

Year 10 Maths Foundation Knowledge Booklet Term 4

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	Construction and LOCI	Unit 2	Measuring angles for bearings, parallel line angle facts.
7	FDP	Unit 1	Using powers, understanding lowest common multiples.
8	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.
9	Ratio & Proportion	Unit 1/7	Decimals/powers as multipliers, calculating/understanding fractions as parts.
10	Transformations	Unit 2/8	Identifying 90/180/270 degrees, plotting mirror lines of basic functions.
11	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.
12	Forming and solving	Unit 3/4	Properties of 2d shapes, angle facts including polygons & parallel lines, algebraic notation and simplifying, forming expressions.
13	Measures	Unit 1/7	Calculating, multiplying decimals and powers of 10 for metric conversions.
14	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.
15	Probability	Unit 1/7	Types of numbers, calculating with fractions & decimals.
16	Inequalities	Unit 12/8/5/7	Solving equations, rounding, plotting graphs for regions, calculating with fractions.
17	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 4: Foundation

Overview	Learning Objective		
Topic: TransformationsBig Questions- Convince me how to:- reflect a shape into a horizontal mirror line reflect a shape into a mirror line where the shape touches the line rotate a simple shape or object about its centre.	 Enlarge a shape by a positive scale factor. Rotate shapes about any point Reflect shapes in lines such as x = 2 and y = -1. Reflect shapes in the lines y = x and y = -x. 	 Enlarge a shape by a positive integer scale fac- tor from a given centre. Enlarge a shape by a positive fractional scale factor given a centre. 	
Topic: Pythagoras and Trigonometry Big Questions - What is the same/ different about (Diagram of) a triangle with sides 5cm, 12cm and an un- known hypotenuse and (diagram of) a triangle with sides 5cm, 12cm and an unknown shorter side - True/Never/Sometimes: - Pythagoras's Theorem can be used to find the lengths of sides in a right angle triangles	 Use Pythagoras' Theorem to calculate the length of the hypotenuse of a right- angled triangle. Use Pythagoras' Theorem to calculate the length of any side of a right-angled triangle. Use Pythagoras' Theorem to calculate the height of an isosceles triangle. Use Pythagoras' Theorem in practical problems. 		
Topic: Forming and solving equationsBig Questions- Show me:- a linear equation with the solution x = 4- a two-step linear equa- tion with the solution x = 4- what the same/ difference between: $3x-2=2$ and $3x=4$	- Solve simple linear equa- tions 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 for- mulae & equations from words. (including shape) Mathematical reasoning. (is the sum of two odd number odd?) 	 Factorise and solve quadratics in the form ax² bx + c = 0 where a = 1. Solve linear simultaneous equations.



TRANSFORMATIONS KNOWLEDGE ORGANISER

ROTATION











translation along y-axis

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.

Rotational Symmetry

etry

a regular octagon has 8 lines of symi

For shapes that have only "order 1" rotational symmetry a centre of

rotation can be found anywhere within it.

Order 2

Order 1

_ 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. Order 4 Order 3

Name	Parallelogram	Regular Polygon Exan with n sides	Rhombus	Circle	Trapezium	Kite
Shape			\diamond	0		\diamond
Order of Rotationa Symmetry	8	c	7	Unlimited	None	None

TRANSLATION

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'.

an equilateral triangle has 3 lines of symmetry

REFLECTION

'n

r' (-2, 4)





C (4, 0)^K

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D (2, -1) N

> 7 Ņ φ 4 ιņ

7 D' (-2, -1) Ņ

C [4]

etry

a regular hexagon has 6 lines of symm

B (4, 3)

ลิ

ო (0, 2)2)

