THE DUSTON SCHOOL
Knowledge itself is power
TDS 4-19

Year 8 Maths
Knowledge Organiser
Term 5

Name:	Class:

Keyword	Definition
Median	The middle number in an ordered list.
Range	The difference between the smallest and largest values in a data set.
Mean	The sum of all the data divided by how many data there are.
Mode	The most common piece of data.
Average	An indication of the typical value.
Qualitative	Data which is non-numerical.
Quantitative	Data which is numerical.
Discrete	Data which can only take certain values in a range.
Continuous	Data which can take any value in a range.
Frequency	How often something happens
Grid	A set of horizontal and vertical lines.

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 5 Overview

Big Questions for the term

Area, perimeter and volume

- How can we work out the circumference of a circle?
- How can we work out the area of a circle?
- What is a prism?
- How do nets help is with Surface Area?
- How is Volume different from Surface Area?
- How can we work out the volume of prisms?
- What are the conversions of units in 2 and 3 dimensions?

Sequences, functions and graphs

- What types of sequences are there?
- How can algebra help us with formulating nth term?
- How can we describe position and lines on graphs?
- How does a table of values help me with plotting graphs?
- What is and how can we work out the gradient?
- How can we work out the equation of a straight line?

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 6 – Area, perimeter and volume

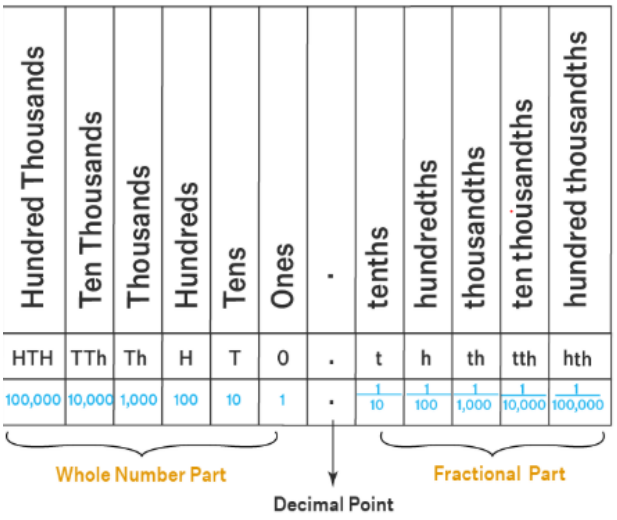
#	Question	Answer
1	What is the formula for calculating the area of a circle?	Area = $\pi \times \text{radius}^2$
2	What is the formula for calculating the circumference of a circle?	Circumference = π x diameter
3	How do you work out the surface area of a shape?	Work out the area of each face and add 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.

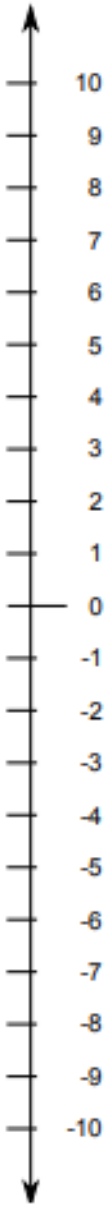
Unit 7 – Sequences, functions and graphs

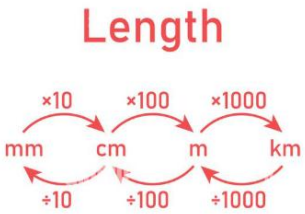
#	Question	Answer
1	How do you find the nth term of a linear sequence?	Identify the term-to-term rule, then work out what you have to add/subtract to get to the first term.
2	How do you work out the equation of a horizontal or vertical line?	Identify the number where the line goes through the axis, a. If horizontal: $y = a$. If vertical: $x = a$.
3	How do you find the value of any term using the nth term rule?	Substitute the number of the term into the nth term rule.
4	How do you work out the gradient of a line?	Choose 2 points on the line, then divide the change in y by the change in x.
5	What do the letters m and c represent in $y = mx + c$?	m = gradient, c = y-intercept
6	How do you find the equation of a line given two points on it?	Find the gradient. Substitute the gradient and the (x,y) of one of the points into $y = mx + c$ and solve for c.
7	How do you know, given the equations of two lines, if they are parallel?	They have the same gradient.
8	How do you find the midpoint given two points?	The midpoint will have coordinates halfway between the x and y coordinates of the two given points.

