CORE KNOWLEDGE – Non-Calculator Arithmetic		
1	**What does BIDMAS stand for?**	Brackets, Indices, Divide, Multiply, Add and Subtract
2	**What does BIDMAS tell us?**	The order of operations we use to do calculation
3	**What order do we do division and multiplication, or addition and subtraction?**	If we have a string of multiplications and/or divisions, we work it out from left to right (and the same with addition and/or subtraction)
4	**What are synonyms for add?**	Total, sum, plus, more than
5	**What are synonyms for subtract?**	Difference, take away, minus, less than
6	**What are synonyms for multiply?**	Repeated addition, lots of, times, product
7	**What are synonyms for divide?**	Split into equal groups, share equally
8	**What are positive numbers?**	Numbers that are **greater than 0**. They have no sign or a + sign.
9	**What are negative numbers?**	Numbers that are **less than 0**. They have a – sign.
10	**What happens we add a negative number?**	It is the same as subtracting a positive number
11	**What happens when we subtract a negative number?**	It is the same as adding a positive number
12	**When we multiply or divide a positive and negative number, is the answer positive or negative?**	Negative
13	**When we multiply or divide two negative numbers, is the answer positive or negative?**	Positive

14	**How do we use column addition or subtraction?**	1. Line up the digits by their place value column. 2. Add/subtract from right to left.
15	**How do we use column multiplication to multiply by a 2 digit number?**	1. Line up the digits by their place value column 2. Multiply each digit in the top number by the right-hand number in the bottom number, from right to left. 3. On the next row, put a 0 in the right-hand column 4. Multiply each digit in the top number by the next number in the bottom number, from right to left. 5. Add the rows together to get your final answer
16	**Short division**	**'Bus stop'** method. Divide each number from left to right.
17	**What is an integer?**	A whole number that can be positive or negative
18	**What is a decimal?**	A number that contains a decimal point
19	**How do we multiply two decimals?**	1. Ignore the decimal points and multiply the integers 2. Count how many decimal places there are in the question and put that many into the answer
20	**How do we divide by a decimal?**	Multiply both numbers by a power of 10 to make the number you are dividing by into a decimal. Then divide the new sum.
21	**Multiplying by 0.1 is equivalent to …**	Dividing by 10
22	**Multiplying by 0.01 is equivalent to …**	Dividing by 100
23	**Multiplying by 0.5 is equivalent to …**	Dividing by 2
24	**Dividing by 0.1 is equivalent to …**	Multiplying by 10
25	**Dividing by 0.01 is equivalent to …**	Multiplying by 100

CORE KNOWLEDGE - Approximations		
1	**What does round mean?**	Make a number simpler but keep its value close to what it was.
2	**What is the rule for rounding?**	Identify the position of the last digit that you want to keep – the 'rounding digit' If the **digit to the right** of the rounding digit is: • **less than 5, round down: rounding digit stays the same** • **5 or more, round up: add 1 to the rounding digit**
3	**What are whole numbers?**	A number with no decimal places
4	**What are decimal places (dp)?**	Position of a number after the decimal point
5	**What are significant figures (sf)?**	The digits in a number except zeros at the start of the number
6	**What does estimate mean?**	Find an answer close to the true answer but easier to calculate
7	**How do we estimate a calculation?**	1. Round each number to 1 significant figure 2. Use your rounded figures to calculate the sum
8	**What does underestimate mean?**	The estimate is less than the actual answer
9	**What does overestimate mean?**	The estimate is more than the actual answer
10	**What symbol means 'approximately equal to'?**	≈
11	**What is the lower bound?**	The smallest value that would round up the estimate value
12	**How do we calculate the lower bound?**	Halve the degree of accuracy specified (e.g. nearest 10, then do 10÷2) and subtract it from the rounded value
13	**What is the upper bound?**	The smallest value that would round up the **next** estimated value
14	**How do we calculate the upper bound?**	Halve the degree of accuracy specified (e.g. nearest 10, then do 10÷2) and add it from the rounded value
15	**What is an error interval?**	The range of values that a number could have taken before being rounded
16	**How do we write error intervals?**	Lower bound ≤ n < Upper bound
17	**What does truncate mean?**	Miss off digits past a certain point in the number.

CORE KNOWLEDGE – Powers and Roots		
1	**What does square mean?**	Multiply by itself
2	**What are the first 15 square numbers?**	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225
3	**What does square root mean and what symbol do we use for it?**	The number you multiply by itself to get another number. The **inverse** (opposite) of squaring. The symbol is $\sqrt{\ }$
4	**What does cube mean?**	Multiply a number by itself **3 times**.
5	**What are the first 5 cube numbers?**	1, 8, 27, 64, 125
6	**What does cube root mean and what symbol do we use for it?**	The number you multiply by itself three times to get a value. The **inverse** of cubing a number. The symbol is $\sqrt[3]{\ }$
7	**What is an index (indices) or power?**	The **small number** on the top-right; the **number of times** a value is multiplied by itself.
8	**What is the base number?**	The **big number** on the left. The number that will be **multiplied** by itself.
9	**What is index notation?**	A number written with a base number and index
10	**To multiply two powers with the same base number, …**	Add the indices ($\boldsymbol{a^m \times a^n = a^{m+n}}$)
11	**To divide two powers with the same base number, ….**	Subtract the indices ($\boldsymbol{a^m \div a^n = a^{m-n}}$)
12	**To raise one power to another power (brackets), …**	Multiply the indices $\left((a^m)^n = a^{mn}\right)$
13	**Anything to the power of 1 is ...**	Itself ($p^1 = p$)
14	**Anything to the power of 0 is …**	1 ($p^0 = 1$)
15	**A negative power means we…**	Take the reciprocal i.e. we ‘flip’ the number
16	**What is the reciprocal?**	1/number i.e. we ‘flip’ the number
17	**What does simplify mean?**	Make simpler – with indices this means write it as one number where possible

18	**What is standard form?**	$A \times 10^b$ where $1 \leq A < 10, b$ is an integer
19	**How do we convert standard form and ordinary numbers?**	The **power** tells you how many places to move the decimal point. A **positive** power means the number is **large.** A **negative** power means the number is **small.**
20	**How do we add or subtract numbers in standard form?**	Convert each number to an ordinary number and add/subtract. Then change back to standard form
21	**How do we multiply or divide numbers in standard form?**	1. Multiply or divide the normal numbers 2. Use the laws of indices to multiply or divide the powers of 10 3. Make sure your answer is still in standard form

CORE KNOWLEDGE – Multiples and Factors		
1	**What is a multiple?**	The **times tables** of a number.
2	**What is a common multiple?**	A multiple of two or more numbers
3	**What is a factor?**	A number that **divides exactly** into another number without a remainder. Factors come in pairs.
4	**What is a common factor?**	A factor of two or more numbers
5	**What is a prime number?**	A number with **exactly two factors,** one and itself.
6	**What are the first 10 prime numbers?**	$2, 3, 5, 7, 11, 13, 17, 19, 23, 29$
7	**What is prime factor decomposition?**	**Product** means multiply so write your answer as a multiplication.
8	**How do we write numbers as a product of primes?**	1. Use a **prime factor tree** to find the prime factors 2. Write your answer as a multiplication, with repeated factors written in index notation
9	**What is the unique factorisation theorem?**	The prime factorisation of each number is unique – it has only one prime factorisation and no two numbers have the same one
10	**What is a lowest common multiple?**	The **smallest** number that is in the **times tables** of each of the numbers given.
11	**What is a highest common factor?**	The **biggest** number that **divides exactly** into two or more numbers.

