THE DUSTON TDS 4-19 SCHOOL
Knowledge itself is power

Year 9 Higher Maths Knowledge Organiser Term 3

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.
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 3 Overview

Big Questions for the term

Simplifying and substitution

- What do we already know?
    - Simplifying algebra, writing expressions, expanding and factorising linear
- How do we factorise quadratic expressions?
- How do we simplify algebraic fractions?
- How do we operate with algebraic fractions?

Constructions

- How can we construct triangles?
- How can we bisect a line?
- How can we bisect an angle?
- How can we bisect a line from different points?
- How can we construct different angles?
- How can we map 3D shapes?
- What is a locus of points?

Knowledge Retrieval Questions – From Year 7

Unit 5 – 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.

Unit 6 – Constructions

None

Knowledge Retrieval Questions – From Year 8

Unit 5 – Simplifying and substitution

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

Unit 6 – Constructions

None

Knowledge Retrieval Questions – For Year 9

Unit 5 – Simplifying and substitution

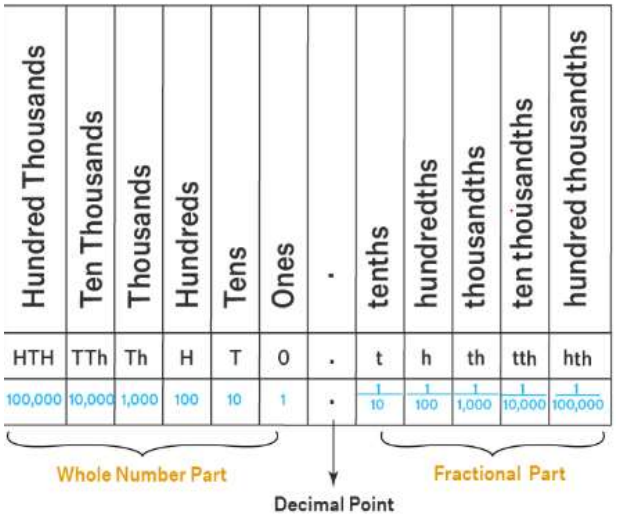
#	Question	Answer
1	How do you add algebraic fractions?	Same as number fractions, make the denominators the same and add the numerators.
2	How do you multiply algebraic fractions?	Same as number fractions, multiply the numerators and the denominators, then simplify.
3	How do you divide algebraic fractions?	Same as number fractions, multiply the first one by the reciprocal of the second, then simplify.
4	How do you factorise a quadratic with a leading coefficient of 1?	Find the 2 numbers which add to make the coefficient of x and multiply to make the constant.

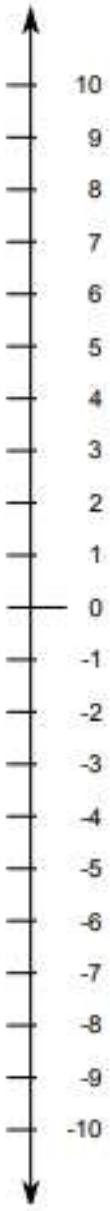
Unit 6 – Constructions

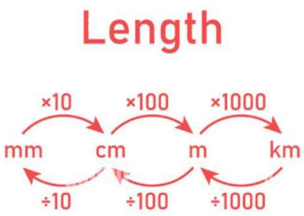
#	Question	Answer
1	What does it mean to "construct" in maths?	To draw accurately, using a combination of pencil, ruler, protractor and a pair of compasses.
2	How do you construct a triangle, given one side length and two angles?	Use a ruler to draw the side, measure the angles on either end, draw the lines so they connect.
3	How do you construct a triangle, given two side lengths and the angle between?	Use a ruler to draw one side, measure the angle, use a ruler to draw the second side, join the ends up.
4	How do you construct a triangle, given three side lengths?	Use a ruler to draw one side, use a pair of compasses to draw arcs on either end with radii equal to the two remaining sides, the point they intersect is the third vertex.
5	How do you construct a perpendicular bisector?	Set your compass to more than half way, draw two arcs from each end of the line, connect the two points where the arcs meet
6	How do you construct an angle bisector?	Put your compass on the vertex and make a mark on each line, draw an arc with your compass on each mark, connect the point where the arcs meet with the vertex.

