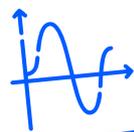




# What's available for **Secondary**.

An overview of the Secondary topics available in the Mathsbox Question Generator plus find out about the other resources we offer for Secondary level.



Graphs



Fractions



Decimals



Geor



Measures



Statistics



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"An indispensable tool for teachers,  
lightening the workload whilst enriching  
the learning experience of students"

- @RJS2212 -

# Getting Started with Mathsbox.

Whether you're looking for Primary, Secondary, or A-Level resources, we've got you covered.

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Over 2,000 question structures from the UK Curriculum to select from. Simply choose your resource type, select your topics, and generate unlimited questions and resources (with answers)

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# Number.

## BIDMAS

### Positive Integers

- Order of operations:  $a - b + c \times d$
- Order of operations:  $a + b + c \times d$
- Order of operations:  $a + b \times c$
- Order of operations:  $a - b \times c$
- Order of operations:  $a + b \div c$
- Order of operations:  $a - b \div c$
- Order of operations:  $a \times b - c \times d$
- Order of operations:  $a \times b + c \times d$
- Order of operations:  $a + (b + c) \times d$
- Order of operations:  $(a + b) \times c$
- Order of operations:  $(a - b) \times c$
- Order of operations:  $a - (b + c) \times d$
- Order of operations:  $a - b + c \times d$
- Order of operations:  $a + b + c \times d$
- Order of operations:  $a + b \times c$
- Order of operations:  $a - b \times c$
- Order of operations:  $a + b \div c$
- Order of operations:  $a - b \div c$
- Order of operations:  $a \times b - c \times d$
- Order of operations:  $a \times b + c \times d$
- Order of operations:  $a + (b + c) \times d$
- Order of operations:  $(a + b) \times c$
- Order of operations:  $(a - b) \times c$
- Order of operations:  $a - (b + c) \times d$
- Order of operations:  $(a - b)^2$
- Order of operations:  $(a + b)^2$
- Order of operations:  $a \times (b - c) \times d$

### Directed Numbers

- Order of operations - directed numbers mixture
- Order of operations:  $a - b + c \times d$
- Order of operations:  $a - (b + c) \times d$
- Order of operations:  $a + b + c \times d$
- Order of operations:  $a + (b + c) \times d$
- Order of operations:  $a \times (b - c)^2$
- Order of operations:  $a - b^2$
- Order of operations:  $a + b^2$
- Order of operations:  $a \times (b - c) \times d$
- Order of operations:  $a \times b - c \times d$
- Order of operations:  $a \times b + c \times d$
- Order of operations:  $(a + b) \times c$
- Order of operations:  $a \times (b - c)$
- Order of operations:  $(a - b) \times c$
- Order of operations:  $a \div (b + c)$
- Order of operations:  $a \div (b - c)$
- Order of operations:  $a + b \times c$
- Order of operations:  $a - b \times c$
- Order of operations:  $a + b \div c$

## Decimals

### Complements

- Complements to 1 - hundredths
- Complements to 1 - tenths and hundredths
- Complements to 1 - thousandths

### Ordering and comparing

- Comparing tens and tenths
- Ordering decimals (up to 2 d.p.)

### Addition

- Add decimals across 1
- Counting in tenths
- Add decimals - hundredths
- Add decimals - tenths and hundredths
- Add decimals - same number of d.p
- Add decimals (up to 2 d.p)
- Add decimals (up to 3 d.p)

# Number.

## Decimals

### Subtraction

- Subtract decimals within 1 (hundredths)
- Subtract decimals within 1 (1/10 and 1/100)
- Subtract decimals across 1
- Subtract decimals (same d.p.)
- Subtract decimals (up to 2 d.p.)
- Subtract decimals (up to 3 d.p.)

### Division

- Dividing a 1 digit number by 10
- Dividing a 2 digit number by 10
- Dividing a 1 digit number by 100
- Dividing a 2 digit number by 100
- Dividing (up to 3 digit number) by 10
- Dividing (up to 3 digit number) by 100
- Dividing (up to 3 digit number) by 1000
- Dividing by 10 (including decimals)

### Multiplication

- Multiplying by 10
- Multiplying by 100
- Multiplying by 1000
- Multiplying by 10,100,1000 missing values
- Multiplying a decimal by an integer
- Multiplying by multiples of 10 or decimals
- Use known facts - multiplication (inc decimals)
- Multiplying decimals (written methods)

### Division

- Dividing by 100 (including decimals)
- Dividing by 1000 (including decimals)
- Missing values  $\div$  10, 100, 1000
- Dividing a decimal by and integer
- Division decimal by a decimal
- Division - mixture

## Directed Numbers

### Temperatures and Ordering

- Comparing temperatures
- Comparing directed numbers
- Ordering temperatures
- Calculating temperature after an increase
- Calculating temperature after a decrease
- Finding the difference between temps

### Directed Numbers

- Order of operations - directed num mixture
- Order of operations:  $a - b + c \times d$
- Order of operations:  $a - (b + c) \times d$
- Order of operations:  $a + b + c \times d$
- Order of operations:  $a + (b + c) \times d$
- Order of operations:  $a \times (b - c)^2$
- Order of operations:  $a - b^2$
- Order of operations:  $a + b^2$
- Order of operations:  $a \times (b - c) \times d$
- Order of operations:  $a \times b - c \times d$
- Order of operations:  $a \times b + c \times d$

### Arithmetic

- Counting in 1's (negative numbers)
- Counting in 2, 3, 4, 5 etc
- Addition crossing zero
- Directed numbers:  $a + (-b)$
- Subtraction crossing zero
- Directed numbers:  $a - (-b)$
- Finding more or less
- Directed numbers:  $(\pm a) \times (\pm b)$
- Directed numbers:  $(\pm a) \div (\pm b)$

### Directed Numbers

- Order of operations:  $(a + b) \times c$
- Order of operations:  $a \times (b - c)$
- Order of operations:  $(a - b) \times c$
- Order of operations:  $a \div (b + c)$
- Order of operations:  $a \div (b - c)$
- Order of operations:  $a + b \times c$
- Order of operations:  $a - b \times c$
- Order of operations:  $a + b \div c$

# Number.

## Missing numbers

- Missing numbers:  $? - a = b$
- Missing numbers:  $? - a = b$
- Missing numbers:  $? + a = b$
- Missing numbers:  $? - (-a) = b$
- Missing numbers:  $a - ? = b$
- Missing numbers:  $a \div ? = b$
- Missing numbers:  $a \times ? = b$
- Missing numbers mixture

## Equivalence

### Decimals and fractions

- Decimals as fractions
- Fraction as a decimal
- Decimals and fractions - tenths
- Decimals and fractions - hundredths
- Write division as a fraction
- Use division - fraction as a decimal

### Decimals and percentages

- Decimal as a percentage less than 100
- Decimal as a percentage greater than 100
- Percentage as a decimal less than 100
- Percentage as a decimal greater than 100
- Mixture less than 100
- Mixture greater than 100

### Decimals and fractions

- Decimals as fractions
- Fraction as a decimal
- Decimals and fractions - tenths
- Decimals and fractions - hundredths
- Write division as a fraction
- Use division - fraction as a decimal

### Decimals and fractions

- Decimals as fractions
- Fraction as a decimal
- Decimals and fractions - tenths
- Decimals and fractions - hundredths
- Write division as a fraction
- Use division - fraction as a decimal

### Recurring decimals to fractions

- Recurring decimals as fractions

### Decimals and fractions

- Fractions as percentages
- Percentages to fractions (<100)
- Percentages to fractions (>100)

### Ratios and fractions

- Expressing a ratio as a fraction
- Expressing a fraction as a ratio

### Mixture

- Fractions, decimals and percentages

## Estimation

### Rounding to the nearest

- Rounding to the nearest 10
- Rounding to the nearest 100
- Rounding to the nearest 1000
- Mixed Rounding up to 10,000
- Round within 1,000,000
- Round within 1,000,000,000
- Mixed rounding up to 10000000
- Rounding to the nearest integer
- Rounding to the nearest tenth
- Rounding to the nearest hundredth

# Number.

## Estimation

### Significant figures

- Rounding to 1 significant figure (integers)
- Rounding to 1 significant figure (decimals)
- Rounding to 1 significant figure
- Rounding to 2 significant figure (integers)
- Rounding to 2 significant figure (decimals)
- Rounding to 2 significant figures
- Rounding to 3 significant figure (integers)
- Rounding to 3 significant figure (decimals)
- Rounding to 3 significant figures
- Rounding-significant figures (integers)
- Rounding-significant figures (decimals)

### Error intervals

- Error intervals - numbers - nearest integer
- Error intervals - numbers - 1 d.p.
- Error intervals - numbers - 2 d.p.
- Error intervals - numbers - mixture
- Error intervals - measures -nearest integer
- Error intervals - measures -1 d.p.
- Error intervals - measures -nearest 10
- Error intervals - measures -nearest 100
- Error intervals - measures -nearest 1000
- Error intervals - measures -mixture

### Bounds

- Min/max radius
- Min/max perimeter
- Min/max containers
- Min/max:  $(A \times B) \div C$
- Min/max:  $A \div (B \times C)$
- Min/max:  $A + B - C$
- Min/max:  $C \times (A - B)$
- Calculations involving bounds – mixture

### Decimal places

- Rounding to 1 decimal place
- Rounding to 2 decimal places
- Rounding to 1 or 2 decimal places

### Truncating

- Truncating to thousands
- Truncating to hundreds
- Truncating to tens
- Truncating to an integer
- Truncating to 1 d.p.
- Truncating to 2 d.p.
- Truncating to 1 s.f (integers)
- Truncating to 1 s.f (decimals)
- Truncating to 2 s.f (integers)
- Truncating to 2 s.f (decimals)

### Error intervals - Truncated Num

- Truncating to thousands
- Truncating to hundreds
- Truncating to tens
- Truncating to an integer
- Truncating to 1 d.p.
- Truncating to 2 d.p.
- Truncating to 1 s.f (integers)
- Truncating to 1 s.f (decimals)
- Truncating to 2 s.f (integers)
- Truncating to 2 s.f (decimals)

### Estimating answers

- Estimation:  $(a + b) \div c$
- Estimation:  $(a - b) \div c$
- Estimation:  $(a \times b) \div c$
- Estimation:  $a \times b$
- Estimation:  $a + b$
- Estimation:  $a - b$
- Mixture