CORE KNOWLEDGE - Fractions		
1	**What is a fraction?**	Tells us how many parts of a whole we have
2	**What does a fraction represent?**	Division: $\frac{a}{b} = a \div b$
3	**What is the numerator?**	The top number in a fraction : how many parts we have
4	**What is the denominator?**	The bottom number in a fraction: how many equal parts the whole is divided into
5	**What is a unit fraction?**	A fraction where the numerator is 1 e.g. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$
6	**What does equivalent mean?**	Two things are equal – they represent the same value
7	**How do we find equivalent fractions?**	Multiply or divide the numerator and denominator by the same number
8	**How do we simplify fractions?**	Divide the numerator and denominator by a common factor
9	**What does it mean if a fraction is in 'simplest form'?**	The fraction cannot be simplified any more – the numerator and denominator are co-prime so there are no common factors except 1
10	**How do we find a fraction of an amount?**	Divide by the denominator, multiply by the numerator.
11	**What is a mixed number?**	A number formed of both an integer part and a fraction part e.g. $3\frac{1}{2}$
12	**What is an improper fraction?**	A fraction greater than one where the numerator is larger than the denominator e.g. $\frac{7}{2}$
13	**What does convert mean?**	Change e.g. from a mixed number to an improper fraction
14	**How do we convert from a mixed number to an improper fraction?**	1. Multiply the whole number part by the fraction's denominator 2. Add that to the numerator 3. Write the result on top of the denominator

15	**How do we convert from an improper fraction to a mixed number?**	1. Divide the numerator by the denominator 2. Write down the whole number answer 3. Then write down any remainder above the denominator.
16	**How do we order fractions?**	1. Find equivalent fractions so they all have a common denominator. 2. Order the numerators
17	**What does ascending mean?**	Increasing in size (smallest to largest)
18	**What does descending mean?**	Decreasing in size (largest to smallest)
19	**How do we add or subtract fractions?**	1. Find equivalent fractions so there is a common denominator 2. Add / subtract the numerators and keep the denominator the same 3. Simplify if possible
20	**How do we multiply fractions?**	**Multiply** the **numerators** and **multiply** the **denominators**.
21	**How do we divide fractions?**	**KFC: Keep** the first fraction the same; **Flip** the second fraction upside down; **Change** the divide to a multiply. Then multiply the fractions.

CORE KNOWLEDGE – Equivalent fractions, decimals, percentages		
1	**What does convert mean?**	Change e.g. from a decimal to a percentage
2	**What is a fraction?**	Tells us how many parts of a whole we have
3	**What is a decimal?**	A number that contains a decimal point
4	**What is a percentage?**	Parts per 100
5	**What does equivalent mean?**	Equal, they have the same value
6	**How do we convert a fraction to a decimal?**	Numerator ÷ denominator
8	**How do we convert a decimal to a fraction?**	1. Find the place value column of the last digit 2. Write the decimals as a fraction over the place value 3. Simplify if possible
9	**How do we convert a decimal to a percentage?**	Multiply the decimal by 100
10	**How do we convert a percentage to a decimal?**	Divide the percentage by 100
11	**How do we convert a percentage to a fraction?**	1. Write as a fraction over 100 2. Simplify if possible
12	**How do we convert a fraction to a percentage with a calculator?**	Numerator ÷ denominator x 100%
13	**How do we convert a fraction to a percentage without a calculator?**	1. Write as an equivalent fraction with the denominator as 100 2. The numerator is the percentage with a % sign
14	**How do we order fractions, decimals and percentages?**	1. Convert all the numbers to percentages 2. Order the percentages

CORE KNOWLEDGE – Common Equivalences

	FRACTION	DECIMAL	PERCENT		FRACTION	DECIMAL	PERCENT		FRACTION	DECIMAL	PERCENT
1	1/2	0.5	50%	**6**	1/10	0.1	10%	**11**	6/10 = 3/5	0.6	60%
2	1/4	0.25	25%	**7**	2/10 = 1/5	0.2	20%	**12**	7/10	0.7	70%
3	2/4	0.5	50%	**8**	3/10	0.3	30%	**13**	8/10 = 4/5	0.8	80%
4	3/4	0.75	75%	**9**	4/10 = 2/5	0.4	40%	**14**	9/10	0.9	90%
5	4/4	1	100%	**10**	5/10	0.5	50%	**15**	10/10 = 5/5	1	100%

CORE KNOWLEDGE - Ratio		
1	**What is a ratio?**	**Relationship** between the number of parts. Has a colon (:).
2	**What does simplify mean?**	Make simpler. In this case, divide by a common factor
3	**What does it mean if a ratio is in simplest form?**	There are no common factors of the parts in the ratio except 1 – the numbers are co-prime. The parts must be integers
4	**What does equivalent mean?**	Equal, the same value. They have the same simplest form.
5	**How do we find equivalent ratios?**	Multiply or divide every part of the ratio by the same number
6	**How do we write the ratio a : b in the form 1 : n?**	Divide each part by the number a to get $1 : \frac{b}{a}$. We can have a decimal.
7	**How do we write a ratio as a fraction?**	Add together the total number of parts – this goes in the denominator The number of parts you want is the numerator
8	**What does share mean?**	Split into parts, but not necessarily equally, in a predefined ratio
9	**How do we share an amount in a ratio?**	1. Add together the total number of parts 2. Divide the amount by the total number of parts 3. Multiply by the number of parts you want

CORE KNOWLEDGE - Percentages		
1	**What is a percentage?**	Parts ‘per 100’. %
2	**How do we express a number as a percentage of another number?**	$\frac{\text{Number 1}}{\text{Number 2}} \times 100$
3	**How do we find 10% of a number?**	÷ 10
4	**How do we find 1% of a number?**	÷ 100
5	**NON-CALCULATOR: How do we increase by a percentage?**	Calculate the percentage and add it on to the original
6	**NON-CALCULATOR: How do we decrease by a percentage?**	Calculate the percentage and subtract it from the original
7	**What is the multiplier?**	A single number we can multiply the amount by that represents the percentage change. It is the decimal equivalent of the percentage
8	**How do we find a percentage of an amount using a calculator?**	Amount x percentage ÷ 100
9	**What is the multiplier for a percentage increase?**	$1 + \frac{\%\ \text{increase}}{100}$
10	**What is the multiplier for a percentage decrease?**	$1 - \frac{\%\ \text{increase}}{100}$
11	**How do we find the percentage change?**	$\frac{\text{New number} - \text{original number}}{\text{Original number}} \times 100$
12	**How do we find the original amount? (reverse percentages)**	1. Find what percentage of the original we have 2. Find 1% by dividing by percentage found in step 1 3. Find 100% (original amount) by multiplying your answer in step 2 by 100

13	**What is interest?**	Money that is paid regularly at a particular percentage when money has been lent or borrowed
14	**What is simple interest?**	Interest is calculated as a percentage of the original amount borrowed
15	**What is compound interest?**	Interest is calculated on both the amount borrowed and any previous interest
16	**What is the formula for compound interest?**	$\text{Amount} \times \text{multiplier}^{\text{time}}$
17	**What does appreciate mean?**	Increase in value or price
18	**What does depreciate mean?**	Decrease in value or price
19	**What does 'per annum' mean?**	Annually; per year

CORE KNOWLEDGE – Algebraic Expressions		
1	**What is a 'variable'?**	A **letter** that represents any number. It can take on any value.
2	**What is a 'coefficient'?**	The **number before** the variable (letter).
3	**What is a 'term'?**	The **variable**(s), **coefficient** and **symbol** (+/-) before it.
4	**What are 'like terms'?**	Terms with the **same variable**(s) (letters) with the same powers.
5	**What is an 'expression'?**	A collection of **terms** (variables, coefficients, operator symbols $(+, -, \times, \div)$, but **no equals** (=) sign.
6	**What does 'simplify' mean in algebra?**	Collect '**like terms**' by adding/subtracting the coefficients
7	**What is a 'power' or 'index'?**	The **small number** on the top-right; the **number of times** a value/term is multiplied by itself.
8	**What is the 'base number'?**	The big number on the left. The number/term that will be multiplied by itself.
9	**What is the law of indices for multiplying with the same base?**	$\boldsymbol{a^m \times a^n = a^{m+n}}$ (add the powers, base stays the same)
10	**What is the law of indices for dividing with the same base?**	$\boldsymbol{a^m \div a^n = a^{m-n}}$ (subtract the powers, base stays the same)
11	**What is the law of indices for brackets?**	$\boldsymbol{(a^m)^n = a^{mn}}$ (multiply the powers, base stays the same)
12	**What does 'expand' mean?**	**Multiply** each term in the bracket by what is outside the bracket.
13	**What does 'square' mean?**	Multiply by itself.
14	**What does 'factorise' mean?**	Put into brackets. Look for the **highest common factor (HCF)** of all the terms. It is the opposite of expanding brackets.