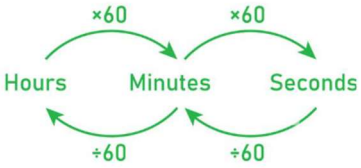
Multiplication Chart

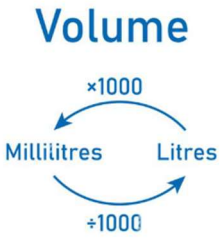
X	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72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

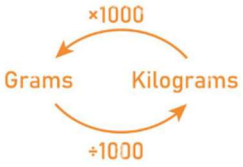












Remote-Learning

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

MathsWatch

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 3 - Homework 1

#	Type	Question	Answer
1	Knowledge	With a calculator, how do you decrease an amount by a percentage?	Subtract the percentage from 100%, then multiply by the amount
	Application 1	Decrease 70 by 11%	
	Application 2	Decrease 40 by 32%	
2	Knowledge	With a calculator, how do you increase an amount by a percentage?	Add the percentage to 100%, then multiply by the amount
	Application 1	Increase 45 by 24%	
	Application 2	Increase 78 by 9%	
3	Knowledge	How do you share in a ratio if you are given the difference?	Work out the difference in the ratio and scale up to the difference you want
	Application 1	Anna and Ben share money in the ratio 8:1. Anna gets £56 more than Ben, how much does Anna get?	
	Application 2	Anna and Ben share money in the ratio 7:1. Anna gets £24 more than Ben, how much does Anna get?	
4	Knowledge	How do you work out the value after adding compound interest?	$\text{amount} \times (100\% + \%\ \text{interest})^{\ years}$
	Application 1	Calculate the balance if an account with £9800 got 6% compound interest for 5 years.	
	Application 2	Calculate the balance if an account with £5200 got 2% compound interest for 3 years.	

5	Knowledge	How do you find 30% of an amount without a calculator?	Find 10% by dividing the amount by 10, then multiply by 3.
	Application 1	Find 30% of 90	
	Application 2	Find 30% of 70	

6	Knowledge	How do you decrease an amount by a percentage?	Calculate the percentage of the amount, then subtract it from the original amount
	Application 1	Decrease 80 by 25%	
	Application 2	Decrease 120 by 40%	

7	Knowledge	How do you use exchange rates to convert money?	Scale up the currency you know and apply to the other
	Application 1	The exchange rate for GBP to USD is 1:1.23. How many Dollars would get for £220?	
	Application 2	The exchange rate for GBP to USD is 1:1.21. How many Pounds would get for $350.90?	

8	Knowledge	How do you share in a ratio if you are given one of the final amounts?	Scale up from the ratio to the amount you know and apply to the other
	Application 1	Carly and Dan share money in the ratio 9:4. Dan gets £120, how much does Carly get?	
	Application 2	Carly and Dan share money in the ratio 7:4. Dan gets £200, how much does Carly get?	

9	Knowledge	What does it mean to work out a reverse percentage?	You are given the amount AFTER a percentage has been applied and asked to work out the original amount
	Application 1	In a sale where prices are cut by 40% a pair of trainers cost £36.00, work out the original price.	
	Application 2	In a sale where prices are cut by 20% a pair of trainers cost £72.00, work out the original price.	

10	Knowledge	How do you work out the value after adding simple interest?	amount + % of amount × number of years
	Application 1	Calculate the balance if an account with £7100 got 3% simple interest for 5 years.	
	Application 2	Calculate the balance if an account with £6300 got 6% simple interest for 3 years.	

11	Knowledge	How do you work out percentage change?	(Change ÷ Original) × 100 (%)
	Application 1	Over a year, your bank account goes from £6300 to £10200, calculate the percentage change.	
	Application 2	Over a year, your bank account goes from £6300 to £5100, calculate the percentage change.	

12	Knowledge	What is direct proportion?	Describes quantities which have a constant ratio
	Application 1	x and y are in direct proportion. When: x = 10 y = 40. What would x be if y = 48?	
	Application 2	x and y are in direct proportion. When: x = 9 y = 27. What would x be if y = 42?	