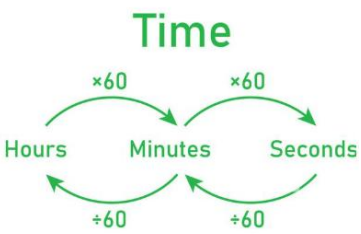
Multiplication Chart

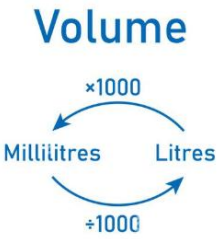
X	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	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

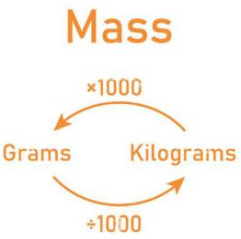












Remote-Learning

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

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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 5 - Homework 1

#	Type	Question	Answer
1	Knowledge	How do you expand double brackets?	Multiply each of the terms in the first bracket by each of the terms in the second bracket
	Application 1	Expand $(z + 2)(z + 2)$	
	Application 2	Expand $(r + 4)(r + 4)$	
2	Knowledge	Which operation do we use for the word 'of'?	Multiplication
	Application 1	Write the calculation for 'Two thirds of 48'	
	Application 2	Write the calculation for 'Seven twelfths of 72'	
3	Knowledge	How do you determine the index when converting large numbers into standard form?	It is the number of digits after the first non-zero digit before the decimal point
	Application 1	What is the index when the number 8350000 is written in standard form?	
	Application 2	What is the index when the number 235000000 is written in standard form?	
4	Knowledge	What does HCF stand for?	Highest Common Factor
	Application 1	What is the HCF of 18 and 30?	
	Application 2	What is the HCF of 66 and 60?	
5	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 $a+5=11$	
	Application 2	Solve $b-10 = 11$	

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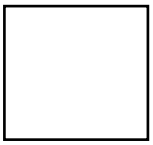
#	Type	Question	Answer
6	Knowledge	How do you find the range of a set of data?	Largest number - Smallest number
	Application 1	What is the range of the following data: 19, 17, 14, 14, 13	
	Application 2	What is the range of the following data: 16, 11, 20, 17, 19	
7	Knowledge	How do you simplify fractions?	Divide both the numerator and denominator by a common factor.
	Application 1	Fully simplify 6/12	
	Application 2	Fully simplify 16/30	
8	Knowledge	With a calculator, how do you convert a percentage to a fraction?	Type the percentage in and press =
	Application 1	Convert 82% into a fraction.	
	Application 2	Convert 35% into a fraction.	
9	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 $7(5x+3)=20$	
	Application 2	Complete the first step to solve $2(3x+4)=15$	
10	Knowledge	With a calculator, how do you convert a percentage to a decimal?	Type the percentage in and press =, followed by Format
	Application 1	Convert 95% into a decimal.	
	Application 2	Convert 69% into a decimal.	

#	Type	Question	Answer
11	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	Draw the lines of symmetry on this shape	
12	Knowledge	What is a cube number?	The product of 3 equal numbers.
	Application 1	What is 2 cubed?	
	Application 2	What is 5 cubed?	
13	Knowledge	What does the word sum mean?	The result of addition.
	Application 1	What is the sum of 8 and 6?	
	Application 2	What is the sum of 3 and 6?	
14	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: 17, 15, 16, 17, 18, 10	
	Application 2	What is the median of the following data: 15, 17, 13, 17, 11, 13	
15	Knowledge	What does percent mean?	Out of 100
	Application 1	Write 45% as a fraction in it's simplest form.	
	Application 2	Write 178% as a fraction in it's simplest form.	

Term 5 - Homework 2

#	Type	Question	Answer
1	Knowledge	How do you solve an equation with an unknown on one side?	Undo each of the parts of the equation, in reverse BIDMAS order.
	Application 1	Solve 3x+1=10	
	Application 2	Solve 5x – 2 = 10	
2	Knowledge	How do you determine the index when converting large numbers into standard form?	It is the number of digits after the first non-zero digit before the decimal point
	Application 1	What is the index when the number 34200 is written in standard form?	
	Application 2	What is the index when the number 8290000 is written in standard form?	
3	Knowledge	How do you convert a fraction to a decimal if the denominator is a factor of 100?	Write the equivalent fraction with a denominator of 100 (then divide by 100)
	Application 1	What is 4/25 as a decimal?	
	Application 2	What is 2/200 as a decimal?	
4	Knowledge	In algebra, what is substitution?	Replacing something in an expression with something else which is equal to it
	Application 1	Evaluate 3x + 2y, if x = 2 and y = 5	
	Application 2	Evaluate 7x + 6y, if x = 7 and y = 3	
5	Knowledge	How do you find the range of a set of data?	Largest number - Smallest number
	Application 1	What is the range of the following data: 15, 11, 14, 16, 14	
	Application 2	What is the range of the following data: 10, 18, 14, 15, 10	