# Number.

## Finance

### Working with money (non decimal)

- Pence and pounds ( $755\text{p} = \text{£}7$  and  $55\text{p}$ )
- Adding money (within a pound)
- Adding money
- Subtracting money (within a pound)
- Subtracting money
- Calculating change from  $\text{£}1$
- Calculating change from  $\text{£}5$
- Calculating change from  $\text{£}10$

### Working with money (decimal)

- Adding money - decimals
- Subtracting money - decimals
- Addition and Subtraction - mixture
- Calculating change from  $\text{£}1$  as a decimal
- Calculating change from  $\text{£}5$  as a decimal
- Calculating change from  $\text{£}10$  as a decimal
- Calculating change mixture

### Problems in context

- Multiplication problems
- Finding the difference
- Totals and change
- Tickets and change
- Multiply and divide in context
- Problem solving with money

### Simple Interest

- Simple interest - calculating the total
- Simple interest - calculating the interest
- Simple interest mixture

### VAT and Income tax

- Calculating the price including VAT
- Calculating the price before VAT
- Working with VAT - mixture
- Calculating Income tax

## Fractions

### Equivalence and simplifying

- Equivalent to a unit fraction
- Equivalent to a non-unit fraction

### Comparing and ordering

- Comparing unit fractions
- Comparing non-unit fractions
- Comparing fractions less than 1
- Ordering fractions less than 1
- Comparing fractions greater than 1
- Order unit fractions
- Order non-unit fractions
- Compare Mixed numbers

### Mixed Nums and Improper fractions

- Count beyond 1 (unit fractions)
- Count beyond 1 (increasing)
- Count beyond 1 (decreasing)
- Partition a mixed number
- Improper fractions equivalent to whole(s)
- Mixed numbers to improper fractions
- Improper fractions to mixed numbers
- Order Mixed numbers

### Comparing and ordering

- Unit fraction of a quantity
- Non-unit fraction of a quantity
- Comparing fractions quantities
- Find the whole - given a unit fraction
- Find the whole - given a fraction

# Number.

## Fractions

### Addition

- Partition the whole:  $2/5 + ?/5 = 1$
- Partition the whole:  $2/5 + 1/5 + ?/5 = 1$
- Add fractions within 1
- Add fractions total greater than 1
- Add any two proper fractions
- Add a proper fraction to a mixed number
- Adding mixed numbers: same denominator
- Adding mixed numbers: common multiple
- Adding mixed numbers

### Addition and Subtraction

- Fractions (common multiple denominators)
- Mixed numbers
- Fractions and decimals - tenths and hundredths
- Fractions and decimals (answer as a fraction)
- Fractions and decimals (answer as a decimal)

### Division

- Dividing a unit fraction by an integer
- Divide an integer by a fraction
- Dividing a fraction by an integer
- Divide a fraction by a unit fraction
- Divide any pair of fractions
- Divide mixed numbers

### Subtraction

- Subtracting fractions from a whole
- Subtracting fractions - same denominator
- Subtract fractions (common multiple den)
- Subtract fractions
- Subtract a whole from a mixed number
- Fraction from a mixed number
- Subtract mixed numbers

### Multiplication

- Multiply - Unit fraction by an integer
- Find the product of a pair of unit fractions
- Multiply - fraction by an integer
- Find the product of a pair of proper fractions
- Multiply - mixed number by an integer
- Multiply mixed numbers

## Indices

### Evaluating Indices

- Positive integer powers
- Negative integer powers
- Fractional powers:  $1/2$  and  $1/3$
- Fractional powers:  $n/m$
- Negative fractional powers:  $1/2$  and  $1/3$
- Negative fractional powers:  $n/m$

### Solving Equations

- Solving:  $?^{(n/2)} = 1/m$
- Solving:  $?^{(n/2)} = m$
- Solving:  $?^{(n/3)} = 1/m$
- Solving:  $?^{(n/2)} = m$
- Solving:  $?^{(-n/2)} = m$
- Solving:  $?^{(-n/3)} = m$
- Solving:  $a^m \times b^n = m$

## Integers

### Addition

- Add a 2 digit to a 3 digit number
- Add two 3 digit numbers (no exchanges)
- Add two 3 digit numbers (across 10)
- Add two 3 digit nums across a 10 and/or 100
- Add two 3 digit numbers
- Add up to 4-digit numbers – no exchange
- Add up to 4-digit numbers – one exchange
- Add two 4-digit nums – more than one exchange
- Addition - More than 4 digits
- Addition - up to 1000000

# Number.

## Subtraction

- Subtract a 2 digit from a 3 digit num
- Subtract two 3 digit num (no exchanges)
- Subtract two 3 digit num across a 10
- Subtract two 3 digit num across a 100
- Subtract two 3 digit num across a 10 or 100
- Subtract two 4-digit num – no exchange
- Subtract two 4-digit num – (1 exchange)
- Subtract two 4-digit num – (1+ exchange)
- Subtraction - More than 4 digits
- Subtraction - numbers up to 1000000

## Division

- Division - related calculations
- Dividing by 10
- Dividing by 100
- Dividing by 10,100 or 1000
- Division - by multiples of 10,100,1000
- 2-digit  $\div$  1-digit - no exchange
- 2-digit  $\div$  1-digit- with exchange
- 2-digit  $\div$  1-digit- with remainders
- 3-digit  $\div$  1-digit
- 3-digit  $\div$  1-digit- with remainders
- Division - 3 or 2 digit by 1 digit
- Division - remainders as decimals)
- Division - (with remainders as fractions)
- Division - 4 digit by 1 digit - no remainders
- Division - 4 digit by 1 digit - with remainders
- Division - 3 or 4 digit by 2 digit numbers

## Inverse operations and language

- Addition up to 100
- Addition up to 1000
- Addition up to 10000
- Subtraction up to 100
- Subtraction up to 1000
- Subtraction up to 10000
- Finding the sum
- Finding the product
- Finding the difference

## Addition

- Comparing calcs - addition and subtraction
- Inverse operations - addition and subtraction
- Missing numbers in equivalent calculations
- Complements to 100
- Multiplication and Division - by multiples of 10
- Comparing multiplication and division calculations
- Multiplication and division - multiple powers of 10
- Related calculations - multiplication and division

## Times Tables

- Multiplying by 3
- Dividing by 3
- Multiplying by 4
- Dividing by 4
- Multiplying by 8
- Dividing by 8
- Divide a number by 1 and itself
- Multiply by 1 and 0
- Multiply and divide by 6
- Multiply and divide by 9
- Multiply and divide by 7
- Multiply and divide by 11
- Multiply and divide by 12
- Multiply mixture
- Dividing mixture
- Multiplying and Dividing mixture
- Comparing single digit multiplication calculations
- Multiply 3 numbers

## Multiplication

- Using factor pairs
- Multiplying - 2 digit by a single digit
- Comparing calcs involving multiples of 10
- Multiply a 2 digit by a 1 digit num - no exch
- Multiply a 2 digit by a 1 digit num- with exch
- Multiply a 3 digit by a 1 digit number
- Multiply a 4 digit by a 1 digit number
- Multiply by 10
- Multiply by 100
- Multiply by 10,100 or 1000
- Multiply by 0.1 or 0.01
- Multiply - 2 digit by 2 digit
- Multiply - 3 digit by 2 digit
- Multiply - 4 digit by 2 digit
- Multiplication - by multiples of 10,100,1000
- Use factors to simplify multiplication calcs
- Comparing related products

# Number.

## Place Value

### Roman numerals

- Roman numerals to figures (12)
- Figures to Roman numerals (12)
- Roman numbers to figures (100)
- Roman numbers to figures (100)

### Reading and writing numbers

- Making large and small numbers (5 digits)
- Words to figures to 1,000
- Words to figures to 100,000
- Words to figures up to 1,000,000
- Words to figures up to 1 billion in figures

### Place value and partitioning

- Partition numbers up to 100
- Hundreds and tens - equivalence
- Place value in numbers up to 1000
- Partition numbers to 1000
- 1's, 10's, 100's, 1000's equivalence
- Partition numbers up to 10,000
- Flexible partitioning of numbers to 10,000
- Place value in numbers up to 1,000,000
- Partition numbers up to 1,000,000
- Place value within 1
- Place value - integers and decimals
- Place value - decimals (up to 3 d.p.)

### Ordering and comparing

- Compare numbers up to 1000
- Comparing numbers up to 1000 using  $<$  or  $>$
- Comparing numbers up to 10,000 using  $<$  or  $>$
- Comparing numbers up to 100,000
- Comparing numbers up to 1,000,000
- Order numbers up to 1000
- Order numbers up to 10,000
- Order numbers up to 100,000
- Order numbers up to 1,000,000
- Order numbers up to 10,000,000
- Order numbers up to 100,000,000

### More or less

- Finding 1 more or less than a number
- Finding 10 more or less than a number
- Finding 100 more or less than a number
- Finding 10 or 100 more than a number
- Finding 10 or 100 less than a number
- Finding 10, 100 or 1000 more (1,000)
- Finding 10, 100 or 1000 less (1,000)
- Finding 10, 100 or 1000 more (10,000)
- Finding 10, 100 or 1000 less (10,000)
- Finding 10, 100 or 1000 more (1,000,000)
- Finding 10, 100 or 1000 less (1,000,000)
- Multiples of powers of 10 more than a num
- Multiples of powers of 10 less than a num
- Finding 10 or 100 more or less than a num
- Powers of 10 more/less
- Multiples of powers of 10 more/less

### Ordering and comparing

- Finding  $10a \times b$
- Finding  $a \times 10b$
- Finding  $a \div 10 \times b$
- Finding  $a \times b \div 10$
- Finding  $a \div 10 \times b \div 10$
- Finding  $a \div 10 \times 10b$
- Finding  $10a \times b \div 10$
- Finding  $a \div 100 \times b$
- Finding  $a \times b \div 100$
- Finding  $a \div 100 \times 10b$
- Finding  $10a \times b \div 100$
- Finding  $a \times (b + 1)$
- Finding  $(a + 1) \times b$
- Finding  $a \times (b - 1)$
- Finding  $(a - 1) \times b$
- Finding  $2a \times b$
- Finding  $a \times 2b$
- Finding  $(a - 1) \div 10 \times b$
- Finding  $a \times (b - 1) \div 10$
- Finding  $(a + 1) \div 10 \times b$
- Finding  $a \times (b + 1) \div 10$
- Finding  $(a - 1) \div 100 \times b$
- Finding  $a \times (b - 1) \div 100$

