

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

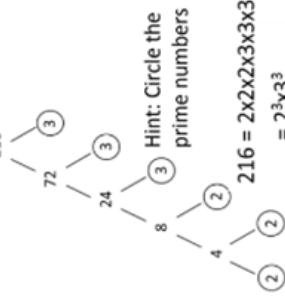
Homework 3 Due



Overview	Learning Objective	
<p><u>Topic: Integers, Powers and Roots</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - Which has the greatest value $(2^3)^4$ or $(2^4)^3$? - List all the factors of m^2n^2p - Who might use standard form in their jobs? - What's the same and what's different about 3×10^6 and 3×10^{-6}? 	<ul style="list-style-type: none"> - Calculate HCF and LCM of pairs of numbers. - Know that anything to the power of 0 is 1. - Know and use the index laws for multiplication and division of positive integer indices. 	<ul style="list-style-type: none"> - Convert from ordinary to standard form. Both positive & negative powers. - Convert from Standard form to ordinary numbers. - Know that $(a^b)^c = a^{bc}$
<p><u>Topic: Lines, angles and shapes</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - A square and a regular hexagon tessellate with another regular shape. How many sides does this shape have? - Why do exterior angles always add up to 360°? - What is the correct name for an F angle? 	<ul style="list-style-type: none"> - Use angle facts to solve problems involving triangles. - Use angle facts to solve quadrilateral problems. - Circle definitions. - Calculate interior and exterior angles of a regular polygon. - Solve problems involving corresponding, alternate and supplementary angles. 	<ul style="list-style-type: none"> - Recognise tangents, arcs, sectors and segments of circles.
<p><u>Topic: Simplifying and substituting</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - What's the same/different - $6y+3y$ and $3(2y+y)$ and $9y$ - List all the factors of 24 / 13 / 60 - Show that $a^2b^2 - 16x^4$ is the difference of two squares. 	<ul style="list-style-type: none"> - Substitute numbers into an expression. - Substitute numbers into a formula and more complicated formula. - Substitute numbers into more complicated formula. - Expand single brackets. 	<ul style="list-style-type: none"> - Expand and simplify. - Expand quadratics. - Interpret basic functions. $(f(5))$ - Factorise single brackets.

Prime Factor Tree

216



$$216 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^3 \times 3^3$$

Lowest Common Multiple and Highest Common Factor

First draw a PFT and then place in the venn diagram.



HCF: Multiply the middle numbers

LCM: Multiply all the numbers

Integers

"Integer" is just a posh word for **whole number**.

The thing to remember is that integers can be **positive** or **neg**. **Shared by two or more things.**
So: 1, 7, 298, -3, 0 and -49 are all integers, but 2.5 is not and neither is $3\frac{5}{8}$!

Multiples

The Multiples of a number are all the numbers in **your number's times table**.

Don't forget: you must count the number itself!

e.g. Some multiples of 7 are: 7, 14, 21, 28... but there are loads more, like 700 and 4445

Factors

The Factors of a number are all integers that **divide into your number exactly** (there must not be a remainder!)
Don't forget: 1 is a factor of all numbers, and so is the number itself!

e.g. The factors of 12 are: 1, 2, 3, 4, 6 and 12

Prime Number	A positive integer greater than 1 that can only be divided by itself and 1 without leaving a remainder.
Base	The big number on the <u>left</u> ; the number that will be multiplied by itself.
Index	The small number on the top-right; the number of times a value is multiplied by itself.
Power of exponent	Another word for index.
Indices	Plural of index
Reciprocal	The reciprocal of a number is one divided by that number

7, 23, and 67 are examples. 1 is not a prime number.
5 is the base in 5^3
3 is the index in 5^3
3 to the power of 2 = 3^2
The reciprocal of 4 is $\frac{1}{4}$
which is equal to 0.25

Remember

$$a^2 + a^2 = 2a^2 \quad \text{BUT} \quad a^2 \times a^2 = a^4$$

Steps to estimate a square root

- 1: Identify the **square on either side**.
- 2: Place the squares and their roots at **either end of a blank line**.
- 3: Identify the **halfway point**.
- 4: **Place** your number on the line.
- 5: **Estimate** its position.
- 6: **Square** your answer to check.

