THE DUSTON SCHOOL
Knowledge itself is power
4-19

Year 10 Maths Foundation Knowledge Booklet Term 2

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 2: Foundation

Overview	**Learning Objective**		
Topic: Area and Perimeter **Big Questions** - A square has a perimeter of 20cm. What is the area of this square? - The area of a circle is 49π. What is the circumference of this circle? - Can you think of another mathematical name for a circular prism?	- Calculate the area of a triangle, parallelogram, trapezium and kite.	- Calculate the area and perimeter of compound shapes. -Calculate the area and circumference of a circle. -Calculate the surface area of prisms.	- Solve problems involving area and perimeter.
Topic: Calculations and Accuracy **Big Questions** - Estimate the answer to a question. Is your answer an over/under estimate? - What do you think is a suitable degree of accuracy to round to? Why? - Why might it ne useful to work out an error interval?	- Understand and apply the correct order of operations (BIDMAS). - Use a calculator for complex calculations. -understand and use the four rues of negative numbers. - Round to a given number of significant figures. - Estimate answers to calculations. - Use place value to calculate changes to calculations.	- Introduction to upper and lower bounds.	- Use inequality notation to specify error intervals due to rounding.
Topic: Fractions, decimals and percentages **Big Questions** - What happens when you divide by a half? - Can you write 3/16 as the sum of unit fractions? (Egyptian fractions) - A sale says 20% off. A top in the sale costs £40. Was the original price of the top £48? Why not?	-Adding & subtracting decimals - Introduction to fractions (with shape) - Express on quantity as a fraction of another. - Find equivalent fractions. - Simplify fractions. - Calculate percentages of quantities. - Convert between improper & mixed fractions. - Multiply and divide fractions.	- Multiply and divide decimals. - Find a fraction of an amount. - Express one quantity of another as a percentage. (With Calculator). -Find a percentage of an amount (Non – calc). -Increase/decrease an amount by a given percent. (Non-calc) - Compare & order fractions. - Add and subtract fractions	-Calculate with mixed numbers. - Compare fractions, decimals and percentages. -Express one quantity of another as a percentage. (Non-Calculator). - Find percentage multipliers. -Find a percentage of an amount using multipliers (Calc) - Increase/decrease a quantity by a given percentage using multipliers. (Calc) -Calculate simple interest.

AREA & PERIMETER KNOWLEDGE ORGANISER

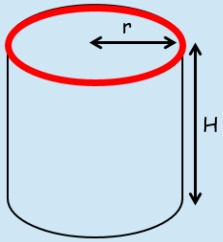
DO NOT FORGET YOUR UNITS!

Surface area =

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

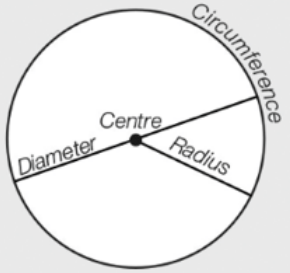
Bottom = $(\pi \times r^2) +$

Curved = $(2 \times r \times \pi \times H)$



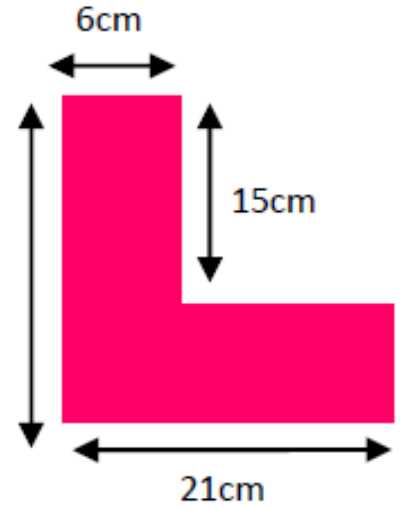
By adding the area of all of the faces, we can find the **surface area** of the whole cylinder.

