THE DUSTON SCHOOL
Knowledge itself is power
TDS 4-19

Year 8 Maths
Knowledge Organiser
Term 4

Name:	Class:

Keyword	Definition
Area	A measure of 2D size.
Perimeter	The length around the outside of a 2D shape.
Compound shape	A shape made by combining other shapes.
Grid	A set of horizontal and vertical lines.
Term	In sequences, a term is on of the elements in the sequence.
Sequence	A list of elements in a special order.
Linear/arithmetic	A type of sequence where the difference between terms is constant.
Quadratic	A type of sequence where the second difference between terms is constant.
Gradient	The change in the y coordinate for every 1 moved along the x axis (how steep it is)
Intercept	When two or more things meet.
Quadrants	On a coordinate grid, the 4 quadrants are the sections separated by the axes.

Homework 1 due:	
Homework 2 due:	
Homework 3 due:	

RESPECT

In Mathematics, a classroom environment should always be respectful. Students can show respect through:

- **Supporting each other with their learning.** Pupils should recognise that every individual has their own strengths and weaknesses and, as a class, we should 'up-lift' students.
- **Students should not be felt to be rushed by others in the classroom**. Respect that all students have different experiences and therefore will access the knowledge at different rates.
- **Being Polite.** As no different to the rest of school. Students should embrace diversity and treat all others with tolerance and decency.

ASPIRATION

- **Building logical processes.** Understanding that learning mathematical concepts improves our logical reasoning which improves other aspects of our lives: language, culture, games etc. the essence of mathematics is in respect of ideas, structures and relationships by logical reasoning.
- **Every day needs.** Understanding that being numerate, along with literate, is a strong indicator of long-term success and students' ability to climb the tree of knowledge.

RESILIENCE

- **I don't know it… yet.** Understanding that maths can be abstract and that, as with anything new, it will take time to learn. With time, you will succeed.
- **Mathematical concept won't always come easily.** Understanding that getting things wrong is a frustrating and not pleasant feeling but, to succeed, it is a passage we need to go through.
- **Practice makes permanent.** Mathematics is a logical subject such that, rehearsal and repetition of method is the key to being successful and committing the knowledge to long-term memory. This process takes time and will come with failures along the way which we must persevere through.

Term 4 Overview

Big Questions for the term

Transformations

- What is a reflection?
- Where is the reflection?
- What is a rotation?
- What is a translation?
- How do we perform combined transformations?
- What does it mean to be 'mathematically similar'?
- How do we describe enlargements?

Forming and Solving

1. How do we form expressions and equations?

2. How can we solve a linear equation?

3. Where do we find equations in other topics?

4. How can we re-arrange formulas?

Knowledge Retrieval Questions – From Year 7

Unit 6 – Area, perimeter and volume

#	Question	Answer
1	State the properties of a square.	4 edges, all equal length, 4 right angles.
2	State the two properties of a trapezium.	Quadrilateral with one pair of parallel edges
3	What is a vertex?	A point where edges meet
4	State the properties of a parallelogram.	Quadrilateral with 2 pairs of parallel edges.
5	What is the formula for calculating the area of a rectangle?	Area = base × height
6	How do you work out the perimeter of a 2D shape?	Add all the edge lengths
7	What is the formula for calculating the area of a triangle?	1/2 x base x height
8	How do you work out the height of a rectangle if you know the area and the base length?	Area ÷ Base length
9	What is the formula for calculating the area of a trapezium?	Area = ½ × (a+b) × height
10	What is the formula for working out the area of a parallelogram?	Area = base × height
11	What are the properties of a rectangle?	Quadrilateral with 2 pairs of parallel edges and 4 right angles.
12	What is the formula for working out the area of a square?	Area = $base^2$
13	How do you work out the height of a triangle if you know the area and the base length?	2 x Area ÷ Base length

