THE DUSTON SCHOOL 4-19
Knowledge itself is power

Year 10 Maths FOUNDATION Knowledge Booklet Term 3

Name:

Class:

Order	Unit	Links	Pre-requisite skills
1	Integers, powers & roots		
2	Lines, angles & shape		
3	Simplifying & substituting	Unit 1	Using powers, listing factors, understanding product / sum.
4	Area and perimeter	Unit 2	Forming expressions for area/perimeter algebraically through use of brackets, correct notation and simplifying expressions.
5	Calculations & Accuracy	Unit 1	Understanding numbers.
6	FDP	Unit 1	Using powers, understanding lowest common multiples.
7	Sequences, functions and graphs	Unit 3/5	Substituting into a function applying BIDMAS to calculate coordinates, factorising for roots of quadratics, understanding powers and all 4 operations with negatives.
8	Ratio & Proportion	Unit 1/7	Decimals/powers as multipliers, calculating/understanding fractions as parts.
9	Transformations	Unit 2/8	Identifying 90/180/270 degrees, plotting mirror lines of basic functions.
10	Pythagoras and Trigonometry	Unit 1/2/3/4/5	Powers/surds, types of triangles, use in area/perimeter problems to find required lengths, rounding answers.
11	Forming and solving	Unit 3/4	Properties of 2d shapes, angle facts including polygons & parallel lines, algebraic notation and simplifying, forming expressions.
12	Measures	Unit 1/7	Calculating, multiplying decimals and powers of 10 for metric conversions.
13	Volume and Surface area	Unit 4/5/13	Area of 2d shapes, rounding/calculating with bounds, conversion of units (length/area/volume), calculating missing sides using pythagoras/ trigonometry.
14	Probability	Unit 1/7	Types of numbers, calculating with fractions & decimals.
15	Inequalities	Unit 12/8/5/7	Solving equations, rounding, plotting graphs for regions, calculating with fractions.
16	Statistics	Unit 1/6/9/16	Using a protractor for pie charts, proportion to calculate angles for a pie chart, use of inequality symbols for recording data.

Homework 1 Due	
Homework 2 Due	
Homework 3 Due	

Year 10 - Term 3: Foundation

Overview	**Learning Objectives**		
Topic: Sequences, functions and graphs **Big Questions** - Convince me that there are no coordinates on the graph of $y=3x^2+4$ which lie below the x-axis - what is the same/ different between: 4, 7, 10, 13 and 13, 10, 7, 4	-Plotting straight line graphs from a table of values. -Recognise & plot horizontal & vertical lines. (x=1 , y=3). -Calculate the gradient of a linear graph. - Generate a sequence given the nth term rule. - Find the nth term rule given a sequence. - Mathematical reasoning with nth term rules. - Draw quadratic graphs from a table of values.	- Recognise and use sequences of quadratic and geometric sequences. - Solve simultaneous equations graphically. - Recognise and use sequences of triangular, square and cube numbers and Fibonacci type sequences. - Calculate the mid-point of a line. -Use y= mx + c to identify the equation of a line. - Use y = mx + c to identify parallel lines.	- Find the equation of a line through two points or one point with a given gradient. - Sketch graphs of cubic and reciprocal functions from a table of values. - Identify the turning point of a quadratic by sketching the graph. - Complete the square of a quadratic to calculate its turning point. -Geometric progression.
Topic: Ratio and Proportion **Big Questions** - What is the same / different: - 4:5 and £4:500p - 2:3, 34:51 and 3:2 - The answer is '£350 and £450'. What is the question?	- Solve problems involving recipes. - Introduction to proportion. (clip 42) - Calculate the best value of a product.	- Divide quantities by simple ratios. - Write ratios as a fraction. - Use ratio to convert between currencies. Use ratio to solve problems about exchange rates. -Ratio/fractions/graphs.	-Similar shapes length. - Similar shapes with area & volume.
Topic: Forming and solving equations **Big Questions** - Show me: - a linear equation with the solution x = 4 - a two-step linear equation with the solution x = 4 - what the same/ difference between: 3x– 2 = 2 and 3x = 4	- Solve simple linear equations using a flow chart. - Change the subject using a flow chart.	- Solve linear equations -Solve all forms of linear equations with unknowns on both sides. - Derive more complex formulae & equations from words. (including shape) -Mathematical reasoning. (is the sum of two odd number odd?)	- Factorise and **solve** quadratics in the form $ax^2 + bx + c = 0$ where a = 1. - Solve linear simultaneous equations.

