Half Term 1 Knowledge Organiser: Year 7

NUMBER		
Integer	A **whole number** that can be positive, negative or zero.	$-3,\ 0,\ 92$
Decimal	A number with a **decimal point** in it. Can be positive or negative.	$3.7,\ 0.94,\ -24.07$
Negative Number	A number that is **less than zero**. Can be decimals.	$-8,\ -2.5$
Addition	To find the **total**, or **sum**, of two or more numbers. 'add', 'plus', 'sum'	$3 + 2 + 7 = 12$
Subtraction	To find the **difference** between two numbers. To find out how many are left when some are taken away. 'minus', 'take away', 'subtract'	$10 - 3 = 7$
Multiplication	Can be thought of as **repeated addition**. 'multiply', 'times', 'product'	$3\times6 = 6 + 6 + 6 = 18$
Division	Splitting into equal parts or groups. The process of calculating the **number of times one number is contained within another one**. 'divide', 'share'	$20\div4 = 5$ $\frac{20}{4} = 5$
Remainder	The amount '**left over**' after dividing one integer by another.	The remainder of $20\div6$ is 2, because 6 divides into 20 exactly 3 times, with 2 left over.
BIDMAS	An acronym for the **order** you should do calculations in. BIDMAS stands for **'Brackets, Indices, Division, Multiplication, Addition and Subtraction'**. Indices are also known as 'powers' or 'orders'. With strings of division and multiplication, or strings of addition and subtraction, and no brackets, work from left to right.	$6 + 3\times5 = 21$, *not* 45 $5^2 = 25$, where the 2 is the index/power. $12\div4\div2 = 1.5$, *not* 6
Recurring Decimal	A decimal number that has **digits that repeat forever**. The part that repeats is usually shown by placing a dot above the digit that repeats, or	$\frac{1}{3} = 0.333\ldots = 0.\dot{3}$ $\frac{1}{7} = 0.142857142857\ldots = 0.\dot{1}42857\dot{}$ $\frac{77}{600} = 0.128333\ldots = 0.128\dot{3}$

	dots over the first and last digit of the repeating pattern.	

NEGATIVE NUMBERS		
Multiplying and dividing with negatives	- x - = + - x + = - + x - = - + x + = +	
Adding and subtracting with negatives	Use a number line to identify your start point +- moves DOWN or SUBTRACT -- moves UP or ADD	

FACTORS, MULTIPLES, PRIMES		
Prime number	A number with exactly two factors: 1 and itself	
Factor	Something which goes into a number exactly	
Multiple	In the times table of a number	
Prime factor	A factor which is prime	
Prime factor decomposition	Use a factor tree to identify all the prime factors of a number	
Product of prime factors	A number expressed as a multiple of prime factors from factor tree	
Highest Common Factor (HCF)	The highest factor that two or more numbers have in common	
Lowest Common Multiple (LCM)	The lowest multiple that two or more numbers have in common	

POWERS		
Squared	Multiplied by itself	
Cubed	Multiplied by itself 3 times	
To the power of	Multiplied by itself the number of times indicated by the indice	
The first 5 squared numbers	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225	
The first 5 cube numbers	1, 8, 27, 64, 125	
Square root	The number you would square to get the answer	
Cube root	The number you would cube to get the answer	
The first 5 powers of 10	10, 100, 1000, 10000, 1000000	

The first 10 power of 2	2, 4, 8, 16, 32, 64, 128, 256, 512, 1024	

1 x 2 = 2	1 x 3 = 3	1 x 4 = 4	1 x 5 = 5
2 x 2 = 4	2 x 3 = 6	2 x 4 = 8	2 x 5 = 10
3 x 2 = 6	3 x 3 = 9	3 x 4 = 12	3 x 5 = 15
4 x 2 = 8	4 x 3 = 12	4 x 4 = 16	4 x 5 = 20
5 x 2 = 10	5 x 3 = 15	5 x 4 = 20	5 x 5 = 25
6 x 2 = 12	6 x 3 = 18	6 x 4 = 24	6 x 5 = 30
7 x 2 = 14	7 x 3 = 21	7 x 4 = 28	7 x 5 = 35
8 x 2 = 16	8 x 3 = 24	8 x 4 = 32	8 x 5 = 40
9 x 2 = 18	9 x 3 = 27	9 x 4 = 36	9 x 5 = 45
10 x 2 = 20	10 x 3 = 30	10 x 4 = 40	10 x 5 = 50
11 x 2 = 22	11 x 3 = 33	11 x 4 = 44	11 x 5 = 55
12 x 2 = 24	12 x 3 = 36	12 x 4 = 48	12 x 5 = 60

1 x 6 = 6	1 x 7 = 7	1 x 8 = 8	1 x 9 = 9
2 x 6 = 12	2 x 7 = 14	2 x 8 = 16	2 x 9 = 18
3 x 6 = 18	3 x 7 = 21	3 x 8 = 24	3 x 9 = 27
4 x 6 = 24	4 x 7 = 28	4 x 8 = 32	4 x 9 = 36
5 x 6 = 30	5 x 7 = 35	5 x 8 = 40	5 x 9 = 45
6 x 6 = 36	6 x 7 = 42	6 x 8 = 48	6 x 9 = 54
7 x 6 = 42	7 x 7 = 49	7 x 8 = 56	7 x 9 = 63
8 x 6 = 48	8 x 7 = 56	8 x 8 = 64	8 x 9 = 72
9 x 6 = 54	9 x 7 = 63	9 x 8 = 72	9 x 9 = 81
10 x 6 = 60	10 x 7 = 70	10 x 8 = 80	10 x 9 = 90
11 x 6 = 66	11 x 7 = 77	11 x 8 = 88	11 x 9 = 99
12 x 6 = 72	12 x 7 = 84	12 x 8 = 96	12 x 9 = 108

