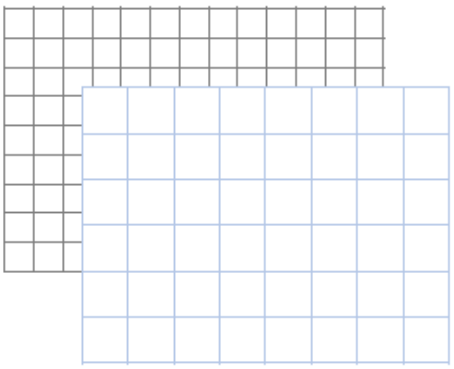
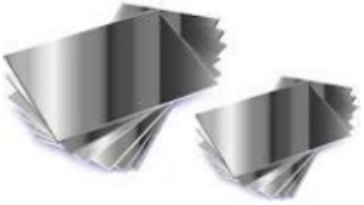
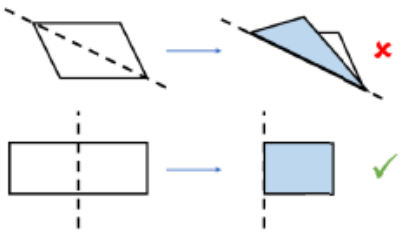
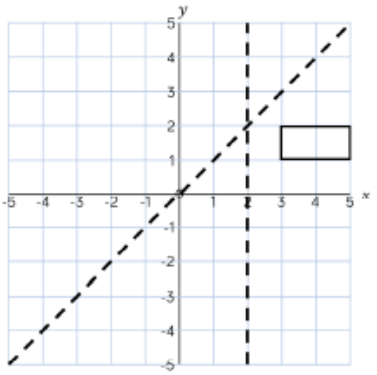
|---|---|---|
| **Topic: Line symmetry and reflection** | **Year: 8** | **NC Strand: Geometry** |

## Key Representations










## Key Questions

Do all regular polygons have lines of symmetry?

Why does a rhombus have two lines of symmetry but a parallelogram none? What do you notice about the other special quadrilaterals?

After a reflection, does the resulting shape always have a line of symmetry? Why or why not?

What's the same and what's different about the two parts of a shape following a reflection?

What's the area of the original shape? What's the area of the resulting shape?

How far is each vertex of the object from the mirror line? What does this tell us about the position of the image?

How do we know whether the equation of a line parallel to an axis is of the form $x = \ldots$ or $y = \ldots$?

Why does it help to rotate your exercise book when reflecting in diagonal lines?

Why don't we have to worry about points/vertices that are on the line?

How do we know how far the vertices of the image are from the mirror line?

What is the equation of the line that goes through (0,0), (1,1) etc.?

How can we tell the lines $y = x$ and $y = -x$ apart?

Why do we count the distance to the mirror line diagonally rather than horizontally?

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|---|---|---|
| **Topic: The data handling cycle** | **Year: 8** | **NC Strand: Statistics** |

## What should I already know?

- How to solve problems with frequency trees
- How to solve problems with bar charts and line charts
- How to interpret simple pie charts using proportion
- How to interpret pie charts using a pie chart
- How to draw pie charts

## What will I know by the end of the unit?

- How to set up a statistical enquiry
- How to design and criticise questionnaires
- How to draw and interpret pictograms, bar charts and vertical line charts
- How to draw and interpret pie charts
- How to draw and interpret line graphs
- How to choose the most appropriate diagram for given set of data
- How to represent and interpret grouped quantitative data
- How to find and interpret the range
- How to compare distributions using charts
- How to identify misleading graphs

## Vocabulary

| | | | |
|---|---|---|---|
| Hypothesis | Multiple choice | Scale | Change |
| Investigation | Response box | Axes | Read off |
| Enquiry | Biased | Comparison | Read from |
| Primary data | Pictogram | Key | Scatter graph |
| Secondary data | Bar chart | Pie chart | Bivariate |
| Sample | Line chart | Fraction | Line graph |
| Questionnaire | Tally | Full turn | Proportion |
| Questions | Frequency | Proportion | Compare |
| Design | Multiple Bar chart | Line graph | Grouped data |
| Frequency diagram | Discrete | Continuous | Intervals |
| Range | Spread | Consistent | Average |
| Distribution | Mislead | Difference | Broken axis |

## Investigate/Homework tasks

- Homework will be set by your teacher using google classroom
- You should complete at least 30 minutes of maths tasks using the website and log in provided by your teacher. Please attend help sessions if you do not have access to the internet at home
- Additional work you could complete:
  - Find out more about the meaning of the vocabulary list using http://www.amathsdictionaryforkids.com/
- To challenge yourself: Answer the key questions to deepen your knowledge

