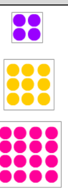
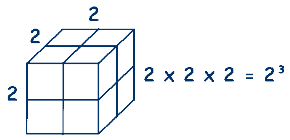
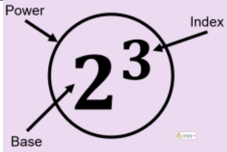
Y11 Maths Knowledge Organiser – Half term 1

Types of Number – Key Vocabulary			Examples
1	**Prime number**	A whole number greater than one that has exactly two factors.	2 (factors 2,1) 3 (factors 3,1) 37 (factors 37,1) 51 is not prime (factors 51,17,3,1)
2	**Prime numbers 1-20**	2, 3, 5, 7, 11, 13, 17, 19	
3	**Factor**	Any whole number that divides exactly into another number leaving no remainder.	Factors of 20 are: 1, 2, 4, 5, 10, 20
4	**Multiple**	The result of multiplying a number with a whole number (times tables!)	Multiples of 8: 8, 16, 24, 32, 40, ….
5	**Lowest Common Multiple (LCM)**	The LCM of 2 or more numbers is the smallest number that is a multiple of each of those numbers.	The LCM of 8 and 12 is 24.
6	**Highest Common Factor (HCF)**	The HCF of 2 or more numbers is the largest number that is a factor of each of those numbers.	The HCF of 18 and 30 is 6.
7	**Prime factor**	A factor that is also a prime number.	Factors of 12 are 1,2,3,4,6 and 12; 2 and 3 are prime factors
8	**Prime factor decomposition**	The process of expressing a number as a product of factors that are prime numbers. Also called product of prime factors.	24 = 2 x 2 x 2 x 3 or 2^3 x 3
9	**Product**	The result of multiplying one number by another.	The product of 2 and 3 is 6 since 2 x 3 = 6
Decimals & Rounding – Key Vocabulary			**Examples**
10	**Significant figures**	The total number of digits in a number, not counting zeros at the beginning or the end of a number.	345 000 has 3 significant figures 0.3047 has 4 significant figures
11	**Estimate**	Find a rough or approximate answer by calculating with numbers rounded to one significant figure.	2.3 x 18.4 ≈ 2 x 20 = 40
12	**Upper Bound**	The highest value that would be rounded down to a number.	A number, n, is rounded to 5.3 to 1 decimal place.
13	**Lower bound**	The lowest value that would be rounded up to a number.	Upper Bound = 5.35 Lower Bound = 5.25
14	**Error interval**	The range of values (between the upper and lower bounds) in which the precise value could be.	Error interval is: $5.25 \leq n < 5.35$
15	**Truncate**	A method of approximating a decimal number by dropping all decimal places past a certain point without rounding.	3.14159265 can be truncated to 3.1415
Indices – Key Vocabulary			**Examples**
16	**Square number**	The result of multiplying a number by itself. It will always be positive.	 4 — 2^2 or 2 x 2 = 4 9 — 3^2 or 3 x 3 = 9 16 — 4^2 or 4 x 4 = 16
17	**First fifteen square numbers**	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225	
18	**Cube number**	The result of multiplying a number by itself, then itself again.	
19	**First six cube numbers**	1, 8, 27, 64, 125, 216	
20	**Square root**	The opposite of squaring a number to find the original factor.	$\sqrt{9} = 3 \text{ or } -3$ Since $3^2 = 9$ and $(-3)^2 = 9$
21	**Cube root**	The opposite of cubing a number to find the original factor.	$\sqrt[3]{64} = 4$ Since $4^3 = 64$ Note: $(-4)^3 = -64$ so $\sqrt[3]{64} \neq -4$

22	**Index notation**	The notation in which a product such as a x a x a x a = a^4 where the number 4 is called the index (plural indices) and the number represented by a is called the base number.	