1 x 10 = 10	1 x 11 = 11	1 x 12 = 12
2 x 10 = 20	2 x 11 = 22	2 x 12 = 24
3 x 10 = 30	3 x 11 = 33	3 x 12 = 36
4 x 10 = 40	4 x 11 = 44	4 x 12 = 48
5 x 10 = 50	5 x 11 = 55	5 x 12 = 60
6 x 10 = 60	6 x 11 = 66	6 x 12 = 72
7 x 10 = 70	7 x 11 = 77	7 x 12 = 84
8 x 10 = 80	8 x 11 = 88	8 x 12 = 96
9 x 10 = 90	9 x 11 = 99	9 x 12 = 108
10 x 10 = 100	10 x 11 = 110	10 x 12 = 120
11 x 10 = 110	11 x 11 = 121	11 x 12 = 132

12 x 10 = 120	12 x 11 = 132	12 x 12 = 144

Half Term 2 Knowledge Organiser: Year 7

ROUNDING		
Decimal places	The number of digits after the decimal point	
Significant figures	Counted from the first non zero digit	
Estimate	Round to a suitable degree of accuracy before calculating	
Integer	A whole number that can be positive, negative or zero.	$-3,\ 0,\ 92$
Decimal	A number with a decimal point in it. Can be positive or negative.	$3.7,\ 0.94,\ -24.07$
Rounding	Cutting a number off after a given number of decimal places of significant figures and looking to the next number to determine direction. 0, 1, 2, 3, 4 stays the same 5, 6, 7, 8, 9 rounds up	
Rounding to decimal places	Count the decimal places and then cut off. Look to the next number to indicate rounding.	
Rounding to significant figures	Count from the first non zero digit. If cutting off before the decimal place, replaces integers with zeros.	

FRACTIONS		
Fraction	A mathematical expression representing the division of one integer by another. Fractions are written as two numbers separated by a horizontal line.	$\frac{2}{7}$ is a 'proper' fraction.
Numerator	The top number of a fraction.	In the fraction $\frac{3}{5}$, 3 is the numerator.
Denominator	The bottom number of a fraction.	In the fraction $\frac{3}{5}$, 5 is the denominator.
Mixed Number	A number formed of both an integer part and a fraction part.	$3\frac{2}{5}$ is an example of a mixed number.
Improper Fraction	When the numerator is greater than the denominator.	$\frac{9}{4}$ is an 'improper' or 'top-heavy' fraction.

Improper Fraction to a Mixed Number	1. Numerator divided by the denominator for the whole number. 2. Remainder becomes the new numerator. 3. Denominator stays the same.	$\frac{9}{4}$ becomes $2\frac{1}{4}$ 9 / 4 = 2 remainder 1
Mixed Number to an Improper Fraction	1. Denominator multiplied by the whole number, plus the numerator for the new numerator. 2. Denominator stays the same.	$3\frac{2}{5}$ becomes $\frac{17}{5}$ 3 x 5 + 2 = 17

STANDARD FORM		
Standard Form	$A \times 10^b$ *where* $1 \leq A < 10$, b = *integer*	$8400 = 8.4 \times 10^3$ $0.00036 = 3.6 \times 10^{-4}$
Multiplying or Dividing with Standard Form	Multiply: **Multiply the numbers** and **add the powers**. Divide: **Divide the numbers** and **subtract the powers**.	$\left(1.2\times10^3\right)\times\left(4\times10^6\right)=8.8\times10^9$ $\left(4.5\times10^5\right)\div\left(3\times10^2\right)=1.5\times10^3$
Adding or Subtracting with Standard Form	**Convert** in to **ordinary** numbers, **calculate** and then **convert back** in to standard form	$2.7\times10^4+4.6\times10^3$ $=27000+4600=31600$ $=3.16\times10^4$

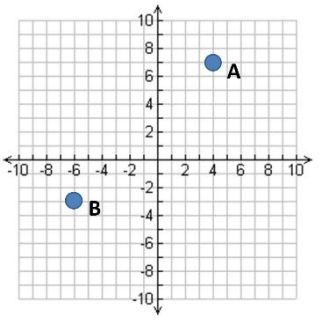
Half Term 3 Knowledge Organiser: Year 7

BASIC ALGEBRA		
Expression	A mathematical statement written using **symbols**, **numbers** or **letters**,	$3x + 2$ or $5y^2$
Equation	A statement showing that **two expressions are equal**	$2y - 17 = 15$
Identity	An equation that is **true for all values** of the variables	$2x \equiv x+x$

	An identity uses the symbol: ≡	
Formula	Shows the **relationship** between **two or more variables**	Area of a rectangle = length x width or A= LxW
Simplifying Expressions	**Collect 'like terms'.** Be careful with negatives. x^2 and x are not like terms.	$2x + 3y + 4x - 5y + 3 = 6x - 2y + 3$ $3x + 4 - x^2 + 2x - 1 = 5x - x^2 + 3$
x times x	The answer is x^2 not $2x$.	Squaring is multiplying by itself, not by 2.
$p \times p \times p$	The answer is p^3 not $3p$	If p=2, then p^3 =2x2x2=8, not 2x3=6
$p + p + p$	The answer is 3p not p^3	If p=2, then 2+2+2=6, not $2^3 = 8$
Expand	To expand a bracket, **multiply** each term **in the bracket** by the expression **outside** the bracket.	$3(m + 7) = 3x + 21$
Factorise	The **reverse** of **expanding**. Factorising is writing an expression as a product of terms by '**taking out' a common factor**.	$6x - 15 = 3(2x - 5)$, where 3 is the common factor.