Sequences, Functions and Graphs

Along the corridor, up/down the stairs (x, y)

How to Complete a Table and Plot a Straight Line Equation

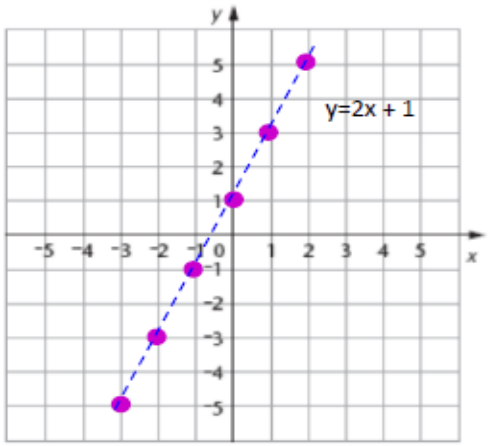
1. Complete the table by substituting (replacing) the x values from the table into the equation $y = 2x + 1$

   This will give you the *corresponding y values*

x	-3	-2	-1	0	1	2
y	-5	-3	-1	1	3	5

2. Plot the coordinates

   (2; 5) (1; 3) (0; 3) (-1; -1) (-2; -3) (-3; -5)



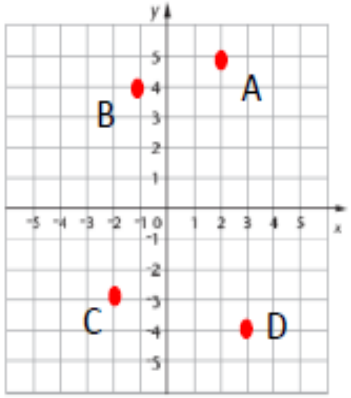
Always write the X first (across), then Y (up)

A (2 ; 5)

B (-1 ; 4)

C (-2 ; -3)

D (3 ; - 4)



Term to term rule tells you the next number in the sequence.

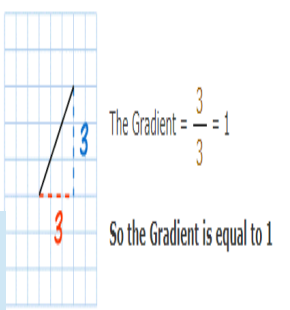
1, 3, 5, 7 [add 2]

29, 25, 21, 17 [subtract 4]

$y = mx + c$

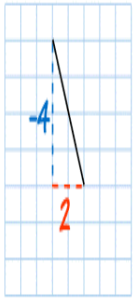
m is the gradient, or the slope of the graph

c is the y-intercept, or where the graph cuts the y-axis



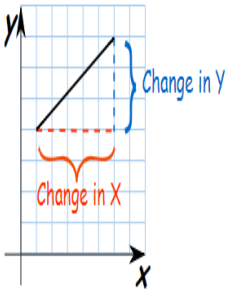
The Gradient = $\frac{3}{3} = 1$

So the Gradient is equal to 1



Gradient = $\frac{-4}{2} = -2$

Gradient = $\frac{\text{Change in Y}}{\text{Change in X}}$



A sequence is a series of numbers that follow a set pattern. Each number in a sequence is called a term.

