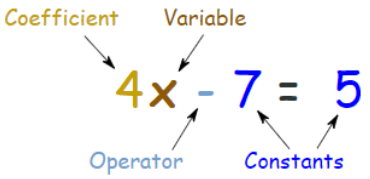
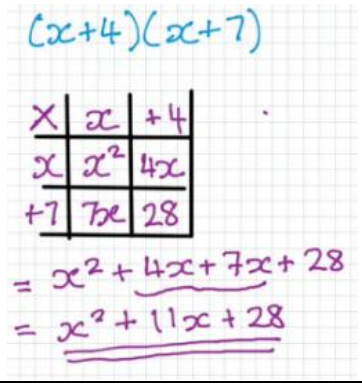
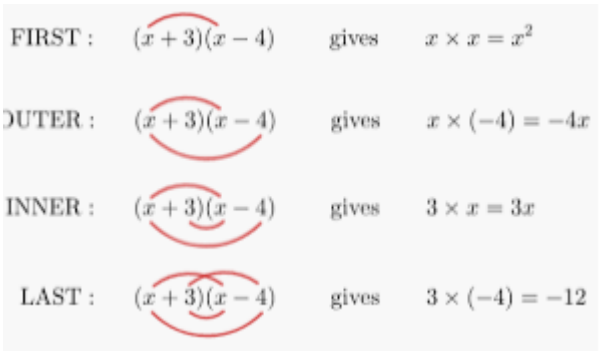
Year 8 Mathematics Core Term 2

Expressions and equations definitions

1.	Variable	A letter representing a varying or unknown quantity.	
2.	Coefficient	A number which multiplies a variable e.g. 4 is the coefficient in 4a	
3.	Term	One part of an expression/equation/formula Can involve multiplying and dividing coefficients and variables Separated from other terms by addition and subtraction	e.g. 4c $\frac{w}{5}$
4.	Like terms	Terms that have the same variable but have different coefficients	e.g. c + 4c are like terms c^2 and c^3 are not like terms
5.	Constant	A fixed value. A number on its own or sometimes a letter such as a, b or c to represent a fixed number.	
6.	Expression	One or a group of terms. Can include variables, constants, operators and grouping symbols. No 'equals' sign	e.g. 3y -3 $3y^2 + y^3$
7.	Equation	Contains an 'equals' sign, = Has at least one variable	e.g. 3y – 3 = 12
8.	Formula	A special type of equation that shows the relationship between a set of variables	
9.	Formulae	Plural of 'formula'	
10.	Identity	An equation that is true no matter what values are chosen, ≡	e.g. 3y ≡ 2y – y for any value of y.
11.	Subject	The variable on its own on one side of the equals sign.	
12.	Substitute	Replace a variable with a number.	$a = 3, b = 2$ *and* $c = 5$. **Find:** 1. $2a = 2 \times 3 = 6$ 2. $3a - 2b = 3 \times 3 - 2 \times 2 = 5$ 3. $7b^2 - 5 = 7 \times 2^2 - 5 = 23$
13.	Simplify	Minimising the size of an expression	
14.	Factorise	Splitting an expression into a product of factors	

15.	Expand	Removing brackets by using multiplication	
16.	Solve	Find the value of an unknown	
Algebraic Notation			
17.	Adding like terms	Add the coefficients	$b + 2b = 3b$
18.	Subtracting like terms	Subtract the coefficients	$5b - 4b = b$
19.	Multiplying like terms	If the base is the same, add the powers	$b \times b = b^2$
20.	Dividing terms	If the base is the same, subtract the powers	$b^5 \div b^2 = b^3$
21.	Adding different terms	Cannot combine if the terms are different.	$b + 2c = b + 2c$
22.	Subtracting different terms	Cannot combine if the terms are different.	$3c - 4 = 3c - 4$
23.	Multiplying different terms	Combine with no '×' sign	$d \times e = de$
24.	Multiplying different terms with coefficients	Combine with no '×' sign, multiply the coefficients	$2d \times 3e = d6e$
25.	Dividing different terms	Write as fractions with no '÷' sign	$3d \div e = \frac{3d}{e}$
26.	Dividing different terms with coefficients	Write as fractions with no '÷' sign, simplify the coefficients where possible.	$14d \div 7e = \frac{2d}{e}$
Expanding (single brackets)			
27.	Multiply all the terms inside the bracket, by the term on the outside.		
28.	$3(a + 4) = 3a + 12$	× $2x$ -3 / $2x$ $4x^2$ $-6x$	$4x^2 - 6x$
Factorising (single brackets)			
29.	• Find the highest common factor of the terms • This goes outside the bracket • Divide each term by the factor to get the new terms inside the bracket • Always check by expanding your bracket	$2x + 4y$	$2(x + 2y)$
		$5x^2y - 10xy$	$5xy(x - 2)$

