THE DUSTON SCHOOL
Knowledge itself is power
TDS 4-19

Year 8 Maths

Knowledge Organiser

Term 2

Name:	Class:

Keyword	Definition
Simplify	To make simpler or easier to understand by reducing the size of numbers or the number of terms.
Like terms	Terms which have the exact same letters in an expression.
Expression	One or more terms combined by addition or subtraction.
Function	A special relationship where each input has one output.
Substitute	Replace something in an expression with something else which is equal to it.
Numerator	The top number in a fraction.
Denominator	The bottom number in a fraction.
Improper Fraction	A fraction where the numerator is not smaller than the denominator.
Mixed Number	A combination of a whole number and a fraction.
Product	The result of multiplication.
Percent	Out of 100
Simplify	To make simpler or easier to understand by reducing the size of numbers or the number of terms.
Reciprocal	The result of dividing 1 by the number.

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 2 Overview

Big Questions for the term

Integers, Powers and Roots

- What did we learn in year 7?
- What is index notation and why do we have it?
- What does it mean to 'root' a number?
- How can we perform operations with Index Notation?
- What is Standard Form and why do we use it?

Simplifying and substitution

- What do we already know?
- What does it mean to simplify an expression?
- How do we form expressions?
- What is a function machine?
- What does it mean to expand brackets?
- What does it mean to factorise?
- How do we expand double brackets?

Knowledge Retrieval Questions – From Year 7

Unit 2 – Integers, Powers and Roots

#	Question	Answer
1	What does the word product mean?	The result of a multiplication.
2	What sign would the product of 2 negative numbers have?	Positive
3	What sign would the product of a positive and a negative number have?	Negative
4	What sign would the answer to a negative number divided by a positive number have?	Negative
5	What is the definition of a square number?	The product of a number and itself
6	List the first 13 square numbers.	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169
7	What is the definition of a factor?	A number which divides another number exactly.
8	What is the definition of a multiple?	A number in another number's times table.
9	What does HCF stand for?	Highest Common Factor
10	What does LCM stand for?	Lowest Common Multiple
11	What is a cube number?	The product of 3 equal numbers.
12	How do you divide by a fraction?	Multiply by its reciprocal (the fraction flipped over)
13	What is the definition of a prime number?	A number with only 2 factors.

Unit 3 – Simplifying and substitution

#	Question	Answer
1	In algebra, what does "collecting like terms" mean?	Adding or subtracting terms with the exact same letters
2	In algebra, what is substitution?	Replacing something in an expression with something else which is equal to it
3	The symbol for which operation is not written in algebra?	Multiplication
4	How is division represented algebraically?	As a fraction
5	How do you write expressions from sentences?	Replace unknown numbers with letters, everything else should be a number or an operation.

Knowledge Retrieval Questions – For Year 8

Unit 2 – Integers, Powers and Roots

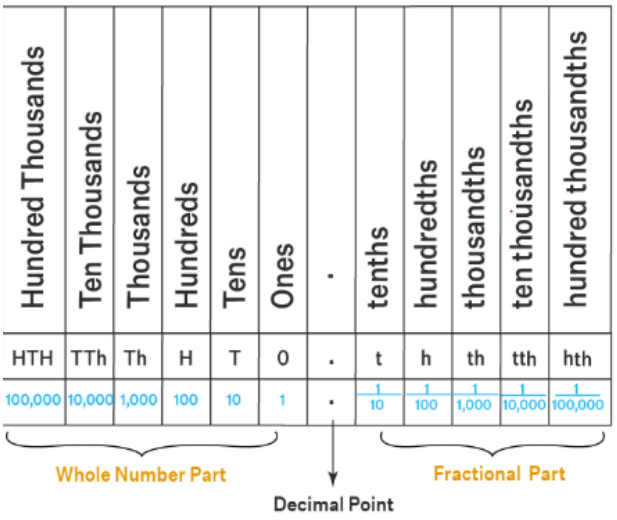
#	Question	Answer
1	How do you estimate a square root?	Identify the square numbers either side of it
2	How do you simplify the product of two powers with the same base?	Add the indices together
3	How do you simplify the division of two powers with the same base?	Subtract the second index from the first
4	What is the answer to any number raised to the power zero?	1
5	How do you simplify a power raised to another power?	Multiply the indices together
6	How is a negative index related to the same positive index?	The negative index is the reciprocal of the positive one
7	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
8	How do you determine the index when converting small numbers into standard form?	It is the number of digits before the first non-zero digit
9	The first part of a number written in standard from should be between which 2 numbers?	1 and 10 (smaller than 10…)

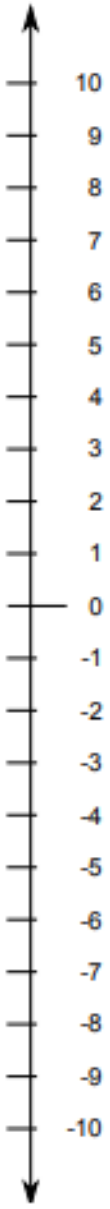
Unit 3 – Simplifying and substitution

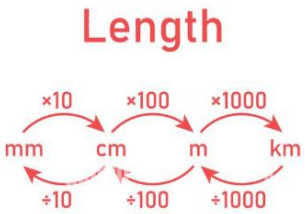
#	Question	Answer
1	When are brackets used in an expression?	When the order of operations is different to BIDMAS order.
2	How do you expand single brackets?	Multiply the term outside the brackets by each of the terms inside.
3	How do you expand double brackets?	Multiply each of the terms in the first bracket by each of the terms in the second bracket.
4	What is the first step in factorising into single brackets?	Find the highest common factor of the terms.