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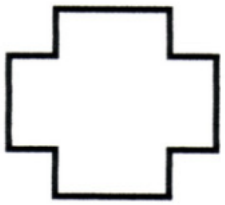
#	Type	Question	Answer
6	Knowledge	What does consecutive mean?	Following each other continuously.
	Application 1	Select 2 of these numbers which are consecutive: 9, 14, 10, 17.	
	Application 2	Select 2 of these numbers which are consecutive: 4, 9, 6, 8.	
7	Knowledge	Which operation do we use for the word 'of'?	Multiplication
	Application 1	Write the calculation for 'Two thirds of 18'	
	Application 2	Write the calculation for 'Seven twelfths of 84'	
8	Knowledge	How do you find the median when you have an odd number of pieces of data?	Put the numbers in order and select the middle number
	Application 1	What is the median of the following data: 15, 11, 14, 16, 14	
	Application 2	What is the median of the following data: 10, 18, 14, 15, 10	
9	Knowledge	How do you simplify a power raised to another power?	Multiply the indices together
	Application 1	Simplify $(18^3)^5$	
	Application 2	Simplify $(17^6)^3$	
10	Knowledge	How do you convert a decimal to a fraction?	The numerator is the same digits without the decimal point, the denominator is the place value of the last digit.
	Application 1	Write 0.15 as a fraction.	
	Application 2	Write 0.181 as a fraction.	

#	Type	Question	Answer
11	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	
12	Knowledge	How do you find a fraction of an amount?	Divide the amount by the denominator and multiply by the numerator.
	Application 1	Find 9/11 of 99	
	Application 2	Find 8/12 of 48	
13	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 $13^4 \times 13^3$	
14	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)	
15	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	

Term 5 - Homework 3

#	Type	Question	Answer
1	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?	

2	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?	

3	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	

4	Knowledge	What is the answer to any number raised to the power zero?	1
	Application 1	Evaluate 12^0	
	Application 2	Evaluate 15^0	

5	Knowledge	What is the definition of a multiple?	A number in another number's times table.
	Application 1	Give an example of a multiple of 8	
	Application 2	Give an example of a multiple of 5	

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#	Type	Question	Answer
6	Knowledge	What is the first step when trying to find the next term in a sequence?	Identify the pattern.
	Application 1	What is the next term in the following sequence 4, 13, 22, 31, 40?	
	Application 2	What is the next term in the following sequence 8, 11, 14, 17, 20?	
7	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 4x+2=18	
	Application 2	Solve 10-x=9	
8	Knowledge	How do you convert a percentage to a decimal?	Divide by 100 (%)
	Application 1	Write 45% as a decimal.	
	Application 2	Write 159% as a decimal.	
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	With a calculator, how do you convert a percentage to a fraction?	Type the percentage in and press =
	Application 1	Convert 20% into a fraction.	
	Application 2	Convert 45% into a fraction.	

#	Type	Question	Answer
11	Knowledge	How do you divide a number by 10?	Move all the digits 1 place to the right
	Application 1	Calculate 66 divided by 10.	
	Application 2	Calculate 135 divided by 10.	
12	Knowledge	How do you find a fraction of an amount?	Divide the amount by the denominator and multiply by the numerator.
	Application 1	Find 9/11 of 44	
	Application 2	Find 8/11 of 88	
13	Knowledge	What does the word product mean?	The result of a multiplication.
	Application 1	What is the product of 2 and 8?	
	Application 2	What is the product of 4 and 5?	
14	Knowledge	How is division represented algebraically?	As a fraction
	Application 1	How do you write b divided by 2 algebraically?	
	Application 2	How do you write 4 divided by c algebraically?	
15	Knowledge	How do you multiply fractions?	Multiply the numerators and multiply the denominators.
	Application 1	Calculate 9/180 × 5/90	
	Application 2	Calculate 3/40 × 8/40	

Careers in Maths

Astronomer

You might be working in laboratories and observatories, you might also work in a museum, planetarium, or university.

Astronomy is divided into observational astronomy and theoretical astronomy.

In observational astronomy, your duties might include:

- *collecting data from satellites and spacecraft using radio and optical telescopes*
- *developing new instrumentation and maintaining existing equipment*
- *developing software to interpret the images captured by satellites*
- *analysing data and testing theories.*

In theoretical astronomy, your duties might include:

- *creating complex computer models to develop theories on the physical processes happening in space*
- *analysing the results of past observations to develop new predictions*
- *making observations and testing theories*
- *analysing data to help develop our understanding of events in the universe*

Working Hours and Environment

You may need to work long and irregular hours, including weekends, evenings and nights,

Your work is likely to include frequent travel to meetings and conferences. You'll often need to visit observatories in the UK and overseas.

Entry Requirements

You'll usually need a BSc (Hons) degree (2:1 or higher) in:

- astronomy
- physics
- astrophysics
- geophysics

You could move into astronomy if you've got a background in computer science, maths or some branches of chemistry or engineering.

You could also take an extended degree, leading to a postgraduate qualification like an MPhys or MSci.

Skills Required:

You'll need:

- good powers of observation and attention to detail
- a methodical and logical approach to work
- the ability to analyse problems, work with abstract ideas and do complex calculations
- the ability to produce scientific reports for publication and present your research findings
- strong IT skills

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