Expanding double brackets

30.	Everything in the first bracket must be multiplied by everything in the second	
31.	Grid method  	FOIL method 

Factorising a quadratic expression

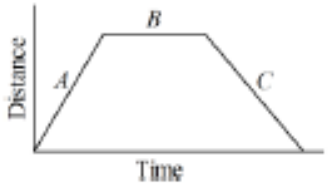
32.	Factorising a quadratic in the form of $ax^2 + bx + c$	Multiply to 5 Factorise $x^2 + 5x + 6$ ← Add to 6 2 and 3 add to 5 2 and 3 multiply to 6 $(x + 2)(x + 3)$ Check: $(x + 2)(x + 3) = x^2 + 5x + 6$
33.	Difference of two squares	A special type of quadratic which only has two terms. One term is subtracted from the other $x^2 - 25 = x^2 - 5^2 = (x + 5)(x - 5)$ $y^2 - 49 = y^2 - 7^2 = (y + 7)(y - 7)$ $a^2 - 16 = a^2 - 4^2 = (a + 4)(a - 4)$

Equations

34.	To solve equations we need to use inverse operations
35.	What ever you do to one side of the equals sign you must do the same to the other

36.	One step	$x+4=7$ $(-4)\quad(-4)$ $x=11$	$x-5=12$ $(+5)\quad(+5)$ $x=17$ $3x=18$ $(\div 3)\quad(\div 3)$ $x=1$ $\frac{x}{4}=6$ $(\times 4)\quad(\times 4)$ $x=24$
37.	Two step	Requires the use of two inverse operations	$2x-7=19$ $2x=26$ $x=13$
38.	With brackets	Expand the brackets first $5(2x+1)=35$ $10x+5=35$ $10x=30$ $x=3$	OR if possible divide by the number outside of the bracket first $4(2x+4)=20$ $2x+4=5$ $2x=1$ $x=\frac{1}{2}$
39.	Unknowns on both sides	Start by eliminating the unknown from one of the signs.	$5x+2=3x-8$ $2x+2=-8$ $2x=-10$ $x=-5$
40.	With fractions	Eliminate any terms that are being added or subtracted separate from the fraction first. $\frac{f}{5}+2=8$ $\frac{f}{5}=6$ $f=30$	If everything is part of the fraction then multiply by the denominator first. $\frac{f+2}{5}=8$ $f+2=40$ $f=38$

Real life graphs		
41.	Steady speed	Travelling the same distance each minute
42.	Velocity	Speed in a particular direction
43.	Rate of change	Shows how a variable changes over time
44.	Acceleration	How fast velocity changes; measured in m/s^2 or km/s^2 etc

Distance - Time graphs		
45.	Represent a journey	 A = steady speed, B = no movement, C = steady speed back to start
46.	Vertical axis represents the distance from the starting point	
47.	Horizontal axis represents the time taken	
48.	Straight lines mean constant speed	
49.	Horizontal lines mean no movement	
50.	Gradient = speed	
51.	Average speed = $=\frac{total\ distance}{total\ time}$	

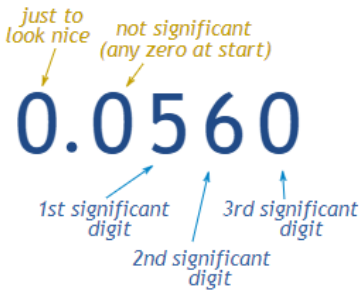
Year 8 Mathematics Core Term 3

Number Definitions

1.	Integer	A whole number and the negative equivalents.
2.	Positive	Greater than zero.
3.	Negative	Less than zero.
4.	Decimal	A number with digits after the decimal point.
5.	Operations	Symbols describing how to combine numbers.
		$\times \rightarrow$ Multiply, $\div \rightarrow$ Divide, $+ \rightarrow$ Add, $- \rightarrow$ Subtract,

