

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
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
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.

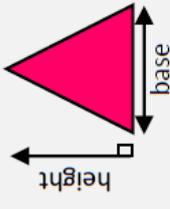
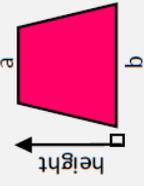
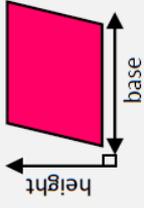
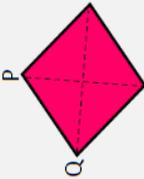
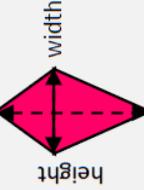
Homework 1 Due	
Homework 2 Due	
Homework 3 Due	



Year 10 - Term 2: Higher

<u>Overview</u>	<u>Learning Objectives</u>		
<p><u>Topic: Area and Perimeter</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - Show me a sector with a bigger area than a circle. - A square has a perimeter of 49mm. What is its area? - A farmer has 1000m of fencing. What is the largest area he can enclose with it? 	<ul style="list-style-type: none"> - Solve problems involving area and perimeter. 	<ul style="list-style-type: none"> - Calculate the length of an arc and the area of a sector. 	
<p><u>Topic: Calculations and accuracy</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - Why might it be useful to know an error interval? - Why is the upper bound of 460 rounded to the nearest 10, not 464? 	<ul style="list-style-type: none"> - Use inequality notation to specify error intervals due to rounding. 	<ul style="list-style-type: none"> - Find the upper and lower bounds of calculations with quantities given to a various degrees of accuracy. 	
<p><u>Topic: Fractions, decimals and percentages</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - What is the same/ different about: $120 \times 1.06 \times 1.06$ and $120 \times (1.06)^2$ - A top was reduced by 20% in a sale, then increased by 20% after the sale. What % of it's original price is it now? 	<ul style="list-style-type: none"> - Calculate compound interest/ depreciation -Calculate percentage change. -Work out reverse percentage problems. 	<ul style="list-style-type: none"> - Convert recurring decimals to fractions 	<ul style="list-style-type: none"> -proof of recurring decimals.

Circles

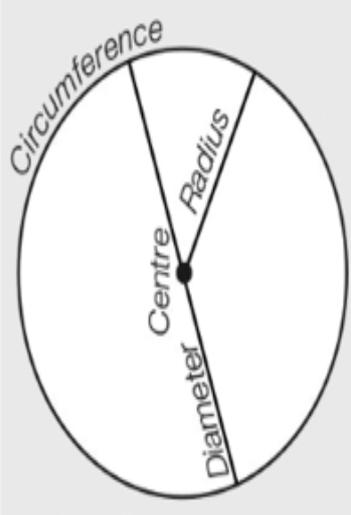
Triangle	$\frac{\text{base} \times \text{height}}{2}$	
Trapezium	$\frac{(a + b) \times \text{height}}{2}$	
Parallelogram	base x height	
Rhombus	$\frac{P \times Q}{2}$	
Kite	$\frac{\text{width} \times \text{height}}{2}$	

Surface area =

Top = $(\pi \times r^2) +$
 Bottom = $(\pi \times r^2) +$
 Curved = $(2 \times r \times \pi \times H)$

By adding the area of all of the faces, we can find the **surface area** of the whole cylinder.

Circumference = $\pi \times \text{diameter}$, $C = \pi d$
 Circumference = $2 \times \pi \times \text{radius}$, $C = 2\pi r$
 Area of a circle = $\pi \times \text{radius squared}$, $A = \pi r^2$



Need-To-Know Facts



The radius of a circle is exactly half the diameter.

π

Pi is the ratio between the circumference of a circle and its diameter always equal to ≈ 3.14

$A = \pi r^2$

Sector = $\pi r^2 \times \frac{\theta}{360}$

Used to calculate the AREA of a circle.

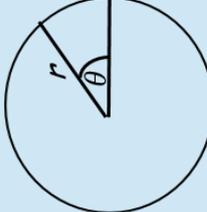
FRACTION of the area (sector)

$C = \pi d$

Arc length = $\pi d \times \frac{\theta}{360}$

Used to calculate the CIRCUMFERENCE.