B' (-4, 3)

of syn

a square has 4 lines o

a regular pentagon has 5 lines of symmetry



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Knowledge Recall



Date Due

Score to beat

Section A:Number	Section B: Algebra Geometry & measures	Section C: Using and applying	
1. Which is bigger: $\frac{3}{10}$ or $\frac{3}{5}$?	11. Expand: y(2 – 5y)	21. Work out the height of a parallelogram of base 5cm and ar	E.
2. Which is bigger: 0.96 or $\frac{19}{20}$?	12. Factorise: 9x - 6xy	60cm².	
3. Increase 1500 by 50%	13. Solve: 3x - 3 = x +5	22. Add the total internal angles of a	
4. Decrease £1200 by 25%	14. Solve: 5(x - 4) = 0	triangle and a hexagon.	
5. Write 12:18 in form 1: n	15. Find the 10th term 7 6 5 4 3	23. Work out the height of a triangle with a base 50cm and area 2m ² .	
 8 bags of plaster cover 32m² What will 17 bags cover? 	16. If T(n) = 3+ 2n, what is the 5 th term?		
7. Estimate: 285 x 32.5	17. If $x + y = 6$, find the value of y when $x = -2$	24. If the probability of a win is 0.02 i the probability of a draw is 0.8, w	nd lat
8. If 89 x 25 = 2225 Work out 222.5 ÷ 25	18. If x + y = 6, find the value of y when x = 8	is the probability of a loss?	
9. Work out: $\frac{5}{8} \times 2$	$\frac{Use \pi = 3}{19}$. Calculate the area of a circle with radius of 6m	25. Work out the surface area of a c of edge 0.2m?	pe
10. Work out: $6 \div \frac{3}{5}$	<u>Use π = 3</u> 20. Calculate the length of the circumference of a circle with radius of 4.5cm		
Total (A)	Total (B)	Total (C)	
Test Total (A+B+C)	R (0-9)	Y (10-19) G (2)	-25)



PYTHAGORAS' THEOREM AND TRIGONOMETRY KNOWLEDGE

ORGANISER

Key Facts – Pythagoras' Theorem

Where C is the	hypotenuse	
1 12 - 22		
2	5	

Pythagoras' Theorem is used to work out the length of

Key Facts - When would I use this?

Where the unknown side is the shorter (aka 'leg') side $= b^2$

– a²

²2

Pythagoras Theorem – An Algebraic approach

Pythagoras Theorem – Line on a graph

Pythagoras in 3D

Curriculum Flowchart

Pythagoras Theorem – A simple approach

150a 150b 150c 217

MathsWatch References and Worksheet Links

The HYPOTENUSE is the longest side.

any side in a right angle triangle.

Opposite

Hypotenuse

ch cos tan

4 Abs x³

1 540 Mt

RCL ENG ((-) ···· hy

Tri logal

C

Adiacent

Sin, Cos or Tan for length

is used to find the Shift 2nd function

angle size



Basic trigonometry is used to calculate angles and side lengths in right-angled

Important Ideas

triangles.

Trigonometry involves three ratios: sine, cosine and tangent which are

abbreviated to: *sin*, cos and tan.



the theorem in a

3D context

Know & apply

Hypotenuse

Shorter

.

sides

theorem

 $a^{2} + b^{2} = c^{2}$

right-angled parts of the Identify the

triangle.

Apply

Know the theorem

the



Shorter side (leg_

Hypotenuse

Square

Keywords

Sum (add)

Side

find the length of the slanted roof.

triangle and apply Pythagoras.

Draw the right angled-

Cover the term you are looking

TOA

CAH

HOS

Key Facts – SOH CAH TOA – Learn the Ratios

for.

To work out 'A', cover A and

<u>Example:</u> Using Cos ratio:

0|₹

 $fan \theta =$

<|⊥

 $\cos \theta =$

 $\sin \theta = \frac{0}{H}$

Cos Θ x Hypotenuse

×

×₽

X₀X

NO, this is NOT a right-

 $5^2 + 12^2 = 169$ cm

TEST for a Right-Angled Triar

 $\sqrt{169} = 13$ cm

The answer should be

exactly 13cm.

ພວຽ

angled triangle.

13.08cm

(65, 72, 97) (33, 56, 65)

(28, 45, 53) (12, 35, 37) (48, 55, 73)

(16, 63, 65) (36, 77, 85) (9, 40, 41)

(13, 84, 85)

(11, 60, 61) (20, 21, 29) (39, 80, 89)

(8, 15, 17)

(7, 24, 25)

(5, 12, 13)

(3, 4, 5)

Pythagorean Triples

Opposite

Right-angled

Square root

Pythagorean Triples)

(Look at the

12cm

my calculation is

You made need to do some 'rearranging formula' so practise this.