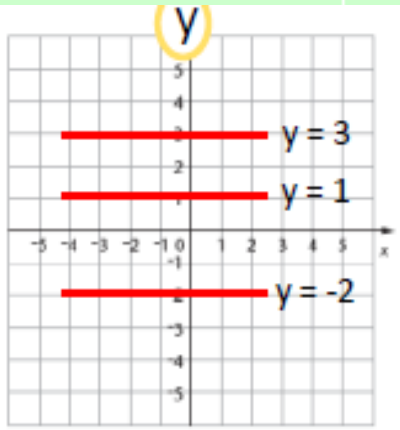
Linear Sequences

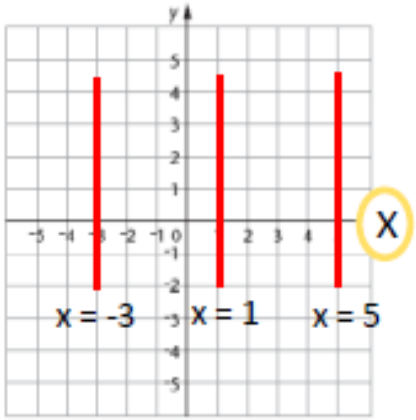
A *linear* sequence increases or decreases by the same amount from term to term

4, 11, 18, 25... or 12, 8, 4, 0...

Special Sequences

Square numbers: 1, 4, 9, 16, 25...
Cube numbers: 1, 8, 27, 125, 216...
*Triangular numbers: 1, 3, 6, 10, 15
**Fibonacci sequence: 0, 1, 1, 2, 3, 5...





How to find the nth term in a Linear Sequence

3 8 13 18 23

+5 +5 +5 +5

1. Find the *difference* between each term:

   5

2. Always put 'n' next to it (n = term number)

   5n

3. Add or subtract to get the first term in the sequence?

   5-2 = 3

The nth term is 5n -2

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Knowledge Recall **Term 3 HW: 1**

Date Due_____ **Score to beat**_____

Section A:Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Which is bigger: $\frac{7}{8}$ or 0.78?		11. Expand: y(y + 10)		21. Work out the height of a parallelogram of base 10m and area 60m^2.	
2. Which is bigger: 0.125 or 0.15?		12. Factorise: 14x + 21			
3. Increase £40 by 5%		13. Solve: 2(x + 3) = 8		22. Five of the angles of a hexagon are 12^0, 147^0 , 76^0, 104^0 and 105^0. What is the size of the 6th angle?	
4. Decrease £900 by 5%		14. Solve: 2x - 2 = x - 5			
5. Write 12 : 6 in form n: 1		15. Find the 10th term 5 8 11 14 17 ...		23. Work out the area of a triangle of base 12m and height 2.4m.	
6. 10 pens cost £4.20 Find the cost of 3 pens		16. If T(n) = 6n - 1, what is the 1st term?			
7. Estimate: 8552 ÷ 28		17. If y=4x - 1, find the value of y when x = -2		24. If the probability of a win is 0.2 and the probability of a draw is 0.1, what is the probability of a loss?	
8. If 25 x 68 = 1700 What is 1700 ÷ 6.8		18. If y = -4x + 1, find the value of y when x = 3			
9. Work out: $\frac{3}{4} - \frac{3}{5}$		***Use π = 3*** 19. Calculate the area of a circle with diameter of 10cm		25. Work out the volume of a cube where the area of a single face = 49mm^2?	
10. Work out: $\frac{3}{5}$ of 7kg		***Use π = 3*** 20. Calculate the length of the circumference of a circle with radius of 4cm			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	

RATIO & PROPORTION KNOWLEDGE ORGANISER

Key Facts - Ratio

Ratios are used to show how things are shared.

For example: The ratio of red smarties of blue smarties. For every 3 RED smarties there are TWO blue smarties

Red: Blue
3 : 2

Keywords

Common denominator	Proportion
Fraction	Ratio
Highest common factor	Simplify
Portion	Share

Common Problems and Misconceptions

- ❑ Not reading the question correctly and always assuming you divide the total by the total ratio

Key Facts – Sharing an Amount in Part of a Ratio (C)

Sharon and Bob share some money in a ratio 2 : 5
Bob gets £45 more than Sharon. How much does each person get?