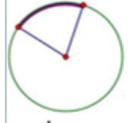
FRACTION of the circumference (arc length)



Area of sector = $\frac{\theta}{360} \times \pi r^2$

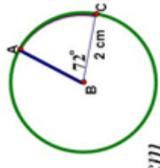
Arc Length

Arc length is the distance around an arc.



How to find an arc length $\frac{\text{angle}}{360} \times 2\pi r$

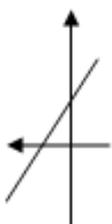
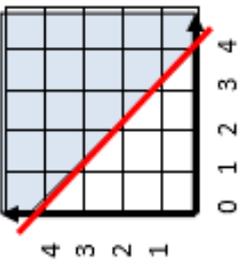
Example: Arc Length = $\frac{a}{360} \times 2\pi r$
 $= \frac{72}{360} \times 2\pi \times 4$
 $= 0.8\pi = 2.51 \text{ cm}$



Perimeter of an a sector is:
 Arc length + 2r

Date Due:

Score to beat:

Section A: Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Write $\frac{5}{9}$ as a recurring decimal		11. Factorise: $x^2 + x - 12$		21. <u>Linear-Quadratic-Cubic-Reciprocal</u> Which function is represented by this graph? 	
2. Write 0.17 as a fraction		12. Factorise: $x^2 - 100$		22. What inequality is represented here? 	
3. Work out the balance for £800 invested for 5 years at 6% per annum		14. Multiply & simplify: $(x - 1)(3x - 2)$			
4. The value of a house depreciates by 6% per year. Work out the current value of a house bought 3 years ago for £250000.		14. Multiply & simplify: $(4x + 1)^2$			
5. In a '70% off' sale, a dress was £48. Work out the original price.		15. Make a the subject of the formula: $v^2 = u^2 + 2as$		23. On a spinner: $P(3) = \frac{1}{2}$ and the $p(4) = \frac{1}{4}$ What is the probability of getting 3 or 4 	
6. The cost of a tyre has increased by 20% to £78. Work out the original price.		16. Make e the subject of the formula: $A = de - 2ef$			
7. Write 0.0004 in standard form:		17. $S = \frac{u^2 - v^2}{2a}$ Find S when, $u = -4$ $v = -1.5$ $a = 2.5$			
8. Write 7.12×10^3 as an ordinary number		18. $D = ut - kt^2$ Find D when $u = 25$ $t = \frac{1}{2}$ $k = -2$			
9. Work out $(6 \times 10^7) \div (2 \times 10^3)$ Give your answer in standard form		19. If $\cos 28^\circ = \frac{x}{4}$, find x (3sf)			
10. Work out $(3.7 \times 10^{-4}) \times (2.9 \times 10^{-3})$ Give your answer in standard form		20. Each of these measures is rounded to nearest whole: $a = 5\text{cm}$ and $b = 3\text{cm}$ Calculate the lower bound of $a - b$			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)		Y (10-19)	G (20-25)

UPPER AND LOWER BOUNDS

DIRECTED NUMBER RULES

- $+$ $+$ $=$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$ $+$
- $+$ $-$ $=$ $-$ $+$ $-$ $-$ $+$ $-$ $-$ $-$
- $-$ $+$ $=$ $-$ $-$ $+$ $-$ $-$ $+$ $-$ $-$
- $-$ $-$ $=$ $-$ $-$ $-$ $-$ $-$ $-$ $-$ $-$

HALFWAY VALUES—THE DECISION

5 + above **↑** the number being rounded increases by 1.

4 + below **=** the number being rounded stays the same.

Rounding to...

10, 100 & 1000

Remember to keep the place value of each number by insert zeros where applicable.

Look at the number which **represents the place value**, look to the **right**, if this digit is **5 or more** the number **rounds up by 1**.

If the number is **4 or less** the number **stays the same**.