Write the equation, then substitute the information given

Solve the equation to find the missing length or angle

4 ŝ

က်

Label the triangle (hyp, opp, adj) - see diagram below

...i 5

Choose the correct ratio (sin, cos, tan)

R Angle in a Right-An

How to Calculate a Length

Knowledge Recall



Date Due

Term 4 HW: 2

Score to beat

Section A:Number	Section B: Algebra Geometry & measures	Section C: Using and app	lying
1. Which is bigger: $\frac{1}{8}$ or 12%?	11. Expand: w(3w – 4)	21. Work out the height of a parallelogram of base 6cr	m and area
2. Which is bigger: $\frac{3}{5}$ or $\frac{2}{3}$?	12. Factorise: 3 + 9x + 6y	27cm².	
3. Increase 160km by 30%	13. Solve: 4x + 3 = 2x + 9	22. Add the total internal ang	gles of a
4. Decrease £840 by 5%	14. Solve: 7(x – 4) = 7	pentagon and an octagor	
5. Write 25 : 75 in form 1: n	15. Find the 10th term 7 5 3 1 -1	23. Work out the height of a with a base 6m and area.	triangle 27m².
6. If 5 miles = 8km How many km is 40miles	16. If T(n) = 5 - 2n, what is the 4 th term?		
7. Estimate: 543 x 21	17. If $x + y = 8$, find the value of y when $x = -1$	24. If the probability of a win the probability of a draw	i is 0.24 and is 0.16,
8. If 89 x 25 = 2225 Work out 89 x 250	18. If $x + y = 8$, find the value of y when $x = 11$	what is the probability of	a loss?
9. Work out: $\frac{3}{4}$ of $7kg$	<u>Use π = 3</u> 19. Calculate the area of a circle with diameter of 14cm	25. Work out the surface are cuboid 2cm by 5cm by 3c	aaofa m?
10. Work out: $8 \div \frac{2}{3}$	<u>Use π = 3</u> 20. Calculate the length of the circumference of a circle with diameter of 14cm		
Total (A)	Total (B)	Total (C)	
Test Total (A+B+C)	R (0-9)	Y (10-19)	G (20-25)