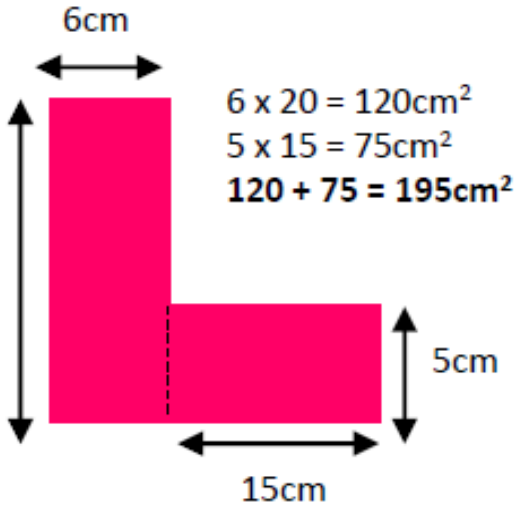
Circles

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

Area	The **area** of a 2D shape is the amount of space inside it. Examples of units of area are mm^2, cm^2, and m^2
Perimeter	The **perimeter** is the total distance around the edge of a 2D shape. Examples of units of distance are millimetres (mm), centimetres (cm) and metres (m).
Compound shape	A **compound** shape is a shape that is made up of 2 or more different shapes put together. Usually rectangles.

Break the compound shape into rectangles and work out each area separately then add the areas together for the TOTAL area.



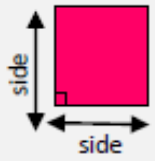
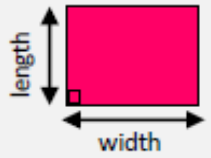
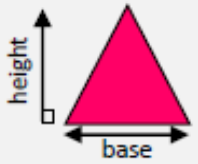
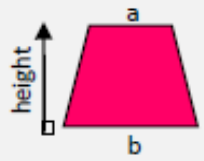
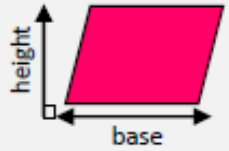
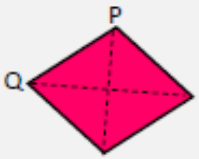
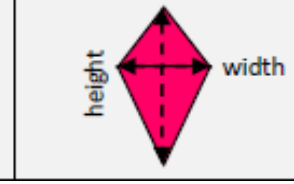


$6 \times 20 = 120cm^2$

$5 \times 15 = 75cm^2$

$120 + 75 = 195cm^2$

Key Facts - Formula

Square	$(side)^2$	
Rectangle	length x width	
Triangle	$\frac{\text{base x height}}{2}$	
Trapezium	$\frac{(a + b) \text{ x height}}{2}$	
Parallelogram	base x height	
Rhombus	$\frac{P \text{ x } Q}{2}$	
Kite	$\frac{\text{width x height}}{2}$	

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Knowledge Recall **Term 2 HW: 1**

Date Due_____ **Score to beat**_____

Section A:Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Which is bigger: 67% or $\frac{2}{3}$?		11. Expand: x(x - 2)		21. Work out the area of a parallelogram of base 10cm and height 7cm.	
2. Increase £42 by 10%		12. Solve: 4x – 5 = 9			
3. 10 pens cost £3.50 Find the cost of 3 pens		13. If T(n) = 3n - 5, what is the 3rd term?		22. Three of the angles of a quadrilateral are 100^0, 104^0 and 44^0. What is the size of the 4th angle?	
4. Estimate: 57 x 388		14. If y = 5x - 3, find the value of y when x = 0			
5. Work out: $\frac{4}{5} - \frac{2}{3}$		***Use π on the calculator*** 15. Calculate the area of a circle with radius of 3.5cm (1dp)		23. An apple has a mass of 150g and a volume of $100cm^3$ Find its density in g/cm^3?	
6. To decrease an amount by 70%, what single multiplier would you use?		16. Expand & simplify: 3(x + 1) + 2(x + 5)			
7. Decrease £64 by 70%		17. Give the inequality:		24. If the relative frequency of getting a 'blue' on a spinner is 0.1, how many reds would you expect to get in 50 spins?	
8. Without a calculator work out: 0.3 x 7		18. Work out the value of: 3x + 2y When x = 2 and y = -5			
9. Round off 3. 55 to one significant figure		19. Write down the next term in this sequence: 1 5 13 25 41 ...		25. Work out the volume of this cuboid?	
10. Use a calculator to work out: $5.6^3 + 11.2$		20. If $y = x^2 + 2x$, find the value of y when x = 3			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	

