

Year 9 Higher Maths

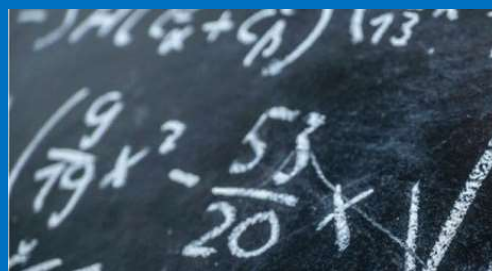
Knowledge Organiser

Term 2

Name:	Class:
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Keyword	Definition
Ratio	Shows the relative sizes of two or more values.
Proportion	The relationship compared to the whole.
Equivalent	Equal to the same amount.
Simplifying	With fractions and ratio, simplifying is finding the equivalent fraction or ratio with the smallest numbers.
Direct Proportion	A relationship between 2 variables, the ratio between them is always constant.
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

Ratio and proportion

- What have we learnt so far?
 - representing ratios, equivalent ratios, simplifying ratios, sharing using ratios,
- What is unitary ratio?
- What is inverse proportion?
- What does it mean for shapes to be similar?
- How do we convert Area and Volume metric units?
- What is the relation between Length, Area and Volume Scale Factors for similar shapes?

Fractions, decimals and percentages

- What have we covered so far?
 - Representing fractions, operations with fractions, converting FDP, calculating percentages
- How can we order Fractions, Decimals and Percentages?
- How can we write recurring decimals?
- How can we work out percentages on a calculator?
- How do we work out percentage change?
- What do we mean by reverse percentages?
- What is compound interest?

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

Knowledge Retrieval Questions – From Year 7

Unit 3 – Ratio and proportion

#	Question	Answer
1	How do you simplify a ratio?	Divide both numbers by a common factor.
2	How do you write a ratio into the form n:1?	Divide both numbers in the ratio by the second number in the ratio.
3	What is the unitary method?	A method where the first step is making the ratio 1:n or n:1
4	How do you calculate best value?	Work out the cost of the same amount for each option and compare those.
5	How do you share an amount in a ratio?	Add the ratio numbers and divide by that to get the value of each part.

Unit 4 – Fractions, decimals and percentages

#	Question	Answer
1	What is a numerator?	Top number in a fraction
2	What is a denominator?	Bottom number in a fraction
3	What operation does a fraction represent?	Division
4	Which operation do we use for the word 'of'?	Multiplication
5	What's the first step when adding or subtracting fractions?	Write the fractions with a common denominator
6	How do you multiply fractions?	Multiply the numerators and multiply the denominators.
7	How do you convert a decimal to a percentage?	Multiply by 100 (%)
8	How do you simplify fractions?	Divide both the numerator and denominator by a common factor.
9	How do you find an equivalent fraction?	Multiply or divide the numerator and denominator by the same number.
10	How do you convert a mixed number to an improper fraction?	Multiply the whole number by the denominator and add it to the numerator
11	How do you find a fraction of an amount?	Divide the amount by the denominator and multiply by the numerator.
12	What does percent mean?	Out of 100
13	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)
14	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.
15	How do you convert a percentage to a decimal?	Divide by 100 (%)

Knowledge Retrieval Questions – From Year 8

Unit 4 – Fractions, decimals and percentages

#	Question	Answer
1	With a calculator, how do you convert a decimal to a percentage?	Multiply by 100 (%)
2	With a calculator, how do you convert a decimal to a fraction?	Type the decimal in and press =
3	With a calculator, how do you convert a fraction to a percentage?	Multiply by 100 (%) and press S \leftrightarrow D
4	With a calculator, how do you convert a fraction to a decimal?	Type the fraction in and press =, followed by S \leftrightarrow D
5	With a calculator, how do you convert a percentage to a decimal?	Type the percentage in and press =, followed by S \leftrightarrow D
6	With a calculator, how do you convert a percentage to a fraction?	Type the percentage in and press =

Knowledge Retrieval Questions – For Year 9

Unit 3 – Ratio and proportion

#	Question	Answer
1	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
2	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
3	How do you use exchange rates to convert money?	Scale up the currency you know and apply to the other
4	What is direct proportion?	Describes quantities which have a constant ratio
5	What is indirect proportion?	Describes quantities which have a constant product
6	What is a scale factor?	The ratio between corresponding measurements of similar shapes