E.g. Round **17 839** to the nearest 10, 100 & 1000

- (i) Nearest 10 – 17 840
- (ii) Nearest 100 – 17 800
- (iii) Nearest 1000 – 18 000

Decimal places (d.p.)

1. **Identify the position** of the decimal place to be rounded to, e.g. 2d.p. would be the 2nd digit after the decimal place.
2. Then look to the **right** of this digit, this is called the **decider**, this number now decides whether the decimal place is rounded up or kept the same.
3. If the **decider** is **5 or more** then **round the digit up**.
4. If the **decider** is **4 or less** then **leave the digit as it is**.

Significant figures (s.f.)

1. The **first significant number** is the first digit of a number which isn't zero.
2. The **2nd, 3rd, digits** follow immediately after the 1st, regardless of zeros.

0.002309
 $\begin{matrix} \text{1st} & \text{2nd} & \text{3rd} & \text{4th} \\ \text{2} & \text{0} & \text{3} & \text{0} \end{matrix}$
2.03070
 $\begin{matrix} \text{1st} & \text{2nd} & \text{3rd} & \text{4th} \\ \text{2} & \text{0} & \text{3} & \text{0} \end{matrix}$
(If we're rounding to say 3 s.f., then the LAST DIGIT is simply the 3rd sig. fig.)

3. When rounding numbers the **place value** of each digit must be the same.

- Any recorded measurement has almost certainly been rounded. The true value will be somewhere between the lower bound and the upper bound
- The lower bound is the smallest number that rounds up to the given number. The upper bound is the largest number that rounds down to the given number
- Students should use 'half a unit above' and 'half a unit below' to find upper and lower bounds
 - For discrete data: - data that can only take certain values within a given range
 - e.g. a coach is carrying 50 people, to the nearest 10. The lower bound is 45, and the upper bound is 54
 - For continuous data: - data that can take any value within a given range
 - E.g. The length of a stick of wood is 32 cm, measured to the nearest centimetre. The lower bound is 31.5 cm, and the upper bound is 32.5 cm
 - Due to a mathematical peculiarity the upper bound is 32.5 cm rather than 32.49 cm
- The lower and upper bounds are sometimes known as the limits of accuracy and the range between them is the error interval
 - E.g. The error interval for the 32 cm stick is as follows; $31.5 \text{ cm} \leq \text{length of stick} < 32.5 \text{ cm}$
 - Note the use of the strict inequality (<) for the upper bound
- The following table shows the combinations to give minimum and maximum values for all four operations of two numbers, a and b :
 - a and b lie within limits $a_{min} \leq a < a_{max}$ and $b_{min} \leq b < b_{max}$

<u>Operation</u>	<u>Minimum</u>	<u>Maximum</u>
Addition ($a + b$)	$a_{min} + b_{min}$	$a_{max} + b_{max}$
Subtraction ($a - b$)	$a_{min} - b_{max}$	$a_{max} - b_{min}$
Multiplication ($a \times b$)	$a_{min} \times b_{min}$	$a_{max} \times b_{max}$
Division ($a \div b$)	$a_{min} \div b_{max}$	$a_{max} \div b_{min}$

Estimating

When estimating you are **not guessing** you are making the numbers 'easier' for you to work out the sum.

To estimate a sum, you need to

1. Round each number to **1s.f.**
2. Then calculate the sum using **BIDMAS**

Example 1:

Estimate $\frac{29.91 \times 38.3}{3.1 \times 3.9}$

- Round to 1s.f. $\frac{30 \times 40}{3 \times 4} = \frac{1200}{12} = 100.$

Example 2:

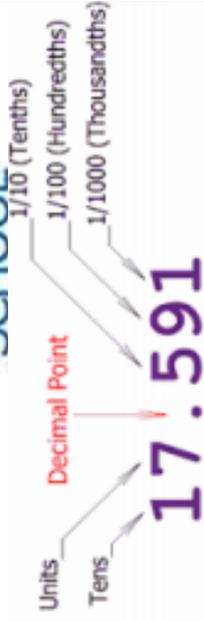
Estimate $\frac{23.43 \times 4.3}{0.483}$