15	**What is the 'highest common factor' (HCF)?**	The biggest number/term that divides exactly into two or more numbers/terms
16	**What is a 'quadratic expression'?**	An expression where the highest power of the variable (e.g. x) is 2.
17	**What is the general form of a quadratic expression?**	$x^2 + bx + c$ where b and c are numbers
18	**How do we factorise a quadratic into two brackets?**	1) Write the brackets (x)(x) 2) Find two numbers that multiply to give c and add to give b 3) Write one number inside each bracket
19	**What is the rule for the difference of two squares?**	$a^2 - b^2 = (a + b)(a – b)$

CORE KNOWLEDGE – Equations and identities		
1	**What is an 'expression'?**	A collection of **terms** (variables, coefficients, operator symbols (+, −,×,÷) but **no equals** (=) sign.
2	**What is a 'coefficient'?**	The **number before** the variable (letter).
3	**What is a 'variable'?**	A **letter** that represents any number. It can take on any value.
4	**What is a 'term'?**	The **variable**(s), **coefficient** and **symbol** (+/-) before it.
5	**What is an 'equation'?**	One or more terms with an equals (=) sign. Can be **solved.**
6	**What is a 'linear equation'?**	The **highest power of the variable is 1**.
7	**What does 'solve' mean?**	Find the answer/value of an **unknown** letter.
8	**What is the 'solution?**	The **value** of the **unknown** in an equation.
9	**What does 'inverse' mean?**	**Opposite**
10	**How do you solve a linear equation?**	Use **BIDMAS** backwards and **inverse** operations on both sides of the equation (balancing method) to **undo** each step.
11	**How do you solve a linear equation where the variable appears twice?**	Rearrange to get all the x-terms on one side and all the numbers on the other. Get the x's on the side with the most to start with.
12	**How can you check your solution is correct?**	Substitute your solution into the equation and see if it works, i.e. is the answer correct.
13	**What is an 'identity'?**	An equation that is **true for all values** of the variables
14	**What symbol do we use for an identity and what does it mean?**	An identity uses the symbol: ≡ which means 'always equal to'
15	**What does 'prove' mean?**	Demonstrate that something is true or false
16	**What is a 'counterexample'?**	An example where the statement doesn't work so we can show it is false

CORE KNOWLEDGE - Inequalities		
1	**What is an 'inequality'?**	It compares two values, showing if one is less than, greater than or not equal to another value
2	**What does this symbol mean <?**	Less than
3	**What does this symbol mean >?**	Greater than
4	**What does this symbol mean ≤?**	Less than or equal to
5	**What does this symbol mean ≥?**	Greater than or equal to
6	**What are strict inequalities?**	Greater than > or less than <
7	**How are strict inequalities(< >) represented on a number line?**	An empty circle
8	**How are not strict inequalities (≤ ≥) represented on a number line?**	A solid circle
9	**What does 'solve' mean?**	Find the answer/value of an **unknown** letter.
10	**What is the 'solution?**	The **value(s)** of the **unknown** in an equation or inequality.
11	**How do we solve an inequality?**	Exactly like an equation by using **BIDMAS** backwards and **inverse** operations on both sides of the equation (balancing method) to **undo** each step. The answer has the same inequality symbol as the question.
12	**What happens when we multiply or divide an inequality by a negative number?**	The inequality sign 'flips over'. E.g. < changes to >
13	**What is a compound inequality?**	Multiply inequalities combined in one e.g. $3 < x < 9$
14	**How can you check your solution is correct?**	By substituting your solution into the equation and checking that it is satisfied.
15	**What is an integer?**	A whole number (no decimal places)

CORE KNOWLEDGE		
1	**What does ‘simultaneous’ mean?**	At the same time
2	**What are ‘simultaneous equations’?**	Two equations which contain two variables. The solution is a pair of values that make both equations true.
3	**What does ‘solve’ mean?**	Find the answer/value of **unknown** letters.
4	**What is a ‘solution’?**	The **value(s)** of the **unknown(s)** in an equation.
5	**What is a ‘coefficient’?**	The **number before** the variable (letter).
6	**What is a ‘variable’?**	A **letter** that represents any number. It can take on any value.
7	**What does ‘eliminate’ mean?**	Remove or get rid off
8	**What do we need to have to eliminate a variable?**	A common coefficient in both equations on one of the variables
9	**If we don’t have a common coefficient, what do we do?**	Find the Lowest Common Multiple of one set of coefficients and multiply one or both equations to make one set of coefficients match
10	**When do we add or subtract to eliminate a variable?**	Same signs = Subtract; Different signs = aDD
11	**What does ‘substitute’ mean?**	Replace a variable (letter) with a specific number
12	**How can we check our solution is correct?**	Substitute your solution into the equation and see if it works, i.e. is the answer correct.

CORE KNOWLEDGE – Quadratic equations		
1	**What is a 'quadratic expression'?**	An expression where the highest power of the variable (e.g. x) is 2.
2	**What is the general form of a quadratic equation?**	$x^2 + bx + c = 0$ where b and c are numbers
3	**How do we decide how to solve a quadratic equation?**	1) Is there a common factor? If yes, factorise it into one bracket 2) If no, factorise it into two brackets
4	**How do we factorise a quadratic into two brackets?**	1) Write the brackets (x)(x) 2) Find two numbers that multiply to give c and add to give b 3) Write one number inside each bracket
5	**How do we solve a quadratic equation in the form (x + a)(x + b) = 0**	Set each bracket to zero (either x + a = 0 or x + b = 0) then solve
6	**What does 'solve' mean?**	Find the answer/value of an **unknown** letter.
7	**What is the 'solution' to a quadratic equation?**	The 0, 1 or 2 **values** of the **unknown** in the equation. Always look for 2 solutions.

CORE KNOWLEDGE - Formulas		
1	**What is a 'formula'?**	A rule or relationship between two or more variables
2	**What is an 'expression'?**	A collection of **terms** (variables, coefficients, operator symbols (+, −,× ,÷) but **no equals** (=) sign.
3	**What does 'evaluate' mean?**	Work out the value of. The answer is a number.
4	**What does 'substitute' mean?**	Replace a variable (letter) with a number and use BIDMAS to evaluate.
5	**What is a 'variable'?**	A **letter** that represents any number. It can take on any value.
6	**What do we use BIDMAS for?**	Knowing the order of operations
7	**What do the letters in BIDMAS stand for?**	Brackets, Indices, Division, Multiplication, Addition, Subtraction
8	**What are 'units'?**	It tells us what the number means e.g. is it a length, weight. It could be cm, kg, m^2
9	**What does 'rearrange' mean?**	Change the position of (in this case, the subject)
10	**What is the 'subject of the formula'?**	The letter on its own on one side of the equals sign.
11	**How do we change the subject of the formula?**	1. Circle the letter that needs to be the subject 2. Use inverse operations to 'undo' each step in the order of BIDMAS backwards 3. Write your final answer with the new subject on the left-hand side
12	**What is the inverse of each operation (+, -, x, ÷, ², √)?**	$+ \Leftrightarrow -$; $\times \Leftrightarrow \div$; $^2 \Leftrightarrow \sqrt{\ }$

CORE KNOWLEDGE - Sequences		
1	**What is a sequence?**	A list of numbers or shapes that follows a particular rule
2	**What is a term in a sequence?**	Each number or shape in the sequence is called a term
3	**What is the term-to-term rule?**	The rule that tells us how to go from one term to the next
4	**What is an arithmetic sequence?**	The term-to-term rule is add or subtract the same number. E.g. add 3 or subtract 6.
5	**What is the common difference?**	The number you add in the term-to-term rule in an arithmetic sequence
6	**What is a geometric sequence?**	The term-to-term rule is multiply or divide by the same number each time.
7	**What is the common ratio?**	The number you multiply by in the term-to-term rule for a geometric sequence
8	**What is a quadratic sequence?**	There is a common second difference so the difference between terms changes by the same amount each time.
9	**What is a Fibonacci-type sequence?**	The term-to-term rule is 'add together the previous two terms'.
10	**What are the first 10 square numbers?**	1, 4, 9, 16, 25, 36, 49, 64, 81, 100
11	**What are the first 5 cube numbers?**	1, 8, 27, 64, 125
12	**What are triangular numbers?**	Start at 1, then add 2, then 3, then 4, then 5 etc. to each new term so the sequence is 1, 3, 6, 10, 15, ….
13	**What is the 'nth term'?**	n is the position in the sequence so it is a rule that tells us how to find the term that is in position *n.* It is a 'position-to-term' rule.
14	**What does substitute mean?**	Replace a variable (letter) by a number
15	**How do we find the nth term of a sequence?**	1. Find the coefficient of *n* by finding the common difference (__n) 2. Find the 0^{th} term by doing the inverse of the common difference. This number is the constant that goes on its own at the end