Unit 4 – Fractions, decimals and percentages

#	Question	Answer
1	How do you find 30% of an amount without a calculator?	Find 10% by dividing the amount by 10, then multiply by 3.
2	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.
3	How do you increase an amount by a percentage?	Calculate the percentage of the amount, then add it on to the original amount
4	How do you decrease an amount by a percentage?	Calculate the percentage of the amount, then subtract it from the original amount
5	With a calculator, how do you increase an amount by a percentage?	Add the percentage to 100%, then multiply by the amount
6	With a calculator, how do you decrease an amount by a percentage?	Subtract the percentage from 100%, then multiply by the amount
7	How do you work out the value after adding simple interest?	amount + % of amount × number of years
8	How do you work out percentage change?	$(\text{Change} \div \text{Original}) \times 100 (\%)$
9	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
10	How do you work out the value after adding compound interest?	amount × (100% + % interest) ^ number of years

Term 2 - Homework 1

#	Type	Question	Answer
1	Knowledge	How do you multiply numbers in standard form?	Multiply the numbers, add the indices, adjust if necessary
	Application 1	Calculate, giving your answer in standard form, $(4 \times 10^3) \times (2 \times 10^{-9})$	
	Application 2	Calculate, giving your answer in standard form, $(3 \times 10^2) \times (3 \times 10^5)$	

2	Knowledge	What does a fractional power represent?	A root
	Application 1	What does $13^{1/4}$ represent, in words.	
	Application 2	What does $12^{1/3}$ represent, in words.	

3	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 9	
	Application 2	Give an example of a multiple of 5	

4	Knowledge	The first part of a number written in standard form should be between which 2 numbers?	1 and 10 (smaller than 10...)
	Application 1	What is the initial number when 0.00000442 is written in standard form?	
	Application 2	What is the initial number when 29.3 is written in standard form?	

#	Type	Question	Answer
5	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?	

6	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?	

7	Knowledge	What is the definition of a prime number?	A number with only 2 factors.
	Application 1	Is the number 6 prime?	
	Application 2	Is the number 23 prime?	

8	Knowledge	What sign would the product of a positive and a negative number have?	Negative
	Application 1	What is the product of 5 and -3?	
	Application 2	What is the product of 3 and -3?	

9	Knowledge	What does the word product mean?	The result of a multiplication
	Application 1	What is the product of 5 and 9?	
	Application 2	What is the product of 6 and 5?	

#	Type	Question	Answer
10	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?	

11	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 0.0000158 is written in standard form?	
	Application 2	What is the index when the number 0.0000295 is written in standard form?	

12	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?	

13	Knowledge	What sign would the answer to a negative number divided by a positive number have?	Negative
	Application 1	Calculate -15 divided by 3	
	Application 2	Calculate -21 divided by 7	

Term 2 - Homework 2

#	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 10cm and 20cm. What is the scale factor?	
	Application 2	Corresponding sides on two similar shapes are 10cm and 25cm. What is the scale factor?	
2	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 0.000789 is written in standard form?	
	Application 2	What is the index when the number 0.0000008 is written in standard form?	
3	Knowledge	What is direct proportion?	Describes quantities which have a constant ratio
	Application 1	x and y are in direct proportion. When: $x = 10$ $y = 30$. What would x be if $y = 36$?	
	Application 2	x and y are in direct proportion. When: $x = 9$ $y = 45$. What would y be if $x = 13$?	
4	Knowledge	How do you share an amount in a ratio?	Add the ratio numbers and divide by that to get the value of each part.
	Application 1	Share 90 into the ratio 4 : 5	
	Application 2	Share 33 into the ratio 1 : 2	

#	Type	Question	Answer
5	Knowledge	How do you write a ratio into the form $n:1$?	Divide both numbers in the ratio by the second number in the ratio
	Application 1	Write the ratio $1:2$ into the form $n:1$	
	Application 2	Write the ratio $4:10$ into the form $n:1$	

6	Knowledge	What does HCF stand for?	Highest Common Factor
	Application 1	What is the HCF of 60 and 40?	
	Application 2	What is the HCF of 8 and 9?	

7	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 £24 more than Ben, how much does Anna get?	
	Application 2	Anna and Ben share money in the ratio $7:3$. Anna gets £12 more than Ben, how much does Anna get?	