23	**Multiplying indices**	$a^n \times a^m = a^{n+m}$ Same base numbers, ADD the indices.	$a^3 \times a^5 = a^{3+5} = a^8$
24	**Dividing indices**	$a^n \div a^m = a^{n-m}$ Same base numbers, SUBTRACT the indices.	$a^6 \div a^2 = a^{6-2} = a^4$
25	**Indices with Brackets (2 indices)**	$(a^n)^m = a^{n \times m}$ MULTIPLY the indices	$(a^4)^3 = a^{4\times3} = a^{12}$
26	**Indices with Brackets (coefficient and a variable)**	$(ab)^n = a^n \times b^n = a^n b^n$ Raise each number or variable to the same index	$(ab)^3 = a^3 \times b^3 = a^3 b^3$ $(2c)^4 = 2^4 \times c^4 = 16c^4$
27	**Index of zero**	$a^0 = 1$ Any number or variable to the index of zero equals 1.	$8^0 = 1$
28	**Hidden index of 1**	Every number has an index.	3 is actually 3^1.
29	**Fractional index**	A fractional index represents a root.	$x^{½} = \sqrt{x}$
30	**Reciprocal**	The reciprocal of a number is 1 divided by the number. The reciprocal is shown as $\frac{1}{x}$, or x^{-1} Any non-zero number multiplied by its reciprocal is equal to one.	Reciprocal of 4 is $\frac{1}{4}$ since $4 \times \frac{1}{4} = 1$ Reciprocal of $\frac{3}{5}$ is $\frac{5}{3}$ since $\frac{3}{5} \times \frac{5}{3} = 1$
31	**Negative index**	A negative index represents the reciprocal.	$x^{-1} = \frac{1}{x}$
Fractions – Key Vocabulary			**Examples**
32	**Proper fraction**	The numerator is smaller than the denominator.	$\frac{3}{8}$
33	**Improper Fraction**	The numerator is greater than or equal to the denominator.	$\frac{7}{2}$
34	**Mixed Number**	A whole number and a fraction.	$2\frac{3}{5}$
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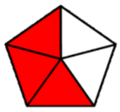
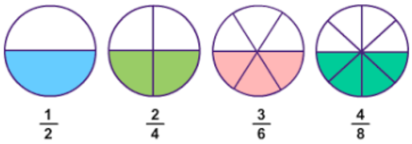
36	**Equivalent Fractions**	Fractions which have the same value. The numerator and the denominator can be multiplied or divided by the same number.	x5 $\frac{2}{3} = \frac{10}{15}$ x5
37	**Simplify/cancel a fraction**	Reduce a fraction to an equivalent fraction with the lowest possible numbers in both numerator and denominator. The numerator and the denominator are divided by the same number.	÷4 $\frac{8}{20} = \frac{2}{5}$ ÷4

Fraction - Key Skills			Examples
38	**Shade/recognise a fraction**	 $\frac{3}{5}$ 3 red parts 5 parts altogether	
39	**Use diagrams to show equivalent fractions**		
40	**Convert a mixed number to an improper fraction**	Change the whole number into a fraction (same denominator) and add on the the fraction part.	$2\frac{3}{4} = \frac{4}{4} + \frac{4}{4} + \frac{3}{4} = \frac{11}{4}$
41	**Convert an improper fraction to a mixed number**	Write the improper fraction as an addition of whole numbers and the remaining fractional part.	$\frac{11}{3} = \frac{3}{3} + \frac{3}{3} + \frac{3}{3} + \frac{2}{3} = 3\frac{2}{3}$
42	**Find a fraction of an amount**	Find the unit fraction first by sharing the amount into the number of equal parts (the denominator). Then multiply by the number of parts you want (the numerator).	Find $\frac{2}{5}$ of £60 $\frac{1}{5} = 60 \div 5 = 12$ $\frac{2}{5} = 12 \times 2 = 24$
