This is your starting point . . .

SP

. . . the end is up to you!

'I will take responsibility for my learning, be intellectually curious and work independently at school and at home.'

The Regis School
The best in everyone™
Part of United Learning

MATHS (Foundation)

EXAM BOARD: EDEXCEL **COURSE CODE: 1MA1/F**

TOPIC NUMBER	TOPIC	TOPIC NUMBER	TOPIC
1	ROUNDING AND ESTIMATION	12	SEQUENCES
2	TYPES OF NUMBER	13	AVERAGES AND RANGE
3	DECIMALS AND FRACTIONS	14	PROBABILITY
4	PERCENTAGES	15	VEN DIAGRAMS AND TWO-WAY TABLES
5	INDEX NOTATION AND STANDARD FORM	16	PYTHAGORAS' THEOREM
6	EXPANDING AND FACTORISING	17	TRIGONOMETRY AND SPECIAL ANGLES
7	FORMULAE AND SUBSTITUTION	18	ANGLE IN PARALLEL LINES AND POLYGONS
8	LINEAR EQUATIONS AND INEQUALITIES	19	COMPOUND MEASURE
9	QUADRATIC EQUATIONS	20	AREA AND VOLUME
10	SIMULTANEOUS EQUATIONS	21	RATIO
11	LINEAR GRAPHS AND EQUATIONS OF STRAIGHT LINES	22	PROPORTION

TOPIC AREA KEY

NUMBER	ALGEBRA	PROBABILITY AND STATISTICS	GEOMETRY AND MEASURE	RATIO AND PROPORTION

Name: .... Tutor Group: ....

September 2021

MATHS (Foundation) SP – TOPIC 1

Rounding and Estimation

INTRODUCTION

There are ways to find approximate solutions by simplifying calculations. For example, it is not always necessary to give the exact number – you can give an approximate number by rounding.

KEY WORDS

Integer	A whole number
Decimal place	The position of a digit to the right of a decimal point
Significant figures	Digits of a number that are used to express it to the required degree of accuracy, starting from the first non-zero digit.
Estimate	Roughly calculate or judge the value of a calculation

FURTHER LINKS

Hegartymaths (Clips 17, 56, 130-131)

Corbett Maths (Video clips 276-280)

EXAM TIPS:

Rounding

The rule is, if the next digit is: **5 or more**, we '**round up**'. **4 or less**, it stays the same.

Ensure the number makes sense after you have rounded.

E.g. Round 35474 to the nearest thousand.
It is not 35 but 35,000

Significant figures

The first significant figure is the one with the highest place value. It is the first non-zero digit in the number counting from the left.

Estimation

Unless otherwise directed, to estimate the answer to a calculation, you round every number to one significant figure. Remember to show your working at every step.

KEY FACTS TO MEMORISE

Rounding to the nearest integer – Round to the nearest whole number

Rounding decimals to significant figures
e.g. round 0.02547 to 2 significant figures (sf) = 0.025

EXAM QUESTIONS

1. Round 3925 to the nearest thousand.
2. Round 3925 to the nearest hundred.
3. Round 3925 to the nearest ten.
4. Round 17.89 to the nearest whole number.
5. Calculate

$$\frac{7.2}{9.2 \, x \, 2.8}$$

(a) Write down all oif the digits in your calculator display

(b) Write your answer to 1 significant figure.

6. Estimate the following

$$\frac{31.1 \, x \, 19.4}{3.98 \, x \, 5.04}$$

STRETCH

To be able to work out Upper and Lower bounds

MATHS (Foundation) SP – TOPIC 2

TYPES OF NUMBER

INTRODUCTION

Numbers are the basic building blocks of Mathematics

KEY WORDS

Integer	A whole number
Even	Any integer found by multiplying any other integer by 2 2, 4, 6, 8, 10, 12 ....
Odd	An even number plus or minus 1 1, 3, 5, 7, 9 ....
Square	The number obtained when multiplying a number by itself 1, 4, 9, 16, 25 ......
Prime	A number that has only one pair of distinct integer factors (so 1 is not prime!)
Factor	An integer which divides another integer exactly (no remainder)
Multiple	Numbers which occur in the multiplication table for a given number

FURTHER LINKS

Hegartymaths (Clips 25 - 36)

Corbett Maths (Video clips 216, 218, 219, 220)

EXAM TIPS:

SQUARE AND CUBE NUMBERS

Make sure that you can recall the first 15 square numbers and the first 5 cube numbers – know these for the non-calculator exam.

PRIME NUMBERS

There is no pattern to the prime numbers – make sure that you can recall the first 5 or so and that you can recognise if a number is prime.
2 is the only even prime number!!!!

PROOF

If asked to show that a statement is false then you need to find just one example to demonstrate this.

EXAMPLE

Jack says that all odd numbers are prime.
Show that he is wrong.

ANSWER

9 is not prime as it has more than 1 pair of factors
9 = 9 x 1 and 9 = 3 x 3

CALCULATOR SKILLS

Make sure that you can find powers and roots on your calculator

KEY FACTS TO MEMORISE

1.The first 15 square numbers are:
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225

2. The first 5 cube numbers are:
1, 8, 27, 64, 125

3. The first 5 prime numbers are:
2, 3, 5, 7, 11

HCF means **Highest Common Factor** and is the largest number which is a factor of 2 or more numbers

LCM means **Lowest Common Multiple** and is the smallest number to be found in the multiplication tables for 2 or more numbers

EXAM QUESTIONS

1. Write down the first even multiple of 5

2. *The factors of an even number are always even*
   Give an example to show that this statement is false.

3. Give two examples of a number which is both a factor of 24 and a multiple of 4

4. Write down all of the prime numbers between 10 and 20

5. Write down a square number which is also a factor of 52

6. a) Find the HCF of 12 and 20

   b) Find the LCM of 12 and 18

STRETCH

Find out about triangle numbers

Find out about Prime Factor Decomposition (PFD)

Find out how to use PFD to work out HCF and LCM

Create your own problem-solving maths GCSE question to include PFD and share it with the class.