Knowledge Retrieval Questions – For Year 8

Unit 4 – Transformations

#	Question	Answer
1	What is a line of symmetry?	A line which would split a shape into two equal parts, which are mirror images of each other.
2	What is rotational symmetry?	When you can rotate a shape and it looks exactly the same as it did to start with.
3	What does it mean for two shapes to be similar?	When all the angles are the same, but the shape could be bigger or smaller.
4	What information do you need for a translation?	A movement vector
5	What information do you need for a rotation?	An angle of turn, direction of turn, centre of rotation
6	What information do you need for a reflection?	A mirror line
7	What information do you need for an enlargement?	A scale factor of enlargement, A centre of enlargement

Unit 5 – Forming and solving equations

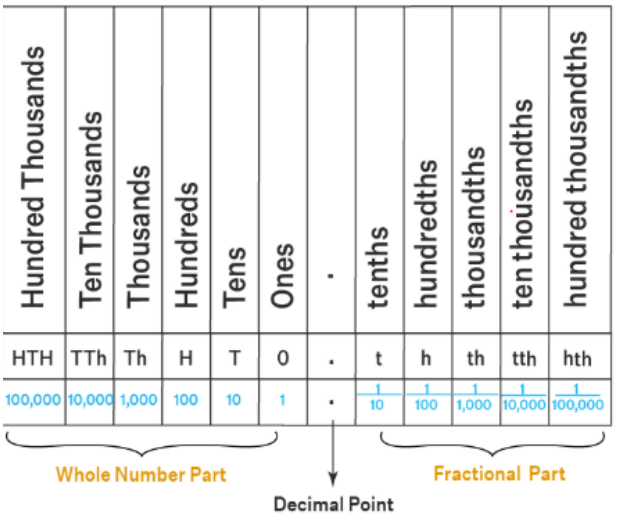
#	Question	Answer
1	How do you solve an equation with an unknown on one side?	Undo each of the parts of the equation, in reverse BIDMAS order.
2	How do you solve an equation with an unknown on both sides?	Simplify, by subtracting the smaller of the two terms containing the unknown, then proceed as normal.
3	What does it mean to "solve an equation"?	Find the value or values of the unknown which make the equation correct.
4	What do you do if you have brackets in your equations?	If you only have one letter, proceed as normal. If you have more than one letter, expand and simplify, then proceed as normal.
5	How do you rearrange an equation so that x is the subject?	Treat it as if you were solving for x, but your answer will be algebraic.
6	What does it mean to "form an equation"?	Write the sentence as an equation, you may need to remember a formula first.

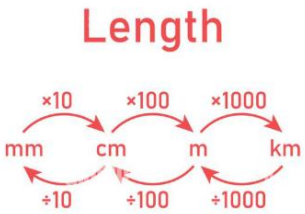
Unit 6 – Area, perimeter and volume

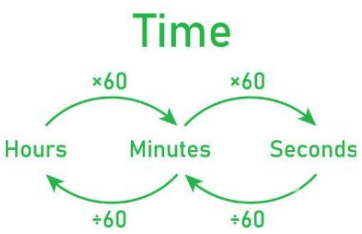
#	Question	Answer
1	What is the formula for calculating the area of a circle?	Area = $\pi \times \text{radius}^2$
2	What is the formula for calculating the circumference of a circle?	Circumference = π x diameter
3	How do you work out the surface area of a shape?	Work out the area of each face and add them together.
4	What is the relationship between radius and diameter?	Diameter = $2 \times$ radius
5	What is the formula for the volume of a prism?	Volume = Cross-sectional Area × Length
6	How do you work out the surface area of a prism?	Surface Area = Cross-sectional Area × 2 + Cross-sectional Perimeter × Length
7	What is the difference between a face, an edge, and a vertex?	A face is a flat surface on a 3D shape, an edge is where two faces meet, a vertex is where edges meet.

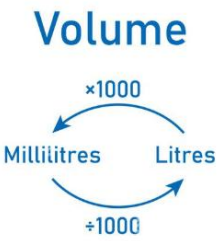
Multiplication Chart

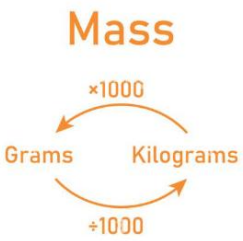
X	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

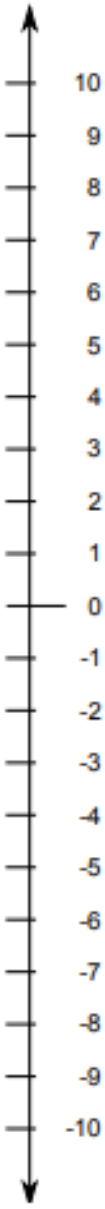












Remote-Learning

If you are absent from school, lesson work can be found on your year group Teams channel: files -> class materials -> maths

---

This website is useful to students as it contains videos to support students understanding and also extra questions to extend and support students.