8	Knowledge	What is the unitary method?	A method where the first step is making the ratio $1:n$ or $n:1$
	Application 1	12 pens cost 72p. Work out the cost of 5 pens.	
	Application 2	5 pens cost 35p. Work out the cost of 6 pens.	

#	Type	Question	Answer
9	Knowledge	How do you simplify a ratio?	Divide both numbers by a common factor
	Application 1	Fully simplify 4:18	
	Application 2	Fully simplify 6:42	

10	Knowledge	What is the definition of a square number?	The product of a number and itself
	Application 1	List the first 10 square numbers	
	Application 2	What is the 11th square number?	

11	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 1:2 How many Dollars would get for £70?	
	Application 2	The exchange rate for GBP to USD is 1:3.50 How many Dollars would get for £180?	

12	Knowledge	How do you multiply numbers in standard form?	Multiply the numbers, add the indices, adjust if necessary
	Application 1	Calculate, giving your answer in standard form, $(3 \times 10^0) \times (2 \times 10^5)$	
	Application 2	Calculate, giving your answer in standard form, $(2 \times 10^9) \times (2 \times 10^2)$	

Term 2 - Homework 3

#	Type	Question	Answer
1	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 50 by 15%	
	Application 2	Increase 200 by 35%	

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 £5300 got 3% simple interest for 3 years	Value of 3% → Value of interest after 3 years → Value in the account after 3 years
	Application 2	Calculate the balance if an account with £2600 got 2% simple interest for 4 years.	Value of 2% → Value of interest after 4 years → Value in the account after 4 years →

3	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 400 by 40%	
	Application 2	Increase 120 by 40%	

4	Knowledge	How do you convert a percentage to a decimal?	divide the percentage by 100
	Application 1	Convert 29% into a decimal.	
	Application 2	Convert 60% into a decimal.	

#	Type	Question	Answer
5	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 74 by 17%	
	Application 2	Increase 88 by 3%	

6	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 99 by 7%	
	Application 2	Decrease 77 by 8%	

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 80 by 30%	
	Application 2	Decrease 60 by 10%	

8	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 40	
	Application 2	Find 30% of 50	

#	Type	Question	Answer
9	Knowledge	With a calculator, how do you convert a decimal to a percentage?	Multiply by 100 (%)
	Application 1	Convert 0.291 into a percentage.	
	Application 2	Convert 0.6804 into a percentage.	

10	Knowledge	With a calculator, how do you convert a decimal to a fraction?	Type the decimal in and press =
	Application 1	Convert 0.85 into a fraction.	
	Application 2	Convert 0.11 into a fraction.	

11	Knowledge	With a calculator, how do you convert a percentage to a fraction?	Type the percentage in and press
	Application 1	Convert 7% into a fraction.	
	Application 2	Convert 14% into a fraction.	

12	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 £10200, calculate the percentage change.	
	Application 2	Over a year, your bank account goes from £6300 to £10200, calculate the percentage change.	



Robotics Engineer

Robotics engineers design and build robots and robotic systems.

Your day-to-day tasks may include:

- install, calibrate, operate, or maintain robots
- conduct research on robotic technology to create new robotic systems or system capabilities
- investigate mechanical failures or unexpected maintenance problems
- build, configure, or test robots or robotic applications
- design robotic systems, such as automatic vehicle control, autonomous vehicles, advanced displays, advanced sensing, robotic platforms, computer vision, or telematics systems
- document robotic application development, maintenance, or changes. Review or approve designs, calculations, or cost estimates
- make system device lists or event timing charts

Working Hours and Environment

- You'll usually work around 40 hours a week. You may work longer to meet project deadlines.
- You'll usually work in an office or a lab. You may work in factories, workshops or outdoors

Entry Requirements

You'll need to do a degree or postgraduate qualification in:

- artificial intelligence and robotics
- mechatronics
- robotics engineering
- mechanical engineering
- electronics engineering
- mathematics

Skills Required:

You'll need:

- knowledge of engineering science and technology
- knowledge of computer operating systems, hardware and software
- maths knowledge
- design skills and knowledge
- excellent verbal communication skills
- the ability to use, repair and maintain machines and tools
- thinking and reasoning skills
- complex problem-solving skills
- to be able to use a computer and the main software packages confidently

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