### Ordering and comparing

- Finding  $(a + 1) \div 100 \times b$
- Finding  $a \times (b + 1) \div 100$
- Finding  $a \div 10 \times (b + 1) \div 10$
- Finding  $a \div 10 \times (b - 1) \div 10$
- Finding  $(a + 1) \div 10 \times b \div 10$
- Finding  $(a - 1) \div 10 \times b \div 10$

# Number.

## Product Rule

### Dials

- Dials
- Dials - multiples of 5 or 10
- Dials - Odd and even

### Menu Choices

- Menu - 3 course selection
- Menu - 2 course selection

### Selecting cards

- Cards - Different numbers
- Cards - Different pairs

## Standard Form

### Powers of 10

- Multiplying positive powers of 10
- Dividing positive powers of 10
- Multiplying and Dividing positive powers of 10
- Expressing negative powers of 10 as a decimal

### Ordering

- Order numbers in standard form
- Compare numbers in standard form

### Expressing in standard form

- Writing in standard form  $0 < n < 1$
- Writing in ordinary form  $0 < n < 1$
- Standard form and ordinary form mixed
- Writing in standard form - integers
- Writing in ordinary form - integers
- Standard form and ordinary form mixed

### Addition and subtraction

- Addition - decimals
- Addition - integers
- Subtraction - decimals
- Subtraction - integers
- Mixture + and - decimals
- Mixture + and - integers

### + and - same power

- Writing in standard form  $0 < n < 1$
- Writing in ordinary form  $0 < n < 1$
- Standard form and ordinary form mixed
- Writing in standard form - integers
- Writing in ordinary form - integers
- Standard form and ordinary form mixed

### Multiplication and division

- Multiply a num in standard form by an integer
- Divide a num in standard form by an integer
- Multiply numbers in standard form
- Divide numbers in standard form

### $\times$ and $\div$ same power

- Multiply a num in standard form by an integer
- Divide a num in standard form by an integer
- Multiply nums in standard form
- Divide numbers in standard form

### Calculators and standard form

- Standard form - addition - calculator
- Standard form - subtraction - calculator
- Standard form - multiplication - calculator
- Standard form - division - calculator
- Standard form -  $\times$  and  $\div$  - calculator
- Standard form - mixed arithmetic (calc)

# Number.

## Types of numbers

### Identifying Integers

- Identifying Positive Integers
- Identifying Negative Integers
- Identifying Integers

### Factors

- Finding factors
- Using factor pairs
- Finding common factors
- Finding the HCF

### Prime numbers

- Listing prime numbers
- Product of prime factors (10-100)
- Product of prime factors

### Square and cubes

- Listing square numbers
- Cube numbers
- Cube and square numbers
- Square roots and intervals

### Odd and even numbers

- Listing even numbers
- Listing odd numbers

### Multiples

- Listing multiples of 2
- Listing multiples of 5 and 10
- Listing multiples of 2
- Finding multiples of a number
- Listing multiples - mixture
- Finding common multiples
- Finding the lowest common multiple

### Reciprocals

- Finding the reciprocal

## Surds

### Simplifying

- Simplifying  $\sqrt{a}$
- Simplifying  $\sqrt{a \pm b} + \sqrt{a \pm c}$
- Simplifying  $n\sqrt{a \pm b} + m\sqrt{a \pm c}$
- Simplifying  $n\sqrt{a} + \sqrt{b}$
- Simplifying  $n\sqrt{a} \times m\sqrt{a}$
- Simplifying  $\sqrt{a} \times \sqrt{b}$
- Simplifying  $m\sqrt{a} \times n\sqrt{b}$

### Expanding brackets

- Expanding  $\sqrt{a}(a\sqrt{b} \pm c)$
- Expanding  $\sqrt{a}(b \pm \sqrt{a})$
- Single bracket mixture
- Expanding  $a\sqrt{b}(c\sqrt{d} \pm e)$
- Expanding  $(\sqrt{a} \pm b)(\sqrt{a} \pm c)$
- Expanding  $(a\sqrt{b} \pm c)(d\sqrt{b} \pm e)$

### Rationalising the denominator

- Rationalising the denominator:  $a / \sqrt{b}$
- Rationalising the denominator:  $a / (c \pm \sqrt{b})$
- Rationalising the denominator:  $(a \pm \sqrt{b}) / (c \pm \sqrt{b})$
- Rationalising the denominator mixture

# Number.

## Using a calculator

### Positive values

- Using a calculator:  $a \times \sqrt{b}$
- Using a calculator:  $a \times \sqrt{b} + \sqrt{c}$
- Using a calculator:  $a \times b^2 + \sqrt{b}$
- Using a calculator:  $a \times b^2 + \sqrt{(c \times d)}$
- Using a calculator:  $\sqrt{a} \times b + c \times \sqrt{d}$
- Using a calculator:  $\sqrt{(a \times b^2)} + c \times \sqrt{d}$
- Using a calculator:  $a \times \sqrt{b} - \sqrt{c}$
- Using a calculator:  $a \times b^2 - \sqrt{c}$
- Using a calculator:  $a \times b^2 - \sqrt{(c \times d)}$
- Using a calculator:  $\sqrt{(a \times b)} - c \times \sqrt{d}$
- Using a calculator:  $\sqrt{(a \times b^2)} - c \times \sqrt{d}$
- Using a calculator:  $a - b / c$
- Using a calculator:  $\sqrt{(a - b)} + c$
- Using a calculator:  $\sqrt{(a^2 - b)} - \sqrt{c}$
- Using a calculator: cube root  $(a + c / b)$
- Using a calculator: cube root  $(a / b) + c^3$
- Using a calculator:  $a^2 + b^3 + c^4$
- Using a calculator:  $(b / a) \times 10^3$
- Using a calculator:  $a / (b + c)$

### Directed Numbers

- Directed numbers:  $-a \times -b - c$
- Directed numbers:  $-a + (-b) + c$
- Directed numbers:  $-(a)^2 + (-b) + c$
- Directed numbers:  $(-a)^2 + (-b) + c$
- Directed numbers:  $(-a)^2 - (-b) + (-c)$
- Directed numbers:  $(-a)^2 - (-b) - (-c)$

## Summary of Topics:

Number

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>▪ Bidmas</li> <li>▪ Decimals</li> <li>▪ Directed Numbers</li> <li>▪ Equivalence</li> <li>▪ Estimation</li> <li>▪ Finance</li> <li>▪ Fractions</li> <li>▪ Indices</li> </ul> | <ul style="list-style-type: none"> <li>▪ Integers</li> <li>▪ Place Value</li> <li>▪ Product rule</li> <li>▪ Standard Form</li> <li>▪ Types of numbers</li> <li>▪ Surds</li> <li>▪ Using a calculator</li> </ul> |
|--|---|

# Algebra.

## Fractions

### Simplifying + and -

- Simplify  $x/a + x/b$
- Simplify  $x/a - x/b$
- Simplify  $(a \cdot x)/b + (c \cdot x)/d$
- Simplify  $(a \cdot x)/b - (c \cdot x)/d$
- Simplify  $(x + a)/b + (x + c)/d$
- Simplify  $(x + a)/b - (x + c)/d$
- Simplify  $(x + a)/b - (x - c)/d$
- Simplify  $(x - a)/b - (x + c)/d$

### Simplifying $\times$ and $\div$

- Multiply algebraic fractions
- Divide algebraic fractions

### Simplifying + and -

- Simplify  $(x - a)/b - (x - c)/d$
- Simplify  $(x - a)/b + (x - c)/d$
- Simplify  $(x + a)/b - (x - c)/d$
- Simplify Mixture

## Equations with fractions (quadratic formula needed)

- $a/x + b/(x + c) = d$
- $a/x - b/(x + c) = d$
- $a/x + b/(x - c) = d$
- $a/(x - c) - b/x = d$
- $a/(x + b) + c/(x + d) = e$
- $a/(x + b) - c/(x + d) = e$
- $a/(x - b) - c/(x + d) = e$
- $a/(x - b) - c/(x - d) = e$

## Changing the subject

### One-step formula

- Change the subject:  $y = x + a$
- Change the subject:  $y = x - a$
- Change the subject:  $y = a \times x$
- Change the subject:  $y = a / x$
- Change the subject:  $y = x / a$
- Change the subject:  $y = a - x$

### Two-step formula

- Rearranging to the form  $y = mx + c$
- Rearrange two step:  $y = x / a + b$
- Rearrange two step:  $y = x / a - b$
- Rearrange two step:  $y = (x + a) / b$
- Rearrange two step:  $y = (x - a) / b$
- Rearrange two step - mixture

### Variable appears more than once

- Subject appears twice:  $ax = bx + c$
- Subject appears twice:  $ax = c - bx$
- Subject appears twice:  $ax + b = cx + d$
- Subject appears twice:  $ax - b = cx + d$
- Subject appears twice:  $ax - b = d - cx$
- Subject appears twice:  $ax + b = d - cx$
- Subject appears twice:  $(x + a) / (x + b) = c$
- Subject appears twice:  $(x - a) / (x + b) = c$
- Subject appears twice:  $(x + a) / (x - b) = c$
- Subject appears twice:  $ax - b = cd - d$
- Subject appears twice:  $x / (x - b) = c$
- Subject appears twice:  $x / (x + b) = c$
- Subject appears twice:  $(ax + b) / (cx + d) = e$
- Subject appears twice:  $(ax - b) / (cx + d) = e$
- Subject appears twice:  $(ax - b) / (cx - d) = e$
- Subject appears twice - mixture

### Complex formula

- Rearrange complex:  $y = \sqrt{x + a}$
- Rearrange complex:  $y = \sqrt{x - a}$
- Rearrange complex:  $y = \sqrt{a - x}$
- Rearrange complex:  $y = (\sqrt{x}) / a$
- Rearrange complex:  $y = a / \sqrt{x}$
- Rearrange complex:  $y = \sqrt{a / x}$
- Rearrange complex:  $y = \sqrt{x / a}$
- Rearrange complex:  $y = \sqrt{x} + a$
- Rearrange complex:  $y = \sqrt{x} - a$
- Rearrange complex:  $y = -\sqrt{x}$
- Rearrange complex formula - mixture