DUSTON		FORMING AND SC	OLVING KNG	OWLEDGE ORG	ANISER		
SCHOOL				FORMING	; EQUATIONS FROM WORD:	S (INC SHAPES)	
EQUATIONS WITH UNKNO	WNS ON	BOTH SIDES AND BRACK	(ETS	Equations are used t	o represent situations, so that you c	an solve real-life problems.	
Solve $5x + 4 = 3x + 10$.		Solve $3(2x + 5) + x = 2(2 - x) + 2$.		The rectangle shown h	las a perimeter of 40 cm.	3x + 1	
There are more xs on the left-hand side, so leave the equat	tion as It is.	Multiply out both brackets. $6x + 15 + x = 4$	- 2x + 2	Find the value of x.			
Subtract $3x$ from both sides. $2x + 4 = 10$		Simplify both sides. 7x + 15 = 6	-2x	The perimeter of the r	ectangle is:	x + 3	
Subtract 4 from both sides. $2x = 6$		Incre are more xs on the left-hand slide, so leave Add 2× +0 hoth sides	the equation as it is.	O + O + X + 1 + XO	0 + 1 + x + 0 = 40		
Divide both sides by 2. $x = 3$		Subtract 15 from both sides. $9x = -3$	0	5ubtract 8. 8x	r = 32		
How to Solve a Simultaneous Equation Algebrai	ically	Divide both sides by 9. $x = -1$		Divide by 8. x	= 4		
Example A - EASY		CHANGING THE SUBJEC	Ч				
5x + y = 20 (1) Label equa $2x + y = 11$ (2) Subtract (2) from (1) to	ations to 'eliminate'	A formula usually has a single variable on one side of the variables becomes the subject. To do this you use inverse	· equals sign. This is called the su e operations (in a similar way to e 	ibject of the formula. Sometimes you solving equations) in order to isolate	will want to rearrange the formula so that one of the other the new subject.		
3x = 9		Example 1ExampleMake r the subject of $C = 2\pi r$.Make x t	$\frac{2}{he \text{ subject of } y = \frac{x}{e} + 3.$	Example 3 Make <i>r</i> the subject of $V = \frac{1}{2}\pi r$	Example 4 Make x the subject of $3x + 5 = y - ax$.		
3x = 9		To isolate r , divide by 2π . To isolate	s x, start by subtracting	$_{3}^{3}$ To start. isolate r^{2} by multiplyin	is by When a formula contains the new subject		
x = 3		$\frac{c}{2\pi} = r$ 3.	$y = \frac{x}{1}$	3 and then dividing by πh . $3V = \pi r^2 h$	more than once, start by isolating any terms including it on one side of the equals sign.	TTEP ATTON	
Substitute x = 3 into equation (1)		We often write formulae with	5 Iltiply by 5 – remember	$\frac{3V}{\pi\hbar} = r^2$	Here, add ax and subtract 5. 3x + ax = y - 5	TIEKAITON	
		the subject on the tert-hand to multip side, so this becomes hand side	Ny each term of the left- e. 5(v-3) = x	Now we square root both sides.	Now we factorise the side with our new subject.	 Iteration means the act of repeating a process with the approaching a desired goal, target or result. 	ie aim of
$3 \times 3 + y = 20$ 15 + v = 20 $y = 5$		$r = \frac{C}{2\pi}$	x = 5(v - 3)	$\frac{3V}{\pi h} = r$	x(3+a) = y - 5	1 P	
$y = 5$ Are the solutions to my ϵ	equations	***			Then divide by the bracket to leave x on its own.	1) Re-arrange the equation to make one of the x 's the sumple of the subject x_{n+1} and the other x becomes x_n	subject
How to Solve a Simultaneous Equation Algebrai Example B – MORE CHALLENGING	ically			$r = \sqrt{\frac{3V}{\pi\hbar}}$	$x = \frac{y-5}{3+a}$	 Substitute in a value of x (this is either x₀or x₁) to profirst result Now keep substituting vour solutions back in until vou 	oroduce your
						converses out the required degree of accuracy require stimulated.	red, or
3x + 9y = 36 (1) Label equations 2x + 3y = 15 (2) Label equations	20	Content When we colve nuadratic enurations there will be two QUADRATIC EQUATIONS	<u>Method 2 – Completing th</u> This method can be used w the quadratic and usually h	e <u>Square</u> when we can't easily factorise has surds in the solutions.	Method 3 – The Quadratic Formula This method is also used when we cannot easily factorise the quadratic. This will be on a calculator paper and the	$x^2 - 5x + 6 = 0$ 1) Re-arrange to make one of the x's the subject:	
3x + 9y = 36 2xx 3 + 3yx 3 = 15x 3 Multiply all terms	s bv 3 to	You can also solve quadratic equations using a graph, find the points where the graph crosses the x-axis, these are	Example Solve $x^2 - 4x - 3 = 0$		For quadratic equations of the form	$x^2 = 5x - 6$ $x = \sqrt{5x - 6}$	
equate the coeffi	icient		Rearrange so that the unkr χ^2 –	nowns are on one side $-4x = 3$	$x = \frac{-v \pm v v^24uc}{2a} \qquad ax^2 + bx + c = 0$	a second a solds out but a training off class (c	
3x + 9y = 36 of y, then you elit 6x + 9y = 45	minate	Method 1 – Factorisation First we factorise the quadratic into 2 brackets. As at	Halve the coefficient of x . a bracket, along with x , an	This number must be put into d squared. We then subtract	Example color 202 - 112 - E - 0. Circo concretente en dociment	2) Make the subject x_{n+1} and the other x becomes x_n	
-3x = -9 Subtract (2) from (1) to '	'eliminate' v	reast one of these brackets must equal of we then have 2 linear equations to solve.	the square of this number $(x-2)$	$2)^2 - 4 = 3$	JUNE 24 T 114 - J - U. UNE YOU BISMELLU Z UCUITAL	$q - u_{XC} \wedge = 1 + u_X$	
x = 3		Example	Solve the equation $(x - (x $	$-2)^{2}=7$	a = 2, b = 11, c = -5 Substitute these into the quadratic formula, use brackets	3) Substitute in a value of x (this is either x_0 or x_1) to produresult	duce your first
Substitute x = 3 into equation (1)		Solve $x^2 - 2x - 15 = 0$	- x	$2 = \pm \sqrt{7}$	for negative numbers. $-11 + ./11^2 - 4 \times 2 \times (-5)$	$x_{n+1} = \sqrt{5x_n - 6}$	
3 x 3 + 9y = 36		Factorise into 2 brackets $(x + 3)(x - 5) = 0$	$x = 2 + \sqrt{7}$	$\overline{7}$ or $x = 2 - \sqrt{7}$	x = x - x + x - x + x - x + x + x + x + x +	$\cdot x_i = 4$	
9 + 9y = 36 x = 3		Either $(x + 3) = 0$ or $(x - 5) = 0$	Remember that the square	e root of a number can be	to find your two solutions. x = -5.92 or $x = 0.42$	$x_2 = \sqrt{5(4) - 6}$	
y = 3 Are the solutions to my	/ equations	Therefore $x = -3$ or $x = 5$				$= 3.741657$ • $x_3 = \sqrt{5(3.741657) - 6}$	
PROOF "oof": Ve	erify that, Sh	ow that, and Prove that				= 3.564868	
 At the lowest level (verification), 	all you have t	o do is to substitute numbers into the re	esult to			• $x_4 = \sqrt{3}(3,394000 \dots) - 0$ = 3,438654	
 At the middle level works. 	فيما فيطف 1	بالممام معمد مطرميم بالبيب عليات كم تكلف				• $x_5 = \sqrt{5(3.438654) - 6}$ and so on. Carrying t = 3.345634 eventually converge on roots at $x = 3$	ng this on will e on one of the
	SDOW UIDL DUI	U SIDES OF UP FESSIFI ATE UTE SAFIJE ALECTI	AICALV.				

