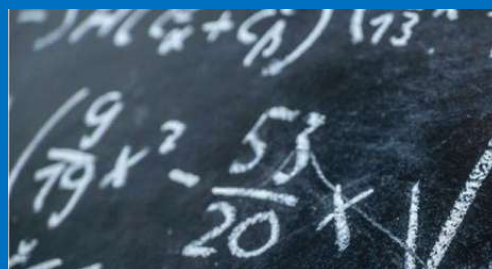


Year 9 Higher Maths Knowledge Organiser Term 4

Name:	Class:
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Keyword	Definition
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.
Equation	An expression which is equal to another expression.
Elimination	In solving equations, elimination refers to removing something from one side of the equation by doing the same operation to both sides.
Unknown	In algebra, an unknown is a letter which represents a value we don't know.
Subject	The subject of an equation is the letter on its own on one side of the equation.

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

Forming and solving equations

- What did we learn in Year 8?
 - Forming equations, re-arranging and solving linear equations.
- How do we re-arrange equations?
- How do we solve simultaneous equation?

Sequences, functions and graphs

- What have we learnt so far?
 - Working with linear sequences, finding and drawing equations of straight lines.
- How can we work out the equation of a straight line?
- What does a quadratic look like?

Knowledge Retrieval Questions – From Year 8

Unit 7 – 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 8 – 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 $y = mx + c$?	$m = \text{gradient}$, $c = \text{y-intercept}$
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.

Knowledge Retrieval Questions – For Year 9

Unit 7 – Forming and solving equations

#	Question	Answer
1	What is the first step for solving simultaneous equations where one of the equations has one unknown?	Solve the equation with a single unknown.
2	What is the first step for solving simultaneous equations where both have two unknowns, but there is a common term?	If the signs of the common terms is the same, subtract one equation from the other. If the signs are different, add them
3	What is the first step for solving simultaneous equations where both have two unknowns, and one of the terms is a multiple of the other?	Multiply the equation with the smaller term so that it is the same as the other equation, then add or subtract, as appropriate.
4	What is the first step for solving simultaneous equations where both have two unknowns, and neither is a multiple of the other?	Scale both equations to the LCM of one of the unknowns. Then add or subtract, as appropriate.

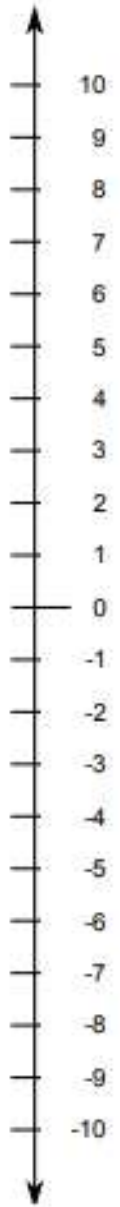
Unit 8 – Sequences, functions and graphs

#	Question	Answer
1	How do you plot a quadratic graph?	Substitute x values (often -3, -2, -1, 0, 1, 2, 3) into the equation to find y values, then plot those coordinates.
2	How do you know, given the equations of two lines, if they are perpendicular?	The product of their gradients is -1.
3	How do you work out the nth term of a quadratic sequence?	Find the second difference, halve it, this is leading coefficient. Add on the nth term of the difference between the sequence and the quadratic term.

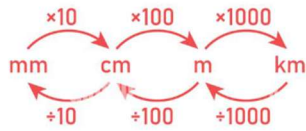
Multiplication Chart

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

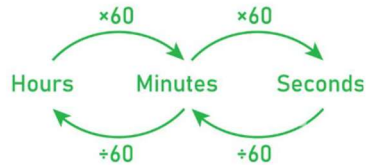
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	.	tenths	hundredths	thousandths	ten thousandths	hundred thousandths
HTH	TTh	Th	H	T	0	.	t	h	th	tth	hth
100,000	10,000	1,000	100	10	1	.	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1,000}$	$\frac{1}{10,000}$	$\frac{1}{100,000}$
Whole Number Part						Decimal Point	Fractional Part				



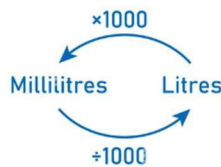
Length



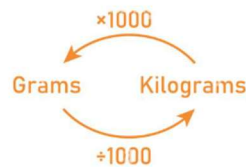
Time



Volume



Mass



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 4 - Homework 1

#	Type	Question	Answer
1	Knowledge	What is a scale factor?	The ratio between corresponding measurements of similar shapes
	Application 1	Corresponding sides on two similar shapes are 12cm and 36cm. What is the scale factor?	
	Application 2	Corresponding sides on two similar shapes are 11cm and 22cm. What is the scale factor?	