## Key Information/Diagrams

**PIE CHARTS**

$24 + 16 + 15 + 5 = 60$

| Treatment | Clients | Degrees |
|---|---|---|
| Manicure | 24 | $24 \times 6 = 144°$ |

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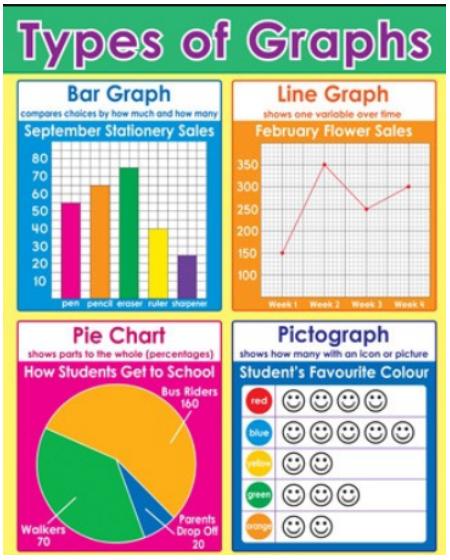
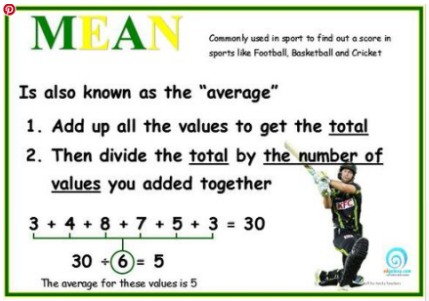
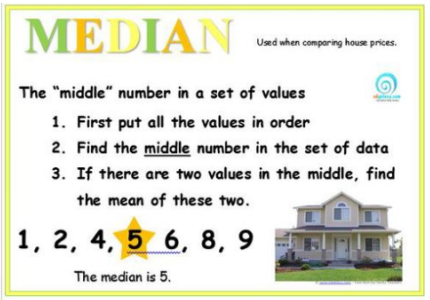
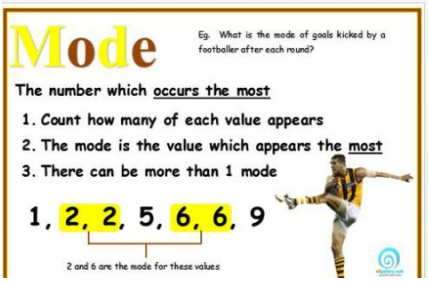
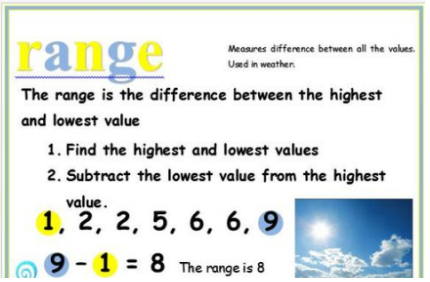
|---|---|---|
| **Topic: The data handling cycle** | **Year: 8** | **NC Strand: Statistics** |




## Key Questions

What is a hypothesis? Why do you need a hypothesis?
What is the difference between discrete and continuous data?
What are the advantages/disadvantages of using primary/secondary data?
What features do you need on a data collection sheet?

Imagine you are completing this questionnaire, which questions would you find difficult to answer? Why?
Why could having multiple choice answers/ranges make a questionnaire easier to answer?
Do you think a name should be included on a questionnaire? What influence might this have?

Why is it important to include e.g. a key, labels on the axes etc.?
Is this discrete or continuous data? Is the data qualitative or quantitative?
How are a line chart and bar chart the same? How are they different?

When might it be useful to create a multiple bar chart?
Why do multiple bar charts need a key?
What other questions could you ask about the bar chart?
What would you put on each of the axes? How can you decide your scale for the vertical axes?

What are the factors of 360?

If you had e.g. 36 people in total, would you use the fraction of 360 or a multiplier to get to 360 in order to find the number of degrees? What about e.g. 35 people?

What type of data would you represent in a pie chart?

Does the line graph have to start at 0? How can you show that your axis has not started from 0?
Is it possible to read off points between those given?
Would it be better to use a solid or a dotted line here?
What other information/comparisons can you make from the line graph? What other questions could you ask?

In which situation is a pie chart/bar chart/line graph the most useful? Why?
Which chart best shows changes over time/proportion/comparison?
When would you/wouldn't you use a scatter graph to represent a set of data?

Why do we leave a space between the bars on a bar chart, but we don't on a frequency diagram?

How do we know which group/class a data item belongs to?

Why is it helpful to tally data to find the frequencies?

What is the same and what is different the charts?

Is the data symmetrical or not? How does this compare to the other distribution?

What can you, and what can't you, tell about each distribution from the charts?

Who has made the chart/graph? Why might the data/representation of data be biased?