At the highest level (proof), you have to manipulate the left-hand side of the result to become its right-hand side.

The following example demonstrates these three different procedures.

Knowledge Recall



Date Due

Term 4 HW: 3

Score to beat

Section A:Number	Section B: Algebra Geometry & measures	Section C: Using and applying	
1. Which is bigger: $\frac{3}{8}$ or 0.3	11. Expand: x(3y - 4)	21. Work out the area of a parallelo; with a base of 12cm and a heigh	am of
2. Which is bigger: $\frac{7}{9}$ or $\frac{5}{6}$?	12. Factorise: 5 + 10x + 15y	4cm	
3. Increase £520 by 10%	13. Solve: 4x - 3 = x + 9	22. Add the total internal angles triangle, quadrilateral an octago	of a and
4. Decrease £2500 by 1%	14. Solve: 3(2x + 5) = 3	subtract the internal angles of a nonagon.	
5. Write 150 : 75 in form n : 1	15. Find the 10th term 4 9 14 19 24	23. Work out the area of a triangle v height of 6m and a base length o	ith a
6. If 5 miles = 8km How many km is 55miles?	16. If T(n) = 4 + 3n, what is the 2 nd term?	14m	
7. Estimate: 836.3 x 42	17. If $y = 2x+3$, find the value of y when $x = 5$	24. If the probability of a train being time is 0.24 and the probability o	on Fit
8. lf 24.5 x 32 = 784 Work out 245 x 320	18. If x - y = 8, find the value of y when x = 11	being late is 0.66 what is the probability of it being early?	
9. Work out: $rac{2}{5}$ of $f 16$ miles	$\frac{Use \pi = 3}{19}$. Calculate the area of a circle with radius of 1m	25. Work out the surface area of a cuboid 3cm by 3cm by 4cm?	
10. Work out: $6 \div \frac{5}{9}$	$Use \pi = 3$ 20. Calculate the length of the circumference of a circle with diameter of 10.4cm		
Total (A)	Total (B)	Total (C)	
Test Total (A+B+C)	R (0-9)	Y (10-19) G (2)-25)