Please see your class teacher for any login issues

vle.mathswatch.co.uk

Username: firstnamesurname@dustonschool

Password: berrywood

Term 4 - Homework 1

#	Type	Question	Answer
1	Knowledge	Which operation do we use for the word 'of'?	Multiplication
	Application 1	Write the calculation for 'Two thirds of 60'	
	Application 2	Write the calculation for 'Seven twelfths of 36'	
2	Knowledge	With a calculator, how do you convert a decimal to a percentage?	Multiply by 100 (%)
	Application 1	Convert 0.3 into a percentage.	
	Application 2	Convert 0.54 into a percentage.	
3	Knowledge	How do you convert a percentage to a decimal?	Divide by 100 (%)
	Application 1	Convert 92% into a percentage.	
	Application 2	Convert 170% into a percentage.	
4	Knowledge	With a calculator, how do you convert a percentage to a decimal?	Type the percentage in and press =, followed by S <=> D
	Application 1	Convert 25% into a decimal.	
	Application 2	Convert 73% into a decimal.	
5	Knowledge	With a calculator, how do you convert a percentage to a fraction?	Type the percentage in and press =, then select fraction
	Application 1	Convert 26% into a fraction.	
	Application 2	Convert 95% into a fraction.	

#	Type	Question	Answer
6	Knowledge	How do you multiply fractions?	Multiply the numerators and multiply the denominators.
	Application 1	$\frac{4}{6} \times \frac{2}{8}$	
	Application 2	$\frac{4}{10} \times \frac{3}{8}$	

7	Knowledge	What is a line of symmetry?	A line which would split a shape into two equal parts, which are mirror images of each other.
	Application 1	How many lines of symmetry does a square have?	
	Application 2	How many lines of symmetry does a rectangle have?	

8	Knowledge	What do you do if you have brackets in your equations?	If you only have one letter, proceed as normal. If you have more than one letter, expand and simplify, then proceed as normal.
	Application 1	Complete the first step to solve 3(4d - 9) = -15	
	Application 2	Complete the first step to solve 2(5d + 9) = 48	

9	Knowledge	How do you find a fraction of an amount?	Divide the amount by the denominator and multiply by the numerator.
	Application 1	Find $\frac{3}{5}$ of 60	
	Application 2	Find $\frac{10}{20}$ of 60	

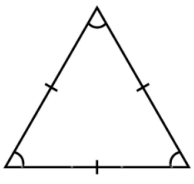
10	Knowledge	What does it mean to "solve an equation"?	Find the value or values of the unknown which make the equation correct.
	Application 1	Solve a - 3 = 27	
	Application 2	Solve a + 2 = 20	

#	Type	Question	Answer
11	Knowledge	What does it mean to "form an equation"?	Write the sentence as an equation, you may need to remember a formula first.
	Application 1	Susan is 3 years older than Mary (x) and the total of their ages is 23	
	Application 2	Susan is 4 years younger than Mary (x) and the total of their ages is 45	

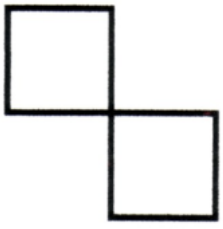
12	Knowledge	What operation does a fraction represent?	Division
	Application 1	What calculation would you do to write 4 tenths as a decimal?	
	Application 2	What calculation would you do to write 4 ninths as a decimal?	

13	Knowledge	What does HCF stand for?	Highest Common Factor
	Application 1	What is the HCF of 60 and 72?	
	Application 2	What is the HCF of 20 and 50?	