ALGEBRA		
Solve	To find the **answer**/value of something **Use inverse operations** on both sides of the equation (balancing method) until you find the value for the letter.	Solve $2x - 3 = 7$ Add 3 on both sides $2x = 10$ Divide by 2 on both sides $x = 5$
Inverse	**Opposite**	The inverse of addition is subtraction. The inverse of multiplication is division.

Rearranging Formulae	**Use inverse operations** on both sides of the formula (balancing method) until you find the expression for the letter.	Make x the subject of $y = \frac{2x-1}{z}$ Multiply both sides by z $yz = 2x - 1$ Add 1 to both sides $yz + 1 = 2x$ Divide by 2 on both sides $\frac{yz+1}{2} = x$ We now have x as the subject.
Writing Formulae	**Substitute letters for words** in the question.	Bob charges £3 per window and a £5 call out charge. $C = 3N + 5$ Where N=number of windows and C=cost
Substitution	**Replace letters with numbers**. Be careful of $5x^2$. You need to square first, then multiply by 5.	$a = 3,\ b = 2$ *and* $c = 5$. Find: 1. $2a = 2\times3 = 6$ 2. $3a - 2b = 3\times3 - 2\times2 = 5$ 3. $7b^2 - 5 = 7\times2^2 - 5 = 23$

COORDINATES		
Coordinates	Written in **pairs**. The **first** term is the **x-coordinate** (movement **across**). The **second** term is the **y-coordinate** (movement **up or down**)	 A: (4,7) B: (-6,-3)
Midpoint of a Line	Method 1: **add the x coordinates and divide by 2**, **add the y coordinates and divide by 2** Method 2: Sketch the line and find the values half way between the two x and two y values.	Find the midpoint between (2,1) and (6,9) $\frac{2+6}{2} = 4$ and $\frac{1+9}{2} = 5$ So, the midpoint is (4,5)

Half Term 4 Knowledge Organiser: Year 7

<table>
<tr><th colspan="3">MEASURES OF SPREAD</th></tr>
<tr><td>Types of Data</td><td>Qualitative Data – non-numerical data
Quantitative Data – numerical data

Continuous Data – data that can take any numerical value within a given range.
Discrete Data – data that can take only specific values within a given range.</td><td>Qualitative Data – eye colour, gender etc.

Continuous Data – weight, voltage etc.

Discrete Data – number of children, shoe size etc.</td></tr>
<tr><td>Grouped Data</td><td>Data that has been bundled in to categories.

Seen in grouped frequency tables, histograms, cumulative frequency etc.</td><td><table><tr><th>Foot length, l, (cm)</th><th>Number of children</th></tr><tr><td>$10 \leqslant l < 12$</td><td>5</td></tr><tr><td>$12 \leqslant l < 17$</td><td>53</td></tr></table></td></tr>
<tr><td>Primary /Secondary Data</td><td>Primary Data – collected yourself for a specific purpose.

Secondary Data – collected by someone else for another purpose.</td><td>Primary Data – data collected by a student for their own research project.

Secondary Data – Census data used to analyse link between education and earnings.</td></tr>
<tr><td>Mean</td><td>Add up the values and divide by how many values there are.</td><td>The mean of 3, 4, 7, 6, 0, 4, 6 is
$\frac{3+4+7+6+0+4+6}{7} = 5$</td></tr>
<tr><td>Mean from a Table</td><td>1. Find the midpoints (if necessary)
2. Multiply Frequency by values or midpoints
3. Add up these values
4. Divide this total by the Total Frequency

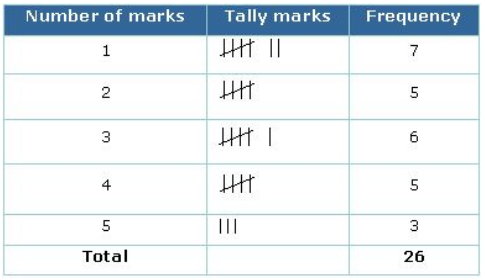
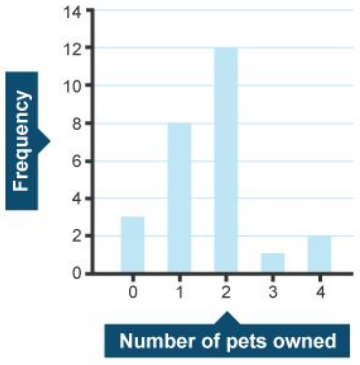
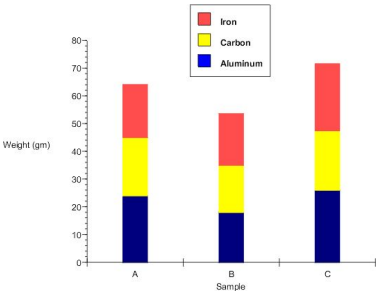
If grouped data is used, the answer will be an estimate.</td><td><table><tr><th>Height in cm</th><th>Frequency</th><th>Midpoint</th><th>F × M</th></tr><tr><td>$0 < h \leq 10$</td><td>8</td><td>5</td><td>8×5=40</td></tr><tr><td>$10 < h \leq 30$</td><td>10</td><td>20</td><td>10×20=200</td></tr><tr><td>$30 < h \leq 40$</td><td>6</td><td>35</td><td>6×35=210</td></tr><tr><td>Total</td><td>24</td><td>Ignore!</td><td>450</td></tr></table>Estimated Mean height: 450 ÷ 24 = 18.75cm</td></tr>
<tr><td>Median Value</td><td>The middle value.