2	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 1:1.22. How many Dollars would get for £100?	
	Application 2	The exchange rate for GBP to USD is 1:1.21. How many Dollars would get for £300?	

3	Knowledge	How do you expand single brackets?	Multiply the term outside the brackets by each of the terms inside
	Application 1	Expand $5s(4s - 5)$	
	Application 2	Expand $5(9u + 9)$	

4	Knowledge	What is a significant figure?	Any digit after the first non-zero digit
	Application 1	How many significant figures does the number 3.06593 have?	
	Application 2	How many significant figures does the number 0.00483 have?	

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 2:1. Dan gets £30, how much does Carly get?	
	Application 2	Carly and Dan share money in the ratio 3:1. Dan gets £60, how much does Carly get?	

6	Knowledge	How do you divide by a decimal?	Multiply both numbers by 10 repeatedly until you are dividing by a whole number
	Application 1	Calculate 0.168 divided by 0.008	
	Application 2	Calculate 0.0224 divided by 0.0008	

7	Knowledge	What is direct proportion?	Describes quantities which have a constant ratio
	Application 1	x and y are in direct proportion. When: $x = 6$ $y = 10$. What would y be if $x = 18$?	
	Application 2	x and y are in direct proportion. When: $x = 7$ $y = 14$. What would y be if $x = 14$?	

8	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 data: 15, 14, 14, 16, 17, 12	
	Application 2	What is the median of the data: 13, 19, 13, 19, 16, 18	

9	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: x add r all divided by d	
	Application 2	Write this as an expression: x subtracts p all multiplied by b	

10	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 $(z + 2)(z + 6)$	

11	Knowledge	What sign would the product of a positive and a negative number have?	Negative
	Application 1	What is the product of 10 and -6?	
	Application 2	What is the product of 11 and -6?	

12	Knowledge	What does LCM stand for?	Lowest Common Multiple
	Application 1	What is the LCM of 6 and 9?	
	Application 2	What is the LCM of 10 and 14?	

Term 4 - Homework 2

#	Type	Question	Answer
1	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 1:1.22. How many Dollars would get for £200?	
	Application 2	The exchange rate for GBP to USD is 1:1.21. How many Dollars would get for £350?	

2	Knowledge	What sign would the product of 2 negative numbers have?	Positive
	Application 1	What is the product of -9 and -3?	
	Application 2	What is the product of -5 and -5?	

3	Knowledge	What is the definition of a square number?	The product of a number and itself
	Application 1	What is the 9th square number?	
	Application 2	What is the 14th square number?	

4	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 658000 is written in standard form?	
	Application 2	What is the index when the number 7010000 is written in standard form?	

5	Knowledge	How do you expand single brackets?	Multiply the term outside the brackets by each of the terms inside
	Application 1	Expand $3s(2s - 5)$	
	Application 2	Expand $u(9u + 9)$	

6	Knowledge	What is a scale factor?	The ratio between corresponding measurements of similar shapes
	Application 1	Corresponding sides on two similar shapes are 8cm and 16cm. What is the scale factor?	
	Application 2	Corresponding sides on two similar shapes are 8cm and 32cm. What is the scale factor?	

7	Knowledge	How do you work out the value after adding compound interest?	$\text{amount} \times (100\% + \% \text{ interest})^{\text{number of years}}$
	Application 1	Calculate the balance if an account with £5300 got 3% compound interest for 3 years.	
	Application 2	Calculate the balance if an account with £8100 got 2% compound interest for 3 years.	

8	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 113 by 20%	
	Application 2	Increase 101 by 5%	

9	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 £9100 got 5% simple interest for 4 years.	
	Application 2	Calculate the balance if an account with £2300 got 4% simple interest for 3 years.	