Rule	Example
1 $x^1 = x$	$5^1 = 5$
2 $x^0 = 1$	$5^0 = 1$
3 $x^n \times x^m = x^{n+m}$	$x^2 \times x^3 = x^{2+3} = x^5$
4 $x^n \div x^m = x^{n-m}$	$x^5 \div x^2 = x^{5-2} = x^3$
5 $(x^n)^m = x^{n \times m}$	$(x^3)^2 = x^{3 \times 2} = x^6$

Standard Form

A number in standard form must be written in this way.

$$\begin{matrix} \text{A number} & & \text{A power of} \\ \text{between 1} & \times & 10 \\ \text{and 10} & & \end{matrix}$$

$$2 \times 10^{15} \text{ and } 1.5 \times 10^{-12}$$

Going from standard form to ordinary numbers

$$5 \times 10^{10} = \boxed{50\,000\,000\,000} \quad 0.0006 = \boxed{6 \times 10^{-4}}$$

$$7.1 \times 10^6 = \boxed{7\,100\,000} \quad 0.00000072 = \boxed{7.2 \times 10^{-7}}$$

Look at the power: positive the number will get bigger, if negative the number will be smaller.

Date Due _____

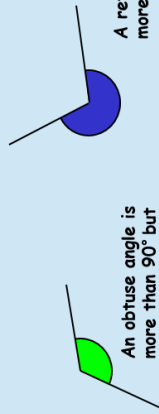
Score to beat _____

Section A: Number	Section B: Algebra Geometry & measures	Section C: Using and applying
1. Which is bigger: $\frac{3}{7}$ or $\frac{2}{5}$?	11. Expand: $3(x + 5)$	21. Work out the area of a parallelogram of base 6cm and height 8cm.
2. Which is bigger: 0.45 or $\frac{2}{5}$?	12. Factorise: $3x + 9$	
3. Increase £30 by 15%	13. Solve: $2(x - 5) = 7$	22. Three of the angles of a quadrilateral are 120° , 48° and 92° . What is the size of the 4 th angle?
4. Decrease £40 by 15%	14. Solve: $3x + 1 = 2x + 10$	
5. Write 4 : 8 in form 1: n	15. Find the 10th term 1 3 5 7 9 ...	23. Work out the area of a triangle of base 6cm and height 8cm.
6. 10 pens cost £2.50 Find the cost of 7pens	16. If $T(n) = 3n - 1$, what is the 3 rd term?	
7. Estimate: 32×43	17. If $y = 3x + 2$, find the value of y when $x = -2$	24. If the probability of rain is 0.87, what is the probability of NO rain?
8. If $36 \times 47 = 1692$ What is 3.6×47 ?	18. If $y = -3x - 2$, find the value of y when $x = 2$	
9. Add: $\frac{1}{3}$ and $\frac{1}{4}$	19. Calculate the area of a circle with radius of 5cm <u>Use $\pi = 3$</u>	25. Work out the volume of a cuboid 5cm by 3cm by 6cm?
10. Work out: $\frac{2}{5}$ of 8	20. Calculate the length of the circumference of a circle with diameter of 6cm <u>Use $\pi = 3$</u>	
Total (A)	Total (B)	Total (C)
Test Total (A+B+C)	R (0-9)	Y (10-19) G (20-25)

Types of Angles



An acute angle is less than 90°



Angle Facts

Angles on a straight line sum to 180°



Opposite angles are equal



Angles round a point sum to 360°



Alternate angles are equal



Corresponding angles are equal



Co-interior angles sum to 180°



Circumference	The distance around the edge of the circle
Radius	The distance from the centre of the circle to the edge of the circle
Diameter	The distance across the circle from edge to edge, going through the centre
Tangent	A straight line that touches the circle

Quadrilateral	Properties
<p>Square</p>	<ul style="list-style-type: none"> A square is a regular quadrilateral. All angles are equal (90°). All sides are of equal length. Opposite sides are parallel. The diagonals bisect each other at 90°. The diagonals are equal in length.
<p>Rhombus</p>	<ul style="list-style-type: none"> Diagonally opposite angles are equal. All sides are of equal lengths. Opposite sides are parallel. The diagonals bisect each other at 90°.
<p>Rectangle</p>	<ul style="list-style-type: none"> All angles are equal (90°). Opposite sides are of equal length. The diagonals are equal in length.
<p>Parallelogram</p>	<ul style="list-style-type: none"> Diagonally opposite angles are equal. Opposite sides are of equal length. Opposite sides are parallel. The diagonals bisect each other.
<p>Trapezium</p>	<ul style="list-style-type: none"> One pair of opposite sides is parallel.
<p>Kite</p>	<ul style="list-style-type: none"> Two pairs of sides are of equal length. One pair of diagonally opposite angles is equal. Only one diagonal is bisected by the other. The diagonals cross at 90°.