Put the data in order and find the middle one.
If there are two middle values, find the number half way between them by adding them together and dividing by 2.</td><td>Find the median of: 4, 5, 2, 3, 6, 7, 6

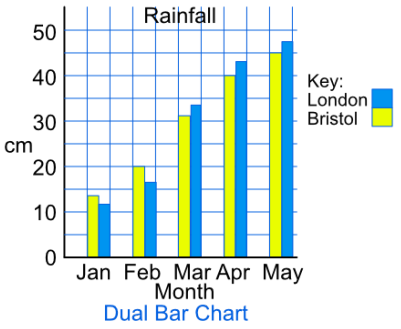
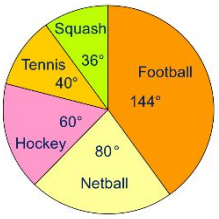
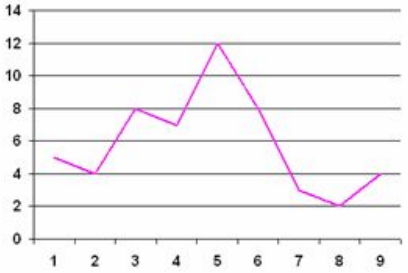
Ordered: 2, 3, 4, 5, 6, 6, 7

Median = 5</td></tr>
<tr><td>Median from a Table</td><td>Use the formula $\frac{(n+1)}{2}$ to find the position of the median.</td><td>If the total frequency is 15, the median will be the $\left(\frac{15+1}{2}\right) = 8th$ position</td></tr>
</table>

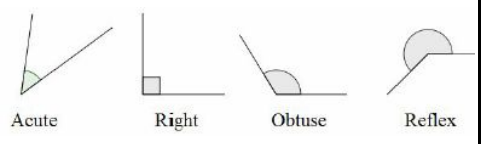
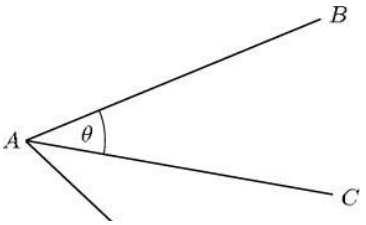
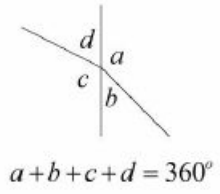
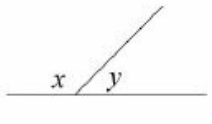
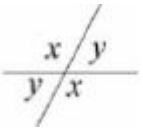
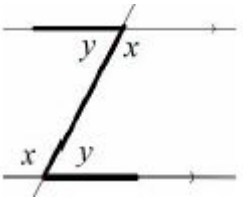
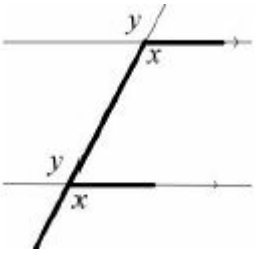
	n is the total frequency.	
Mode /Modal Value	**Most** frequent/common. Can have more than one mode (called bi-modal or multi-modal) or no mode (if all values appear once)	Find the mode: 4, 5, 2, 3, 6, 4, 7, 8, 4 Mode = 4
Range	**Highest value subtract the Smallest value** Range is a 'measure of spread'. The smaller the range the more <u>consistent</u> the data.	Find the range: 3, 31, 26, 102, 37, 97. Range = 102-3 = 99

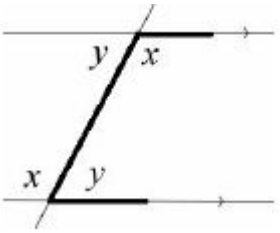
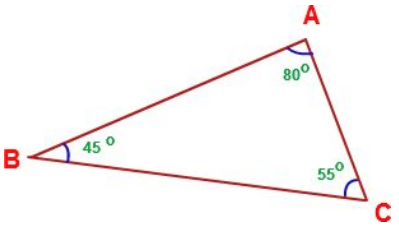
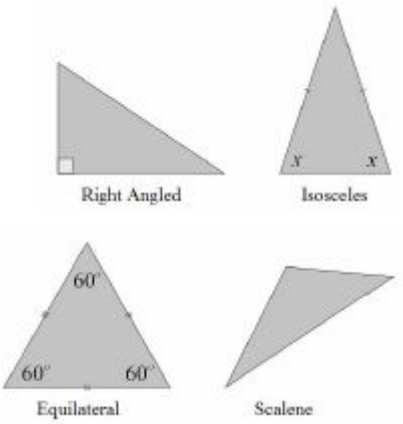
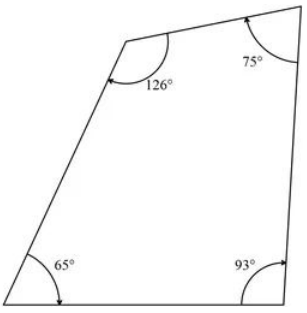
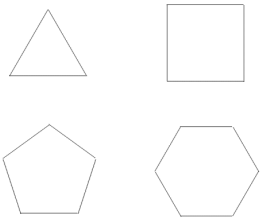
DATA DISPLAY		
Frequency Table	A record of **how often each value** in a set of data **occurs**.	
Bar Chart	Represents data as vertical blocks. $x-axis$ shows the **type** of data $y-axis$ shows the **frequency** for each type of data Each bar should be the **same width** There should be **gaps** between each bar Remember to **label** each axis.	
Types of Bar Chart	**Compound/Composite** Bar Charts show data stacked on top of each other. **Comparative/Dual** Bar Charts show data side by side.	