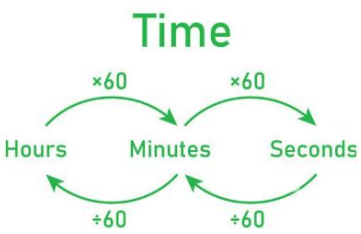
Multiplication Chart

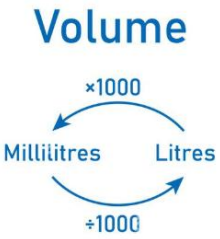
X	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72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

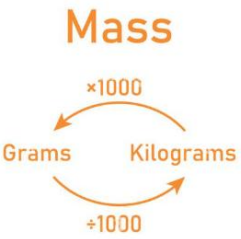












Remote-Learning

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 2 - Homework 1

#	Type	Question	Answer
1	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 6^{-4} using a positive index	
	Application 2	Write 5^{-3} using a positive index	
2	Knowledge	The first part of a number written in standard from should be between which 2 numbers?	1 and 10 (smaller than 10…)
	Application 1	What is the initial number when 3 530 000 000 is written in standard form?	
	Application 2	What is the initial number when 91 800 000 000 is written in standard form?	
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 148 000 is written in standard form?	
	Application 2	What is the index when the number 93 800 is written in standard form?	
4	Knowledge	How do you simplify the product of two powers with the same base?	Add the indices together
	Application 1	Simplify $13^5 \times 13^6$	
	Application 2	Simplify $16^6 \times 16^3$	

5	Knowledge	What is the definition of a factor?	A number which divides another number exactly
	Application 1	Give an example of a factor of 21	
	Application 2	Give an example of a factor of 49	
6	Knowledge	What sign would the product of 2 negative numbers have?	Positive
	Application 1	What is the product of -3 and -2?	
	Application 2	What is the product of -7 and -2?	
7	Knowledge	What does LCM stand for?	Lowest Common Multiple
	Application 1	What is the LCM of 5 and 15?	
	Application 2	What is the LCM of 8 and 6?	
8	Knowledge	Why do we use BIDMAS?	Order of operations
	Application 1	Calculate $37 + 5 \times 5$	
	Application 2	Calculate $180 + 6 \times 6$	

9	Knowledge	What does HCF stand for?	Highest Common Factor
	Application 1	What is the HCF of 24 and 44?	
	Application 2	What is the HCF of 72 and 66?	

12	Knowledge	What is the definition of a square number?	The product of a number and itself
	Application 1	What is the 7th square number?	
	Application 2	What is the 11th square number?	

13	Knowledge	How do you simplify the division of two powers with the same base?	Subtract the second index from the first
	Application 1	Simplify $12^5 \div 12^3$	
	Application 2	Simplify $15^6 \div 15^5$	

14	Knowledge	What sign would the answer to a negative number divided by a positive number have?	Negative
	Application 1	Calculate -4 divided by 2	
	Application 2	Calculate -21 divided by 3	

Term 2 - Homework 2

#	Type	Question	Answer
1	Knowledge	List the first 15 square numbers.	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169,196,225
	Application 1	What is the 11^{th} square number?	
	Application 2	What is the 9^{th} square number?	
2	Knowledge	How do you write expressions from sentences?	Replace unknown numbers with letters, everything else should be a number or an operation.
	Application 1	Write '9 lots of a number plus 3' as an expression.	
	Application 2	Write '4 less than k' as an expression.	
3	Knowledge	What sign would the answer to a negative number divided by a positive number have?	Negative
	Application 1	Calculate -10 divided by 2	
	Application 2	Calculate -28 divided by 3	
4	Knowledge	The symbol for which operation is not written in algebra?	Multiplication
	Application 1	How do you write 3 multiplied by k algebraically?	
	Application 2	How do you write f multiplied by 6 algebraically?	

5	Knowledge	How do you expand single brackets?	Multiply the term outside the brackets by each of the terms inside
	Application 1	Expand 3(6u - 4)	
	Application 2	Expand 5u(5u - 2)	

6	Knowledge	What does LCM stand for?	Lowest Common Multiple
	Application 1	What is the LCM of 6 and 7?	
	Application 2	What is the LCM of 4 and 6?	