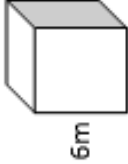
Exterior angles of a polygon	add up to 360°
The interior and exterior angle of any polygon	add up to 180°
The sum of the interior angles of a polygon can be found by using the formula	$(\text{number of sides} - 2) \times 180^\circ$
Regular polygons have all sides the same length and all angles the same size	



Number of Sides	Name of Polygon	Picture of Polygon	Interior angle of a regular polygon	Sum of the interior Angles	Number of Triangles
3	Triangle		60°	180°	1
4	Quadrilateral		90°	360°	2
5	Pentagon		108°	540°	3
6	Hexagon		120°	720°	4
7	Heptagon		128.6°	900°	5
8	Octagon		135°	1080°	6
9	Nonagon		140°	1260°	7
10	Decagon		144°	1440°	8

Date Due _____

Score to beat _____

Section A: Number	Section B: Algebra Geometry & measures	Section C: Using and applying
1. Which is bigger: $\frac{3}{4}$ or $\frac{2}{3}$?	11. Factorise: $5x + 20$	21. Work out the area of a parallelogram of base 10cm and height 4cm.
2. Increase £60 by 15%	12. Solve: $3x + 5 = 14$	
3. 10 pens cost £4.00 Find the cost of 7 pens	13. If $T(n) = 4n - 1$, what is the 3 rd term?	22. Three of the angles of a quadrilateral are 53° , 127° and 72° . What is the size of the 4 th angle?
4. Estimate: 69×33	14. If $y = 3x + 2$, find the value of y when $x = -3$ <i>Use π on the calculator</i>	
5. Work out: $\frac{2}{3}$ of 8	15. Calculate the area of a circle with radius of 2cm (1dp)	23. A car travels at a steady speed and takes 5 hours to travel 510 miles. Work out the average speed?
6. To decrease an amount by 3%, what single multiplier would you use?	16. Expand & simplify: $4(x + 5) - 2(x - 3)$	
7. Decrease 42kg by 3%	17. Give the inequality 	24. If the relative frequency of getting a 'six' on a dice is 0.3, how many sixes would you expect to get in 400 throws of the dice?
8. Without a calculator work out: 0.7×0.1	18. Work out the value of: $3x + 2y$ When $x = 4$ and $y = -5$	
9. Round off 4252 to one significant figure	19. Write down the next term in this sequence: 3 8 15 24 ...	25. Work out the volume of this cube? 
10. Use a calculator to work out: $2.7^2 + 3.9^2$	20. If $y = x^3 + 3$, find the value of y when $x = -1$	
Total (A)	Total (B)	Total (C)
Test Total (A+B+C)	R (0-9)	Y (10-19) G (20-25)

HOW SHOULD WE WRITE THIS?

4 more than p = $p + 4$
 6 less than g = $g - 6$
 $y \times y \times y = y^3$
 $y + y + y + y = 4y$
 $1 \times r = r$
 $b \times a = ba = ab$
 $p \div 3 = \frac{p}{3}$
 $p \div q = \frac{p}{q}$

Expression: A collection of terms.
 (Simplified)

Equation: Expressions that equal one another.
 (Solved) (An inequality is a special ≠ equation)

Identity: An equation that is true for all values of the variables.

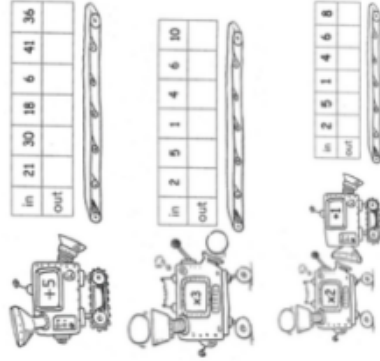
Formula: An identity seen as a general rule.

(Subject)

Function: An expression for which inputs are used to generate outputs from inputs.

Constants are numbers that stand on their own.
 They will not have an "x", "y", "z", or any other variable attached to them. They can be small numbers, like "7", or big numbers, like "23 849".
 A variable is usually written as a letter, such as "x", "y", or "z".
 The difference between constants and variables is that the value of a variable can change, while the value of a constant stays the same.

FUNCTION MACHINES



Key Facts - Adding and Subtracting

Consider the family meal below.

We need to group the same items together, so when we order through the drive-through its simple.



$$3b + f + 5c + 3b + s + 2f + m + 2m + mf + c + s + 2b$$

This would be a mouthful to say into the microphone when ordering ... so lets group all the same items together.