# Algebra.

## Linear Equations

### Forming equations and expressions

- Forming single step expressions
- Forming equations 1 step
- Forming equations 2 step
- Forming and solving equations

### Two-step equations

- Positive solutions:  $ax + b = c$
- Positive solutions:  $ax - b = c$
- Positive solutions:  $a - bx = c$
- Negative solutions:  $ax + b = c$
- Negative solutions:  $ax - b = c$
- Negative solutions:  $a - bx = c$
- Postive mixture
- Postive/Negative mixture

### Brackets

- Solving:  $a(bx + c) = d$
- Solving:  $a(bx - c) = d$
- Solving:  $a(c - bx) = d$
- Solving:  $a(bx + c) + d = e$
- Solving:  $a(bx - c) + d = e$
- Solving:  $a(bx + c) - d = e$
- Solving:  $a(bx - c) - d = e$
- Solving:  $a(b - cx) + d = e$
- Solving:  $a(b - cx) - d = e$
- Equations with brackets - mixture

### Equations with fractions 2

- Equations with fractions:  $x/a + b = cx + d$
- Equations with fractions:  $x/a - b = cx + d$
- Equations with fractions:  $x/a + b = cx - d$
- Equations with fractions:  $x/a - b = cx - d$
- Equations with fractions:  $b - x/a = cx + d$
- Equations with fractions:  $b - x/a = cx + d$
- Equations with fractions:  $x/a + b = x/c + d$
- Equations with fractions:  $x/a - b = x/c + d$
- Equations with fractions:  $x/a + b = x/c - d$
- Equations with fractions:  $x/a - b = x/c - d$
- Equations with fractions:  $x/a + b = d - x/c$
- Equations with fractions:  $x/a - b = d - x/c$
- Equations with fractions:  $x/a + x/b = c$
- Equations with fractions:  $x/a - x/b = c$
- Equations with fractions:  $x/a + x/b = cx + d$

### One-step equations

- One step:  $x + a = b$
- One step:  $x - a = b$
- One step:  $a - x = b$
- One step:  $a \cdot x = b$
- One step:  $x / a = b$
- One step equations - mixture

### Fractions

- Equations with fractions:  $x/a - b = c$
- Equations with fractions:  $x/a + b = c$
- Equations with fractions:  $(x + a)/b = c$
- Equations with fractions:  $(x - a)/b = c$
- Equations with fractions:  $a - x/b = c$
- Equations with fractions - mixture

### Unknown on both sides (+ only)

- Both sides:  $ax + b = cx + d$
- Both sides:  $ax - b = cx + d$
- Both sides:  $ax - b = cx - d$

### Unknown on both sides

- Both sides:  $ax + b = x + c$
- Both sides:  $ax - b = x + c$
- Both sides:  $ax + b = x - c$
- Both sides:  $ax - b = x - c$
- Both sides:  $ax + b = c - x$
- Both sides:  $ax - b = c - x$
- Both sides:  $ax + b = cx + d$
- Both sides:  $ax - b = cx + d$
- Both sides:  $ax + b = cx - d$
- Both sides:  $ax - b = cx - d$
- Both sides:  $ax + b = d - cx$
- Both sides:  $ax - b = d - cx$
- Both sides:  $a(bx + c) = dx + e$
- Both sides:  $a(bx - c) = dx + e$
- Both sides:  $a(bx + c) = dx - e$
- Both sides:  $a(bx - c) = dx - e$
- Both sides:  $a(c - bx) = dx + e$
- Both sides:  $a(c - bx) = dx - e$
- Both sides - mixture

# Algebra.

## Linear Equations

### Equations with fractions 2

- Equations with fractions:  $x/a - x/b = cx + d$
- Equations with fractions:  $x/a + x/b = cx - d$
- Equations with fractions:  $x/a - x/b = cx - d$
- Equations with fractions:  $x/a + x/b = e - dx$
- Equations with fractions:  $x/a - x/b = e - dx$
- Equations with fractions - mixture

## Linear Equations - alternative forms

### Integer Solutions

- One step equations:  $b = x + a$
- One step equations:  $b = x - a$
- One step equations:  $b = a - x$
- One step equations:  $b = x / a$
- Two step equations:  $b = ax + b$
- Two step equations:  $b = ax - b$
- Two step equations:  $b = a - bx$
- Fractions:  $c = x / a + b$
- Fractions:  $c = x / a - b$
- Fractions:  $c = a - x / b$
- Fractions:  $c = (x + a) / b$
- Fractions:  $c = (x - a) / b$
- Brackets:  $d = a(bx + c)$
- Brackets:  $d = a(bx - c)$
- Brackets:  $d = a(c - bx)$

### Fraction - Solutions

- Fractions:  $d = ax / b + c$
- Fractions:  $d = ax / b - c$
- Fractions:  $d = c - ax / b$
- Fractions:  $d = (ax + b) / c$
- Fractions:  $d = (ax - b) / c$

## Quadratic Equations

### Factorise and solve

- Factorise and solve  $x^2 + ax = 0$
- Factorise and solve  $x^2 - ax = 0$
- Factorise and solve  $ax^2 + bx = 0$
- Factorise and solve  $ax^2 - bx = 0$
- Factorise and solve  $x^2 + ax = 0$
- Factorise and solve  $x^2 - ax = 0$
- Factorise and solve  $ax^2 + bx = 0$
- Factorise and solve  $ax^2 - bx = 0$
- Factorise and solve  $x^2 + ax = 0$
- Factorise and solve  $x^2 - ax = 0$
- Factorise and solve  $ax^2 + bx = 0$
- Factorise and solve  $ax^2 - bx = 0$
- Factorise and solve mixture

### Difference of 2 squares

- Factorise and solve  $x^2 - b^2 = 0$
- Factorise and solve  $a^2x^2 - b^2 = 0$

### Rearrange before factorising

- Rearrange and solve

### Quadratic formula

- Find the discriminant
- Solve  $x \pm bx \pm c = 0$
- Solve  $ax \pm bx \pm c = 0$
- Rearrange and solve

# Algebra.

## Quadratic Equations

### Expressing in completed square form

- Expressing in the form  $(x \pm a)^2 \pm b$
- Expressing in the form  $(a x \pm b)^2 \pm c$
- Completed square form mixture

### With fractions (quadratic formula)

- $a / x + b / (x + c) = d$
- $a / x - b / (x + c) = d$
- $a / x + b / (x - c) = d$
- $a / (x - c) - b / x = d$
- $a / (x + b) + c / (x + d) = e$
- $a / (x + b) - c / (x + d) = e$
- $a / (x - b) - c / (x + d) = e$
- $a / (x - b) - c / (x - d) = e$

## Simultaneous Equations

### Linear

- Find pairs of values
- Solve problems with two unknowns
- $x + y = r$  and  $x - y = s$
- $ax + by = r$  and  $ax - y = s$
- $ax + by = r$  and  $ax + y = s$
- $ax - by = r$  and  $ax - y = s$
- $ax + by = r$  and  $x - by = s$
- $ax - by = r$  and  $x - by = s$
- $ax + by = r$  and  $x + by = s$
- $x + by = r$  and  $cx + dy = s$
- $x - by = r$  and  $cx + dy = s$
- $x + by = r$  and  $cx - dy = s$
- $x - by = r$  and  $cx - dy = s$
- $ax + y = r$  and  $cx + dy = s$
- $ax - y = r$  and  $cx + dy = s$
- $ax + y = r$  and  $cx - dy = s$
- $ax + y = r$  and  $cx - dy = s$
- Mixture

## Expanding Brackets

### Single brackets

- Expanding:  $a(bx + c)$
- Expanding:  $a(bx - c)$
- Expanding:  $a(b - cx)$
- Expanding:  $ax(bx + c)$
- Expanding:  $ax(bx - c)$
- Expanding:  $ax(b - cx)$
- Expanding mixture

### Multiple, single brackets

- Expanding:  $a(bx + c) + d(ex + f)$
- Expanding:  $a(bx - c) + d(ex + f)$
- Expanding:  $a(bx + c) + d(ex - f)$
- Expanding:  $a(bx - c) + d(ex - f)$
- Expanding:  $a(bx + c) - d(ex + f)$
- Expanding:  $a(bx - c) - d(ex + f)$
- Expanding:  $a(bx + c) - d(ex - f)$
- Expanding:  $a(bx - c) - d(ex - f)$
- Expanding Mixture

### Double brackets

- Expanding:  $(x + a)(x + b)$
- Expanding:  $(x - a)(x - b)$
- Expanding:  $(x + a)(x - b)$
- Expanding:  $(x - a)(x + b)$
- Expanding:  $(x + a)^2$
- Expanding:  $(x - a)^2$
- Expanding:  $(x - a)(x + a)$
- Expanding:  $(ax + b)(cx + d)$
- Expanding:  $(ax - b)(cx + d)$

### Double brackets

- Expanding:  $(ax + b)(cx - d)$
- Expanding:  $(ax - b)(cx - d)$
- Expanding:  $(ax + b)^2$
- Expanding:  $(ax - b)^2$
- Expanding Mixture (8 - 13)
- Expanding 3 brackets

# Algebra.

## Factorising

### Single bracket

- Factorising:  $ax + b$
- Factorising:  $ax - b$
- Factorising:  $a - bx$
- Factorising:  $ax^2 + bx$
- Factorising:  $ax^2 - bx$
- Factorising:  $bx - ax^2$
- Factorising Mixture

### Difference of 2 squares

- Factorising:  $x^2 - b^2$
- Factorising:  $a^2x^2 - b^2$

### 2 brackets

- Factorising:  $x^2 + bx + c$
- Factorising:  $x^2 \pm bx - c$
- Factorising:  $x^2 - bx + c$
- Factorising:  $x^2 \pm 2ax + a^2$
- Factorising:  $ax^2 + bx + c$
- Factorising:  $ax^2 \pm bx - c$
- Factorising:  $ax^2 - bx + c$
- Factorising:  $(ax + b)^2$
- Factorising:  $(ax - b)^2$
- Factorising Mixture