CORE KNOWLEDGE – Straight line graphs		
1	**What are axes (axis, singular)?**	Two perpendicular, labelled lines on a graph.
2	**Is the x-axis horizontal or vertical?**	Horizontal (across)
3	**Is the y-axis horizontal or vertical?**	Vertical (up/down)
4	**What is a quadrant?**	The x- and y-axis divide a coordinate grid into four quarters called quadrants
5	**What is a coordinate?**	A pair of numbers **(x, y)**. Along the corridor and up the stairs.
6	**What does plot mean?**	Draw. Put an X on each co-ordinate then join together.
7	**What is the origin?**	(0,0) on the graph
8	**What is a line segment?**	A part of a line between two points
9	**How do you calculate the midpoint of a line segment?**	**Add the x coordinates and divide by 2** **Add the y coordinates and divide by 2**
10	**What does the line x = a look like?**	A **vertical** line through the **x-axis at a**
11	**What does the line y = b look like?**	A **horizontal** line through the **y-axis at b**
12	**What is a table of values?**	A table we use to **plot** a graph. It contains values of x to **substitute** into the equation to work out the value of y.
13	**What is the gradient?**	How steep a line is. The gradient can be positive (sloping upwards) or negative (sloping downwards).
14	**How do you calculate the gradient?**	$\frac{\boldsymbol{Change\ in\ y}}{\boldsymbol{Change\ in\ x}} = \frac{\boldsymbol{Rise}}{\boldsymbol{Run}}$
15	**What is the y-intercept?**	Where the graph crosses the y-axis. The x-value if 0.
16	**What is the general equation of a straight line?**	$\boldsymbol{y = mx + c}$ where $\boldsymbol{m}$ **is the gradient** and c **is the y-intercept**.

CORE KNOWLEDGE		
17	**What does it mean if two lines are parallel?**	The lines never meet and they have the **same gradient**.
18	**How do we find the equation of a line given a point and a gradient?**	1. Substitute in the gradient (m) and point (x,y) in to the equation $y = mx + c$. 2. Solve for c.
19	**How do we find the equation of a line given two points?**	1. Find the gradient using the two points 2. Substitute in the gradient (m) and point (x,y) in to the equation $y = mx + c$. 3. Solve for c.
20	**What is an equation?**	One or more terms with an equals (=) sign. Can be **solved.**
21	**What does solve mean?**	Find the value(s) of an **unknown** variable(s) (letter)
22	**What does intersect mean?**	Where two lines meet or cross one another
23	**How can we solve a linear equation, in the form mx + c = 0, graphically?**	1. Find where the graph crosses the x-axis (i.e. where y = 0) 2. Read off the x-coordinate – this is the solution
24	**How can we solve a linear equation, in the form mx + c = a, graphically?**	1. Draw the line y = a 2. Find the point where the two lines intersect 3. Read off the x-coordinate – this is the solution
25	**What are simultaneous equations?**	Two equations which contain two variables. The solution is a pair of values that make both equations true.
26	**How can we solve simultaneous equations graphically?**	1. Draw the graphs of both equations 2. Find the point where they intersect and write down the x- and y-values of this point. Your solution should be x = __, y = ___

CORE KNOWLEDGE – Other graphs		
1	**What is a 'quadratic expression'?**	An expression where the highest power of the variable (e.g. x) is 2.
2	**What does a quadratic graph look like?**	It is a curve called a parabola. It is either u-shaped if the coefficient of x^2 is positive, or n-shaped if the coefficient of x^2 is negative.
3	**What is a parabola?**	A smooth u-shaped curve (or upside down u)
4	**What is a table of values?**	A table we use to **plot** a graph. It contains values of x to **substitute** into the equation to work out the value of y.
5	**What does plot mean?**	Draw. Put an X on each co-ordinate then join together with a ruler if it is a straight line graph, or with a smooth curve otherwise.
6	**What does estimate mean?**	Find an answer close to the actual answer, a best guess.
7	**What are the roots of a quadratic equation?**	The solutions to the equation. Where y = 0 so where the graph intersects the x-axis. There can be 0, 1 or 2 roots
8	**How can we solve a quadratic equation graphically?**	Find where the graph crosses the x-axis (where y = 0). Read off the 0, 1 or 2 x-values
9	**What is the turning point?**	The minimum point of a u-shaped curve or maximum point of a y-shaped curve
10	**What is a cubic expression?**	An expression where the highest power of the variable is 3.
11	**What does a cubic graph look like?**	A curve with a 'wiggle' in the middle
12	**What is the general equation of a reciprocal graph?**	$y = \frac{A}{x}$
13	**What do reciprocal graphs look like?**	Two curves that are symmetrical about the lines y = x and y = -x and don't touch either the x- or y-axis.

CORE KNOWLEDGE – Real life graphs		
1	**What do real life straight line graphs show?**	How one thing changes in relation to another when the rate of change is fixed
2	**What is the rate of change?**	Shows how a variable changes over time
3	**What does convert mean?**	Change
4	**What might we discuss when describing straight line graphs?**	The **direction** of the graph (increasing or decreasing) The **gradient** (steepness)
5	**What does the gradient represent?**	The rate of change
6	**How do we draw a graph?**	1. Complete a table of values 2. Draw and label the axes 3. Plot the points from the table of values as coordinates 4. Join the points together with: • A ruler if it is a straight line • A smooth curve if it is not a straight line
7	**What is a fixed cost?**	A cost that is not related to how much of something is sold or produced
8	**How can we see a fixed cost on a straight line graph?**	The y-intercept – the value when x = 0

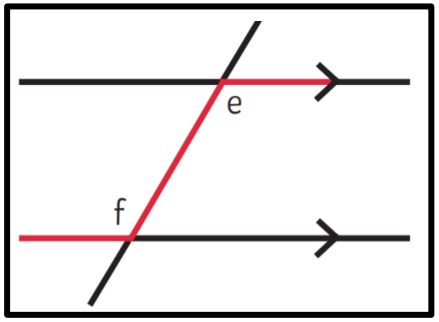
CORE KNOWLEDGE - Proportion		
1	**What does it mean if two variables are proportional?**	A change in one variable is always accompanied by a change in the other
2	**What does it mean if two variables are in 'direct proportion'?**	As one variable increases, the other increases at the same rate
3	**What is the unitary method?**	Find the value of **one item** and then scale up
4	**How do we solve direct proportion problems using the unitary method?**	**Divide** to find the value of one item, then **multiply** to find the value for more
5	**How do we work out best value for money?**	Use the unitary method to work out the cost per item/100g etc. (or the amount you get per penny)
6	**What does a graph showing direct proportion look like?**	A straight line through the origin with positive gradient
7	**What is the general equation of two quantities in direct proportion?**	$y = Ax$
8	**What does it mean if two variables are in 'inverse proportion'?**	As one variable increases, the other **decreases** at the same rate
9	**How do we solve inverse proportion problems using the unitary method?**	**Multiply** to find the value of one item, then **divide** to find the value for more
10	**What does a graph showing inverse proportion look like?**	A reciprocal graph – a curved downward sloping graph that never touches the x- or y-axis
11	**What is the general equation of two quantities in inverse proportion?**	$y = \frac{A}{x}$