3b + 2b + 3b = 8 burgers
 s + s = 2 salads
 5c + c = 6 colas
 f + 2f = 3 fries
 m + 2m = 3 milkshakes
 1 McFlurry

If the coefficient is 1 we don't write it.

$$8b + 2s + 6c + 3f + 3m + mf$$

Key Facts - Multiplying

5 burgers x 2 = 10 burgers
 5b x 2c = 10bc
 3 pizzas x 7 = 21 pizzas
 3p x 7c = 21pc

SIMPLIFYING AND SUBSTITUTION KNOWLEDGE ORGANISER

SUBSTITUTION

SUBSTITUTION means putting numbers where the letters are.

$$x + \frac{x}{2} = 5 + \frac{5}{2}$$

EXPANDING

EXPANDING means multiplying all terms together and simplifying.

Single brackets

$$3(a + 4) = 3a + 12$$

means: "3 times (a + 4)"

Double brackets

$$(a + 2)(a + 3) = a^2 + 3a + 2a + 6 = a^2 + 5a + 6$$

means: "(a + 2) times (a + 3)"

Example of expanding more than two binomials:
 $(x + 3)(x - 5)(x + 4)$
 First two brackets expand to $x^2 + 3x - 5x - 15 = x^2 - 2x - 15$
 $= (x^2 - 2x - 15)(x + 4)$
 We now must multiply everything in the left hand bracket by x and then by 4
 $= x^3 - 2x^2 - 15x + 4x^2 - 8x - 60 = x^3 + 2x^2 - 23x - 60$
 If you have three binomials times together, you will end up with a cubic expression, 4 will make a quartic expression and so on.

Multiply binomials - using a grid.

	x	3	
x	x^2	$-2x$	-15
3	$3x^2$	$-6x$	-45

FACTORISING

FACTORISING means find highest common factors, (numbers, letters or both), in all terms and put back into brackets.

How to Factorise a Single Bracket	How to Factorise a Quadratic Equation
$14y^2 + 21y$ • Find the highest common factor of 14 and 21 • 7 is the highest common factor • y is the common factor letter Factorise... $14y^2 + 7y$ and $21y + 7y$ $7y(2y + 3)$	A) How to factorise when the coefficient of x^2 is 1 $x^2 + 8x + 15$ • Find the factors of 15 which sum to 8. • Factors of 15 are: • 1, 15, 3, 5 • Only 3 and 5 sum to 8 and multiply to give 15 $3 + 5 = 8$ $3 \times 5 = 15$ $(x + 3)(x + 5)$

Difference of Squares

$$4a^4 - 9b^4 = \sqrt{4(a^4)} - \sqrt{9(b^4)} = 2a^2 - 3b^2$$

$$25v^4 - 16u^4 = \sqrt{25(v^4)} - \sqrt{16(u^4)} = 5v^2 - 4u^2$$

$$(2a^2 + 3b^2)(2a^2 - 3b^2) = 5v^2 + 4u^2(5v^2 - 4u^2)$$

FUNCTION

Function $f(x)$ or $x \rightarrow$ or $y =$



A function is a special relationship where each input has a single output.

It is often written as "f(x)" where x is the input value.

Date Due _____

Score to beat _____

Section A: Number	Section B: Algebra Geometry & measures	Section C: Using and applying
1. Which is bigger: $\frac{3}{4}$ or $\frac{4}{5}$?	11. Expand: $x(x - 1)$	21. Work out the area of a parallelogram of base 7cm and height 3cm.
2. Which is bigger: 0.3 or $\frac{1}{3}$?	12. Factorise: $8x + 12$	
3. Increase £60 by 10%	13. Solve: $2(x - 1) = 10$	22. Three of the angles of a quadrilateral are 148° , 104° and 36° . What is the size of the 4 th angle?
4. Decrease £40 by 10%	14. Solve: $3x + 17 = 2x + 14$	
5. Write 4 : 2 in form 1: n	15. Find the 10th term 3 7 11 15 19 ...	23. Work out the area of a triangle of base 9cm and height 4cm.
6. 10 pens cost £6.50 Find the cost of 4 pens	16. If $T(n) = 2n + 3$, what is the 3 rd term?	
7. Estimate: 355×21	17. If $y = 2x - 3$, find the value of y when $x = 2$	24. If the probability of rain is 0.03, what is the probability of NO rain?
8. If $62 \times 38 = 2356$ What is 6.2×3.8	18. If $y = 2x - 3$, find the value of y when $x = -2$	
9. Work out: $\frac{4}{5} - \frac{1}{2}$	19. Calculate the area of a circle with radius of 4cm <u>Use $\pi = 3$</u>	25. Work out the volume of a cuboid 6cm by 4cm by 2.5cm?
10. Work out: $\frac{3}{5}$ of 7	20. Calculate the length of the circumference of a circle with diameter of 7cm <u>Use $\pi = 3$</u>	
Total (A)	Total (B)	Total (C)
Test Total (A+B+C)	R (0-9)	Y (10-19) G (20-25)