MATHS (Foundation) SP – TOPIC 3

Decimals and Fractions

INTRODUCTION

Decimals and fractions are different ways of representing numbers which are not integers

KEY WORDS

Decimal	Not a whole number or integer . For example 3.6 or 0.235
Fraction	The result of dividing one integer by a second integer. Neither integer can be zero.
Numerator	The top part of the fraction. It is the number being divided
Denominator	The bottom part of a fraction
Reciprocal	Any non-zero number multiplied by its reciprocal is equal to 1. eg 5/3 is the reciprocal of 3/5. 5/3 x 3/5 =15/15=1
Ascending Descending	Getting higher in value. Increasing. Getting lower in value. Decreasing
Simplify	To simplify a fraction down to smaller terms the numerator and denominator are divided by the same number e.g. 8/16 =4/8 = 2/4.
Fully simplify	To simplify a fraction down to its smallest terms e.g. 8/16 = 1/2

FURTHER LINKS

Hegartymaths Simplify fractions: 61
Equivalent fractions: 59
Compare fractions: 60
FDP conversions: 149, 52-55, 73-76, 82-83

EXAM TIPS:

BIDMAS applies WHATEVER the form of the number.

Fraction to Decimal conversion

Use the bus stop method for division.

$\frac{3}{8} = 3 \div 8$ $\qquad 8 \overline{)3.000} = 0.375$

Decimal to fraction conversion

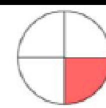
Use the smallest decimal place value as the denominator and write the digits as the numerator.

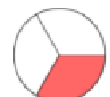
$0.375 = \frac{375}{1000}$

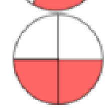
Good practice is to simplify anyway but you MUST simplify if the question tells you to.

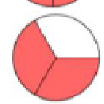
$\frac{375}{1000} = \frac{75}{200} = \frac{15}{40} = \frac{3}{8}$

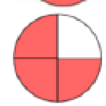
Key facts to memorise

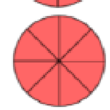
$0.25 = 1 \div 4 = \frac{1}{4} = \frac{5}{20} = \frac{25}{100} = 25\% =$ 

$0.3\dot{3} = 1 \div 3 = \frac{1}{3} = \frac{3}{9} = \frac{9}{27} = 33.3\dot{3}\% =$ 

$0.5 = 1 \div 2 = \frac{1}{2} = \frac{5}{10} = \frac{50}{100} = 50\% =$ 

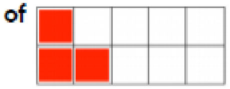
$0.6\dot{6} = 2 \div 3 = \frac{2}{3} = \frac{6}{9} = \frac{18}{27} = 66.6\dot{6}\% =$ 

$0.75 = 3 \div 4 = \frac{3}{4} = \frac{15}{20} = \frac{75}{100} = 75\% =$ 

$1 = 1 \div 1 = \frac{1}{1} = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{9}{9} = 100\% =$ 

EXAM QUESTIONS

Without using a calculator

1. Write 0.7 as a fraction
2. Write 0.012 as a fraction in its simplest form
3. a) Write down the fraction of the grid that is shaded. 

   b) Give your answer as a decimal
4. Arrange the following in ascending order
   0.7 2/3 0.65 3/5 5/8
5. Arrange the following in descending order
   0.012 6/800 1/12 0.06

Stretch it

1. Write 9/40 as a decimal
2. Convert every answer above into a percentage rounded to 2 significant figures
3. Calculate the angle of the shaded sector of each circle in the 'Key facts' box to the left. Any decimal answers should be rounded to the nearest degree
4. Work out problems involving decimals and fractions. Eg. 2/3 + 0.18

MATHS (Foundation) SP – TOPIC 4

Percentages

INTRODUCTION

Percent' means 'per 100'. If 70 percent of the population own a pet, this means that 70 out of every hundred people own a pet. The symbol '%' means 'percent'.

KEY WORDS

Increase	To become bigger
Decrease	To become smaller
Reverse percentages	To find the original percentage
Profit	To sell an item for greater than cost
Loss	To sell an item for less than cost
Interest	Money paid regularly at a particular rate either from money borrowed or money lent
Simple interest	The interest paid out by banks each year for money borrowed or invested. The amount of interest received is the same every year.

FURTHER LINKS

Hegartymaths (Clips 84-88, 90-92, 93, 96)

Corbett Maths (Clips 234-240)

EXAM TIPS:

Original = 100%

Find the original value in the question and write it so that it equals 100%
E.g. 250 = 100%

Percent of an amount Non Calc

Find 10% of the original value first and use this as a building block to find other percentages

Multiplier

To find a multiplier convert the percentage to a decimal.
To find the multiplier divide the percentage by 100
E.g. 27% as a multiplier is
27 ÷ 100 = 0.27

Percentage increase/decrease

Find the percentage of the amount first. Then add or subtract from the original value depending on an increase or decrease question

CALCULATOR SKILLS

Make sure that you can find percentages using a calculator. Always show your working in an exam

KEY FACTS TO MEMORISE

Non Calculator facts
To Find:
10% Divide the original by 10
5% Divide the original by 10 then divide by 2
1% Divide the original by 10 then divide by 10 again
50% Divide the original by 2
25% Divide the original by 2 then divide by 2 again
75% Find 25% then multiply by 3

EXAM QUESTIONS

1. Calculate 70% of 60.
2. A population of 120,000 increases by 10% in a year. Find the size of the population after one year.
3. A car costs £9000 when new. The value decreases by 20% per year. Find the value of the car after one year.
4. What is the multiplier which finds 62% of an amount
5. What is the multiplier which increases an amount by 15%.
6. A lamp is on sale at £22.05. This is a 10% reduction of the normal price. What was the price of the lamp before the reduction?