What information should you check on a graph to ensure the data is not misleading?

How could the information be represented more clearly/more fairly?

How can you work out the range? What does the range tell you about a set of data? Is it an average?

Does a large range mean the data is more spread out or less spread out?

If the data has a range of 0, what does this tell you about the data?

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| **Topic: Measures of location** | **Year: 8** | **NC Strand: Statistics** |

## What should I already know?

- How to solve problems using the mean, median and mode
- How to solve problems using the range

## What will I know by the end of the unit?

- How to understand and use the mean, median and mode
- How to choose the most appropriate average
- How to find the mean from an ungrouped frequency table
- How to find the mean from a grouped frequency table
- How to identify outliers
- How to compare distributions using averages and the range

## Vocabulary

| | | | |
|---|---|---|---|
| Average | Modal value | Subtotal | Outlier |
| Mean | Total | Estimate | Range |
| Median | Frequency | Midpoint | Consistent |
| Mode | Represent | | |

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- To challenge yourself: Answer the key questions to deepen your knowledge

## Key Information/Diagrams

**The frequency table shows pupil ages. Find the mean.**

| Age | Frequency |
|---|---|
| 8 | 12 |
| 9 | 25 |
| 10 | 37 |
| 11 | 14 |

**STEP 1: Find fx**

| Age (x) | Frequency (f) | fx |
|---|---|---|
| 8 | 12 | 8 x 12 = 96 |
| 9 | 25 | 9 x 25 = 225 |
| 10 | 37 | 10 x 37 = 370 |
| 11 | 14 | 11 x 14 = 154 |

**STEP 2: Find the total of fx**

| Age (x) | Frequency (f) | fx |
|---|---|---|
| 8 | 12 | 8 x 12 = 96 |
| 9 | 25 | 9 x 25 = 225 |
| 10 | 37 | 10 x 37 = 370 |
| 11 | 14 | 11 x 14 = 154 |
| | | = 845 |

**STEP 3: Find the total frequency (f)**

| Age (x) | Frequency (f) | fx |
|---|---|---|
| 8 | 12 | 8 x 12 = 96 |
| 9 | 25 | 9 x 25 = 225 |
| 10 | 37 | 10 x 37 = 370 |
| 11 | 14 | 11 x 14 = 154 |
| | = 88 | = 845 |

**STEP 4: Divide the total fx by the total frequency (f)**

**The frequency table shows pupil ages. Find the mean.**

| Age | Frequency |
|---|---|
| 8 - 10 | 12 |
| 11 - 13 | 25 |
| 14 - 16 | 37 |
| 17 - 19 | 14 |

**STEP 1: Find the midpoints**

| Age | Frequency (f) | Midpoint (x) |
|---|---|---|
| 8 - 10 | 12 | 9 |
| 11 - 13 | 25 | 12 |
| 14 - 16 | 37 | 15 |
| 17 - 19 | 14 | 18 |

**STEP 2: Work out fx**

| Age | Frequency (f) | Midpoint (x) | fx |
|---|---|---|---|
| 8 - 10 | 12 | 9 | 12 x 9 = 108 |
| 11 - 13 | 25 | 12 | 25 x 12 = 300 |
| 14 - 16 | 37 | 15 | 37 x 15 = 555 |
| 17 - 19 | 14 | 18 | 14 x 18 = 252 |

**STEP 3: Work out the total of fx**

| fx |
|---|
| 12 x 9 = 108 |
| 25 x 12 = 300 |
| 37 x 15 = 555 |
| 14 x 18 = 252 |
| = 1215 |

**STEP 4: Work out the total frequency**

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| **Topic: Measures of location** | **Year: 8** | **NC Strand: Statistics** |

## Key Questions

What's the same and what's different about finding the median of four numbers and the median of five numbers?

Why is it helpful to order data when finding averages? Which one is it most helpful for?

If you know the mean of a set of numbers, how can you find the total?

Is it possible (e.g.) to have 3.9 people in family? What would be a better average to use?

How does the ____ compare to the actual numbers in the data set? It is roughly the same as all, some, or none of them?

How could you estimate the mean from a table before doing any calculations?

How do you decide if the answer is reasonable?

What other average can you see immediately from a table?

How do we find the midpoint of a class interval?

Why is our value an estimate of the mean rather than the exact mean?

Would the estimate be more or less accurate if you had more/fewer classes?

How do you decide which values are outliers?

Are any of the values impossible/unreasonable? Should these values be included in any calculations we might do?

Which averages are most affected by outliers?

Will outliers always affect the range? Why or why not?

Is it better to have a low or high range?

Why does a high range mean the (e.g.) scores are less consistent?

Which averages are affected by outliers?

Which average is most useful for comparing these groups of data?