1. Find the difference between the ratios 5 – 2 = 3
2. Divide: £45 ÷ 3 = 15
3. Multiply: 2 x 15 = 30 Sharon's share
4. Multiply: 5 x 15 = 75 Bob's share
   Check your answer: 75 – 30 - 45 ✓

Curriculum Flowchart

Simplify a ratio → Share an amount in a ratio → Write a ratio in the format 1:n → Write a ratio as a fraction → Ratios as scale factors

Key Facts – Sharing an Amount in a Ratio Sharing the WHOLE

Monty and Mosaurus get A TOTAL of £72 pocket money.

They share it in the ratio 5 : 3

How much do they each get?

- Add the ratios: 3 + 5 = 8
- Divide 72 by 8 (72 ÷ 8 = 9)

Each ONE portion is worth £9

Monty has 5 portions	Mosaurus has 3 portions
5 x 9 = £45	3 x 9 = £27

£72 split into 8 **equal** portions

Monty's share					Mosaurus's share		
£9	£9	£9	£9	£9	£9	£9	£9

Key Facts – Sharing an Amount in a Ratio (B)

In a school the ratio of boys to girls is 9 : 4.

There are 270 boys in the school. How many students are there in the school altogether?

Divide the total number of boys by the boy's ratio	Girls
270 ÷ 9 = 30	4 x 30 = 120
This gives the number for 1 'portion'	

Key Facts – Simplifying a Ratio

Ratios can be fully simplified just like fractions.

To simplify a ratio, divide all of the numbers in the ratio by the same number (highest common factor) until they cannot be divided any more.

Simplify: 6 : 12	Simplify: 6 : 1.5
Divide both by 6	Multiply both sides by 2
1 : 2	12 : 3
	Divide both by 3
	4 : 1

Key Facts – Writing in the Ratio 1 : n

When asked to write a ratio in the format 1 : n, you need to divide BOTH sides by the ratio where the 1 is.

Write 7 : 21 in the ratio 1: n

7 : 21 divide both sides by 7

1 : 3

Write 16 : 8 in the ratio 1: n

16 : 8 divide both sides by 16

$$1 : \frac{1}{2}$$

Key Facts – Write a Ratio as a Fraction

Bill and Mary share £50 in the ratio 2 : 3

Write Bill's share as a fraction: $\frac{2}{5}$

Bill's fraction

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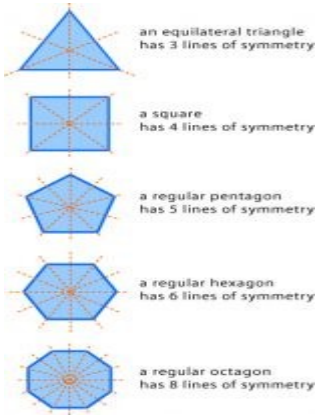
Knowledge Recall **Term 3 HW: 2**

Date Due_____ **Score to beat**_____

Section A:Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Which is bigger: $\frac{7}{8}$ or $\frac{3}{4}$?		11. Expand: y(2y + 1)		21. Work out the height of a parallelogram of base 5cm and area 45cm^2.	
2. Which is bigger: 12.5% or $\frac{3}{20}$?		12. Factorise: 3 - 6x			
3. Increase 44 by 10%		13. Solve: 3(x - 3) = 0		22. A quadrilateral has sides of 147^0 and 89^0 . If the other two angles are equal, what would one of these angle be?	
4. Decrease £680 by 10%		14. Solve: 5x + 1 = 3x + 3			
5. Write 10 : 2 in form n: 1		15. Find the 10th term 4 5 6 7 8 ...		23. Work out the height of a triangle with a base 10m and area 20m^2.	
6. 5 bags of plaster cover 35m^2 What will 7 bags cover?		16. If T(n) = 6n +2, what is the 3rd term?			
7. Estimate: 3670 ÷ 48		17. If y=4x + 3, find the value of y when x = -2		24. If the probability of a win is 0.12 and the probability of a draw is 0.6, what is the probability of a loss?	
8. If 264 x 16 = 4224 What is 4224 ÷ 2640		18. If y = -4x - - 3, find the value of y when x = -2			
9. Work out: $\frac{2}{3} + \frac{3}{4}$		***Use π = 3*** 19. Calculate the area of a circle with radius of 2cm		25. Work out the volume of a cuboid of edge 4m by 4cm by 7cm?	
10. Work out: $5 \times \frac{3}{4}$		***Use π = 3*** 20. Calculate the length of the circumference of a circle with radius of 7cm			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	