CORE KNOWLEDGE – Angles in parallel lines

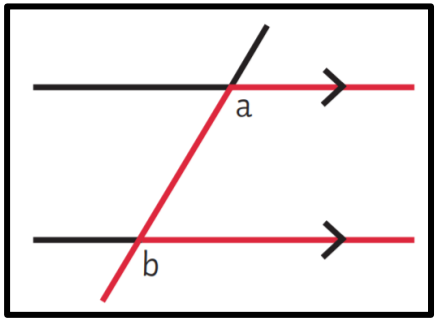
1	**What is an 'angle'?**	The amount of turn from one straight line to another straight line connected at a point
2	**What are the three ways of describing an angle?**	Angle ABC, <ABC, $A\widehat{B}C$
3	**What UNITS are used for measuring an angle?**	Degrees °
4	**What is a right angle?**	A 90° angle
5	**Angles around a point sum to ___**	360°
6	**Angles on a straight line at a point sum to ___**	180°
7	**What does 'sum' mean?**	Add
8	**What are 'parallel lines'?**	Straight lines that will never meet, no matter how far they are extended
9	**Alternate angles are _____**	Equal
10	**Corresponding angles are _____**	Equal
11	**Co-interior (or allied angles) _____**	Sum to 180°

12

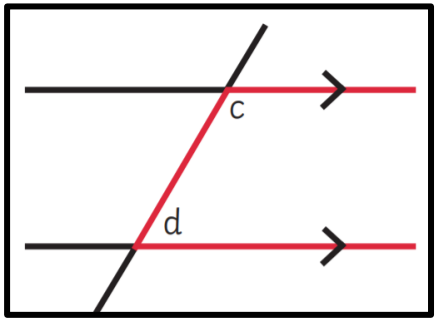
Alternate angles are equal



Corresponding angles are equal

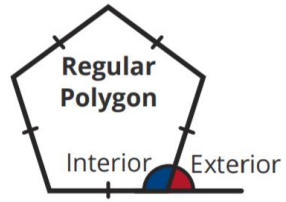


Co-interior angles sum to 180°



CORE KNOWLEDGE – 2D shapes and angles		
1	**What is a triangle?**	A polygon with 3 straight sides and 3 angles
2	**Angles in a triangle sum to ____**	180°
3	**What is an EQUILATERAL triangle?**	A triangle with 3 equal sides and 3 equal 60° angles
4	**What is an ISOSCELES triangle?**	A triangle with 2 equal sides and 2 equal base angles
5	**What is a SCALENE triangle?**	A triangle with all different side lengths and angles
6	**What is a 'quadrilateral'?**	A polygon with 4 straight sides and 4 angles
7	**What is a 'square'?**	A quadrilateral with 4 equal sides and 4 equal 90° angles
8	**What is a 'rectangle'?**	A quadrilateral with 2 pairs of equal (opposite) sides and 4 equals 90° angles
9	**What is a 'parallelogram'?**	A quadrilateral with 2 pairs of equal, parallel sides
10	**What is a 'rhombus'?**	A quadrilateral with 4 equal sides and diagonals that bisect and cross at a right angle
11	**Opposite angles in parallelograms and rhombuses are ____**	Equal
12	**What is a 'kite'?**	A quadrilateral with 2 pairs of equal sides and 1 pair of equal angles in opposite corners
13	**What is a 'trapezium'?**	A quadrilateral with 1 pair of parallel sides
14	**What does 'bisect' mean?**	Cut in two exactly equal halves

15	**What is a 'polygon'?**	A 2D shape with 3 or more straight sides
16	**What is a 'regular polygon'?**	A 2D shape with 3 or more equal straight sides and equal angles
17	**What is a polygon with 5 sides called?**	Pentagon
18	**What is a polygon with 6 sides called?**	Hexagon
19	**What is a polygon with 7 sides called?**	Heptagon
20	**What is a polygon with 8 sides called?**	Octagon
21	**What is a polygon with 9 sides called?**	Nonagon
22	**What is a polygon with 10 sides called?**	Decagon
23	**What are 'interior angles'?**	The angles inside each vertex (corner)
24	**What are 'exterior angles'?**	The angle between the side of the shape and a line extended from the next side
25	**What is the formula to calculate the sum of interior angles in a polygon?**	(n – 2) x 180° where n = number of sides
26	**Exterior angles sum to ____**	360°
27	**The exterior angle and neighbouring interior angle sum to _____**	180° (they make a straight line)
28	**What is a 'line of symmetry'?**	A mirror line where you can fold the shape so that both halves match up exactly
29	**What is 'the order of rotational symmetry'?**	The number of positions you can rotate (turn) the shape into so that it looks exactly the same



CORE KNOWLEDGE – Units and measuring

1	**How do we find an unlabelled value of small interval (gap) on a scale?**	Value of big gap ÷ Number of small gaps
2	**What is accuracy?**	How close a measured value is to the actual (true) value
3	**What is precision?**	How close the measured values are to each other e.g. using mm or cm
4	**What are metric units?**	A system of units based on powers of 10 e.g. centimetre, millimetre
5	**How do we convert metric units?**	From small to big units, divide by the conversion factor From big to small units, multiply by the conversion factor
6	**What are imperial units?**	Old units of measurement such as miles, feet
7	**How can you estimate the size of a real life object?**	Compare it to something you already know the size of. E.g. an average-height man is 1.8m, so think roughly how many men it would be the same as

What is the conversion factor for:

8	**1 cm = ___ mm**	10	**16**	**1 cm^2 = ___ mm^2**	$10^2 = 100$
9	**1 m = ___ cm**	100	**17**	**1 m^2 = ___ cm^2**	$100^2 = 10{,}000$
10	**1 km = ___ m**	1,000	**18**	**1 km^2 = ___ m^2**	$1{,}000^2 = 1{,}000{,}000$
11	**1 g = ___ mg**	1,000	**19**	**1 cm^3 = ___ mm^3**	$10^3 = 1{,}000$
12	**1 kg = ___ g**	1,000	**20**	**1 m^3 = ___ cm^3**	$100^3 = 1{,}000{,}000$
13	**1 tonne = ___kg**	1,000	**21**	**1 km^3 = ___ m^3**	$1{,}000^3 = 1{,}000{,}000{,}000$
14	**1 litre = ___ ml**	1,000			
15	**1 ml = ___ cm^3**	1			

CORE KNOWLEDGE – Compound Measures		
1	**What is a compound measure?**	Combine measures of two different quantities
2	**What is a formula?**	A relationship or rule linking different variables
3	**What is speed?**	The distance travelled in an amount of time
4	**What is the formula for speed?**	$\text{Speed} = \frac{\text{distance}}{\text{time}}$ 
5	**What units is speed usually measured in?**	m/s, km/h, mph
6	**What is density?**	The mass of substance contained in a certain volume
7	**What is the formula for density?**	$\text{Density} = \frac{\text{mass}}{\text{volume}}$ 
8	**What units is density usually measured in?**	g/cm³ or kg/m³
9	**What is pressure?**	The force applied over an area
10	**What is the formula for pressure?**	$\text{Pressure} = \frac{\text{force}}{\text{area}}$ 
11	**What units is pressure usually measured in?**	N/m² (also known as pascals, Pa) or N/cm²

CORE KNOWLEDGE – Distance-Time Graphs		
12	**What do distance-time graphs show?**	How far an object has travelled in a period of time, from a starting point
13	**What does it show if a distance-time graph is going up (positive gradient)?**	The object is moving away from the starting point
14	**What does it show if a distance-time graph is going down (negative gradient)?**	The object is coming back towards the starting point
15	**What does a straight line mean on a distance-time graph?**	The object is moving at a constant speed
16	**What does a horizontal line mean on a distance-time graph?**	The object is stationery (it is not moving)
17	**What does the gradient represent on a distance-time graph?**	The speed
18	**How can we calculate average speed from a distance-time graph?**	$\frac{\text{Total distance}}{\text{Total time}}$

CORE KNOWLEDGE – Scale Drawings and Bearings		
1	**What is a scale drawing?**	A drawing that shows a real object with accurate sizes reduced or enlarged by a certain amount
2	**What is a scale?**	A ratio that shows the relationship between a length on a drawing or map and the actual length in real life
3	**What does convert mean?**	Change
4	**How can we use a scale to convert map distances to real life distances?**	Multiply the map distance by the scale
5	**How can we use a scale to convert real life distances to map distances?**	Divide the real life distance by the scale
6	**What does construct mean?**	Draw accurately using a ruler
7	**What does it mean if a scale drawing is accurate?**	The proportions are the same as in real life. So if we enlarged it, we would get the real life version
8	**What is a bearing?**	The direction of a line in relation to the North line
9	**Which direction do we measure a bearing in and from where?**	Clockwise from North
10	**How many digits do we write for a bearing?**	3 digits e.g. 63° becomes 063°
11	**Where do we draw our North line for a bearing 'of B, from A' from?**	The North line goes at A
12	**Angles around a point sum to ___**	360°
13	**Angles on a straight line at a point sum to ___**	180°
14	**What are 'parallel lines'?**	Straight lines that will never meet, no matter how far they are extended
15	**Alternate angles are _____**	Equal
16	**Corresponding angles are _____**	Equal
17	**Co-interior (or allied angles)**	Sum to 180°