STRETCH

Find out about compound percentages

Find out about depreciation

MATHS (Foundation) SP – TOPIC 5

Index Notation and Standard Form

INTRODUCTION

Index Notation

If a number is the square, or cube, or some other power of another number, then we can use index notation as an alternative way of writing the number. Eg. $4 = 2 \times 2 = 2^2$

2^2 is the number in index notation or index form.

Index notation can also be used to express a number as a product of its prime factors.

Eg. $72 = 2^3 \times 3^2$

The $2^3 \times 3^2$ is the number in index notation.

Index notation also allows us to simplify calculations using rules known as **Index Laws** or Laws of Indices.

Standard Form

Standard form or standard index form is a concise and convenient way of writing either very large or very small numbers.

For example: 21000000 becomes 2.1×10^7

And 0.000075 becomes 7.5×10^{-5}

Also makes calculating with these numbers easier.

KEY WORDS

Index	The small number written behind and above the base number, which indicates what power we must raise it by, also called the exponent.
Indices	The plural of index. When we multiply powers of the same number, we add together the indices.
Power	Powers of a number made by multiplying the number by itself a set number of times. E.g., the third power of 2 or 2^3 is 8.

KEY FACTS TO MEMORISE

Index Laws

Multiplying

When you multiply powers of the same number you add together the indices. E.g. $5^3 \times 5^4 = 5^7$

Dividing

When you divide powers of the same number you subtract the indices. E.g. $7^5 \div 7^3 = 7^2$

Raising a power to a power

When raising a power to another power you multiply the indices. E.g. $(8^3)^4 = 8^{12}$

Special Indices

Anything to the power zero equals 1. E.g. $9^0 = 1$

Anything to the power 1 is itself. E.g. $10^1 = 10$

The power ½ or 0.5 is the square root. E.g. $16^{½} = 4$

Standard Form

Format

Write the non-zero digits as more than 1 but less than 10, multiplied by a power of 10 in index notation. E.g. 5.6×10^3

The index of 10 may be positive (for large numbers) or negative (for small numbers) but must be an integer.

Multiplying and dividing in standard form

$(1.2 \times 10^3) \times (2 \times 10^4) = 1.2 \times 2 \times 10^{3+4}$

$= 2.4 \times 10^7$

$(1.2 \times 10^3) \div (2 \times 10^4) = (1.2 \div 2) \times 10^{3-4}$

$= 0.6 \times 10^{-1}$

$= 6 \times 10^{-2}$

Adding and subtracting in standard form

Convert to normal numbers before you calculate.

Converting to Standard form

Write the number with a decimal point behind the first non-zero digit. The index of the 10 is how many columns the decimal place appears to have jumped. Positive for large numbers negative for tiny numbers. E.g. 5600 is 5.6×10^3

And 0.00045 is 4.5×10^{-4}

To convert back to normal numbers, push all of the digits a number of columns equal to the index on the 10, push left for a positive index and right for negative.

EXAM TIPS:

Be careful!

$3^2 + 3^2$ is 2×3^2 NOT 3^4

If a question says to leave your answer in standard form then make sure you do!

EXAM QUESTIONS

7. Simplify $4^7 \times 4^4$, leave your answer in index form.
8. Convert 3.9×10^4 into a normal number.
9. Calculate $(9 \times 10^8) \times (2 \times 10^7)$, leave your answer in standard form.

FURTHER LINKS

Hegartymaths

Index notation: (Clips 102 - 110)

Standard form: (Clips 122 – 128)

Corbett Maths

Index notation (Clips 172 – 175)

Standard form: (Clips 300 – 303)

LINKED TOPICS

Expressing a number as a product of prime factors,

Or, Prime Factor Decomposition (PFD).

STRETCH

Try looking at Fractional indices.

MATHS (Foundation) SP – TOPIC 6

Expanding and Factorising

INTRODUCTION

Expanding and factorising are tools needed to enable us to manipulate both numerical and algebraic expressions and to then solve equations.
Factorising involves finding a common factor and then putting the rest of the expression into brackets.
Expanding means we multiply to get rid of the brackets

KEY WORDS

Brackets	Symbols used to group numbers in arithmetic or letters and numbers in algebra and indicating certain operations as having priority.
Expression	A collection of terms which can contain variables (letters) and numbers. E.g. 4pq-12p
Expand	To multiply out brackets in an expression
Factor	A number that divides another number exactly. 4 and 3 are factors of 12
Factorise	To express a number or expression as a product of its factors
Coefficient	A factor in an algebraic term, E.g. in the quadratic expression $3x^2 + 4x - 2$ the coefficients of x^2 and x are 3 and 4 respectively

FURTHER LINKS

Hegartymaths Clips Expand single brackets: 160-161
Factorise into single brackets: 168-170
Expand double brackets: 162-163

EXAM TIPS:

Expanding single bracket

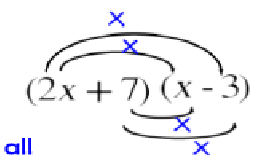
Think where the "multiply" or "x" would be, then use it!
$3(4x + 3)$ expands to $12x + 9$
$3k(2k + 5)$ expands to $6k^2 + 15k$

Expanding double brackets

Expand $(2x + 7)(x - 3)$ ×

Remember it AND Use it. Choose your method

×	x	-3
$2x$	$2x^2$	$-6x$
$+7$	$+7x$	-21



Collect all 4 terms?

$$2x^2 + 7x - 6x - 21$$

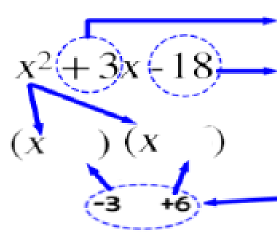
Simplify to 3 terms $2x^2 + x - 21$

Factorising

Identify the Highest common factor (HCF) and put the rest in brackets. Self check by expanding.
$6a + 8$ factorises to $2(3a + 4)$
$8b^2 + 28b$ factorises to $4b(2b + 7)$