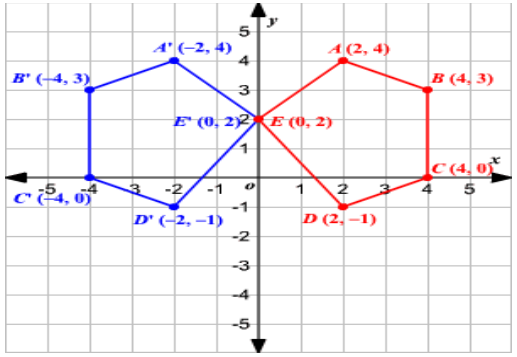
TRANSFORMATIONS KNOWLEDGE ORGANISER

REFLECTION

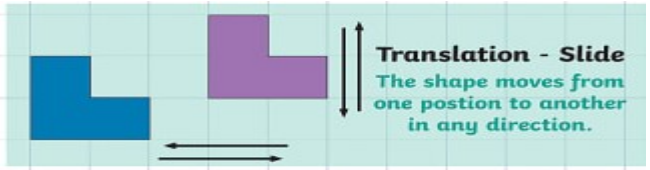


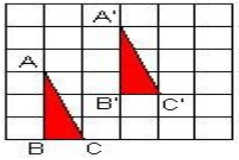
When an object is transformed by a reflection the object and its image are always the same perpendicular distance from the mirror line.

Perpendicular means 'at right angles to'.



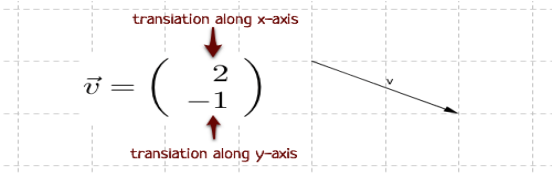
TRANSLATION



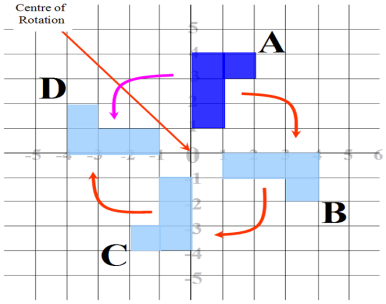


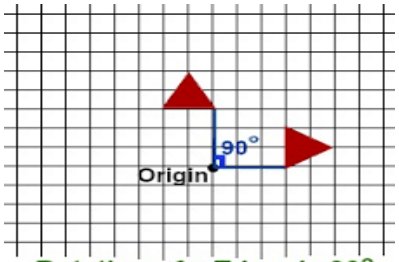
Each point moved 2 to the right and 2 up.

The vector describing this translation is: $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$



ROTATION





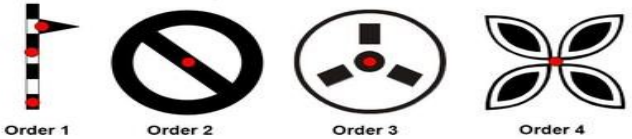
Rotation of a Triangle 90° about the origin

Rotational Symmetry

All 2 dimensional shapes have some rotational symmetry. The degree of rotational symmetry that an object has is known as its **order.**

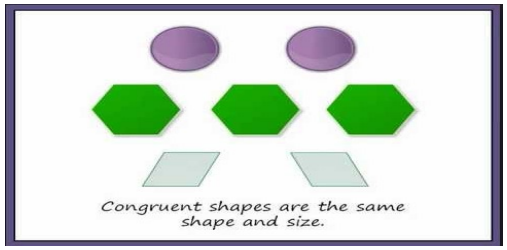
For shapes that have "order 2" rotational symmetry or higher, a single centre of rotation can be located.