## Functions

### Evaluating functions

- Evaluating functions :  $ax^2 - b$
- Evaluating functions :  $b - ax^2$
- Evaluating functions :  $(ax)^2 + b$
- Evaluating functions :  $(ax^2) / b$
- Evaluating functions :  $(ax^2) / b + c$
- Evaluating functions :  $(ax^2) / b - c$
- Evaluating functions :  $\sqrt{ax + b}$
- Evaluating functions :  $\sqrt{b - ax}$
- Evaluating functions :  $\sqrt{(x + a) / b}$
- Evaluating functions :  $x^2 + x$
- Evaluating functions :  $ax^2 \pm x$
- Evaluating functions :  $x^2 \pm ax$
- Evaluating functions :  $ax^2 \pm bx$
- Evaluating functions :  $ax - bx^2 \pm c$
- Evaluating functions :  $ax^3 \pm bx^2$
- Evaluating functions :  $ax^3 \pm bx^2 \pm cx \pm d$

### Forming composite functions

- $fg(x), f(x) = ax \pm b, g(x) = cx \pm d$
- $gf(x), f(x) = ax \pm b, g(x) = cx \pm d$
- $fg(x), f(x) = x^2, g(x) = ax \pm b$
- $gf(x), f(x) = x^2, g(x) = ax \pm b$
- $fg(x), f(x) = ax^2, g(x) = bx \pm c$
- $gf(x), f(x) = ax^2, g(x) = bx \pm c$
- $fg(x), f(x) = x^2 \pm a, g(x) = x \pm b$
- $gf(x), f(x) = x^2 \pm a, g(x) = x \pm b$
- $fg(x), f(x) = a \pm bx, g(x) = cx \pm d$
- $gf(x), f(x) = a \pm bx, g(x) = cx \pm d$
- Composite functions - mixture

### Inverse functions

- |                                |                                     |  |
|--------------------------------|-------------------------------------|--|
| • Inverse functions : $x - a$  | • Inverse functions : $(x + b) / a$ | • Inverse functions : $\sqrt{x + a}$   |
| • Inverse functions : $x + a$  | • Inverse functions : $(x - b) / a$ | • Inverse functions : $\sqrt{x - a}$   |
| • Inverse functions : $a - x$  | • Inverse functions : $(b - x) / a$ | • Inverse functions : $\sqrt{a - x}$   |
| • Inverse functions : $ax$     | • Inverse functions : $a / (x + b)$ | • Inverse functions : $(\sqrt{x}) / a$ |
| • Inverse functions : $x / a$  | • Inverse functions : $a / (x - b)$ | • Inverse functions : $a / \sqrt{x}$   |
| • Inverse functions : $a / x$  | • Inverse functions : $x / a + b$   | • Inverse functions : $\sqrt{a / x}$   |
| • Inverse functions : $ax + b$ | • Inverse functions : $x / a - b$   | • Inverse functions : $\sqrt{x / a}$   |
| • Inverse functions : $b - ax$ | • Inverse functions : $\sqrt{x}$    | • Inverse functions : $\sqrt{x + a}$   |
| • Inverse functions : $ax - b$ | • Inverse functions : $a \sqrt{x}$  | • Inverse functions : $\sqrt{x - a}$   |

# Algebra.

## Functions

### Inverse functions

- Inverse functions :  $a - \sqrt{x}$
- Inverse functions :  $a \sqrt{(x + b)}$
- Inverse functions :  $a \sqrt{(x - b)}$
- Inverse functions :  $a + \sqrt{(x - b)}$
- Inverse functions :  $a - \sqrt{(x - b)}$
- Inverse functions :  $a - \sqrt{(x + b)}$
- Inverse functions :  $(\sqrt{(x + b)}) / a$
- Inverse functions :  $\sqrt{((x - b) / a)}$
- Inverse functions :  $\sqrt{((x + b) / a)}$
- Inverse functions :  $(\sqrt{x}) / a + b$
- Inverse functions :  $(\sqrt{x}) / a - b$
- Inverse functions :  $b - (\sqrt{x}) / a$
- Inverse functions :  $\sqrt{(ax + b)}$
- Inverse functions :  $\sqrt{(ax - b)}$
- Inverse functions :  $\sqrt{(b - ax)}$
- Inverse functions :  $(\sqrt{x}) / a + b$
- Inverse functions mixture

## Function Machines

### One-step finding the output

- Find the output:  $+ a$
- Find the output:  $- a$
- Find the output:  $\times a$
- Find the output:  $\div a$
- Find the output - decimals:  $+ a$
- Find the output - decimals:  $- a$
- Find the output - decimals:  $\times a$
- Find the output - decimals:  $\div a$
- One-step output mixture

### Two-step finding the output

- Find the output:  $\times a + b$
- Find the output:  $\times a - b$
- Find the output:  $+ a \times b$
- Find the output:  $\div a + b$
- Find the output:  $\div a - b$
- Find the output:  $+ a \div b$
- Find the output:  $- a \div b$
- Find the output:  $- a \times b$
- Two-step output mixture

### One-step finding the input

- Find the input:  $+ a$
- Find the input:  $- a$
- Find the input:  $\times a$
- Find the input:  $\div a$
- One-step input mixture

### Two-step finding the input

- Find the input:  $\times a + b$
- Find the input:  $\times a - b$
- Find the input:  $+ a \times b$
- Find the input:  $\div a + b$
- Find the input:  $\div a - b$
- Find the input:  $+ a \div b$
- Find the input:  $- a \div b$
- Find the input:  $- a \times b$
- Two-step input mixture

## Expressions

- Find an expression for the output
- Find the function

## Missing functions

- Two-step - missing functions

# Algebra.

## Linear Graphs

### Equations of $x = a$ , $y = b$ , $y = \pm x$

- Lines parallel to the x-axis
- Lines parallel to the x-axis (Diagram)
- Lines parallel to the y-axis
- Lines parallel to the y-axis (Diagram)
- Lines parallel to the axes
- Lines parallel to the axes (diagram)
- 2 coordinates given

### Coordinates on lines

- Does a point lie on  $y = mx$
- Does a point lie on  $y = mx \pm c$
- Complete a coordinate for  $y = x \pm c$
- Complete a coordinate for  $y = mx$
- Complete a coordinate for  $y = mx \pm c$
- Find the mid-point of a line segment
- Identify equations of non-linear graphs

### Finding the gradient

- Determine which is the steeper line
- Identify the gradient (diagram)
- Identify the gradient of  $y = mx \pm c$
- Identify the gradient after rearranging

### Finding the intercept

- Identify the y-axis intercept for  $y = x \pm a$
- Identify the x-axis intercept for  $y = x \pm a$
- Identify the y-axis intercept for  $y = mx \pm c$
- Identify the intercept after rearranging

### Equation of a straight - words

- Equation of a line - 2 function machines
- Equation of a line - through (a,b) and (0,c)
- Equation of a line - through (a,b) and (c,d)
- Equation of a line - gradient and y-intercept

### Equation of a straight - diagrams

- $y = mx \pm c$  - positive gradient
- $y = mx \pm c$  - negative gradient
- $y = mx \pm c$
- $ax + by =$

### Equations of parallel lines

- Equation of a line - through (0,a)
- Equation of a line - through (0,a) (rearrange)
- Equation of a line - through (a,b)
- Equation of a line - through (a,b) (rearrange)
- Parallel lines - mixture

### Equations of perpendicular lines

- Equation of a line - through (0,a)
- Equation of a line - through (0,a) (rearranging)
- Equation of a line - through (a,b)
- Equation of a line - through (a,b) (rearranging)
- Perpendicular lines mixture
- Parallel and perpendicular mixture
- Equation of a tangent to a circle

## Non-Linear Graphs

### Quadratic graphs

- Sketching  $y = x^2 \pm bx \pm c$
- Quadratic graphs - points to plot
- State the vertex of a quadratic graph
- Complete the square and find the vertex
- Symmetry  $y = (x \pm a)(x \pm b)$
- Symmetry  $y = x^2 \pm bx \pm c$
- Symmetry  $y = ax^2 \pm bx \pm c$
- Roots  $y = x^2 \pm bx \pm c$
- Roots  $y = ax^2 \pm bx \pm c$
- Identify the roots from a graph
- Identify the vertex from a graph
- Solve  $x^2 \pm ax \pm b = \pm c$  from a graph

### Equation of a circle

- Finding the equation of a circle
- Equation of a tangent to a circle

### Trigonometry

- Using the sine graph
- Using the cosine graph
- Sine and cosine graph

## Indices

### Simplifying

- Multiplying terms:  $ax^m \times bx^n$
- Dividing terms:  $(ax^n y^m) \div cx$
- Simplifying:  $(ax^n)^m$
- Simplifying - mixture

### Missing powers

- Addition law:  $x^n \times x^m = x^p$
- Subtraction law:  $x^n \div x^m = x^p$
- Raising to a power:  $(x^n)^m = x^p$
- Missing powers - mixture

## Solving equations

- Solving:  $x^{(n/2)} = 1/m$
- Solving:  $x^{(n/2)} = m$
- Solving:  $x^{(n/3)} = 1/m$
- Solving:  $x^{(n/2)} = m$
- Solving:  $x^{(-n/2)} = m$
- Solving:  $x^{(-n/3)} = m$
- Solving:  $a^m \times b^2 = m$

## Inequalities

### Linear Inequalities

- Solving:  $x + a <> b$
- Solving:  $x - a <> b$
- Solving:  $x \pm a <> b$
- Solving:  $ax + b <> c$
- Solving:  $ax - b <> c$
- Solving:  $ax \pm b <> c$
- Solving:  $x/a - b <> c$
- Solving:  $x/a + b <> c$
- Solving:  $(x + a)/b <> c$
- Solving:  $(x - a)/b <> c$
- Solving:  $a(bx + c) <> d$
- Solving:  $a(bx - c) <> d$
- Solving:  $a(bx \pm c) <> d$
- Solving:  $a(b - cx) <> d$
- Solving:  $a - x/a <> d$
- Solving:  $(a - x)/b <> d$
- Solving:  $ax + b < cx + d$
- Solving:  $ax - b < cx + d$
- Solving:  $ax + b < cx - d$
- Solving:  $ax - b < cx - d$
- Solving:  $ax + b < d - cx$
- Solving:  $ax - b < d - cx$
- Solving:  $a < bx + c < d$
- Solving:  $a < bx - c < d$
- Solving:  $a < b - cx < d$