CALCULATIONS AND ACCURACY KNOWLEDGE ORGANISER

PLACE VALUE

10 000's	1000's	100's	10's	1's	1/10	1/100	1/1000
4	8	4	7	5	4	2	9
5	5	7	5	0	1	2	2
1	9	9	8	6	6	4	1

40 000 400 4/10
5 000 50 2/100
9 000 6 1/1000

ORDERING

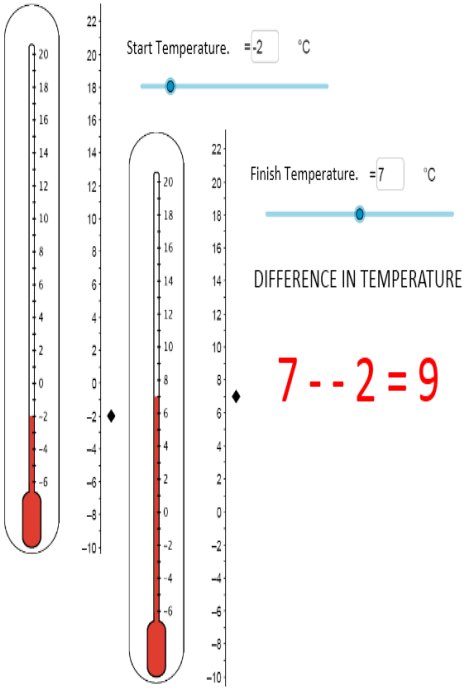
Put the following numbers in ascending order (smallest first).

3.0052 3.0032 3.0122 3.0049

Check integer (whole number) first.

Check $\frac{1}{10}$'s next then $\frac{1}{100}$'s and so on.

3.0032 3.0049 3.0052 3.0122



Multiplying By Powers of 10

10 000's	1000's	100's	10's	1's	1/10	1/100	1/1000
0	0	0	4	5	1	6	0
0	0	4	5	1	6	0	0
0	4	5	1	6	0	0	0
4	5	1	6	0	0	0	0

Dividing By Powers of 10

10 000's	1000's	100's	10's	1's	1/10	1/100	1/1000
0	0	8	2	3	0	0	0
0	0	0	8	2	3	0	0
0	0	0	0	8	2	3	0
0	0	0	0	0	8	2	3

HALFWAY VALUES—THE DECISION

5 + above the number being rounded increases by 1.

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

DIRECTED NUMBER RULES

+ + = +	+ × + = +	+ ÷ + = +
+ − = −	+ × − = −	+ ÷ − = −
− + = −	− × + = −	− ÷ + = −
− − = −	− × − = +	− ÷ − = +

Rounding to...

10, 100 & 1000

Remember to kept 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 2.03070

SIG. FIGS: 1st 2nd 3rd 4th 1st 2nd 3rd 4th

(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.

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.

$$\frac{20 \times 4}{0.5} = \frac{80}{0.5} = 160$$

UPPER AND LOWER BOUNDS

- 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 $32.4\dot{9}$ 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 cm ≤ length of stick < 32.5 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 $b_{min} \leq b < b_{max}$