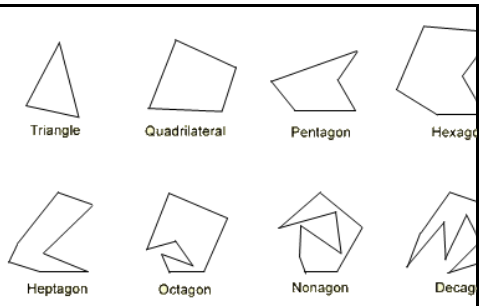
Number of marks	Tally marks	Frequency
1	𝍸 ||	7
2	𝍸	5
3	𝍸 |	6
4	𝍸	5
5	|||	3
Total		**26**

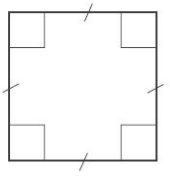
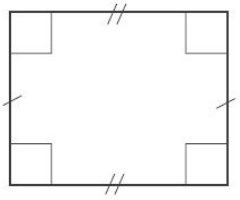
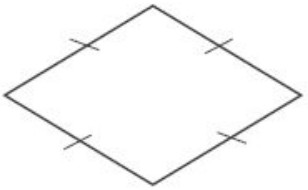
		 Dual Bar Chart
Pie Chart	Used for showing **how data breaks down into** its constituent **parts**. When drawing a pie chart, **divide 360° by the total frequency**. This will tell you how many degrees to use for the frequency of each category. Remember to **label** the category that each sector in the pie chart represents.	 If there are 40 people in a survey, then each person will be worth 360÷40=9° of the pie chart.
Pictogram	Uses **pictures** or symbols to **show the value** of the data. A pictogram must have a **key**.	
Line Graph	A graph that uses **points connected by straight lines** to show how data changes in values. This can be used for **time series data**, which is a series of data points spaced over uniform time intervals in **time order**.	
Two Way Tables	A table that **organises data** around **two categories.** Fill out the information step by step using the information given. Make sure all the totals add up for all columns and rows.	**Question: Complete the 2 way table below.** | | Left Handed | Right Handed | **Total** | | Boys | 10 | | 58 | | Girls | | | | | **Total** | | 84 | 100 | **Answer: Step 1, fill out the easy parts (the totals)** | | Left Handed | Right Handed | **Total** | | Boys | 10 | *48* | 58 | | Girls | | | *42* | | **Total** | *16* | 84 | 100 | **Answer: Step 2, fill out the remaining parts** | | Left Handed | Right Handed | **Total** | | Boys | 10 | *48* | 58 | | Girls | *6* | *36* | *42* | | **Total** | *16* | 84 | 100 |

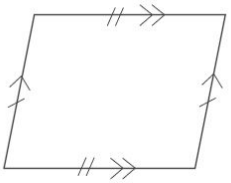
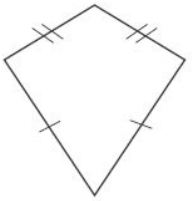
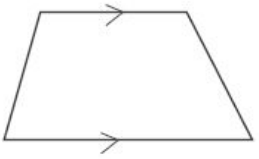
Half Term 5 Knowledge Organiser: Year 7

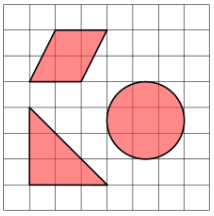
ANGLES		
Types of Angles	**Acute angles** are less than 90°. **Right angles** are exactly 90°. **Obtuse angles** are greater than 90° but less than 180°. **Reflex angles** are greater than 180° but less than 360°.	
Angle Notation	Can use **one lower-case** letters, eg. θ or x Can use **three upper-case** letters, eg. BAC	
Angles at a Point	**Angles around a point add up to 360°**.	 $a+b+c+d=360^o$
Angles on a Straight Line	**Angles around a point on a straight line add up to 180°**.	 $x+y=180^o$
Opposite Angles	**Vertically opposite angles are equal**.	
Alternate Angles	**Alternate angles are equal**. They look like Z angles, but never say this in the exam.	
Corresponding Angles	**Corresponding angles are equal**. They look like F angles, but never say this in the exam.	

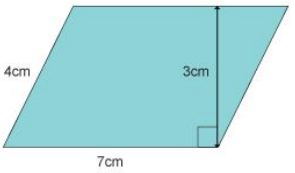
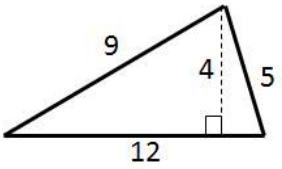
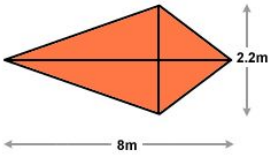
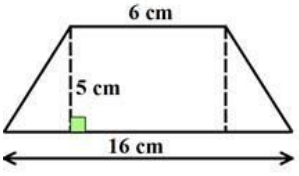
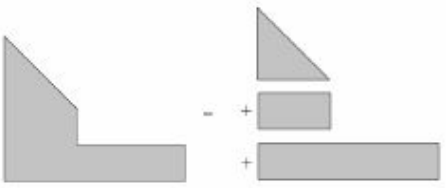
Co-Interior Angles	**Co-Interior angles add up to 180°.** They look like C angles, but never say this in the exam.	
Angles in a Triangle	**Angles in a triangle add up to 180°.**	
Types of Triangles	**Right Angle** Triangles have a **90°** angle in. **Isosceles** Triangles have **2 equal sides** and **2 equal base angles**. **Equilateral** Triangles have **3 equal sides** and **3 equal angles (60°)**. **Scalene** Triangles have **different sides** and **different angles**. **Base angles in an isosceles triangle are equal.**	
Angles in a Quadrilateral	**Angles in a quadrilateral add up to 360°.**	
Polygon	A **2D** shape with **only straight edges**.	Rectangle, Hexagon, Decagon, Kite etc.
Regular	A shape is regular if all the **sides** and all the **angles** are **equal**.	