Factorise Quadratic Equation

Factorise where the x^2 coefficient is 1



+1	-18	-1	+18
+2	-9	-2	+ 9
+3	-6	-3	+6

Then choose the factor pair that sums to the X coefficient

$(x - 3)(x + 6)$

$x^2 + 3x - 18$

Finally self check by expanding

EXAM QUESTIONS

1. Factorise 4y+20
2. Factorise 12y+3w
3. Expand 3(2y - 1)
4. Expand and simplify (2y + 1)(y + 3)
5. Factorise(x+4) (x+5)
6. Factorise $x^2+9x+20$
7. Factorise $x^2+5x-14$

STRETCH

Expand and simplify (w + 3)(w + 4) + (w + 2)(w + 7)
Expand and simplify (2m+3) (3m-1)type expressions

MATHS (Foundation) SP – TOPIC 7

Formulae and Substitution

INTRODUCTION

Formulae help us work out things in the real world such as the acceleration of a racing car or for converting from degrees Centigrade to degrees Fahrenheit.

KEY WORDS

Formula	Something which connects variables e.g. $A = \pi r^2$ *A* and *r* are variables (A variable is a number which can change)
Expression	Contains letters (variables) and/or numbers but no equals sign e.g. $3m + 2n$
Equation	Contains an equals sign, one letter (the unknown), and numbers. Solve to find the value of the unknown. e.g. $7x – 9 = -4$
Identity	True for all values of the unknown e.g. $4d = d + 3d$
Substitute	To replace unknowns by numbers
Subject	The variable (shown by a letter) on its own on one side of the equals sign e.g. $M = 3n – 5$ (M is the subject)
Rearrange	To change the subject of a formula.

FURTHER LINKS

Hegartymaths clips: 278, 279, 280, 281

EXAM TIPS:

If you have to substitute into a formula then write out the full meaning of the formula first
e.g. $C = ed + 4f$
means $C = e \times d + 4 \times f$

BIDMAS

You must apply the rules of BIDMAS when substituting e.g. when working out $8 + 7 \times 2$
BIDMAS requires you to carry out the multiplication before addition:

$$8 + 7 \times 2$$
$$= 8 + 14$$
$$= 22$$

KEY FACTS TO MEMORISE

The definitions of key words – you are expected to be able to know the difference between an identity and an expression and so on.

B Brackets
I Indices
D Division
M Multiplication
A Addition
S Subtraction

Key formulae

Speed = Distance/Time

Density = Mass/Volume

Pressure = Force/Area

EXAM QUESTIONS

1) $P = 4x + 3y$
$X = 5$
$Y = -2$
Work out the value of P

2) Complete the table of values for $y = x^2 - x – 6$

X	-3	-2	-1	0	1	2	3
y	6			-6			

3) The density of a 25g mass is 2.95 g/cm³

Find the volume of the metal

4) A force of 10 Newtons acts on an area of 20 cm³.
Given that $pressure = \frac{force}{area}$

Find the pressure exerted by the force

STRETCH

1) Given that $s = ut + ½at^2$

Find s when $u = 3.4$, $a = 1.6$ and $t = 9.2$

2) Rearrange
$m = \sqrt{(3n – 7)}$
To make n the subject

MATHS (Foundation) SP – TOPIC 8

Linear equations and inequalities

INTRODUCTION

Solving linear equations means finding the value of the unknown.

KEY WORDS

Solve	Find the answer to a problem
Inequalities	Used to compare quantities
Integer	A whole number
Equation	Contains an equal sign, one letter (the unknown) and numbers. Solve to find the value of the unknown

FURTHER LINKS

Hegartymaths (Clips 178-186)

Corbett Maths (Clips 110—11)

EXAM TIPS:

Solving linear equations

You need to isolate the unknown
Use the balance method. What you do to one side you do to the other (inverse function)

E.g. $3x + 2 = 8$

$-2 \qquad -2$

$3x = 6$

$\div 3 \qquad \div 3$

$x = 2$

Unknowns on both sides

Remove the smaller of the two unknowns by carrying out the inverse operation.

E.g. $4x + 1 = 2x + 9$

$-2x \qquad -2x$

$2x + 1 = 9$

$-1 \qquad -1$

$2x = 8$

$\div 2 \qquad \div 2$

$x = 4$

Solving inequalities is exactly the same process.
If equations have brackets, it is usually sensible to multiply these out first.

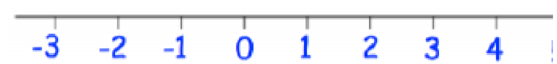
KEY FACTS TO MEMORISE

After solving equations, substitute the answer back into the questions to ensure the answer is correct.

- $<$ Less than
- $>$ Greater than
- $=$ Equal to
- $\leq$ Less than or equal to
- $\geq$ Greater than or equal to

EXAM QUESTIONS

1. Solve $3y + 4 = 22$
2. Solve $10y - 3 = 24$
3. Solve $12 - y = 5$
4. Solve $\frac{x+2}{5} = 3$
5. Solve $7w + 3 = 5w + 9$
6. Solve $2(2x + 1) = 3(x - 4)$
7. Draw the inequality $-2 < x \leq 3$ on the number line



8. n is an integer such that $-5 < n \leq -1$
List the possible values of n

STRETCH

To be able to form and solve algebraic equations from a variety of contexts

MATHS (Foundation) SP – TOPIC 9

Quadratic equations

INTRODUCTION

The name quadratic comes from "quad" meaning square, because the variable gets squared. The form is $Y = ax^2 + bx + c$. Quadratic equations have up to two possible solutions.

KEY WORDS

Expand	Removal of brackets through multiplication
Factorise	Put back into brackets
Turning point	The maximum or minimum point on a parabola
Parabola	The shape of the curve given by a quadratic equation
Roots	The solution to a quadratic equation when it is to zero
Function	A function is a special relationship where each input has a single output.
Equation	A statement that the values of two mathematical expressions are equal
Solve	Find the answer to a problem

FURTHER LINKS

Hegartymaths (Clips 162-163, 165, 223-228)

Corbett Maths (Clips 14, 118-119, 264-266)

EXAM TIP

Expanding double brackets

Multiply each term in one bracket by each term in the other bracket. At the end do not forget to collect together the like terms

What is the question asking?