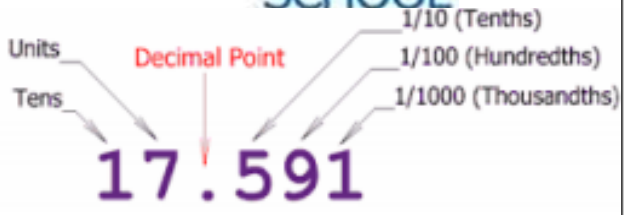
THE DUSTON SCHOOL

Knowledge Recall **Term 2 HW: 2**

Date Due_____ **Score to beat**_____

Section A:Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Which is bigger: $\frac{5}{8}$ or 0.58?		11. Expand: x(x - 1)		21. Work out the area of a parallelogram of base 10cm and height 7cm.	
2. Which is bigger: 15% or $\frac{1}{5}$?		12. Factorise: 8x + 12			
3. Increase £40 by 20%		13. Solve: 2(x – 1) = 4		22. Four of the angles of a pentagon are 90^0, 156^0 , 88^0 and 28^0. What is the size of the 5th angle?	
4. Decrease £60 by 20%		14. Solve: 2x + 7 = x - 3			
5. Write 7 : 21 in form 1: n		15. Find the 10th term 1 6 11 16 21 ...		23. Work out the area of a triangle of base 7.5m and height 6cm.	
6. 10 pens cost £7.50 Find the cost of 4pens		16. If T(n) = n - 7, what is the 5th term?			
7. Estimate: 43 x 345		17. If y=4x + 5, find the value of y when x = 0		24. If the probability of rain is 0.05, what is the probability of NO rain?	
8. If 25 x 68 = 1700 What is 25 x 0.68		18. If y=4x + 5, find the value of y when x = -2			
9. Work out: $\frac{4}{5} + \frac{3}{4}$		***Use π = 3*** 19. Calculate the area of a circle with diameter of 5cm		25. Work out the volume of a cube of edge 3cm?	
10. Work out: $5 \times \frac{5}{6}$		***Use π = 3*** 20. Calculate the length of the circumference of a circle with radius of 3cm			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	

FRACTIONS, DECIMALS AND PERCENTAGES KNOWLEDGE ORGANISER



What Percentage is this?

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

Change the denominator to 100 by x2

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

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

Change the denominator to 100 by ÷2 and x5

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

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.

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

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

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

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

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

$\frac{9}{1000} = .009$

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

COMPARING & ORDERING DECIMALS

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

4.8
4.826
4.08
4.006

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

4.800
4.826
4.080
4.006

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

4.800
4.826
4.080
4.006

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

$$4\overline{)54} = 13 \text{ r } 2$$

The remainder is 2 out of 4

$^2/_4$ can be written as $^1/_2$ or 0.5

54 ÷ 4 = 13 ½ 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:	7.368 – 1.15
"Pad" with zeros:	1.452 + 1.300
Add:	1.452 + 1.300 2.752

Example: Add 1.452 to 1.3

Line the decimals up:	1.452 + 1.3
"Pad" with zeros:	1.452 + 1.300
Add:	1.452 + 1.300 2.752

To convert decimals to percentages, multiply by 100.

For example, 0.36 = 36%

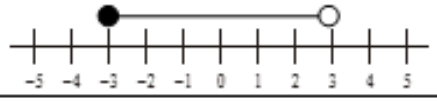
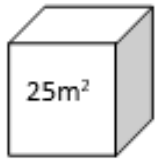
0.5 = 50%

Do the inverse (divide) to convert percentages to decimals

THE DUSTON SCHOOL

Knowledge Recall **Term 2 HW: 3**

Date Due_____ **Score to beat**_____

Section A:Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. Which is bigger: 0.6 or 0.58?		11. Factorise: 10x + 15		21. Work out the area of a parallelogram of base 5m and height 3m.	
2. Increase £80 by 20%		12. Solve: 2(x – 2) = 6			
3. 10 pens cost £8.00 Find the cost of 9pens		13. If T(n) = 2n - 7, what is the 5th term?		22. Four of the angles of a pentagon are 120^0, 26^0 , 128^0 and 43^0. What is the size of the 5th angle?	
4. Estimate: 771 ÷ 3.6		14. If y=3x - 5, find the value of y when x = -1			
5. Work out: $\frac{4}{5} - \frac{1}{4}$		***Use π on the calculator*** 15. Calculate the area of a circle with diameter of 6cm (1dp)		23. A steel ball has s volume of 1500cm³. The density of the ball is 95g/cm³ Work out the mass of the ball **in kg**	
6. To decrease an amount by 18%, what single multiplier would you use?		16. Expand & simplify: 4(x – 3) + 3(x + 2)			
7. Decrease 380 by 18%		17. Give the inequality 		24. If the relative frequency of a train being on time is 0.4, how often could you expect the train to be on time over 20days?	
8. Without a calculator work out: 0.4 x 0.6		18. Work out the value of: 5x - 2y When x = 2 and y = -3			
9. Round off 34162 to one significant figure		19. Write down the next term in this sequence: 2 5 11 20 32 ...		25. Work out the volume of this cube? 	
10. Use a calculator to work out: (1dp) $\sqrt{(3.6^2 - 1.8^2)}$		20. If $y = x^2 + 2x$, find the value of y when x = 5			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)		G (20-25)