- Round to 1s.f. $\frac{20 \times 4}{0.5} = \frac{80}{0.5} = 160$

Date Due:

Score to beat:

Section A: Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Write $\frac{7}{9}$ as a recurring decimal		11. Factorise: $x^2 - 9x - 10$		21. Linear-Quadratic-Cubic-Reciprocal Which function is represented by this graph? 	
2. Write 0.36 as a fraction		12. Factorise: $y^2 - 169$		22. What inequality is represented here? 	
3. Work out the balance for £720 invested for 4 years at 5% per annum		14. Multiply & simplify: $(3x - 1)(3x + 1)$			
4. The value of a house depreciates by 8% per year. Work out the current value of a house bought 2 years ago for £180000.		14. Multiply & simplify: $(2x + 5)^2$			
5. In a '70% off' sale, a hat was £33.60. Work out the original price.		15. Make s the subject of the formula: $v^2 = u^2 + 2as$		23. On a spinner: $P(3) = \frac{1}{4}$ and the $p(4) = \frac{3}{4}$ What is the probability of getting 3 or 4	
6. The cost of a fridge has increased by 15% to £828. Work out the original price.		16. Make D the subject of the formula: $A = 5mn + \pi D$			
7. Write 41500 in standard form:		Give your answer correct to 3sf 17. $A = \pi r^2 - \pi rs$. Find A when, $r = 6.5$ $s = 2.5$			
8. Write 3×10^{-3} as an ordinary number		Give your answer correct to 3sf 18. $V = \frac{1}{3} \pi h(a^3 - b^3)$ Find V when $b = 7$ $h = 5$ & $a = 10$			
9. Work out $(7 \times 10^3) \times (8 \times 10^2)$ Give your answer in standard form		19. If $\tan 63^\circ = \frac{x}{4}$, find x (3sf)			
10. Work out $(1.69 \times 10^8) \times (5.2 \times 10^3)$ Give your answer in standard form		20. Each of these measures is rounded to nearest whole: $a = 8\text{cm}$ and $b = 4\text{cm}$ Calculate the upper bound of $a + b$			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)		Y (10-19)	G (20-25)



What Percentage is this?

If a student received $\frac{28}{50}$ what percentage is this?

Change the denominator to 100 by x2

$$\frac{28}{50} \times 2 = \frac{56}{100} = 56\%$$

If a student received $\frac{26}{40}$ what percentage was this?

Change the denominator to 100 by $\div 2$ and $\times 5$

$$\frac{26}{40} \div 2 = \frac{13}{20} \times 5 = \frac{65}{100} = 65\%$$

Fractions to Decimals

If the fraction has a denominator which is a power of 10, the decimal can be found. You could find an equivalent fraction to create a denominator of 10, 100, 1000 etc.

$$\frac{3}{10} = .3$$

$$\frac{17}{100} = .17$$

$$\frac{5}{100} = .05$$

$$\frac{323}{1000} = .323$$

$$\frac{47}{1000} = .047$$

$$\frac{1}{1000} = .001$$

Key terms

Fraction – written in the form $\frac{a}{b}$, means “a divided by b”.

Numerator – the top number of a fraction, represent the number of parts being studied

Denominator – the bottom number of a

fraction, represents the number of parts to make one whole

Equivalent – worth the same amount as

Simplify – reducing a fraction to the equivalent with the lowest possible numerator and denominator

Decimal – a number that is not an integer

Integer – a whole number with denominator 1

Percentage – written as a number out of 100

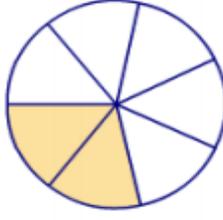
$$\begin{array}{r} 13r2 \\ 4 \overline{)54} \end{array}$$

The remainder is 2 out of 4

$\frac{2}{4}$ can be written as $\frac{1}{2}$ or 0.5

$$54 \div 4 = 13 \frac{1}{2} \text{ or } 13.5$$

You can also use the bus stop method of division to find answers as decimals. This represents the fraction



$$\frac{2}{7}$$

of this circle is shaded.