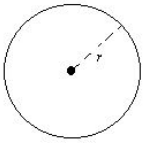
Names of Polygons	**3**-sided = **Triangle** **4**-sided = **Quadrilateral** **5**-sided = **Pentagon** **6**-sided = **Hexagon** **7**-sided = **Heptagon**/Septagon **8**-sided = **Octagon** **9**-sided = **Nonagon** **10**-sided = **Decagon**	
Sum of Interior Angles	$(n-2)\times 180$ where n is the number of sides.	Sum of Interior Angles in a Decagon = $(10-2)\times 180 = 1440°$
Size of Interior Angle in a Regular Polygon	$\frac{(n-2)\times 180}{n}$ You can also use the formula: $180 - Size\ of\ Exterior\ Angle$	Size of Interior Angle in a Regular Pentagon = $\frac{(5-2)\times 180}{5} = 108°$
Size of Exterior Angle in a Regular Polygon	$\frac{360}{n}$ You can also use the formula: $180 - Size\ of\ Interior\ Angle$	Size of Exterior Angle in a Regular Octagon = $\frac{360}{8} = 45°$

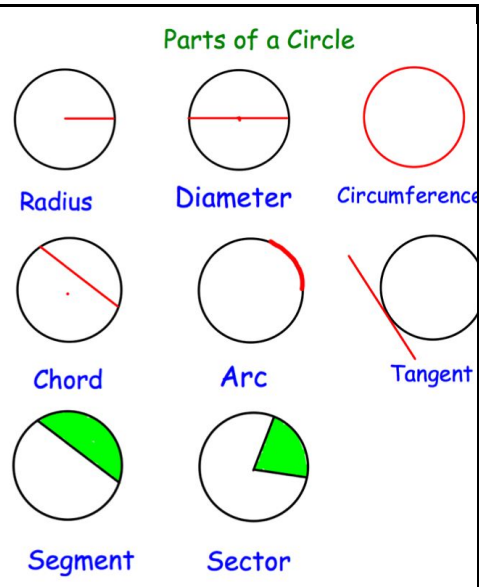
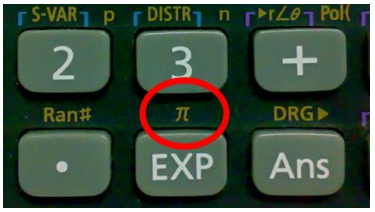
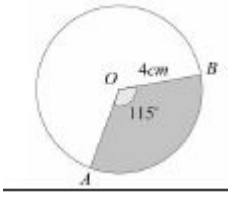
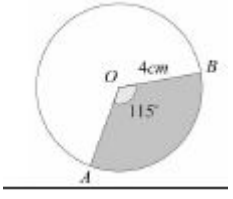
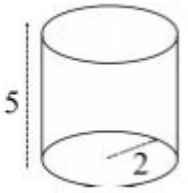
QUADRILATERALS		
Square	• **Four equal sides** • **Four right angles** • **Opposite sides parallel** • **Diagonals bisect** each other at **right angles** • **Four lines** of **symmetry** • **Rotational symmetry** of **order four**	
Rectangle	• **Two pairs** of **equal sides** • **Four right angles** • **Opposite sides parallel** • **Diagonals bisect** each other • **Two lines** of **symmetry** • **Rotational symmetry** of **order two**	
Rhombus	• **Four equal sides** • **Two pairs** of **equal angles** • **Opposite sides parallel** • **Diagonals bisect** each other at **right angles** • **Two lines** of **symmetry** • **Rotational symmetry** of **order two**	

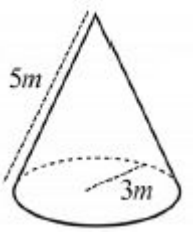
Parallelogram	• **Two pairs** of **equal sides** • **Two pairs** of **equal angles** • **Opposite sides parallel** • **Diagonals bisect each other** • **No lines** of **symmetry** • **Rotational symmetry** of **order two**	
Kite	• **Two pairs** of **adjacent sides** of **equal** length • **One pair** of **equal angles** • **Diagonals intersect** at **right angles** • **One line** of **symmetry**	
Trapezium	• **One pair** of **parallel sides** • Isosceles quadrilaterals of this kind have one line of symmetry.	