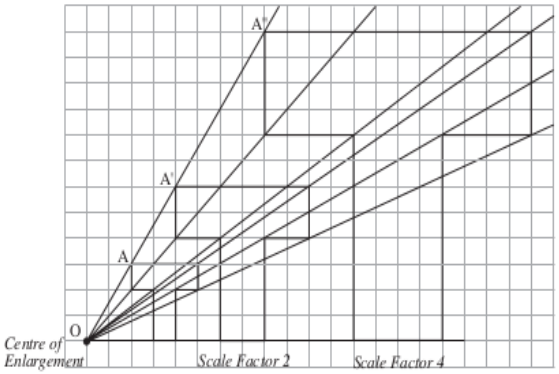
For shapes that have only "order 1" rotational symmetry a centre of rotation can be found anywhere within it.



The order of rotational symmetry that an object has is the number of times that it fits on to itself during a full rotation of 360 degrees.

Name	Shape	Order of Rotational Symmetry
Parallelogram		2
Regular Polygon with n sides	Examples:	n
Rhombus		2
Circle		Unlimited
Trapezium		None
Kite		None

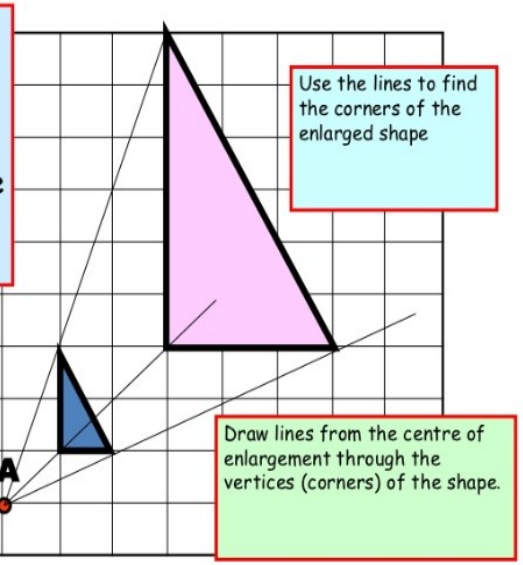




ENLARGEMENT

Enlarge this triangle by a scale factor of 3 using A as the centre of enlargement.

The new lines must be the length of the original distance from the centre of enlargement times the scale factor



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Knowledge Recall **Term 3 HW: 3**

Date Due_____ **Score to beat**_____

Section A:Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Which is bigger: $\frac{5}{8}$ or $\frac{2}{3}$?		11. Expand: y(5 – 3y)		21. Work out the height of a parallelogram of base 4cm and area 32cm^2.	
2. Which is bigger: 17.5% or $\frac{1}{6}$?		12. Factorise: 9x - 6x^2			
3. Increase 1200 by 2%		13. Solve: 3x - 3 = 2x		22. What are the three angles In an isosceles, right-angled triangle?	
4. Decrease £1200 by 2%		14. Solve: 3(x + 1) = 3			
5. Write 8 : 2 in form n: 1		15. Find the 10th term 2 5 8 11 14 ...		23. Work out the height of a triangle with a base 8m and area 12m^2.	
6. 6 bags of plaster cover 42m^2 What will 10 bags cover?		16. If T(n) = 7 - n, what is the 2nd term?			
7. Estimate: 285 ÷ 3.25		17. If x + y = 10, find the value of y when x = 3		24. If the probability of a win is 0.2 and the probability of a draw is 0.64, what is the probability of a loss?	
8. If 89 x 25 = 2225 Work out 8.9 x 250		18. If x + y = 10, find the value of y when x = -2			
9. Work out: $\frac{2}{3}$ x 2		***Use π = 3*** 19. Calculate the area of a circle with radius of 10cm		25. Work out the **surface area** of a cube of edge 3m?	
10. Work out: $8 \div \frac{4}{5}$		***Use π = 3*** 20. Calculate the length of the circumference of a circle with diameter of 6.2cm			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	