7	Knowledge	In algebra, what is substitution?	Replacing something in an expression with something else which is equal to it
	Application 1	Evaluate 8x + 3y, if x = 3 and y = 3	
	Application 2	Evaluate 6x + 7y, if x = 6 and y = 6	

8	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 + 8q - 3p + 3q	
	Application 2	Simplify the following expression: 7p + 6q - 7p + 6q	

9	Knowledge	How is division represented algebraically?	As a fraction
	Application 1	How do you write b divided by 3 algebraically?	
	Application 2	How do you write 6 divided by c algebraically?	

10	Knowledge	In algebra, what is substitution?	Replacing something in an expression with something else which is equal to it
	Application 1	Evaluate 8x, if x = -3	
	Application 2	Evaluate x^2, if x = -6	

11	Knowledge	What is the first step in factorising into single brackets?	Find the highest common factor of the terms.
	Application 1	What is the HCF of 8x and 4?	
	Application 2	What is the HCF of 10x and 2x?	

12	Knowledge	When are brackets used in an expression?	When the order of operations is different to BIDMAS order.
	Application 1	Evaluate 3 + 2 x 4	
	Application 2	Evaluate (3 + 2) x 4	

Term 2 - Homework 3

#	Type	Question	Answer
1	Knowledge	How do you expand single brackets?	Multiply the term outside the brackets by each of the terms inside
	Application 1	Expand 2(8q - 5)	
	Application 2	Expand 3v (4v - 3)	
2	Knowledge	The first part of a number written in standard from should be between which 2 numbers?	1 and 10 (smaller than 10…)
	Application 1	What is the initial number when 0.0023 is written in standard form?	
	Application 2	What is the initial number when 0.715 is written in standard form?	
3	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 + 4) (z + 6)	
	Application 2	Expand (t + 2) (t + 9)	
4	Knowledge	What is the first step in factorising into single brackets?	Find the highest common factor of the terms.
	Application 1	What is the highest common factor of 4x and 16?	
	Application 2	What is the highest common factor of 5y and 10y?	

5	Knowledge	How do you determine the index when converting small numbers into standard form?	It is the number of digits before the first non-zero digit
	Application 1	What is the index when the number 0.0129 is written in standard form?	
	Application 2	What is the index when the number 0.000 001 51 is written in standard form?	

6	Knowledge	What is the answer to any number raised to the power zero?	1
	Application 1	Evaluate 13^0	
	Application 2	Evaluate 11^0	

7	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 229 000 000 is written in standard form?	
	Application 2	What is the index when the number 230 000 000 is written in standard form?	

8	Knowledge	When are brackets used in an expression?	When the order of operations is different to BIDMAS order.
	Application 1	Write this as an expression: w subtracts p all multiplied by d	
	Application 2	Write this as an expression: y adds p all divided by a	

9	Knowledge	How do you simplify a power raised to another power?	Multiply the indices together
	Application 1	Simplify $(14^6)^4$	
	Application 2	Simplify $(20^3)^3$	

10	Knowledge	How do you simplify the division of two powers with the same base?	Subtract the second index from the first
	Application 1	Simplify $15^3 \div 15^4$	
	Application 2	Simplify $18^6 \div 18^3$	

11	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 6^{-7} using a positive index	
	Application 2	Write 4^{-5} using a positive index	

12	Knowledge	How do you estimate a square root?	Identify the square numbers either side of it
	Application 1	Between which two integers is the square root of 50?	
	Application 2	Between which two integers is the square root of 18?	

13	Knowledge	How do you simplify the product of two powers with the same base?	Add the indices together
	Application 1	Simplify $17^3 \times 17^6$	
	Application 2	Simplify $18^4 \times 18^5$	

Careers in Maths

Acoustics Engineer

Acoustics consultants work on ways to reduce noise and vibrations inside a building, or caused by products.

Your day-to-day duties could include:

- carrying out noise assessments on buildings to make sure they meet building regulations
- testing how changes to a building's design affects sound levels and quality
- advising architects and civil engineers
- giving specialist advice in legal cases
- exploring how sound vibrations affect machinery and structures
- finding ways to make noisy products like hair-driers and building machinery quieter
- designing and working with recording studio and broadcast sound equipment
- collecting national and international data
- analysing data using specialist software
- building a picture of crime in an area by studying trends in data
- monitoring the behaviour of individuals or groups
- updating intelligence records on databases
- reviewing the effectiveness of your analysis

Working Hours and Environment

You'll usually work 35 to 40 hours a week, Monday to Friday. During busy periods, you may be required to work more hours including evenings or weekends, depending on project deadlines. You may work freelance or be self-employed. See our guide 'How to become self-employed' for information on the advantages and disadvantages of being self-employed.

Skills Required:

You'll need:

- a creative and practical approach to solving problems
- the ability to explain design plans clearly
- excellent IT skills
- project management and organisational skills

Entry Requirements

You'll usually need a degree in a relevant subject, lik

- acoustics
- maths
- physics
- engineering

If your degree is in environmental science or music technology, you'll likely need to complete an additional qualification in acoustics to give you the skills needed by the industry, such as an MSc in acoustics

Find out more about careers on UNIFROG