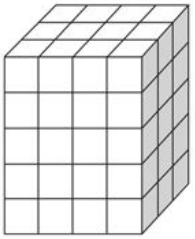
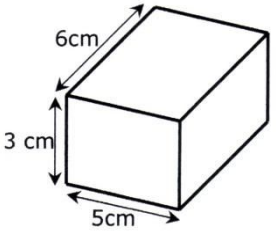
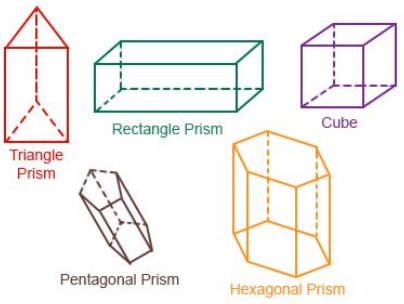
AREA AND PERIMETER		
Perimeter	The **total distance** around the **outside** of a shape. Units include: mm, cm, m etc.	**8 cm** **5 cm**  $P = 8 + 5 + 8 + 5 = 26cm$
Area	The amount of **space inside** a shape. Units include: mm^2, cm^2, m^2	
Area of a Rectangle	**Length x Width**	9 cm 4 cm  $A = 36cm^2$

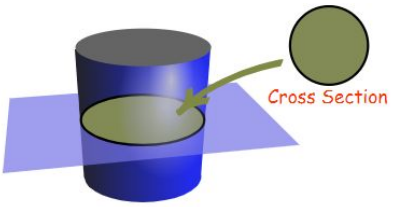
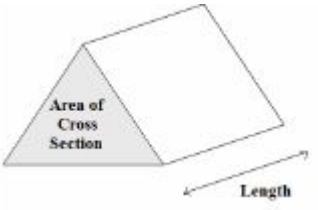
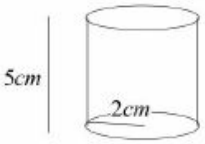
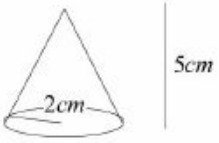
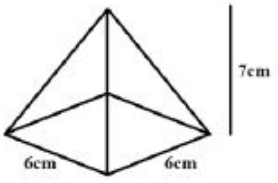
Area of a Parallelogram	**Base x Perpendicular Height** Not the slant height.	 $A = 21cm^2$
Area of a Triangle	**Base x Height ÷ 2**	 $A = 24cm^2$
Area of a Kite	Split in to **two triangles** and use the method above.	 $A = 8.8m^2$
Area of a Trapezium	$\frac{(a+b)}{2} \times h$ "Half the sum of the parallel side, times the height between them. That is how you calculate the area of a trapezium"	 $A = 55cm^2$
Compound Shape	A shape made up of a **combination of other known shapes** put together.	

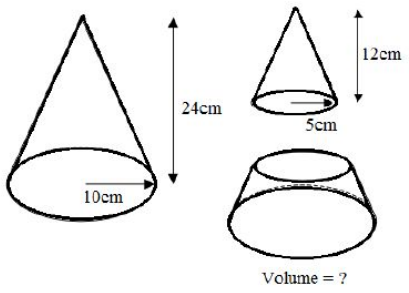
CIRCLES		
Circle	A circle is the locus of all points equidistant from a central point.	

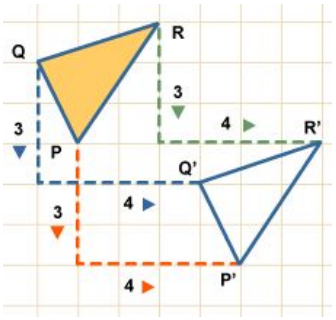
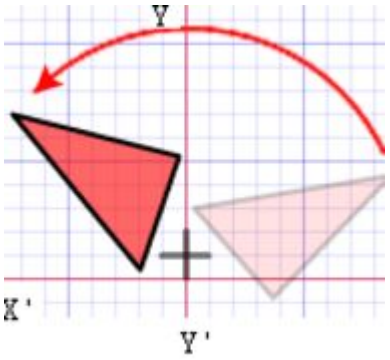
Parts of a Circle	**Radius** – the **distance** from the **centre** of a circle to the **edge** **Diameter** – the total **distance** across the **width** of a circle **through the centre**. **Circumference** – the **total distance** around the **outside** of a circle **Chord** – a **straight line** whose **end points lie on a circle** **Tangent** – a **straight line** which **touches** a circle at exactly **one point** **Arc** – a **part of the circumference** of a circle **Sector** – the **region** of a circle enclosed by **two radii** and their intercepted **arc** **Segment** – the **region** bounded by a **chord** and the **arc** created by the chord	
Area of a Circle	$A = \pi r^2$ which means 'pi x radius squared'.	If the radius was 5cm, then: $A = \pi \times 5^2 = 78.5cm^2$
Circumference of a Circle	$C = \pi d$ which means 'pi x diameter'	If the radius was 5cm, then: $C = \pi \times 10 = 31.4cm$
π ('pi')	Pi is the circumference of a circle divided by the diameter. $\pi \approx 3.14$	
Arc Length of a Sector	The arc length is part of the circumference. Take the **angle** given **as a fraction over 360°** and **multiply** by the **circumference**.	Arc Length = $\frac{115}{360} \times \pi \times 8 = 8.03cm$ 
Area of a Sector	The area of a sector is part of the total area. Take the **angle** given **as a fraction over 360°** and **multiply** by the **area**.	Area = $\frac{115}{360} \times \pi \times 4^2 = 16.1cm^2$ 
Surface Area of a Cylinder	**Curved Surface Area =** πdh or $2\pi rh$ **Total SA =** $2\pi r^2 + \pi dh$ or $2\pi r^2 + 2\pi rh$	