What are you being asked for in the question. Do you have to factorise or solve? Make sure you know the difference.

Factorising quadratics

Find all of the factors of the number first and then work out which factors add or subtract to give the correct number of x terms.

E.g. $x^2 + 5x + 6$

Factors of 6

1×6 2×3

$1 + 6 = 7$ $2 + 3 = 5$

$(x + 2)(x + 3)$

Solving quadratic equation

To solve a quadratic equation. Ensure that the equation is equal to 0. If necessary, rearrange the equation. EG

$x^2 = 5x – 3$ rearrange to

$x^2 - 5x + 3 = 0$ then solve

Drawing quadratics

Use a pencil when you draw a quadratic graph. Remember it must be a curve so do not use a ruler to connect the points

KEY FACTS TO MEMORISE

The rules for multiplying positive and negative numbers

+ x + = +

- x - = +

+ x - = -

- x + = -

EXAM QUESTIONS

1. Expand and simplify $(x + 5)(x - 1)$
2. Expand and simplify $(2y + 1)(y + 3)$
3. Expand and simplify $(x - 7)^2$
4. Factorise $x^2 + x - 6$
5. Factorise $m^2 + 10m + 9$
6. Complete the table for the graph $y = 4 - x^2$

x	-3	-2	-1	0	1	2
y	-5		3	4	3	

STRETCH

Derive a quadratic equation from a context. Eg area of a rectangle

To be able to solve quadratic equations in the form $(2x + 3)(3x – 1) = 0$

Spot the difference of two squares

E.g. $x^2 - 49 = (x + 7)(x - 7)$

$x^2 - 64 = (x + 8)(x – 8)$

MATHS (Foundation) SP – TOPIC 10

Simultaneous equations

INTRODUCTION

Two equations that cannot be solved on their own but are solved together are referred to as simultaneous equations.
Often both equations have both x and y as unknowns and finding the correct pair of solutions is equivalent to finding a point where two straight-line graphs cross.
Simultaneous equations can be solved graphically by drawing them.
Questions are sometimes given in context, requiring you to write the equations yourself and re-interpret the answers afterwards.
There are two main methods used to solve these algebraically (without a graph), Elimination or Substitution.
We generally teach Elimination for solving linear simultaneous equations, which is the type in the foundation tier.

FURTHER LINKS

Hegartymaths (Clips 190 – 195, 218 - 219)
Corbett Maths (Clips 295 - 297)

LINKED TOPICS

Forming and solving equations.
Changing the subject of a formula.

KEY WORDS

Unknown	The letters in the equation. The values you are trying to work out.
Coefficient	The number just in front of an unknown. For 3x the coefficient would be 3.

KEY FACTS TO MEMORISE

Elimination Method

Try using the acronym **MESS** which stands for

Match
Eliminate
Solve
Substitute

It really helps to number your equations. Use numbers in circles on the left of your equations. You can then write down on the right hand side how you are making each equation.
Here is a worked example:

Solve the following simultaneous equations
$3x + 2y = 4$
$4x + 5y = 17$

Label the equations

① $3x + 2y = 4$
② $4x + 5y = 17$

Multiply up one or both equations so that the coefficients of either the Xs or the Ys **match**, don't worry about positive or negative.

③ $15x + 10y = 20$ ①x5
④ $8x + 10y = 34$ ②x2

Now add or subtract two equations to **eliminate** one of the unknowns.

⑤ $7x = -14$ ③-④

Now **solve** to find one unknown.

(÷7) $x = -2$ (÷7)

Substitute this value back into one of the original equations and solve that for the other unknown.

⑥ $3x(-2) + 2y = 4$ sub into ①
$-6 + 2y = 4$
$2y = 10$
$y = 5$

Solutions are $x = -2, y = 5$

EXAM TIPS:

You get no marks for numbering the equations but it really helps you to stay organised and present your work logically, this helps the examiner to award you full marks.

If you look online, you can find videos showing the substitution method.

EXAM QUESTIONS

1) Solve
$4x + 3y = 6$
$5x - 3y = 21$

2) Solve
$4x + 3y = 19$
$3x - 5y = 7$

3) Solve
$3x + 5y = 13$
$2x + 3y = 8$

STRETCH

In Higher tier we solve Quadratic simultaneous equations which have two pairs of answers.

MATHS (Foundation) SP – TOPIC 11

Linear Graphs and Equations of Straight Line

INTRODUCTION

As well as graphing straight lines you will be expected to find the equation of the line between two points, from

the graph and given the y-intercept and the gradient.S

KEY WORDS

Gradient	The steepness of the line (the change in y divided by the change in x)
Y-Intercept	The point where a line crosses the y-axis (x=0)
Rise	The vertical change between two points
Run	The horizontal change between two points
X-intercept	The point where the line crosses the x-axis (y=0)

FURTHER LINKS

Hegartymaths (Clips 205-213)

Corbett Maths (Video clip 186,187,192,193)

EXAM TIPS:

Clearly show the substitution steps.
Don't forget to draw a straight line through your points with the ruler.

Graphing a straight line

- Set x equal to any number and substitute into the equation
- Solve for y
- Write your answer in the form (x,y)
- Do this twice more
- Plot the points found and use your ruler to draw a straight line through your points and through the axes.

Alternative method

- Y =mx + c
- Plot the y-intercept.
- Use the gradient to find another point on the line
- Draw a straight line using a ruler through the points.