14	Knowledge	What's the first step when adding or subtracting fractions?	Write the fractions with a common denominator
	Application 1	Complete the first step $\frac{2}{3}+\frac{1}{2}$	
	Application 2	Complete the first step $\frac{4}{7}+\frac{1}{2}$	

15	Knowledge	What is rotational symmetry?	When you can rotate a shape and it looks exactly the same as it did to start with.
	Application 1	What is the order of rotational symmetry of this shape?	

Term 4 - Homework 2

#	Type	Question	Answer
1	Knowledge	What does it mean to "solve an equation"?	Find the value or values of the unknown which make the equation correct.
	Application 1	Solve a + 2 = 6	
	Application 2	Solve a - 3 = 21	
2	Knowledge	How do you simplify the product of two powers with the same base?	Add the indices together
	Application 1	Simplify $10^6 \times 10^6$	
	Application 2	Simplify $13^4 \times 13^3$	
3	Knowledge	What operation does a fraction represent?	Division
	Application 1	What calculation would you do to write 7 tenths as a decimal?	
	Application 2	What calculation would you do to write 3 hundreths as a decimal?	
4	Knowledge	What is rotational symmetry?	When you can rotate a shape and it looks exactly the same as it did to start with.
	Application	What is the order of rotational symmetry of this shape?	
5	Knowledge	How do you expand single brackets?	Multiply the term outside the brackets by each of the terms inside
	Application 1	Expand 3(4u - 8)	
	Application 2	Expand 4p(2p - 9)	

#	Type	Question	Answer
6	Knowledge	How do you convert a percentage to a decimal?	Divide by 100 (%)
	Application 1	Convert 74% into a percentage.	
	Application 2	Convert 190% into a percentage.	
7	Knowledge	What is a vertex?	A point where edges meet
	Application	Sketch a shape and draw an arrow pointing to a vertex.	
8	Knowledge	What is a line of symmetry?	A line which would split a shape into two equal parts, which are mirror images of each other.
	Application 1	How many lines of symmetry does a circle have?	
	Application 2	How many lines of symmetry does an isosceles triangle have?	
9	Knowledge	What is a numerator?	Top number in a fraction
	Application 1	What is the numerator in the fraction 4 tenths?	
	Application 2	What is the numerator in the fraction 2 sixths?	
10	Knowledge	What is the formula for calculating the area of a rectangle?	Area = base × height
	Application 1	Calculate the area of a rectangle with dimensions 2cm and 2cm.	
	Application 2	Calculate the area of a rectangle with dimensions 4cm and 3cm.	

#	Type	Question	Answer
11	Knowledge	What is the formula for calculating the area of a triangle?	1/2 x base x height
	Application 1	Calculate the area of a triangle with dimensions 2cm and 2cm.	
	Application 2	Calculate the area of a triangle with dimensions 4cm and 3cm.	
12	Knowledge	State the two properties of a trapezium.	Quadrilateral with one pair of parallel edges
	Application	Sketch a trapezium, using the appropriate symbols.	
13	Knowledge	How is a negative index related to the same positive index?	The negative index is the reciprocal of the positive one
	Application 1	Write 5^{-6} using a positive index	
	Application 2	Write 5^{-5} using a positive index	
14	Knowledge	State the properties of a square.	4 edges, all equal length, 4 right angles.
	Application	Sketch a square, using the appropriate symbols.	
15	Knowledge	What is the answer to any number raised to the power zero?	1
	Application 1	Evaluate 12^0	
	Application 2	Evaluate 15^0	

Term 4 - Homework 3

#	Type	Question	Answer
1	Knowledge	How do you work out the height of a rectangle if you know the area and the base length?	Area ÷ Base length
	Application 1	Calculate the height of a rectangle with an area of 18cm² and a base length of 3cm.	
	Application 2	Calculate the height of a triangle with an area of 24cm² and a base length of 6cm.	
2	Knowledge	State the two properties of a trapezium.	Quadrilateral with one pair of parallel edges
	Application	Sketch a trapezium, using the appropriate symbols.	
3	Knowledge	What is the formula for calculating the area of a rectangle?	Area = base × height
	Application 1	Calculate the area of a rectangle with dimensions 10cm and 4cm.	
	Application 2	Calculate the area of a rectangle with dimensions 4cm and 5cm.	
4	Knowledge	How do you find the median when you have an even number of pieces of data?	Put the numbers in order and find the mean of the two middle numbers
	Application 1	What is the median of the following data: 12, 13, 12, 12, 14, 14	
	Application 2	What is the median of the following data: 12, 16, 14, 15, 13, 15	
5	Knowledge	How do you convert a percentage to a decimal?	Divide by 100 (%)
	Application 1	Convert 12.7% into a percentage.	
	Application 2	Convert 300% into a percentage.	