Term 3 - Homework 2

#	Type	Question	Answer
1	Knowledge	How do you work out the value after adding simple interest?	amount + % of amount × number of years
	Application 1	Calculate the balance if an account with £3600 got 4% simple interest for 2 years.	
	Application 2	Calculate the balance if an account with £6600 got 5% simple interest for 5 years.	
2	Knowledge	With a calculator, how do you decrease an amount by a percentage?	Subtract the percentage from 100%, then multiply by the amount
	Application 1	Decrease 88 by 27%	
	Application 2	Decrease 108 by 9%	
3	Knowledge	What is direct proportion?	Describes quantities which have a constant ratio
	Application 1	x and y are in direct proportion. When: x = 6 y = 12. What would x be if y = 26?	
	Application 2	x and y are in direct proportion. When: x = 7 y = 21. What would x be if y = 45?	
4	Knowledge	How do you work out the value after adding compound interest?	amount × (100% + % interest)^{years}
	Application 1	Calculate the balance if an account with £7200 got 5% compound interest for 3 years.	
	Application 2	Calculate the balance if an account with £5500 got 6% compound interest for 5 years.	

5	Knowledge	How do you share in a ratio if you are given one of the final amounts?	Scale up from the ratio to the amount you know and apply to the other
	Application 1	Carly and Dan share money in the ratio 5:4. Dan gets £120, how much does Carly get?	
	Application 2	Carly and Dan share money in the ratio 6:1. Dan gets £40, how much does Carly get?	

6	Knowledge	With a calculator, how do you increase an amount by a percentage?	Add the percentage to 100%, then multiply by the amount
	Application 1	Increase 40 by 7%	
	Application 2	Increase 60 by 11%	

7	Knowledge	How do you decrease an amount by a percentage?	Calculate the percentage of the amount, then subtract it from the original amount
	Application 1	Decrease 50 by 30%	
	Application 2	Decrease 120 by 35%	

8	Knowledge	How do you work out percentage change?	(Change ÷ Original) × 100 (%)
	Application 1	Over a year, your bank account goes from £8400 to £10200, calculate the percentage change.	
	Application 2	Over a year, your bank account goes from £6300 to £6800, calculate the percentage change.	

9	Knowledge	How do you use exchange rates to convert money?	Scale up the currency you know and apply to the other
	Application 1	The exchange rate for GBP to USD is 1:1.26. How many Dollars would get for £390?	
	Application 2	The exchange rate for GBP to USD is 1:1.24. How many Pounds would get for $533.20?	

10	Knowledge	How do you share in a ratio if you are given the difference?	Work out the difference in the ratio and scale up to the difference you want
	Application 1	Anna and Ben share money in the ratio 5:1. Anna gets £64 more than Ben, how much does Anna get?	
	Application 2	Anna and Ben share money in the ratio 4:1. Anna gets £12 more than Ben, how much does Anna get?	

11	Knowledge	What is a significant figure?	Any digit after the first non-zero digit
	Application 1	What is the 3rd significant figure in the number 56.78	
	Application 2	What is the 3rd significant figure in 0.003872	

12	Knowledge	What is a scale factor?	The ratio between corresponding measurements of similar shapes
	Application 1	Corresponding sides on two similar shapes are 6cm and 21cm. What is the scale factor?	
	Application 2	Corresponding sides on two similar shapes are 8cm and 32cm. What is the scale factor?	