Examples

Graph the line y = 3x + 2

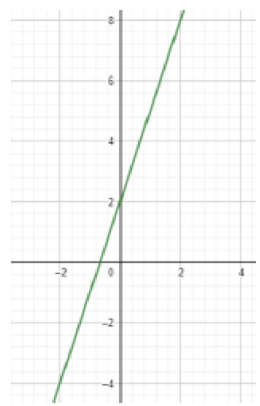
X	-2	0	1	2
Y	-4	2	5	8

X = -2
Y = 3x-2+2=-6+2=-4

X=0
Y= 3x0 + 2 = 2

X=1
Y=3x1+2=5

X=2
Y=3x2+2=8



KEY FACTS TO MEMORISE

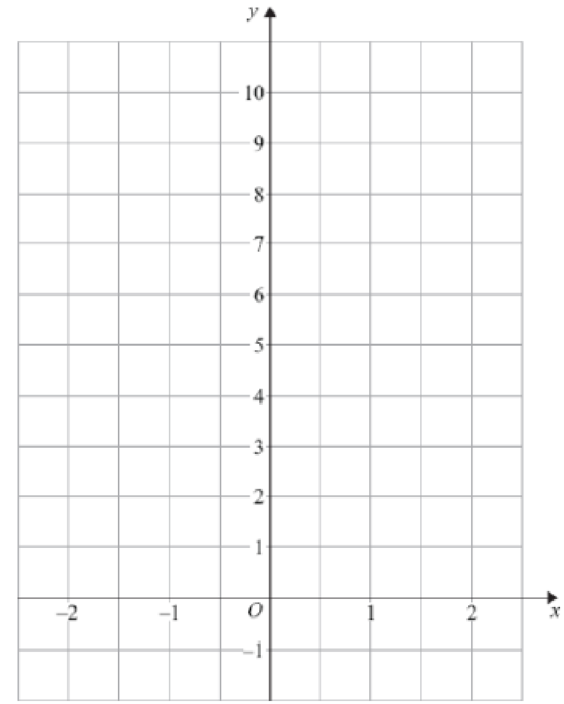
The gradient of a horizontal line is 0.
The gradient of a vertical line is undefined.
If the gradient is positive, the line rises.
If the gradient is negative, the line falls.

EXAM QUESTIONS

(a) Complete the table of values for $y = 2x + 5$

x	–2	–1	0	1	2
y	1		5		

(b) On the grid, draw the graph of $y = 2x + 5$ for values of x from $x = -2$ to $x = 2$



STRETCH

Draw the graph of 3x+5y=2

Find a solution to 3x+8=2x+9 graphically.

Graph y = x^2+3x+2

MATHS (Foundation) SP – TOPIC 12

Sequences

INTRODUCTION

A sequence is a list of numbers that are in an order, typically making a pattern of some sort.

KEY WORDS

Term	A number in a sequence
Term to term rule	The rule to get from one term to the next
Nth term rule	The expression which can be used to generate any term in a sequence
Linear/ Arithmetic Sequence	A sequence which increases or decreases by the same amount from each term to the next
Geometric Progression	A sequence where the term to term rule is a multiplication
Fibonacci Sequence	A sequence where each term is the sum of the two previous terms
Quadratic Sequence	A sequence where the nth term contains an n^2

FURTHER LINKS

Hegarty maths
197-198 Linear Sequences
249 – Quadratic Sequences
263 – Fibonacci Sequences
264 – Geometric Sequences

EXAM TIPS:

Always identify the term-to-term rule of a sequence. Don't just look between the first two terms, check between a few of the terms to find consistency.

Finding the nth term of a linear sequence

Example: 4, 7, 10, 13, 16
Start by finding the term to term rule (in this case, +3)
This becomes the multiplier → 3n
Then look at how to get from the multiplier to the first term. To get from 3 to 4, add 1. This is the constant.
Nth term = 3n + 1

Generating sequences from an nth term

Example: 4n – 3
To generate the first terms of a sequence, substitute in 1 for the value of n and evaluate. Then substitute in 2, then 3 and so on.
4x1 – 3 = 1 4x2 – 3 = 5 4x3 – 3 = 9 4x4 – 3 = 13
1, 5, 9, 13...
You can do this to find other terms. To find the 50th term in the sequence, substitute in 50.
4x50 – 3 = 197

KEY FACTS TO MEMORISE

The most common Fibonacci sequence goes
1, 1, 2, 3, 5, 8, 13, 21, 34, ...

EXAM QUESTIONS

For each of the following sequences
a) Find the next two terms
b) Find the nth term rule
c) Find the 50th term

6, 10, 14, 18, 22, ...

2, 7, 12, 17, 22, ...

9, 5, 1, -3, -7, ...

For each of the sequences below, find the next two terms

4, 12, 36, 108, ...

243, 81, 27, 9, 3, ...

3, 4, 7, 11, 18, ...

STRETCH

Generate the first 5 terms of each sequence

$n^2 + 3$

$n^2 + 4n$

$n^2 - 3n + 5$

MATHS (Foundation) SP – TOPIC 13

Average and range

INTRODUCTION

An average is a single value that is used to represent a collection of data

KEY WORDS

Data	Data is the collective name for pieces of information.
Mean	A type of average where all the data is added then divided by the number of data values.
Median	An average found when all the data is put in order and the middle value is selected. (Remember to find the midpoint if 2 pieces of data are used)
Mode/modal	An average which is the most popular piece of data. It there are two it is bimodal
Range	The difference between the largest value and the smallest value. (Remember it is not an average. It measures the spread.)
Ascending	List values in order smallest to largest
Descending	List values in order largest to smallest

FURTHER LINKS

Hegarty maths 421, 420, 419

Corbett maths 50 - 57

EXAM TIPS:

Find the mean of the numbers
4, 7, 5, 4, 10
Mean – 4+7+5+4+10 = 30
30 ÷ 5 = 6
Mean = 6

Find the median of the numbers
4, 7, 5, 4, 10

Median Put numbers in order smallest to biggest
4, 4, 5, 7, 10
The middle value is 5
Median = 5

Find the mode of the numbers
4, 7, 5, 4, 10
Mode =4 (there are more 4's than any other number)

Find the range of the numbers 4, 7, 5, 4, 10
Range – biggest value subtract the smallest value
10 – 4 = 6 Range = 6

KEY FACTS TO MEMORISE

- Median and mode are useful if there are extreme values
- Mean is most useful if there are not extreme values

EXAM QUESTIONS

Here are the ages of 9 children at a birthday party
10 12 13 10 11 14 15 10 12

Find the mode

Find the median

Work out the range

Work out the mean

STRETCH

A football team played six games. Here are the number of goals they scored in each game
6 0 3 2 2 5

Work out the median number of goals scored

Work out the mean number of goals scored

The football team play one more game. The mean number of coals cored increases to 4.