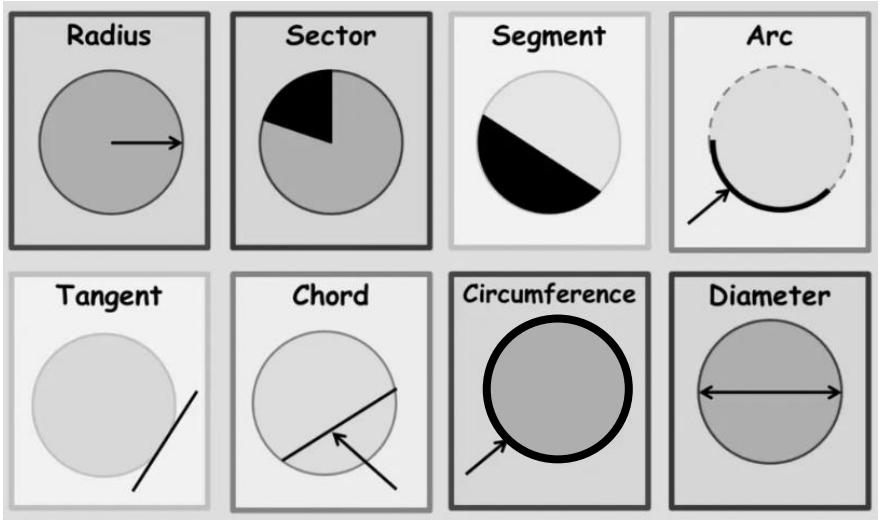
CORE KNOWLEDGE - Pythagoras		
1	**What is a right-angle?**	A **90° angle.**
2	**What is a triangle?**	A polygon (shape) with 3 straight sides and **3 angles**.
3	**What is the hypotenuse?**	The **longest side** of a **right-angled triangle**. It is opposite the right-angle.
4	**What does it mean to 'square' a number?**	**Multiply by itself.**
5	**What does it mean to 'square root' a number?**	Find the number you multiply by itself to get the original number.
6	**What does 'calculate' mean?**	Work out.
7	**What is a surd?**	An **irrational** number that can't be simplified to remove a square root.
8	**What is the perimeter of a shape?**	The distance around the **outside** of a shape.
9	**What does it mean to 'round' a number?**	Make a number simpler but keep its value close to what it was.
10	**What is the rule we use to round?**	If the **digit to the right** of the rounding digit is: • **less than 5, round down: rounding digit stays the same** • **5 or more, round up: add 1 to the rounding digit**
11	**What is a theorem?**	A statement that has been proven to be true.
12	**What is Pythagoras' theorem?**	$\mathbf{a^2 + b^2 = c^2}$ where c is the hypotenuse.
13	**How do we use Pythagoras' theorem to find the hypotenuse?**	**1) Add** the squares of the two short sides together **2) Square root** the answer
14	**How do we use Pythagoras' theorem to find the shorter side?**	**1) Subtract** the square of the short side from the square of the hypotenuse **2) Square root** the answer
15	**How can we tell if a triangle is right-angled?**	If the sides satisfy Pythagoras' theorem, then it is right-angled.
16	**What are Pythagorean triples?**	3 integers that satisfy Pythagoras' theorem. E.g. 3, 4, 5 and 5, 12, 13.

CORE KNOWLEDGE - Trigonometry		
1	**What is trigonometry?**	The study of triangles.
2	**What do we use trigonometry for?**	We use it to find missing side lengths or angles in right-angled triangles.
3	**When do we use trigonometry?**	When we have a right-angled triangle with either: A. 2 known side lengths and an unknown angle; or B. 1 known side length, 1 known angle and an unknown side length
4	**What letter do we give to the angle?**	Theta θ
5	**What is the hypotenuse?**	The **longest side** of a **right-angled triangle**. It is opposite the right-angle.
6	**What is the adjacent side?**	The side **next to** the angle θ marked.
7	**What is the opposite side?**	The side **opposite** the angle θ marked.
8	**How do we use find a missing side?**	1) Label the sides H, O, A and cross off the one we don't need 2) Find the ratio we need that contains the 2 sides we have 3) Substitute the values into that ratio and work out
9	**To find an angle, what button do we use?**	'Shift' button, which means the 'inverse' function e.g. $\sin^{-1}$
10	**What is the angle of elevation?**	The angle between the horizontal line and the line of sight looking up
11	**What is the angle of depression?**	The angle between the horizontal line and the line of sight looking down
12	**What mnemonic do we use for trigonometry?**	SOH CAH TOA
13	**What is the sine ratio?**	$\sin\theta = \frac{O}{H}$
14	**What is the cosine ratio?**	$\cos\theta = \frac{A}{H}$
15	**What is the tan ratio?**	$\tan\theta = \frac{O}{A}$

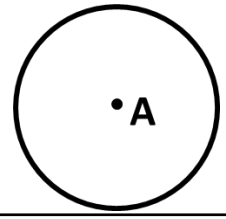
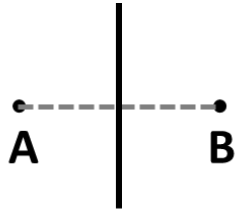
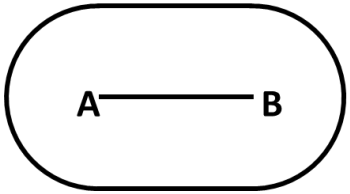
What are the common exact trigonometric values?								
16	**sin0°**	0	**21**	**cos0°**	1	**26**	**tan0°**	0
17	**sin30°**	$1/2$	**22**	**cos30°**	$\sqrt{3}/2$	**27**	**tan30°**	$\sqrt{3}/3$
18	**sin45°**	$\sqrt{2}/2$	**23**	**cos45°**	$\sqrt{2}/2$	**28**	**tan45°**	1
19	**sin60°**	$\sqrt{3}/2$	**24**	**cos60°**	$1/2$	**29**	**tan60°**	$\sqrt{3}$
20	**sin90°**	1	**25**	**cos90°**	0			

CORE KNOWLEDGE		
1	**What is a 'vector'?**	A vector has magnitude and direction.
2	**What is a 'column vector'?**	x-component = horizontal direction y-component = vertical direction $\begin{pmatrix} x \\ y \end{pmatrix}$
3	**What is 'magnitude'?**	Magnitude is the size or length of the vector
4	**What are the four ways vectors can be written?**	(1) As an arrow on a diagram; (2) using their end points with an arrow over the top ($\overrightarrow{AB}$); (3) a bold letter (**a)**; (4) an underlined letter (a)
5	**When are two vectors equal?**	When they have the same magnitude and direction. They can be in different positions.
6	**What is a scalar?**	A normal number. Has magnitude but non direction.
7	**How do you multiply a vector by a scalar?**	Multiply each of the vector's components by the scalar
8	**When are vectors parallel?**	If a vector is multiplied by a scalar
9	**What happens if we multiply a vector by a negative scalar?**	The direction of the vector is reversed
10	**How do we add or subtract vectors?**	Add or subtract the x-components and y-components separately
11	**What is the 'resultant vector'?**	The sum of two or more vectors

CORE KNOWLEDGE - Circles		
1	**What is the 'diameter'?**	A chord that passes through the centre of the circle
2	**What is the 'radius?**	The distance from the centre to the edge of the circle
3	**What does 'radii' mean?**	The plural of radius
4	**What formula links radius and diameter?**	Diameter = 2 x radius
5	**What is 'circumference'?**	The distance around the outside of a circle
6	**What is an arc?**	Part of the circumference
7	**What is a chord?**	A line between two points on the edge of the circle (doesn't need to go through the centre)
8	**What is a tangent?**	A straight line outside the circle that just touches the circle once
9	**What is a sector?**	A 'slice' of a circle – the area between two radii and the connecting arc
10	**What is a segment?**	An area of a circle between an arc and a chord