### Single integer solutions

- Smallest value:  $ax + b > c$
- Smallest value:  $ax - b > c$
- Largest value:  $ax - b < c$
- Largest value:  $ax + b < c$
- Integer solutions - mixture

### Listing integer solutions

- $a < x < b$
- $a \leq x < b$
- $a < x \leq b$
- $a \leq x \leq b$
- $a < mx < b$
- $a \leq mx < b$
- $a < mx \leq b$
- $a \leq mx \leq b$
- $a < mx + c < b$
- $a \leq mx + c < b$
- $a < mx + c \leq b$
- $a \leq mx + c \leq b$
- $a < mx + c \leq b$
- $a \leq mx + c \leq b$
- $a < mx + c \leq b$
- $a \leq mx + c \leq b$
- $a < mx + c \leq b$
- $a \leq mx + c \leq b$
- Inequalities full mix

### Quadratic inequalities

- Solving:  $x^2 - bx + c \geq 0$
- Solving:  $x^2 - bx + c \leq 0$
- Solving:  $x^2 - bx - c \geq 0$
- Solving:  $x^2 - bx - c \leq 0$
- Solving:  $x^2 + bx - c \geq 0$
- Solving:  $x^2 + bx - c \leq 0$
- Solving:  $x^2 + bx + c \geq 0$
- Solving:  $x^2 + bx + c \leq 0$

## Inequalities

### Defining shaded regions

- Representing:  $y \leq a$  or  $y < a$
- Representing:  $y \geq a$  or  $y > a$
- Representing:  $x \leq a$  or  $x < a$
- Representing:  $x \geq a$  or  $x > a$
- Representing:  $ax + by \leq c$  or  $ax + by < c$
- Representing:  $ax + by \geq c$  or  $ax + by > c$
- Representing:  $ax + by \leq c$  and axes bounds
- Representing:  $ax + by \geq c$  and axes bounds
- Representing:  $ax + by \leq c, x \geq p, y \geq 0$
- Representing:  $ax + by \geq c, x \leq p, y \leq 0$
- Representing:  $ax + by \leq c, x \geq 0, y \geq p$
- Representing:  $ax + by \geq c, x \leq 0, y \leq p$
- Representing:  $ax + by \leq c, x \geq p, y \geq q$
- Representing:  $ax + by \geq c, x \leq p, y \leq q$

### Defining unshaded regions

- Representing:  $y \geq a$  or  $y > a$
- Representing:  $y \leq a$  or  $y < a$
- Representing:  $x \geq a$  or  $x > a$
- Representing:  $x \leq a$  or  $x < a$
- Representing:  $ax + by \geq c$  or  $ax + by > c$
- Representing:  $ax + by \leq c$  or  $ax + by < c$
- Representing:  $ax + by \geq c$  and axes bounds
- Representing:  $ax + by \leq c$  and axes bounds
- Representing:  $ax + by \geq c, x \leq p, y \leq 0$
- Representing:  $ax + by \leq c, x \geq p, y \geq 0$
- Representing:  $ax + by \geq c, x \leq 0, y \leq p$
- Representing:  $ax + by \leq c, x \geq 0, y \geq p$
- Representing:  $ax + by \geq c, x \leq p, y \leq q$
- Representing:  $ax + by \leq c, x \geq p, y \geq q$

## Sequences

### Counting patterns and continuing

- Counting in 50's
- Continue a linear sequence (integers)
- Counting in tenths
- Counting in tenths hundredths
- Directed numbers

### Finding missing terms

- Missing terms - linear sequences
- Missing terms - tenths
- Missing terms - hundredths
- Missing terms - directed numbers

### Generating sequences

- First term and addition rule
- First term and subtraction rule
- First term and general rule
- Sequences from algebraic rule
- Increasing sequence (nth term)
- Decreasing sequence (nth term)
- Linear sequence (nth term)
- Quadratic sequence (nth term)

### Finding the nth term

- Linear increasing sequence
- Linear decreasing sequence
- Linear sequence mixture
- Quadratic sequence
- 10th term of quadratic sequence
- Mixture of linear and quadratic sequences
- Fractional sequences
- Mixture of linear and quadratic sequences

### Other sequences

- Continue a fibonacci sequence
- Continue a geometric sequence
- Find missing terms in a geometric sequence
- Recognise a linear sequence
- Fractions and sequences
- Algebraic sequences

# Algebra.

## Simplifying Expressions

### Collecting like terms

- Collecting like terms - addition
- Collecting like terms - single variable
- Collecting like terms - single variable across 0
- Collecting like terms - two variables
- Collecting like powers of a variable

### Multiplication and division

- Multiplying terms
- Multiplying terms with variables
- Multiplying terms with coefficients and variables
- Dividing terms
- Dividing terms with coefficients

### Expand and simplify

- Expanding with addition
- Expanding with subtraction
- Expanding mixed signs
- Expanding mixtures
- Expanding with subtraction and addition
- Expanding with subtraction and subtraction
- Expanding mixed sign mixtures

### Fractions + and -

- $x/a + x/b$
- $x/a - x/b$
- $(ax)/b + (cx)/d$
- $(ax)/b - (cx)/d$
- $(x + a)/b + (x + c)/d$
- $(x + a)/b - (x + c)/d$
- $(x + a)/b - (x - c)/d$
- $(x - a)/b - (x + c)/d$
- $(x - a)/b - (x - c)/d$
- $(x - a)/b + (x - c)/d$
- $(x + a)/b - (x - c)/d$
- Simplify mixture

### Fractions $\times$ and $\div$

- Multiply algebraic fractions
- Divide algebraic fractions

## Substitution

### Positive Integers

- $y = x + a$
- $y = a - x$
- $y = ax$
- $y = a / x$
- $y = ax + b$
- $y = ax - b$
- $y = b - ax$
- $y = x / a + b$
- $y = (x + a) / b$
- $y = (x - a) / b$
- $y = (ax + b) / c$
- $y = (ax - b) / c$
- $y = ax^2$
- $y = x^2 \pm b$
- $y = ax^2 + b$
- $y = ax^2 - b$
- $y = b - ax^2$
- $y = (ax^2) / b$
- $y = (ax^2) / b + c$
- $y = (ax^2) / b - c$
- $y = \sqrt{(ax + b)}$
- $y = \sqrt{(b - ax)}$
- $y = a\sqrt{x} + b$
- $y = b - a\sqrt{x}$
- $y = \sqrt{((x + a) / b)}$
- $y = \sqrt{(b(x + a))}$
- $y = a / \sqrt{(x + b)}$
- $y = x^2 \pm x$
- $y = ax^2 \pm x$
- $y = x^2 \pm ax$
- $y = ax^2 \pm bx$
- $y = x^2 \pm bx + c$
- $y = bx - ax^2 \pm c$
- $y = ax^3 \pm bx^2$
- $y = ax^3 \pm bx^2 \pm cx \pm d$

### Negative Integers

- $y = x + a$
- $y = a - x$
- $y = ax$
- $y = x / a$
- $y = a / x$
- $y = ax + b$
- $y = ax - b$
- $y = b - ax$
- $y = x / a + b$
- $y = (x + a) / b$
- $y = (x - a) / b$
- $y = (ax + b) / c$
- $y = (ax - b) / c$
- $y = ax^2$
- $y = x^2 \pm b$
- $y = ax^2 + b$
- $y = ax^2 - b$
- $y = b - ax^2$
- $y = (ax)^2 + b$
- $y = (ax^2) / b$
- $y = (ax^2) / b + c$
- $y = (ax^2) / b - c$
- $y = \sqrt{(ax + b)}$
- $y = \sqrt{(b - ax)}$
- $y = \sqrt{((x + a) / b)}$
- $y = \sqrt{(b(x - a))}$
- $y = a / \sqrt{(x + b)}$
- $y = x^2 \pm x$
- $y = ax^2 \pm x$
- $y = x^2 \pm ax$
- $y = ax^2 \pm bx$
- $y = x^2 \pm bx \pm c$
- $y = bx - ax^2 \pm c$
- $y = ax^3 \pm bx^2$
- $y = ax^3 \pm bx^2 \pm cx \pm d$

# Algebra.

## Substitution

### Fractional values

- $y = b - ax$
- $y = a(x \pm b)$
- $y = ax^2 \pm b$
- $y = ax^2 \pm bx$

### Using SUVAT formulae

- Calculating the initial velocity  $v = u + at$
- Calculating the acceleration  $v = u + at$
- Calculating the time  $v = u + at$
- Calculating the velocity  $v = u + at$
- Mixture  $v = u + at$
- Calculating the initial velocity  $s = ut + \frac{1}{2} at^2$
- Calculating the displacement  $s = ut + \frac{1}{2} at^2$
- Mixture  $s = ut + \frac{1}{2} at^2$
- Calculating the initial velocity  $v^2 = u^2 + 2as$
- Calculating the displacement  $v^2 = u^2 + 2as$
- Mixture  $v^2 = u^2 + 2as$

## Summary of Topics:

Algebra

- |                          |                     |
|--------------------------|---------------------|
| ▪ Fractions              | ▪ Function Machines |
| ▪ Changing the subject   | ▪ Linear Graphs     |
| ▪ Linear Equations       | ▪ Other Graphs      |
| ▪ Quadratic Equations    | ▪ Indices           |
| ▪ Simultaneous Equations | ▪ Inequalities      |
| ▪ Expanding Brackets     | ▪ Sequences         |
| ▪ Factorising            | ▪ Simplifying       |
| ▪ Functions              | ▪ Substitution      |

# Proportion.

## Compound Measures

### Speed Distance Time

- Speed Distance Time - speed
- Speed Distance Time - distance
- Speed Distance Time - time
- Speed Distance Time - Mixture
- Average speed problems

### Speed Distance Time (easier)

- Speed Distance Time - speed
- Speed Distance Time - distance
- Speed Distance Time - time
- Speed Distance Time (hours only) - Mixture
- Speed Distance Time - Mixture

### Mass, Volume, Density

- Density mass volume - density
- Density mass volume - mass
- Density mass volume - volume
- Density mass volume - Mixture

### Force Area Pressure

- Pressure Force and Area - pressure
- Pressure , Force and Area - force
- Pressure , Force and Area - area
- Pressure , Force and Area - mixture