Work out the number goals scored in the seventh game.

MATHS (Foundation) SP – TOPIC 14

Probability

INTRODUCTION

Probability is the likelihood of an event happening. Where an event cannot happen, its probability is 0. Where an event is certain to happen, its probability is 1. On the scale of probability an event is more likely as the probability gets nearer to 1 and less likely as the probability gets closer to 0.

KEY WORDS

Event	A possible outcome of a statistical trial, for example 'heads' when a coin is tossed. A compound (or combined) event is an event that includes several outcomes; for example, in selecting people at random for a survey a compound event could be 'girl with brown eyes
Outcome	For example, when a coin is tossed there are two possible outcomes 'head' or 'tail'; when a cubic die is cast there are six possible outcomes if there is a different score on each face
Sample space	The sample space is the set of all possible outcomes of a trial. The sum of all the probabilities for all the events in a sample space is 1

FURTHER LINKS

Hegartymaths Probability on a number line: 350
Probability of a single event: 351-353
Mutually exclusive events: 354
Experimental probability: 356
Multiple event probability: 358-359

EXAM TIPS:

A probability can be written as a decimal or a fraction and sometimes as a percentage.

Know that

Probability should always be expressed as either a fraction or decimal less than 1 or as a percentage less than 100%

The probability of an event occurring can never be greater than 1 or 100% and never less than 0.

The sum of the probabilities of every outcome must = 1 or 100%
Probability can be calculated using Venn Diagrams and probability trees.

KEY FACTS TO MEMORISE

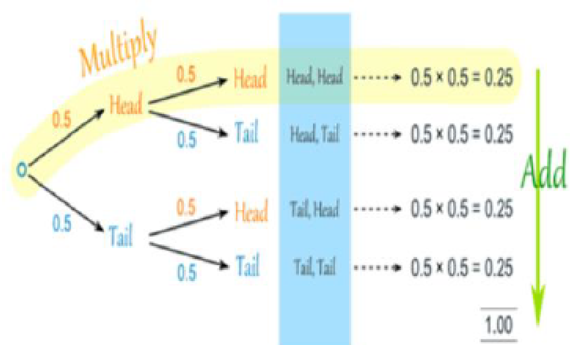
$$P(\text{event})= \frac{\text{Number of ways the event can occur}}{\text{Total number of outcomes}}$$

P(event not happening)= 1-P(event)

So for a fair 6 sided die

$P(\text{rolling a }6)= \frac{1}{6}$

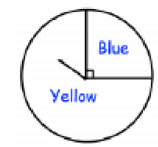
$P(\text{not rolling a }6)= 1- \frac{1}{6} = \frac{5}{6}$



EXAM QUESTIONS

1 The diagram shows a fair spinner

a) Which colour is the arrow most likely to land on?



b) Mark on the probability scale below the probability of it landing on green

2.Six cards numbered 1,2,3,4,5 and 6 are placed in a box.

a) What is the probability of the card with number 3 on it being drawn at random?

b) What is the probability of a card with an odd number being drawn?

STRETCH

3. John has a bag of marbles. The box contains 6 blue, 8 black and 3 red marbles.

(a) What is the probability that he will pick a blue one?

(b) What is the probability that he will pick a green one?

(c) Some more blue ones are added to the box. The probability of selecting a blue one is now ½ . How many blue ones were added to the box?

MATHS (Foundation) SP – TOPIC 15

Venn Diagrams & Two-Way Tables

INTRODUCTION

Venn Diagrams and Two-Way tables are used to sort numbers, items or amounts into different combinations of categories.
They often involve questions on probabilities.

KEY WORDS

Sets	A group of items or numbers, typically all meeting a common rule.
Element	Each item or number in a set is called an element.
Intersect	Where elements or numbers belong to two different sets in a Venn Diagram
Union	Where elements or numbers belong to either one of two different sets or both in a Venn Diagram.
Compliment	The opposite of a set. A set and its compliment make up the universal set.
Universal set	The set of all elements in a Venn Diagram.

FURTHER LINKS

Hegarty maths
Venn Diagrams – 377-391
Two-Way Tables – 422-424

EXAM TIPS:

Two-Way Tables

In a two-way table, all of the rows and all of the columns should add up to a sum at the end. In the bottom right corner you should have the total amount.

e.g.

	French	German	Spanish	Total
Boys	27	15	11	53
Girls	15	19	13	47
Total	42	34	24	100

When asked probability questions, read the question very carefully. Give your probability as a fraction unless asked to do otherwise.

If choosing somebody at random, what is the probability that he or she takes French? $^{42}/_{100}$

If choosing a **boy** at random, what is the probability that they do French? $^{27}/_{53}$

Venn Diagrams

A Venn diagram may contain a group of items (usually numbers) or just a frequency.

When drawing a Venn diagram, remember to draw a box around the outside for anything that is part of the universal set, but does not belong in the sub-sets.

Again, remember to read any probability questions very carefully.

When creating or completing a Venn diagram, it is usually easiest to start from the middle and work outwards to consider any intersections first.

KEY FACTS TO MEMORISE

The intersection of two sets on a Venn diagram is the overlap.
A∩B means "in A and in B".

The union of two sets on a Venn diagram is everything in each set, including what is in both.
A∪B means "in A or in B or in both".