Example: What is $7.368 - 1.15$?

Line the decimals up:

$$\begin{array}{r} 7.368 \\ - 1.15 \end{array}$$

"Pad" with zeros:

$$\begin{array}{r} 1.452 \\ + 1.300 \end{array}$$

Add:

$$\begin{array}{r} 1.452 \\ + 1.300 \\ \hline 2.752 \end{array}$$

Example: Add 1.452 to 1.3

Line the decimals up:

$$\begin{array}{r} 1.452 \\ + 1.3 \end{array}$$

"Pad" with zeros:

$$\begin{array}{r} 1.452 \\ + 1.300 \end{array}$$

Add:

$$\begin{array}{r} 1.452 \\ + 1.300 \\ \hline 2.752 \end{array}$$

To convert decimals to percentages, multiply by 100.

For example, $0.36 = 36\%$

$$0.5 = 50\%$$

Do the inverse (divide) to convert percentages to decimals

COMPARING & ORDERING DECIMALS

STEP 1: Stack the numbers being compared. Line up the decimal points.

$$\begin{array}{r} 4.8 \\ 4.826 \\ 4.08 \\ 4.006 \end{array}$$

STEP 2: Add zeros so that each number has the same number of decimal digits.

$$\begin{array}{r} 4.800 \\ 4.826 \\ 4.080 \\ 4.006 \end{array}$$

STEP 3: Compare each place value one by one. If a number is the same, move to the next place.

$$\begin{array}{r} 4.800 \\ 4.826 \\ 4.080 \\ 4.006 \end{array}$$

STEP 4: Order the numbers from least to greatest or greatest to least. Here, they are ordered from least to greatest.

$$4.006, 4.080, 4.800, 4.826$$

Remove the zeros you previously added.

$$4.006, 4.08, 4.8, 4.826$$

Date Due:

Score to beat:

Section A: Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Write $\frac{1}{9}$ as a recurring decimal		11. Factorise: $a^2 + 8a - 20$		21. Linear-Quadratic-Cubic-Reciprocal Which function is represented by this graph? 	
2. Write 0.39 as a fraction		12. Factorise: $m^2 - 144$		22. What inequality is represented here? 	
3. Work out the balance for £2400 invested for 10 years at 5% per annum		14. Multiply & simplify: $(2a - 3)(2a - 1)$			
4. The value of a bike depreciates by 35% per year. Work out the current value of a bike bought 2 years ago for £600.		14. Multiply & simplify: $(x + y)^2$			
5. In a '30% off' sale, a hat was £101.50. Work out the original price.		15. Make w the subject of the formula: $P = \frac{3w + 20}{200}$		23. On a spinner: $P(3) = \frac{1}{2}$ and the $P(4) = \frac{1}{4}$ What is the probability of getting 3 or 4	
6. The cost of a fridge has increased by 25% to £525. Work out the original price.		16. Make c the subject of the formula: $ab - cd = ac$		24. A courgette seed and a pumpkin seed is planted. $P(\text{courgette seed germinates}) = \frac{3}{4}$ $P(\text{pumpkin seed germinates}) = \frac{1}{4}$ What is the probability that BOTH seeds germinate?	
7. Write 0.000034 in standard form:		Give your answer correct to 3sf 17. $A = \pi r^2 - \pi rs$ Find A when $r = 4.2$ $s = 3.8$			
8. Write 8.62×10^2 as an ordinary number		Give your answer correct to 3sf 18. $V = \frac{1}{3} \pi h(a^3 - b^3)$ Find V when $b = -3$ $h = 5$ & $a = 4$			
9. Work out $(4.8 \times 10^3) \div (1.2 \times 10^2)$ Give your answer in standard form		19. If $\tan 72^\circ = \frac{12}{x}$, find x (3sf)		25. Show on the cumulative frequency graph how to take the upper quartile reading 	
10. Work out $(5.2 \times 10^6)^2$ Give your answer in standard form		20. Each of these measures is rounded to nearest whole: $a = 8\text{cm}$ and $b = 4\text{cm}$ Calculate the lower bound of $a + b$			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	