CORE KNOWLEDGE - Constructions		
1	**What is a ruler used for?**	Measuring lengths
2	**What is a protractor used for?**	Measuring angles
3	**What is a pair of compasses used for?**	Drawing circles or arcs
4	**What are the three ways of describing an angle?**	Angle ABC, <ABC, $A\widehat{B}C$
5	**What does construct mean?**	Draw accurately, using a ruler and a pair of compasses
6	**What are construction lines?**	Working out lines drawn with the compass. They must not be rubbed out.
7	**How do we construct a triangle ASA?**	Given angle, side, angle you can construct with a ruler and protractor
8	**How do we construct a triangle SAS?**	We need two sides and the angle in between to construct with a ruler and protractor
9	**How do we construct a triangle SSS?**	We need three sides to construct with a ruler and compass
10	**What does bisect mean?**	Cut in half exactly
11	**What does perpendicular mean?**	At right angles (90°)
12	**What is a perpendicular bisector?**	The lines that cuts another exactly in half at right angles
13	**What is an angle bisector?**	The line that cuts an angle exactly in half
14	**What is a locus?**	The set of all points that satisfy a certain condition
15	**What is the plural for locus?**	Loci
16	**What does equidistant mean?**	Equal distance

17	**How do we find the locus of points a set distance from point A?**	Use a compass to draw a circle, radius of the set distance, centre A	
18	**How do we find the locus of points a set distance from line AB?**	Create two semi-circles at either end from A and B, with radius of the set distance, centre A and B, and join with two parallel lines	
19	**How do we find the locus of points equidistant from points A and B?**	Draw the perpendicular bisector of the line AB	

CORE KNOWLEDGE – Area and perimeter		
1	**What is 'perimeter'?**	The distance around the outside of a shape
2	**What is a 'formula'?**	A relationship or rule linking different variables
3	**What is a 'square'?**	A quadrilateral with 4 equal sides and 4 equal 90° angles
4	**What is a 'rectangle'?**	A quadrilateral with 2 pairs of equal (opposite) sides and 4 equals 90° angles
5	**What is a 'triangle'?**	A polygon with three straight sides and three angles
6	**What is a 'parallelogram'?**	A quadrilateral with 2 pairs of equal, parallel sides
7	**What is a 'trapezium'?**	A quadrilateral with 1 pair of parallel sides
8	**What is a 'compound (composite) shape'?**	A shape made up of two or more basic shapes
9	**What is a 'quadrilateral'?**	A polygon (shape) with 4 straight sides and 4 angles
10	**What is 'area'?**	The space inside the shape
11	**What is the formula for area of a rectangle?**	Base x height
12	**What is the formula for area of a triangle?**	Base x (perpendicular) height ÷ 2
13	**What is the formula for area of a parallelogram?**	Base x perpendicular height
14	**What is the formula for area of a trapezium?**	$\frac{a+b}{2} \times h$ where h is the perpendicular height, a and b are parallel

CORE KNOWLEDGE – Circles 2		
1	**What is a 'formula'?**	A relationship or rule linking different variables
2	**What is the 'diameter'?**	The length of the line that goes straight across the circle, through the centre
3	**What is the 'radius?**	The distance from the centre to the edge of the circle
4	**What formula links radius and diameter?**	Diameter = 2 x radius
5	**What is 'pi'?**	The circumference divided by the diameter. Approximately 3.14
6	**What is 'circumference'?**	The distance around the outside of a circle
7	**What are the two formulas for the length of the circumference?**	$C = 2\pi r$ or $C = \pi d$
8	**What is 'perimeter'?**	The distance around the outside of a shape
9	**What is 'area'?**	The space inside the shape
10	**What is the formula for the area of a circle?**	$A = \pi r^2$
11	**What is an arc?**	Part of the circumference
12	**What is the formula for the length of an arc?**	$\frac{\theta}{360°} \times 2\pi r$
13	**What is a sector?**	A 'slice' of a circle – the area between two radii and the connecting arc
14	**What is the formula for the area of a sector?**	$\frac{\theta}{360°} \times \pi r^2$

CORE KNOWLEDGE		
1	**What is a ‘solid’?**	Another name for a 3D shape
2	**What is a ‘face’ of a 3D shape?**	One of the flat surfaces of a 3D shape
3	**What are ‘vertices’?**	A corner (one corner is called a vertex)
4	**Which 3D shape has six identical square faces?**	A cube
5	**Which 3D shape has six rectangular faces, where the opposite faces are identical?**	A cuboid
6	**Which 3D shape has two circular faces and one curved side?**	A cylinder
7	**Which 3D shape has a constant cross-section?**	A prism
8	**Which 3D shape has a base that is a polygon and sides that are triangles which meet at the top?**	A pyramid
9	**Which 3D shape has a circular base, joined to a point by a curved side?**	A cone
10	**Which 3D shape is shaped like a ball?**	A sphere
11	**What is ‘volume’?**	The amount of space inside a 3D shape
12	**What is the formula for the volume of a cube?**	Length^3
13	**What is the formula for the volume of a cuboid?**	Length x width x height
14	**What is the formula for the volume of a prism?**	Area of cross-section x length
15	**What is surface area?**	The sum of the areas of each face of a 3D shape
16	**What is the formula for the surface area of a cube?**	$6 \times \text{length}^2$

17	**What is a ‘net’?**	A pattern that you can cut and fold to make a model of a 3D shape.
18	**What is a ‘plan’?**	The 2D view of a 3D object from above
19	**What is an ‘elevation’?**	The 2D view of a 3D object looking from the front (front elevation) or the side (side elevation)
20	**What is a ‘plane of symmetry’?**	Where you could slide the 3D object into two identical halves that are mirror images of one another

CORE KNOWLEDGE - Transformations		
1	**What does 'transformation' mean?**	**Change** – in this case the **size** or **position** of a shape
2	**What is the 'object'?**	The **original** shape
3	**What is the 'image'?**	The **new** transformed shape
4	**What does 'reflection' mean?**	The shape is '**flipped**' in a **mirror line**
5	**What does the line x = a look like?**	A **vertical** line through the **x-axis at a**
6	**What does the line y = b look like?**	A **horizontal** line through the **y-axis at b**
7	**What does the line y = x look like?**	A **diagonal** line through the **origin** that is **positive** (upward-sloping)
8	**How do we describe a reflection?**	The equation of the **mirror line**
9	**What does 'rotation' mean?**	**Turn** around a point
10	**How do we describe a rotation?**	(1) A **centre of rotation**; (2) the **angle**; and (3) the **direction**
11	**How many degrees is a: (i) quarter-turn; (ii) half-turn; (iii) three-quarter turn?**	(i) A quarter-turn is 90°; (ii) a half-turn is 180°; (iii) a three-quarter turn is 270°.
12	**What does 'translation' mean?**	**Move** the shape
13	**How do we describe a translation?**	A column **vector**
14	**What is a 'column vector'?**	Describes a **movement** from one point to another. It has both **direction** and **magnitude** (size). $\begin{pmatrix} x \\ y \end{pmatrix}$
15	**What does a vector tell us?**	The **top** number moves **left (-) or right (+)** and the **bottom** number moves **up (+) or down (-)**

16	**What is an 'enlargement'?**	Change the **size** of the shape. Multiply each side by the scale factor.
17	**How do we describe an enlargement?**	(1) **The scale factor**; and (2) the **centre of enlar**gement
18	**How do we find the centre of enlargement?**	Use a ruler to draw straight lines through **corresponding corners** of the object and its image and find the point where all the lines cross
19	**What is a 'scale factor'?**	The **ratio of corresponding lengths** in similar shapes, ie how much larger or smaller the shapes are
20	**What does it mean if 2 shapes are 'congruent'?**	They are **identical**. The shape can be rotated, reflected or translated
21	**What does it mean if 2 shapes are 'similar'?**	One shape is an **enlargement** of the other. Each side has been multiplied by the same scale factor