### Population Density Area

- Population Density - density
- Population Density - population
- Population Density - area
- Population Density - mixture

### Converting units - speed

- Converting units of speed m/s to km/h
- Converting units of speed km/h to m/s
- Converting units of speed km/h to mph
- Converting units of speed mhp to km/h (4)
- Converting units of speed mixture

### Converting units - density and flow

- Converting units of density g/cm<sup>3</sup> to kg/m<sup>3</sup>
- Converting units of density kg/m<sup>3</sup> to g/cm<sup>3</sup>
- Converting units of density mixture
- Converting units of rates of flow

## Proportion

### Mixed proportion problems

- Solve problems involving scaling
- Solve problems involving rates
- Direct Proportion problems (£s)
- Direct Proportion problems
- Solving recipe problems
- Calculating wages
- Wages and overtime
- Solving best buy problems
- UK currency for foreign currency
- Foreign currency to UK currency
- Exchange rates - comparing prices
- Inverse proportion problems

### Forming and using formulae

- Direct proportion  $y \propto kx$
- Direct proportion  $y \propto kx^2$
- Direct proportion  $y \propto k\sqrt[3]{x}$
- Direct proportion  $y \propto kx^3$
- Direct proportion  $y \propto k\sqrt{x}$
- Direct proportion – formula – mixture
- Forming and using formulae
- Inverse proportion  $y \propto k \div x$
- Inverse proportion  $y \propto k \div x^2$
- Inverse proportion  $y \propto k \div \sqrt{x}$
- Inverse proportion – mixture
- Proportion – mixture

# Proportion.

## Measures

### Time

- Time from a digital clock
- am and pm when comparing times
- Understanding the order of the months
- Converting: years months days
- Converting: weeks days hours
- Converting: hours minutes
- Converting time mixture
- Minutes and seconds as seconds
- Seconds as minutes and seconds
- Comparing s and minutes and seconds
- Time
- Comparing time intervals
- Calculate the time after - minutes
- Calculate the time - before
- Calculate the time Mixture
- Calculating time intervals (5 minutes)
- Calculating time intervals
- Working out end times
- Working out start times
- Mixture
- Decimal hours
- Decimal hours

### Metric Measures - Length

- Equivalence - km and m
- Equivalence - m and cm
- Equivalence -m and cm (decimals)
- Equivalence - cm and mm
- Equivalence - cm and mm (decimals)
- Addition - mixed lengths
- Subtraction - mixed lengths
- Comparing - km and m
- Comparing - mixed units

### Imperial Measures

- Miles and km
- Inches and cm
- Kilograms and pounds
- Pints and gallons
- Mixed imperial measures

### Metric - Mass

- Comparing - mixed measures
- Addition - mixed measures
- Subtraction - mixed measures

### Metric - Capacity

- Equivalence ml and litres
- Addition- mixed measures
- Subtraction - mixed measures

### Metric - Area and volume

- Metric units of area -  $\text{mm}^2$  and  $\text{cm}^2$
- Metric units of area -  $\text{cm}^2$  and  $\text{m}^2$
- Metric units of area - mixture
- Metric units of volume -  $\text{mm}^3$  and  $\text{cm}^3$
- Metric units of volume -  $\text{cm}^3$  and  $\text{m}^3$
- Metric units of volume - mixture

### Imperial Measures

- Mixed Equivalence - kg and km
- Mixed Equivalence - ml and mm
- Equivalence - mixed measures
- Addition of mixed metric measures

### Mixed metric measures

- Mixed Equivalence - kg and km
- Mixed Equivalence - ml and mm
- Equivalence - mixed measures
- Addition of mixed metric measures

### Error intervals for rounded measures

- Error intervals for rounded measures

# Proportion.

## Percentages - calculator

### Percentages with a calculator

- Calculating a percentage of a quantity
- Identifying multipliers for % increases
- Identifying multipliers for % decreases
- Increasing by a given percentage
- Decreasing by a given percentage
- Calculate the percentage increase
- Calculate the percentage decrease
- Calculate the percentage change
- Expressing as a percentage
- Finding the original < 100%
- Finding the original > 100%

### Repeated percentage change

- Repeated percentage change
- Stating a formula for % increase
- Stating a formula for % decrease
- Identifying the interest rate
- Identifying the rate of depreciation
- Calculating compound interest
- Compound interest - years
- Compound interest - total
- Population decrease - total
- Population decrease - overall % decrease
- Population decrease - years
- Calculate depreciation - car

## Percentages non-calculator

### Percentage of a quantity

- Understanding percentages
- 50% of a quantity
- 25% and 50% of a quantity
- 10% of a quantity
- 10% and 20% of a quantity
- 20% of a quantity
- 10% and 5% of a quantity
- Percentage of a quantity
- 5% of a quantity
- 5% 10% and 15% of quantity
- 5% 10% and 20% of a quantity
- 15% of a quantity
- Multiples of 5%
- Percentages - missing values

### Increasing

- Increasing (1) 10%
- Increasing (2) 5%
- Increasing (3) 20%
- Increasing (4) multiples (5%)

### Decreasing

- Decreasing 10%
- Decreasing 5%
- Decreasing 20%
- Decreasing multiples (5%)

### Mixed Questions

- Mixed Questions
- Expressing as a percentage
- Calculate a percentage increase
- Calculate a percentage decrease
- Calculate a percentage change

## Ratio

### Simplifying and equivalence

- |                             |                              |                                |
|-----------------------------|------------------------------|--------------------------------|
| • Understanding percentages | • 20% of a quantity          | • 5% 10% and 20% of a quantity |
| • 50% of a quantity         | • 10% and 5% of a quantity   | • 15% of a quantity            |
| • 25% and 50% of a quantity | • Percentage of a quantity   | • Multiples of 5%              |
| • 10% of a quantity         | • 5% of a quantity           | • Percentages - missing values |
| • 10% and 20% of a quantity | • 5% 10% and 15% of quantity |                                |

# Proportion.

## Ratio

### Dividing in a ratio

- Dividing in a given ratio
- Dividing in a given ratio – difference known
- Dividing in a given ratio – one share known
- Find the larger share – smaller known
- Find the smaller share – larger known
- Find the larger share – difference known
- Find the smaller share – difference known
- Mixed questions

### Maps and scale

- Using scale drawings
- Interpret scale diagrams – model to real
- Interpret scale diagrams – real to model to real
- Interpret maps – map to real
- Interpret maps – real to map

## Combined ratios

- $a:b$  and  $b:c$  – find  $a:c$
- $a:b$  and  $b:c$  – express as a fraction
- $a:b$  and  $b:c$  – calculate a quantity
- $na = mb$  and  $b:c$  – find  $a:b:c$
- $na = mc$  and  $b:c$  – find  $a:c$

## Summary of Topics:

Proportion

- Compound Measures
- Proportion
- Ratio
- Percentages - calculator
- Percentages - non-calculator

# Geometry.

## Angles

### Classifying Angles and turns

- Classifying angles
- Angles (degrees) clocks hands 5 mins

### Angles and parallel lines

- Corresponding angles
- Allied/co-interior angles
- Alternate angles
- Mixture
- Parallel lines

### Angles in polygons

- Calculate angles in a quadrilateral
- Interior angles - polygons
- Exterior angles - polygons

### Basic Angles Facts

- Angles on a straight line
- Angles at a point
- Vertically Opposite Angles

### Angles in Triangles

- Angles in a triangle
- Angles in an isosceles triangle
- Angles in a right angled triangle
- Calculate missing angles triangles

## Area - Polygons

### Squares with diagrams

- Area of a square
- Calculate the side length
- Calculate the perimeter - area known
- Calculate the area - perimeter known

### Rectangles with diagrams

- Area of a rectangle - non calc
- Calculate the side length
- Calculate the area - perimeter known
- Calculate the perimeter - area known

### Triangles with diagrams

- Right angled triangle area
- Right angled triangle base
- Right angled triangle height
- Non right-angled triangle area
- Non right-angled triangle base
- Non right-angled triangle height
- Obtuse-angled triangle area
- Obtuse-angled triangle base
- Obtuse-angled triangle height

### Parallelograms with diagrams

- Parallelogram area
- Parallelogram base
- Parallelogram height

### Trapeziums with diagrams

- Trapezium area
- Trapezium base
- Trapezium height

### Squares With diagrams (calc)

- Area of a square
- Calculate the side length - area known
- Calculate the perimeter - area known
- Calculate the area - perimeter known

### Rectangles with diagrams (calc)

- Area of a rectangle
- Calculate the side length
- Calculate the area - perimeter known
- Calculate the perimeter - area known

# Geometry.

## Area - Polygons

### Triangles with diagrams - calc

- Right angled triangle area
- Right angled triangle base
- Right angled triangle height
- Non right-angled triangle area
- Non right-angled triangle base
- Non right-angled triangle height
- Obtuse-angled triangle area
- Obtuse-angled triangle base
- Obtuse-angled triangle height

### Area of polygons - no-diagrams

- Area of a rectangle
- Height of a rectangle
- Area of a rectangle – mixture
- Area of a triangle
- Area of a triangle – missing length
- Area of a triangle – mixture
- Area of a parallelogram
- Area of a parallelogram – missing length
- Area of a trapezium
- Area of a trapezium – missing lengths

## Area of circles and sectors - non calculator

### Area - with diagrams

- Area of a circle - radius known
- Area of a circle - diameter known
- Area of a circle - mixture
- Area of a semi-circle
- Area of a sector
- Area of a sector - angle
- Area of a sector - radius

### Parallelograms with diagrams - calc

- Parallelogram area
- Parallelogram base
- Parallelogram height

### Trapeziums with diagrams - calc

- Trapezium area
- Trapezium base
- Trapezium height

### Compound shapes - with diagrams

- Compound shapes - missing length
- Compound shapes - area

### Area of polygons - no-diagrams calc

- Area of a rectangle
- Height of a rectangle
- Area of a rectangle – mixture
- Area of a triangle
- Area of a triangle – missing length
- Area of a triangle – mixture

### Area - without diagrams

- Area of a circle - radius known
- Area of a circle - diameter known
- Area of a circle - mixture
- Area of a sector
- Area of a sector - radius
- Area of a sector - angle
- Area of a sector - mixture