Term 3 - Homework 3

#	Type	Question	Answer
1	Knowledge	How do you find 30% of an amount without a calculator?	Find 10% by dividing the amount by 10, then multiply by 3.
	Application 1	Find 30% of 30	
	Application 2	Find 30% of 70	
3	Knowledge	How do you work out the value after adding simple interest?	amount + % of amount × number of years
	Application 1	Calculate the balance if an account with £2900 got 6% simple interest for 4 years.	
	Application 2	Calculate the balance if an account with £8100 got 6% simple interest for 5 years.	
4	Knowledge	With a calculator, how do you increase an amount by a percentage?	Add the percentage to 100%, then multiply by the amount
	Application 1	Increase 63 by 20%	
	Application 2	Increase 79 by 9%	
5	Knowledge	How do you simplify the product of two powers with the same base?	Add the indices together
	Application 1	Simplify $x^5 \times x^7$	
	Application 2	Simplify $y^4 \times y$	

6	Knowledge	How do you increase an amount by a percentage?	Calculate the percentage of the amount, then add it on to the original amount
	Application 1	Increase 120 by 35%	
	Application 2	Increase 80 by 5%	

7	Knowledge	How do you decrease an amount by a percentage?	Calculate the percentage of the amount, then subtract it from the original amount
	Application 1	Decrease 60 by 40%	
	Application 2	Decrease 100 by 25%	

8	Knowledge	With a calculator, how do you decrease an amount by a percentage?	Subtract the percentage from 100%, then multiply by the amount
	Application 1	Decrease 45 by 35%	
	Application 2	Decrease 68 by 26%	

9	Knowledge	How do you simplify the division of two powers with the same base?	Subtract the second index from the first
	Application 1	Simplify $x^{15} \div x^{7}$	
	Application 2	Simplify $y^{5} \div y^{7}$	

10	Knowledge	How do you work out the value after adding compound interest?	$\text{amount} \times (100\% + \%\ \text{interest})^{\ years}$
	Application 1	Calculate the balance if an account with £2300 got 6% compound interest for 5 years.	
	Application 2	Calculate the balance if an account with £4100 got 4% compound interest for 4 years.	

11	Knowledge	What does it mean to work out a reverse percentage?	You are given the amount AFTER a percentage has been applied and asked to work out the original amount
	Application 1	In a sale where prices are cut by 25% a pair of trainers cost £45.00, work out the original price.	
	Application 2	In a sale where prices are cut by 10% a pair of trainers cost £90.00, work out the original price.	

12	Knowledge	How do you increase an amount by 40% without a calculator?	Find 10% by dividing by 10, multiply that by 4, then add the result onto the original amount.
	Application 1	Increase 80 by 40%	
	Application 2	Increase 120 by 40%	

13	Knowledge	How do you work out percentage change?	(Change ÷ Original) × 100 (%)
	Application 1	Over a year, your bank account goes from £10500 to £10200, calculate the percentage change.	
	Application 2	Over a year, your bank account goes from £7000 to £8500, calculate the percentage change.	

Careers in Maths

IT Systems Analyst

IT systems analysts look at a company's IT structure and find ways to improve it.

- Your day-to-day tasks will include:
- talking to people in the company or organisation, to learn about their needs and what's not going well
- designing solutions that will fix the problems, often by improving or creating computer systems or software
- working out the costs and time needed to make your plans work
- working closely with programmers and software developers to build systems
- testing the new system to find problems before the final version goes live
- training staff and writing instruction manuals for the new systems
- You'll need to make sure that your designs are future-proof and are flexible enough to adapt as the organisation or business grows.

Working Hours and Environment

- You'll usually work 37 to 40 hours a week. You may have to work overtime, including weekends, to meet deadlines or solve critical technical problems.
- You'll usually be based in an office, working either at your employer's premises or at your client's site. As a consultant, you may be able to work more flexibly or from home.

Wherever you work, you'll be responsible for making decisions that will have a big impact on the way a company works, you'll manage your own time and tasks, and you'll spend a lot of time either at a computer or speaking with other people.

Entry Requirements

You'll usually need:

- to be at least 18
- to have an undergraduate (bachelor's) degree, normally at 2:2 or above
- to be a citizen in the country in which you'll be working, and have lived there for a minimum amount of time (this is 10 years in the UK)
- to pass security checks and criminal background checks

Skills Required:

You'll need:

- You'll usually need a degree, Higher National Diploma (HND), or apprenticeship. Relevant subjects include:
- computer science
- information technology (IT)
- software engineering
- business information systems
- maths
- Most employers will also want to see relevant work experience, and you'll be expected to have a working knowledge of computer operating systems, programming basics, and databases.

Find out more about careers on **UNIFROG**