10	Knowledge	How do you work out percentage change?	$(\text{Change} \div \text{Original}) \times 100 (\%)$
	Application 1	Over a year, your bank account goes from £5600 to £8500, calculate the percentage change.	
	Application 2	Over a year, your bank account goes from £7700 to £10200, calculate the percentage change.	

11	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 $(x + 2)(x - 6)$	

12	Knowledge	What is direct proportion?	Describes quantities which have a constant ratio
	Application 1	x and y are in direct proportion. When: $x = 6$ $y = 24$. What would y be if $x = 18$?	
	Application 2	x and y are in direct proportion. When: $x = 7$ $y = 21$. What would y be if $x = 14$?	

Term 4 - Homework 3

#	Type	Question	Answer
1	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: x subtract r all divided by e	
	Application 2	Write this as an expression: x adds p all multiplied by c	

2	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 £5900 got 4% simple interest for 2 years.	
	Application 2	Calculate the balance if an account with £8900 got 6% simple interest for 2 years.	

3	Knowledge	How do you divide by a decimal?	Multiply both numbers by 10 repeatedly until you are dividing by a whole number
	Application 1	Calculate 0.16 divided by 0.008	
	Application 2	Calculate 0.22 divided by 0.11	

4	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 60	

5	Knowledge	How do you work out the value after adding compound interest?	$\text{amount} \times (100\% + \% \text{ interest})^{\wedge} \text{ number of years}$
	Application 1	Calculate the balance if an account with £6100 got 6% compound interest for 3 years.	
	Application 2	Calculate the balance if an account with £6600 got 5% compound interest for 4 years.	

6	Knowledge	What is the first step for solving simultaneous equations where both have two unknowns, and neither is a multiple of the other?	Scale both equations to the LCM of one of the unknowns. Then add or subtract, as appropriate.
	Application 1	Complete the first step in solving these simultaneous equations: $6c + 7w = 40$ and $8c + 5w = 36$	

7	Application 1	What is the first step for solving simultaneous equations where one of the equations has one unknown?	Solve the equation with a single unknown.
	Application 2	Complete the first step in solving these simultaneous equations: $3h + 3 = 18$ and $2u + 6h = 34$	

8	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 $(x - 3)(x - 6)$	

9	Knowledge	How do you expand single brackets?	Multiply the term outside the brackets by each of the terms inside
	Application 1	Expand $s(2s - 5)$	
	Application 2	Expand $3u(9u + 9)$	

10	Knowledge	What sign would the product of a positive and a negative number have?	Negative
	Application 1	What is the product of 7 and -6?	
	Application 2	What is the product of 9 and -6?	

11	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 658 is written in standard form?	
	Application 2	What is the index when the number 7010 is written in standard form?	



Air Traffic Controller

Air traffic controllers give information and advice to airline pilots to help them take off and land safely and on time

Your day-to-day tasks will vary depending on which type of controller you become.

There are 3 types:

- area controller – in a regional control centre, tracking and guiding aircraft through your sector
- approach controller – managing aircraft as they approach the airport
- aerodrome controller – in a control tower, helping pilots land and park, and line up for take-off

Air traffic controllers also respond to emergency distress calls, guiding planes to the runway and helping pilots to land safely.

Working Hours and Environment

- You'll usually work 40 hours a week on shifts, including days, nights, weekends and public holidays.
- During a shift you'll usually guide aircraft for up to 2 hours, followed by a half-hour break.
- You'll be based in a flight control centre or airport control tower

Entry Requirements

You'll usually need:

- maths and IT skills
- the ability to work calmly under pressure
- communication skills to give instructions to pilots
- the ability to interpret information from different sources to assess situations

Skills Required:

You'll need:

You'll need an air traffic control licence from the **National Air Traffic Services (NATS)**. It takes around 3 years to train and you'll complete your training while working.

To become a trainee controller, you'll need:

- to be 18 years old
- 5 GCSEs at grades 9 to 4 (A* to C) or equivalent, including English and maths
- a medical examination
- security clearance

NATS has more information about becoming an air traffic controller.