## Area of circles and sectors - calculator

### Area - with diagrams (calc)

- Area of a circle - radius known
- Area of a circle - diameter known
- Area of a circle - mixture
- Area of a semi-circle
- Area of a sector
- Area of a sector - angle
- Area of a sector - radius

### Area - without diagrams (calc)

- Area of a circle - radius known
- Area of a circle - diameter known
- Area of a circle - mixture
- Area of a sector
- Area of a sector - radius
- Area of a sector - angle
- Area of a sector - mixture

# Geometry.

## Area of circles and sectors

### Shaded area problems

- Shaded Area 1
- Shaded Area 2
- Shaded Area 3
- Shaded Area 4
- Shaded Area 5
- Shaded Area 6

## Bearings

### Bearings and compass directions

- Compass directions and right angles
- Bearings - words

### Bearings - with diagrams

- Bearings - from A to B
- Bearings - from B to A
- Bearings - from A to B
- Bearings - from B to A

## Coordinates

### Coordinates

- 1st quadrant
- 2nd Quadrant
- 3rd Quadrant
- 4th Quadrant
- All 4 Quadrants

## Perimeter - non calculator

### Squares - with diagrams

- Perimeter of a square
- Area - perimeter known
- Perimeter - area known
- Side length - perimeter known

### Rectangles - with diagrams

- Perimeter of a rectangle
- Area - perimeter known
- Perimeter - area known
- Side length - perimeter known

### Rectangle - without diagrams

- Perimeter of a rectangle
- Side length - perimeter known

### Mixed polygons - without diagrams

- Square, rectangle and equilateral triangle
- Perimeter of regular polygons
- Side length - perimeter known

### Circumference and arcs - diagrams

- Circumference - radius known
- Circumference - diameter known
- Circumference - mixture
- Semi-circle - perimeter
- Arc length
- Arc length - radius
- Arc length - angle
- Arc length - mixture

### Circumference and arcs

- Circumference - radius known
- Circumference - diameter known
- Circumference - mixture
- Arc length

### Circumference and area

- Area and circumference of circles

## Perimeter of compound shapes

- Compound shapes - 1 length missing
- Compound shapes - 2 lengths missing
- Compound shapes - perimeter

# Geometry.

## Perimeter - calculator

### Squares - with diagrams

- Perimeter of a square
- Area - perimeter known
- Perimeter - area known
- Side length - perimeter known

### Rectangles - with diagrams

- Perimeter of a rectangle
- Area - perimeter known
- Perimeter - area known
- Side length - perimeter known

### Rectangle - without diagrams

- Perimeter of a rectangle
- Side length - perimeter known

### Mixed polygons - without diagrams

- Square, rectangle and equilateral triangle
- Perimeter of regular polygons
- Side length - perimeter known

### Circumference and arcs - diagrams

- Circumference - radius known
- Circumference - diameter known
- Circumference - mixture
- Semi-circle - perimeter
- Arc length
- Arc length - radius
- Arc length - angle
- Arc length - mixture

### Circumference and arcs

- Circumference - radius known
- Circumference - diameter known
- Circumference - mixture
- Arc length

### Circumference and area

- Area and circumference of circles

## Pythagoras' Theorem

### Question with diagrams

- Pythagoras – hypotenuse
- Pythagoras – shorter side
- Pythagoras – any side
- Height – equilateral triangle
- Slant height – isosceles triangle
- Height – isosceles triangle
- Perimeter – isosceles triangle
- Area – isosceles triangle
- Length of a diagonal
- Distance between two points

### Question without diagrams

- Calculating  $c$  in  $a^2 + b^2 = c^2$
- Calculating  $a$  in  $a^2 + b^2 = c^2$
- Calculating  $b$  in  $a^2 + b^2 = c^2$
- Calculating the distance between two points
- Compass directions and distance
- Pythagoras – mixture

### Non-calculator

- Calculating any side – exact

## Similarity

### Volume

- Enlargement - finding the new volume
- Enlargement - finding the original volume
- Enlargement - volume mixture

### Area

- Enlargement - area - mixture
- Enlargement - finding the new area
- Enlargement - finding the original area
- Enlargement - area mixture

# Geometry.

## Similarity

### Length

- Using scale factors - simple
- Missing lengths - similar rectangles
- Calculating missing sides in similar shapes
- Enlargement - lengths mixture
- Enlargement - finding the new length
- Enlargement - finding the original length
- Enlargement - mixture - length

### Area and volume

- Enlargement - area and volume mixture
- Enlargement - mixture

## Surface area

### Questions with diagrams

- Cuboid
- Triangular prism
- Curved surface area – radius
- Curved surface area – diameter
- Total surface area – radius
- Total surface area – diameter
- Cone – height known
- Cone – slant height known
- Sphere – radius known
- Sphere – diameter known
- Sphere – find radius
- Sphere – find diameter
- Hemisphere – radius known
- Hemisphere – diameter known
- Hemisphere – find radius
- Hemisphere – find diameter

### Questions without diagrams

- Cuboid
- Triangular prism
- Trapezoid prism
- Prisms mixture
- Cylinder – radius known
- Cylinder – diameter known
- Curved surface area – radius known
- Curved surface area – diameter known
- Sphere
- Find the radius of a sphere
- Sphere mixture

## Transformations

### Translation

- Translation - x direction
- Translation - y direction

### Enlargement

- Enlargement: scale factor 2
- Enlargement: scale factor 0.5
- Enlargement :scale factor -2
- Enlargement mixture

### Reflection

- Reflection:  $x = a$
- Reflectio :  $y = a$
- Reflection:  $y = x$
- Reflection:  $y = -x$
- Reflection mixture

### Rotation

- Rotation: 90 Clockwise
- Rotation: 90 Clockwise
- Rotation: 180 Anti-clockwise
- Rotation Mixture

# Geometry.

## Trigonometry

### Identifying the correct sides

- Identifying the sine ratio of an angle
- Identifying the cosine ratio of an angle
- Identifying the tangent ratio of an angle
- Identifying mixed ratios of angles

### Sine ratio

- Sine ratio - calculating the opposite
- Sine ratio - calculating the hypotenuse
- Sine ratio - calculating sides
- Sine ratio - calculating the angle
- Sine ratio - calculating angles/sides

### Tangent ratio

- Tangent ratio - calculating the opposite
- Tangent ratio - calculating the adjacent
- Tangent ratio - calculating sides
- Tangent ratio - calculating the angle
- Tangent ratio - calculating angles and sides

### Trigonometry - Sine Rule

- Sine rule - calculating an angle
- Sine rule - calculating sides
- Sine rule - calculating angles and sides

### Sine and area

- Calculating the area
- Calculating an angle
- Calculating a side
- Side and angle mixture

### Using a calculator - Trig

- Evaluating  $\sin(x)$ ,  $\cos(x)$  or  $\tan(x)$
- Evaluating  $a \times \sin(x)$ ,  $a \times \cos(x)$ ,  $a \times \tan(x)$
- Evaluating  $a \div \sin(x)$ ,  $a \div \cos(x)$ ,  $a \div \tan(x)$

### Cosine ratio

- Cosine ratio - calculating the adjacent
- Cosine ratio - calculating the hypotenuse
- Cosine ratio - calculating sides
- Cosine ratio - calculating the angle
- Cosine ratio - calculating angles/sides

### Mixed ratios

- Mixed ratios - calculating angles
- Mixed ratios - calculating sides
- Mixed ratios - calculating angles and sides
- Trigonometry in 3D - Cuboid Problems
- Trigonometry in 3D - Pyramid Problems
- Trigonometry in 3D - mixed Problems

### Trigonometry - Cosine Rule

- Cosine rule - calculating an angle
- Cosine rule - calculating sides
- Cosine rule - calculating angles and sides
- Sine and cosine rules calculating sides
- Sine and cosine rules calculating an angle
- Sine and cosine rules mixture

### Exact Values

- Using Exact Trig Values

## Vectors

### Column Vectors

- Column vectors - sum and difference
- Column vectors - missing values
- Column vectors mixture
- Writing as a column vector

### Vector geometry

- Vector geometry

# Geometry.

## Volume

### Volume - with diagrams

- Volume of a cuboid
- Volume of a cuboid – missing lengths
- Volume of a triangular prism
- Volume – missing lengths
- Volume – missing width
- Volume of a cylinder – radius known
- Volume of a cylinder – diameter known
- Volume – find the radius
- Volume – find the height
- Volume of a cone – height known
- Volume of a cone – slant height known
- Volume – find the radius
- Volume – find the height
- Volume of a square-based pyramid
- Volume – find the height
- Volume – find the base
- Volume of a sphere – radius known
- Volume of a sphere – diameter known
- Volume – find the radius
- Volume – find the diameter
- Volume of a hemisphere – radius known
- Volume of a hemisphere – diameter known
- Volume – find the radius
- Volume – find the diameter

### Volume - without diagrams

- Volume of a cuboid
- Volume of a cylinder – non calculator
- Volume of a cylinder – radius known – non calc
- Volume of a cylinder – diameter known – non calc
- Volume of a cone – radius and vertical height known
- Volume of a cone – radius and slant height known
- Volume of a cone – mixture
- Volume of a triangular prism
- Volume of a trapezoid prism
- Volume of prisms – mixture
- Volume of a sphere
- Calculate the radius of a sphere given the volume
- Volume of a sphere and radius – mixture
- Volume of a pyramid
- Volume of a frustum

## Summary of Topics:

Geometry

- |                   |                   |
|-------------------|-------------------|
| ▪ Angles          | ▪ Pythagoras      |
| ▪ Area (polygons) | ▪ Similarity      |
| ▪ Area (circles)  | ▪ Surface area    |
| ▪ Bearings        | ▪ Transformations |
| ▪ Coordinates     | ▪ Trigonometry    |
| ▪ Measures        | ▪ Vectors         |
| ▪ Perimeter       | ▪ Volume          |

# Statistics.

## Statistics

### Averages

- Calculate the range
- Calculate the mean - from a list
- Mean given - find a missing value
- Calculate the median
- Find the mode

### Collecting Data

- Capture-recapture - estimating the population
- Capture-recapture - calculating the sample size
- Capture-recapture - calc the number marked
- Capture - recapture - mixture

### Representing Data

- Pie Charts - calculating angles

### Probability

- Calculated expected outcome
- Calculating relative frequency

## Summary of Topics:

Statistics

- Averages
- Collecting Data
- Representing Data
- Probability