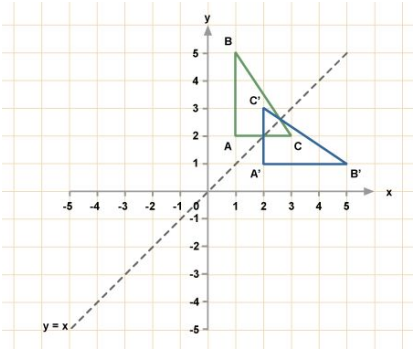
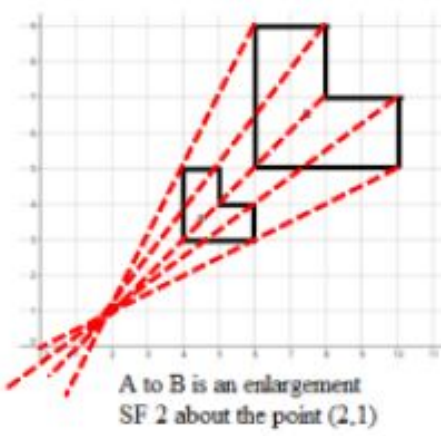
		$Total\ SA = 2\pi(2)^2 + \pi(4)(5) = 28\pi$
Surface Area of a Cone	**Curved Surface Area =** πrl where $l = slant\ height$ **Total SA =** $\pi rl + \pi r^2$ You may need to use Pythagoras' Theorem to find the slant height	 $Total\ SA = \pi(3)(5) + \pi(3)^2 = 24\pi$
Surface Area of a Sphere	$SA = 4\pi r^2$ Look out for hemispheres – halve the SA of a sphere and add on a circle (πr^2)	Find the surface area of a sphere with radius 3cm. $SA = 4\pi(3)^2 = 36\pi cm^2$

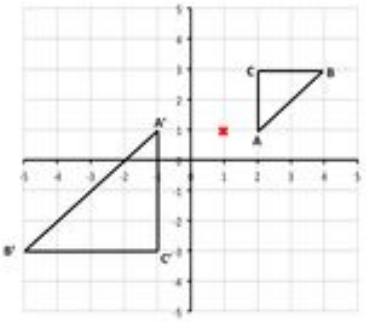
VOLUME		
Volume	Volume is a measure of the amount of **space inside** a solid shape. Units: $mm^3,\ cm^3, m^3$ etc.	
Volume of a Cube/Cuboid	$V = Length \times Width \times Height$ $V = L \times W \times H$ You can also use the Volume of a Prism formula for a cube/cuboid.	 volume = 6 x 5 x 3 = 90 cm^3
Prism	A prism is a 3D shape whose **cross section is the same** throughout.	

Cross Section	The **cross section** is the **shape** that **continues** all the way **through the prism**.	
Volume of a Prism	$V = Area\ of\ Cross\ Section \times Length$ $V = A \times L$	
Volume of a Cylinder	$V = \pi r^2 h$	 $V = \pi(4)(5)$ $= 62.8cm^3$
Volume of a Cone	$V = \frac{1}{3}\pi r^2 h$	 $V = \frac{1}{3}\pi(4)(5)$ $= 20.9cm^3$
Volume of a Pyramid	$Volume = \frac{1}{3}Bh$ where B = area of the base	 $V = \frac{1}{3} \times 6 \times 6 \times 7 = 84cm^3$
Volume of a Sphere	$V = \frac{4}{3}\pi r^3$ Look out for hemispheres – just halve the volume of a sphere.	Find the volume of a sphere with diameter 10cm. $V = \frac{4}{3}\pi(5)^3 = \frac{500\pi}{3}cm^3$

Frustums	A frustum is a solid (usually a cone or pyramid) with the **top removed**. Find the volume of the whole shape, then take away the volume of the small cone/pyramid removed at the top.	 $V = \frac{1}{3}\pi(10)^2(24) - \frac{1}{3}\pi(5)^2(12) = 700\pi cm$

TRANSFORMATIONS		
Translation	**Translate** means to **move a shape**. The shape does not change **size** or **orientation**.	
Column Vector	In a column vector, the **top** number moves **left (-) or right (+)** and the **bottom** number moves **up (+) or down (-)**	$\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ means '2 right, 3 up' $\begin{pmatrix} -1 \\ -5 \end{pmatrix}$ means '1 left, 5 down'
Rotation	The size does not change, but the **shape is turned around a point**. Use tracing paper.	Rotate Shape A 90° anti-clockwise about (0,1) 
Reflection	The size does not change, but the shape is '**flipped**' like in a **mirror**. Line $x = ?$ is a **vertical line**. Line $y = ?$ is a **horizontal line**. Line $y = x$ is a **diagonal line**.	Reflect shape C in the line $y = x$

		
Enlargement	The shape will get **bigger or smaller**. Multiply each side by the **scale factor**.	Scale Factor = 3 means '3 times larger = multiply by 3' Scale Factor = ½ means 'half the size = divide by 2'
Finding the Centre of Enlargement	Draw **straight lines** through **corresponding corners** of the two shapes. The centre of enlargement is the point **where all the lines cross over**. Be careful with negative enlargements as the corresponding corners will be the other way around.	
Describing Transformations	Give the following information when describing each transformation: Look at the number of marks in the question for a hint of how many pieces of information are needed. If you are asked to describe a 'transformation', you need to say the **name of the type of transformation** as well as the other details.	**- Translation, Vector** **- Rotation, Direction, Angle, Centre** **- Reflection, Equation of mirror line** **- Enlargement, Scale factor, Centre of enlargement**
Negative Scale Factor Enlargements	Negative enlargements will **look like they have been rotated**. $SF = -2$ will be rotated, and also twice as big.	Enlarge ABC by scale factor -2, centre (1,1)

		 C B A A' B' C'