Calculating with decimals

6.	Add & subtract decimals	Use the column method making sure making sure the decimal points are vertically aligned	3.8 − 1.26 → 3.80 − 1.26 = 2.54
7.	Multiply decimals	Multiply the integers and correct place value	Calculate: $\mathbf{4.32 \times 20.8}$ Use: $432 \times 208 = 89856$ So: $4.32 \times 20.8 = 89.856$ *2 dp 1 dp 3dp*
8.	Divide decimals	*Dividing a decimal by an integer*: Use short division ensuring that a decimal point is placed vertically above the decimal point in the dividend.	$4\overline{)14.8} = 3.7$
		Division with a decimal remainder: add a decimal point and additional zero's after the dividend to allow you to continue the short division as above.	Calculate: $\mathbf{57 \div 8}$ Use: $8\overline{)57.000} = 07.125$
		Dividing by a decimal: Multiply dividend and divisor by 10, 100 , 1000 so that the divisor becomes an integer then complete short division as above. N.B. Do not place value after the calculation!	Calculate: $\mathbf{6.488 \div 0.8}$ $\times 10 \quad \times 10$ Use: $64.88 \div 8 = 8.11$ So: $6.488 \div 0.8 = \mathbf{8.11}$
9.	Multiply any number between 0 and 1	Use the methods described above in: ii) Multiply decimals *N.B.* Value of the product will be smaller than the value of the multiplicand if the multiplier is between 0 and 1 and vice-versa.	$\mathbf{12 \times 0.2 = 6}$ And: $\mathbf{0.2 \times 12 = 6}$
	Divide any number between 0 and 1	Use the methods described above in: iii) Divide decimals *N.B.* Value of the quotient will be greater than the value of the dividend if the divisor is between 0 and 1.	$\mathbf{12 \div 0.2 = 60}$
10.	Use one calculation to find the answer to another	Given: $a \times b = c$ Then: $c \div b = a$ and $c \div a = b$ Adjust place value if necessary.	If: $\mathbf{19 \times 24 = 456}$ $456 \div 24 = 19$ $456 \div 19 = 24$ $1.9 \times 24 = 45.6$ $456 \div 190 = 2.4$ $19 \times 240 = 4560$

11.	Terminating decimal	A decimal that has digits that end.	0.25 (it has two decimal digits) 3.0375 (it has four decimal digits)
12.	Recurring decimal	A decimal with a digit or groups of digits that repeat forever.	$\frac{1}{3}$ = 0.333... = $0.\dot{3}$ = $0.\overline{3}$ Fraction — Ways to show recurring decimals
13.	Decimal place	The number of digits after the decimal point	
14.	Rounding	Changing a number to a simpler, easy to use value.	
15.	Approximate	An easier figure to use close to the value.	
16.	Significant figure	The digits of a number that express a size to a given degree of accuracy	

Rounding to decimal places

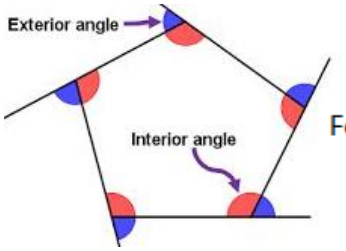
17.	• Count the number of decimal places you need • Look at the number directly to the right of that digit to decide if it rounds up or down • 5 or more means it rounds up; 4 or less means it rounds down		
18.	e.g. 256.1873	256.1 | 873	To 1 d.p. is 256.2
		256.18 | 73	To 2 d.p. is 256.19
		256.187 | 3	To 3 d.p. is 256.187

Rounding large numbers to significant figures

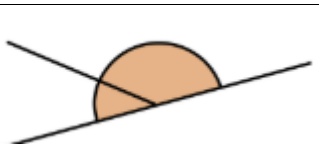
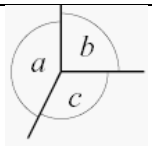
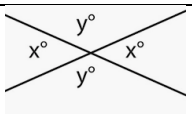
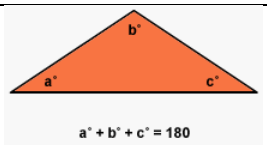
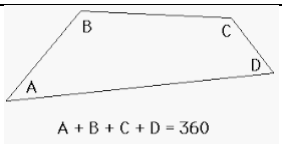
19.	• Count the number of digits you need from the left • Look at the number to the right of the digit to decide if it rounds up or down • 5 or more means it rounds up; 4 or less means it rounds down • Replace remaining digits with zeros as placeholders	