CORE KNOWLEDGE – Similarity and congruence		
1	**What does it mean if two shapes are 'congruent'?**	They are **identical**. The shape can be rotated, reflected or translated
2	**What are the four congruence conditions?**	SSS, RHS, SAS, AAS where the corresponding sides and angles must be identical
3	**How do we prove two triangles are congruent?**	By showing that one of the four congruence conditions is satisfied
4	**What are 'corresponding' sides or angles?**	Matching sides or angles that are in the same position in two different shapes.
5	**What is a right-angle?**	A **90° angle.**
6	**What is the hypotenuse?**	The **longest side** of a **right-angled triangle**. It is opposite the right-angle.
7	**What does it mean if two shapes are 'similar'?**	One shape is an **enlargement** of the other. Each side has been multiplied by the same scale factor
8	**What is a 'scale factor'?**	The **ratio of corresponding lengths** in similar shapes, ie how much larger or smaller the shapes are
9	**What is an 'enlargement'?**	Change the **size** of the shape. Multiply each side by the scale factor.
10	**What are the three similarity conditions?**	SSS, AAA, ASA where the corresponding sides must be in the same ratio and the corresponding angles must be identical
11	**How do we prove two triangles are similar?**	By showing that one of the three similarity conditions is satisfied
12	**How do we find the scale factor of two similar triangles?**	$\frac{\text{Side length of shape B}}{\text{Corresponding side length of shape A}}$
13	**How do we find a missing side on shape B of a similar shape?**	Corresponding side on A x scale factor

CORE KNOWLEDGE – Collecting data		
1	**What is primary data?**	Data you collect yourself
2	**What is secondary data?**	Data collected by someone else
3	**What is qualitative data?**	Data described by words
4	**What is quantitative data?**	Data categorised by numbers – it can be discrete or continuous
5	**What is discrete data?**	Can only take certain values. Data that can be counted.
6	**What is continuous data?**	Can take any value in a given range. Data that can be measured.
7	**What is a sample?**	A smaller group, taken from the whole population
8	**What is a population?**	The whole group
9	**What are the advantages of using a sample?**	It is quicker, cheaper and easier to collect data
10	**What does bias mean?**	Unfair, sways the results inaccurately
11	**What does it mean if a sample be biased?**	Some members of the population are more likely to be included than others e.g. because of when, where or how the sample was taken
12	**What is a random sample?**	Every member of the population has an equal chance of being included
13	**What is a tally chart?**	A way of recording data where you mark groups of 5 with a diagonal line
14	**What is a two-way table?**	A data collection sheet that allows you to record two different pieces of information about the same subject at once
15	**What are the four inequality signs and what do they mean?**	< less than; > greater than; ≤ less than or equal to; ≥ greater than or equal to
16	**If we use inequality signs to group continuous data, what do we need to remember?**	There must be no gaps between classes and classes can't overlap. So use '$\leq t$' to end a class and '$< t$' to start the next class

CORE KNOWLEDGE – Analysing data

1	**What are the three averages?**	Mean, median, mode
2	**How do we find the mean?**	Add up all the values. Divide by how many values there are.
3	**How do we find the median?**	Put the values in order. Locate the middle value
4	**How do we find the mode?**	The value that occurs most often
5	**How do we find the range?**	Biggest value – smallest value
6	**What is an outlier?**	Extreme value that doesn't fit the overall pattern

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Average	Advantages	Disadvantages
Mean	Every value makes a difference	Affected by extreme values
Median	Not affected by extreme values	May not change if a data value changes
Mode	Easy to find; not affected by extreme values; can be used with qualitative data	May not be a mode

8	**How do we find the modal class from a frequency table?**	The class with the highest frequency
9	**How do we find the median from a frequency table?**	If the total frequency is *n,* then the median lies in the class with the $\frac{n+1}{2}th$ value in it
10	**How do we find the mean from a frequency table?**	$\frac{\text{Sum of (frequency} \times \text{data value)}}{\text{Total frequency}}$
11	**How do we estimate the mean from a grouped frequency table?**	$\frac{\text{Sum of (frequency} \times \text{midpoint)}}{\text{Total frequency}}$
12	**What is frequency?**	The number of times an event or value occurs

13	**What is a bar chart?**	A display of data where the bar heights show the frequencies
14	**What is a pictogram?**	A chart using pictures to represent quantities. Must have a key to say what each picture represents
15	**What is a stem and leaf diagram?**	A display of data that shows groups of data arranged by place value. Leaves are only the final digit of each number and must be ordered. The stem is the other digits. It must have a key.
16	**What is a pie chart?**	A circular chart where the sectors show the relative sizes of data.
17	**How do we work out the size of a sector to construct a pie chart?**	$\frac{\text{Total frequency}}{360°} \times \text{Frequency}$
18	**How can we work out the frequency from a pie chart?**	Find either: (a) the frequency represented by 1° or (b) the degrees that represent 1 item
19	**What is a time series graph?**	A line graph with time plotted on the horizontal axis
20	**What is a scatter graph?**	A graph with points plotted to show a relationship between two variables
21	**What is correlation?**	A relationship between two variables
22	**What is positive correlation?**	As one variable increases, the other variable increases
23	**What is negative correlation?**	As one variable increases, the other variable decreases
24	**What is a line of best fit?**	A straight line that passes through the middle of the points with a roughly equal number on either side.
25	**What is interpolation?**	Using a line of best fit to predict values **within** the range of the data. Usually accurate
26	**What is extrapolation?**	Using a line of best fit to predict values **outside** the range of the data. May not be accurate as we don't know if the pattern continues

CORE KNOWLEDGE - Probability		
1	**What is probability?**	How likely an event is to occur
2	**What values can probability take?**	A value between 0 and 1. It can be a fraction, decimal or percentage
3	**What does it mean if an event is certain?**	It will definitely happen. The probability of the event is 1
4	**What does it mean if an event is impossible?**	It will definitely **not** happen. The probability of the event is 0.
5	**How do we write the probability of A?**	P(A)
6	**What is an outcome or event?**	A possible result of an experiment or trial
7	**What does it mean if events are mutually exclusive?**	They cannot happen at the same time.
8	**What does it mean if events are exhaustive?**	They cover all possible outcomes. The sum of the probabilities is 1.
9	**What is the sample space?**	All the possible outcomes for one or more events
10	**How do we calculate the probability of an event for equally likely outcomes?**	$\frac{\text{Number of successful outcomes}}{\text{Total number of possible outcomes}}$
11	**The probability of an event happening is p, what is the probability the event will NOT happen?**	$1 - p$
12	**What does frequency mean?**	The number of times an event or value occurs
13	**What is relative frequency?**	In an experiment, how often something happens as a proportion of the number of trials. Also called experimental probability
14	**How can we calculate relative frequency?**	$\frac{\text{Frequency of event}}{\text{Total number of trials}}$

15	**As we do the experiment more times, what happens to our relative frequency?**	It becomes more accurate
16	**What is the expected frequency?**	How often we expect to get a particular outcome
17	**How can we work out expected frequency?**	Probability x number of trials
18	**What does it mean if events are independent?**	If one of them happening has no effect on the probability of the other happening
19	**What is the AND rule?**	For independent events A and B, P(A and B) = P(A) x P(B)
20	**What is the OR rule?**	For mutually exclusive events A and B, P(A or B) = P(A) + P(B)
21	**What is a frequency tree?**	Shows the number of people who chose different options for different choices
22	**What is a probability tree?**	Shows combinations of outcomes and their probabilities.
23	**What does it mean if outcomes are fair?**	Each outcome is equally likely
24	**What does it mean if outcomes are biased?**	Some outcomes are more likely to occur
25	**What is a set?**	A collection of 'things'
26	**What symbol shows a set of values?**	{} (curly brackets)
27	**What is an element?**	A 'member' of a set
28	**What symbol means 'is an element of'?**	$\in$ e.g. $5 \in \{\text{odd numbers}\}$ means "5 is in the set of odd numbers"
29	**How do we write "A intersection B" and what does it mean?**	$A \cap B$ means all elements in A AND B
30	**How do we write "A union B" and what does it mean?**	$A \cup B$ means all elements in A OR B OR both
31	**How do write the "complement of A" and what does it mean?**	$'A$ means all the elements NOT in A
32	**What is a Venn diagram?**	A diagram that uses circles to represent sets. The space inside the circle represents everything in the set