43	**Add/subtract fractions**	Make the denominators the same (find the LCM). Use equivalent fractions to change each fraction to the common denominator. Add/subtract the numerators only. NEVER add/subtract denominators.	$\frac{1}{2} + \frac{2}{5}$ Common denominator is 10 $\frac{5}{10} + \frac{4}{10} = \frac{9}{10}$
44	**Multiply fractions**	Multiply the numerators. Multiply the denominators.	$\frac{1}{2} \times \frac{2}{5} = \frac{2}{10}$
45	**Divide fractions**	Keep the first fraction the same and multiply by the reciprocal of the second fraction (the dividend).	$\frac{1}{2} \div \frac{2}{5}$ $= \frac{1}{2} \times \frac{5}{2}$ $= \frac{5}{4}$
Decimals & Rounding – Key Vocabulary			**Examples**
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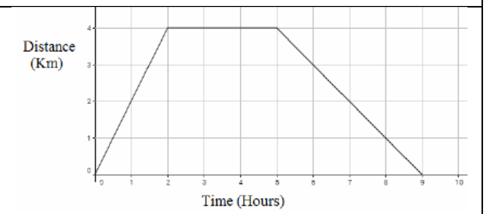
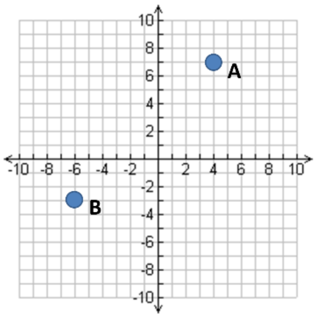
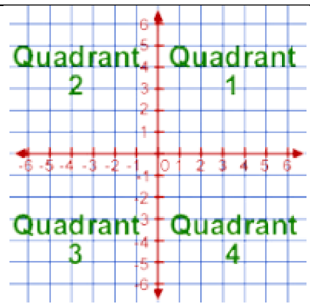
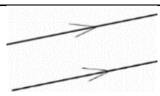
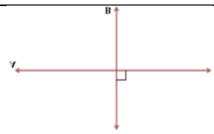
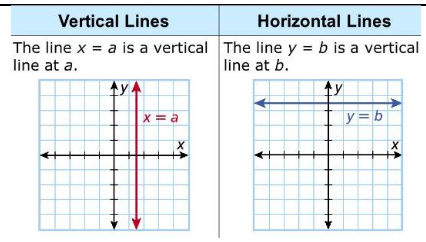
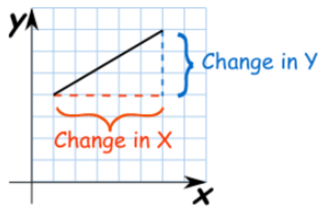
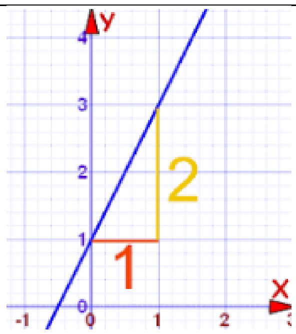
51	**Truncate**	A method of approximating a decimal number by dropping all decimal places past a certain point without rounding.	3.14159265 can be truncated to 3.1415

Ratio – Key Vocabulary & Skills			Examples
52	**Ratio**	A part to part comparison. The ratio of a to b is written a:b. A ratio of 1:2 has three parts in total and can therefore be written as the proportions ⅓ and ⅔.	
53	**Unitary Ratio**	a:b can be changed into the unitary ratio $1 : \frac{b}{a}$ or $\frac{a}{b} : 1$	
54	**Simplifying Ratios**	Ratios can be simplified by dividing each part of the ratio by the same number.	
Compound measures – Key Vocabulary			**Examples**
55	**Compound measures**	Measures made up of two or more other measures, with the unit being a combination of those measures.	Speed can be made from for example: miles travelled in a hour → mph metres travelled in a second → m/s
56	**Speed**	Compound measure made from distance and time $Speed = \frac{Distance}{Time}$	
57	**Density**	Compound measure made from mass and volume $Density = \frac{Mass}{Volume}$	
58	**Pressure**	Compound measure made from force and area $Pressure = \frac{Force}{Area}$	
59	**Distance-Time Graphs**	A graph which allows you to find the speed from the gradient of the line. The steeper the line, the quicker the speed. A horizontal line means the object is not moving (stationary).	
Algebra – Key Vocabulary			**Examples**
60	**Integer**	Whole numbers including zero.	-2, -1, 0, 1, 2, 3 …
61	**Variable**	A letter used to represent any number.	x or y or p or t etc.
62	**Coefficient**	The number to the left of the variable (letter). This number is multiplying the letter.	$4x$ The coefficient of x is 4
63	**Term**	A term is a selection of numbers and variables multiplied together with the multiplication symbol hidden.	$12a$, $12a^6$, $\frac{5ab}{6}$ These are all terms.