-

#	Type	Question	Answer
6	Knowledge	What is the relationship between radius and diameter?	Diameter = 2 × radius
	Application 1	What is the radius of a circle if the diameter is 8m?	
	Application 2	What is the diameter of a circle if the radius is 14cm?	
7	Knowledge	With a calculator, how do you convert a percentage to a fraction?	Type the percentage in and press =, then select fraction
	Application 1	Convert 26% into a fraction.	
	Application 2	Convert 95% into a fraction.	
8	Knowledge	List the first 10 square numbers	1,4,9,16,25,36,49,64,81,100
	Application 1	What is the 9^{th} square number?	
	Application 2	What is the 11^{th} square number?	
9	Knowledge	In algebra, what does "collecting like terms" mean?	Adding or subtracting terms with the exact same letters
	Application 1	Simplify the following expression: 10p + 3q - 2p + 2q	
	Application 2	Simplify the following expression: 7p + 7q - 6p + 7q	
10	Knowledge	State the properties of a square.	4 edges, all equal length, 4 right angles.
	Application	Sketch a square, using the appropriate symbols.	

#	Type	Question	Answer
11	Knowledge	What is a multiple?	A number in another numbers times table
	Application 1	What is the 7^{th} multiple of 9	
	Application 2	What is the 11^{th} multiple of 8	
12	Knowledge	What is the formula for working out the area of a parallelogram?	Area = base × height
	Application 1	Calculate the area of a parallelogram with dimensions 10cm and 4cm.	
	Application 2	Calculate the area of a parallelogram with dimensions 4cm and 5cm.	
13	Knowledge	What is a vertex?	A point where edges meet
	Application	Sketch a shape and draw an arrow pointing to a vertex.	
14	Knowledge	What's the first step when adding or subtracting fractions?	Write the fractions with a common denominator
	Application 1	Complete the first step of the calculation 2/10 + 2/5	
	Application 2	Complete the first step of the calculation 6/9 + 7/6	
15	Knowledge	What are decimal places?	Digits to the right of a decimal point
	Application 1	How many decimal places does the number 0.09660 have?	
	Application 2	How many decimal places does the number 0.0748 have?	

Careers in Maths

Packaging Designer

Packaging designers design and develop packaging for different products.
(Also called: Packaging technologist, Packaging engineer)

Your day-to-day duties may include:

- producing sample packaging to try out different materials and designs
- running production trials and tests to make sure the packaging works properly and is safe
- meeting with production line engineers to work out the best way to make the packaging
- working with graphic designers on the artwork, to make sure it fits in with the company's marketing and branding schemes

You'll need to consider:

- how fragile the product is and how much protection it needs
- possible reactions to light, moisture or materials within the packaging
- the conditions it may be in during transportation, like high or low temperatures
- legal requirements, like accurate labelling and safe packaging of hazardous materials
- the environmental impact of packaging production, and its disposal once used
- reviewing the effectiveness of your analysis

Working Hours and Environment

You'll usually work 9am to 5pm, Monday to Friday. If you work in manufacturing, you may occasionally have on-call duties.

You'll work in an office, with some time spent in laboratories, testing materials. You'll also monitor factory production line processes, where you'll need to wear protective clothing.

Skills Required:

You'll need:

- science and maths skills
- communication and negotiating skills
- excellent IT skills
- attention to detail
- budget management skills
- the ability to work to deadlines

Entry Requirements

You'll usually need a foundation degree, an HND or a degree in packaging or packaging design. Other relevant subjects include materials science, food technology, nutrition, physics or chemistry.

You could start as a packaging line operator and, with training, work your way up.

Find out more about careers on **UNIFROG**