<table>
<tr><td rowspan="3">20.</td><td rowspan="3">e.g. 256. 1873</td><td>2 | 56.1873</td><td>To 1 s.f. is 300</td></tr>
<tr><td>25 | 6.1873</td><td>To 2 s.f. is 260</td></tr>
<tr><td>256 | .1873</td><td>To 3 s.f. is 256</td></tr>
<tr><td colspan="4">Rounding small numbers to significant figures</td></tr>
<tr><td>21.</td><td colspan="2">• Zeros are not significant until after the first non-zero term
• Find the first non-zero term and count the number of digits you need from there
• Look at the number directly to the right of that digit to decide if it rounds up or down
• 5 or more means it rounds up; 4 or less means it rounds down</td><td> 
</td></tr>
<tr><td rowspan="3">22.</td><td rowspan="3" colspan="2">e.g. 0.0023681</td><td>0.002 | 3681</td><td>To 1 s.f. is 0.002</td></tr>
<tr><td>0.0023 | 681</td><td>To 2 s.f. is 0.0024</td></tr>
<tr><td>0.00236 | 81</td><td>To 3 s.f. is 0.00237</td></tr>
<tr><td>23.</td><td>Estimating</td><td colspan="2">• Round each number to 1 significant figure before doing any calculations.
• It is acceptable to round one or more numbers in the calculation to a greater accuracy than 1 sig. fig. if this makes the calculation easier.
• DO NOT round the answer!</td><td>e.g. Estimate:
$\frac{\mathbf{3.91 \times 8789.8}}{\mathbf{620.9 \times 0.492}}$
$\frac{3.91 \times 8789.8}{620.9 \times 0.492} \approx \frac{4 \times 9000}{600 \times 0.5}$
$\approx \frac{3600}{300}$
$\approx \mathbf{120}$</td></tr>
</table>

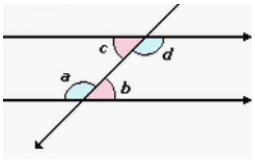
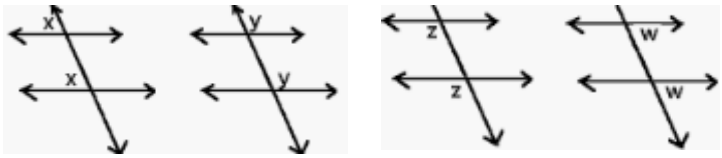
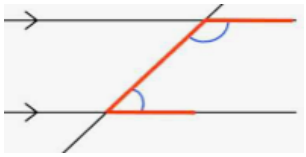
Angle definitions

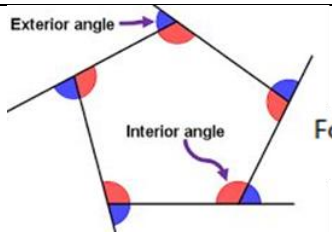
24.	Angle	A measure of turn, measured in degrees ◦	
25.	Protractor	Instrument used to measure the size of an angle	
26.	Acute angle	An angle less than 90◦	
27.	Right angle	A 90◦ angle	
28.	Obtuse angle	An angle more than 90◦ but less than 180◦	
29.	Reflex angle	An angle more than 180◦	
30.	Parallel lines	Lines that are equal distance apart that will never meet even when extended	
31.	Perpendicular lines	Lines that intersect at a right angle	
32.	Polygon	A 2D shape with straight lines only	
33.	Regular polygon	A polygon where: All sides are the same length All angles are the same size	
34.	Interior angles (I)	An angle inside a polygon	 For any polygon: $I + E = 180^0$

Basic angle rules

35.	Angles on a straight line add to 180◦	
36.	Angles around a point add up to 360◦	
37.	Vertically opposite angles are equal	
38.	Angles in a triangle add to 180◦	
39.	Angles in a quadrilateral add up to 360◦	

Angles on parallel lines

40.	Alternate angles are equal	
41.	Corresponding angles are equal	
42.	Co-interior angles add up to 180◦	

Angles in polygons		
43.	Interior and exterior angles add to give 180◦	 For any polygon: $I + E = 180^0$
44.	Sum of interior angles	For a 'n' sided polygon Sum of interior angles = 180 x (n-2)
45.	Size of one interior angle	For a 'n' sided polygon Interior angle =
46.	Sum of exterior angles	For all polygons, sum of exterior angles = 360◦
47.	Regular polygons	Exterior angle = 360 ÷ number of sides
		Number of sides = 360 ÷ exterior angle
		Interior angle = 180 – exterior angle