64	**Expression**	A mathematical statement which contains one or more terms combined with addition and/or subtraction signs.	$4x + 3y - 2x$
65	**Equation**	Contains an equals sign (=) and has at least one variable.	$5x - 2 = 2x + 7$
66	**Formula**	A general rule that is usually expressed algebraically.	Area of a circle is $A = \pi r^2$
67	**Identity**	An equation that holds true for all values of its variables The symbol ≡ is used.	$a^2 - b^2 \equiv (a+b)(a-b)$ For all values of a and b

68	**Inequality symbols**	$>$ Greater than $\geq$ Greater than or equal to $<$ Less than $\leq$ less than or equal to	
Algebraic Operations – Key Vocabulary & Skills			**Examples**
69	**Substitution**	Replace letters in an expression with known values.	When $x = 2$, the value of $3x + 2 = 3(2) + 2 = 6 + 2 = 8$
70	**Collecting like terms**	Combining the like terms in an expression.	$4x + 3y - 2x$ is simplified to $2x + 3y$
71	**Expand**	The removal of brackets from an expression by using multiplication.	4(2a – 3) = 8a - 12
72	**Factorise**	To take out a common factor from every term in an expression, rewriting the expression using brackets. Factorising is the reverse of expanding brackets.	$6x^2 + 9x = 3x(2x + 3)$
73	**Solve**	Solving an equation is to find the numerical value of a variable.	$2x + 3 = 9$ $2x = 6$ (-3 both sides) $x = 3$ (÷2 both sides)
74	**Rearrange**	Equations and formulae can be rearranged to isolate a variable on one side of the equals sign.	
Linear Graphs – Key Vocabulary			**Examples**
75	**Origin**	The coordinate (0,0), where the x -axis and y-axis intersect.	
76	**Axis (plural: Axes)**	x-axis is horizontal ($y = 0$) y-axis is vertical ($x = 0$)	
77	**Coordinates**	Written in pairs and inside a bracket. The first term is the x-coordinate (movement across). The second term is the y-coordinate (movement up or down)	(4,7) indicates 4 right, 7 up from the origin. A: (4,7) B: (-6, -3) 
78	**Coordinate plane (grid)**	Divided into 4 quarters by the x-axis (horizontal) and the y-axis (vertical). Quadrant 1: x and y are positive Quadrant 2: x negative and y positive Quadrant 3: x and y are negative Quadrant 4: x positive and y negative	
79	**Function**	The relationship between a set of inputs and a set of outputs. f(x) read as "f of x".	If the input is -3 and the output is 9, we would write f(-3) = 9
80	**Parallel**	Always equidistant. Parallel lines have the same gradient. They never meet however far they are extended.	
81	**Perpendicular**	At right angles to another line.	

82	**Horizontal**	Parallel to the horizon. A horizontal line will always be in the form $y = a$ and every coordinate on this line will have a y-value of a.	
83	**Vertical**	At right angles to the horizontal plane. A vertical line will always be in the form $x = a$ and every coordinate on this line will have an x-value of a.	
84	**Midpoint of a Line**	The halfway point of a line. **To find the midpoint:** 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 halfway 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)
85	**Gradient**	The steepness of a line = $\frac{change\ in\ y}{change\ in\ x}$ For every unit to the right, the gradient is the movement up or down.	Positive gradient Negative gradient Zero gradient 
86	**Equation of a straight-line**	Written in the form **y = mx + c** Where **m** is the gradient of the line and **c** is the y-intercept (where the line crosses the y-axis)	 The line with equation $y = 2x + 1$ Has gradient 2 and y-intercept 1
87	**Parallel Lines**	Have the same gradient.	$y = 4x + 2$ and $y = 4x - 7$ as both have gradient 4
88	**Perpendicular lines**	The gradients multiply to give -1. i.e. $m_1 \times m_2 = -1$	$y = 3x + 2$ a perpendicular line will have gradient $-\frac{1}{3}$
89	**y-intercept**	Where the equation of a line intersects the y-axis	$y = 2x + 1$ intercepts the y-axis at (0,1).
90	**x-intercept**	Where the equation of a line intersects the x-axis.	$y = 2x - 8$ intercepts the x-axis at (4,0)