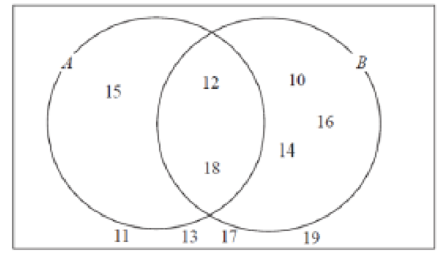
The compliment of a set means anything that is not in that set.
A' means "not in A".

EXAM QUESTIONS

Sami asked 50 people which drinks they liked from tea, coffee and milk.

48 people like at least one of the drinks.
19 people like all three drinks.
16 people like tea and coffee but do not like milk.
21 people like coffee and milk.
24 people like tea and milk.
40 people like coffee.
1 person only likes milk.

Create a Venn diagram for this information.



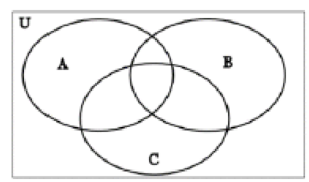
Write down the numbers in the set...

a) A∩B
b) A∪B
c) A'

	Walk	Bike	Car	Total
Boys		17		
Girls		13	17	52
Total	39			100

Somebody is chosen at random, what is the probability that they cycle to school?
A girl is chosen at random, what is the probability that they walk to school?

STRETCH



Shade in the following sets.

(A∪B)∩C'
(A∩B)'∪C
A∪(B∩C)

MATHS (Foundation) SP – TOPIC 16

Pythagoras

INTRODUCTION

Pythagoras' theorem states that in a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

KEY WORDS

Square	A number multiplied by itself
Square root	What number squared makes the root
Hypotenuse	The longest side of a right angled triangle
Pythagoras' theorem	$a^2 + b^2 = c^2$ (if c = Hypotenuse)

FURTHER LINKS

Hegarty maths - 498 – 501

Corbett maths – 257 - 261

EXAM TIPS:

Always show your workings

The Hypotenuse is **ALWAYS** the longest side and is opposite the right angle

Pythagoras' theorem **ONLY** works for right angled triangles

KEY FACTS TO MEMORISE

Pythagoras' theorem $a^2 + b^2 = c^2$

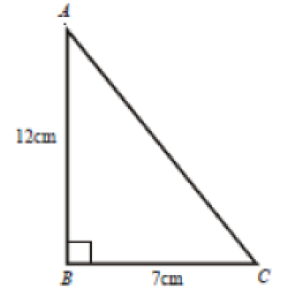
You could be asked a question on a non claculator paper – make sure you know square numbers and square roots.
Especially the following common sides of a right angled tirangle.

$3^2 + 4^2 = 5^2$

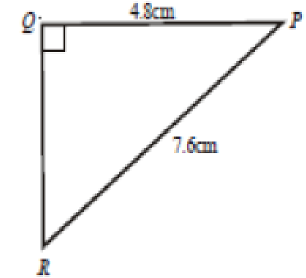
$5^2 + 12^2 = 13^2$

EXAM QUESTIONS

) Find the length of side *AC*.
Give your answer to 1 decimal place.

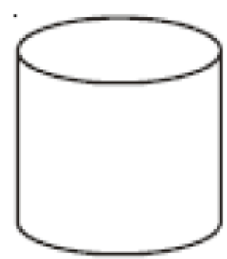


Find the length of side *QR*
Give your answer to 1 decimal place.



STRETCH

Fiona keeps her pencils in a cylindrical beaker as shown below.
The beaker has a diameter of 8cm and a height of 17cm.
Will a pencil of length 19cm fit in the beaker without poking out of the top?
All workings must be shown.



MATHS (Foundation) SP – TOPIC 17

Trigonometry and special triangles

INTRODUCTION

Trigonometry is concerned with the calculation of the length of sides and angles in triangles.
Right-angled trigonometry is used with right-angled triangles.

KEY WORDS

Hypotenuse	The longest side of a right-angled triangle, opposite the right angle
Adjacent	Next to. In a right-angled triangle this is the side opposite the angle we are working with
Opposite	In a right-angled triangle this is the side opposite the angle we are working with *(the side that is not the adjacent or the hypotenuse!)*
Trigonometric ratio	The ratio of 2 sides and a related angle. Used t calculate unknown lengths or angles in right-angled triangles.
Sine (sin)	The trigonometric function that is equal to the ratio of the side opposite a given angle (in a right-angled triangle) to the hypotenuse
Cosine (cos)	The trigonometric function that is equal to the ratio of the side adjacent a given angle (in a right-angled triangle) to the hypotenuse
Tangent (tan)	The trigonometric function that is equal to the ratio of the sides opposite and adjacent to the given angle in a right-angled triangle

FURTHER LINKS

Corbett Maths –under *'Videos and Worksheets'* tab:
Trigonometry – Videos 329, 330, 331, practice questions, 3 textbook exercises

HegartyMaths:
Clips and tasks: 508 - 515

JustMaths:
Google: STICKY! 9-1 Exam questions by topic – HIGHER TIER – version 2

EXAM TIPS:

1. ALWAYS label the sides of your triangle as hypotenuse, adjacent or opposite first
2. ALWAYS Write out SOHCAHTOA
3. Write out the trig ratio before substituting.
4. Remember when finding an angle you need to use the inverse function
5. Write out all the digits on your calculator before doing any rounding

KEY FACTS TO MEMORISE

There are 3 trigonometric ratios to memorise:

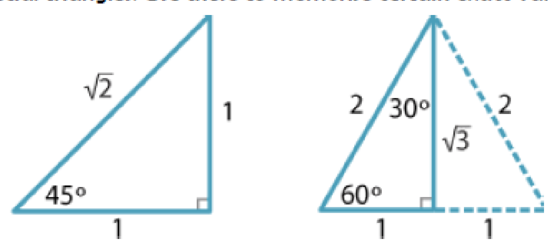
$$\sin\theta = \frac{opposite}{hypotenuse}$$

$$\cos\theta = \frac{adjacent}{hypotenuse}$$

$$\tan\theta = \frac{opposite}{adjacent}$$

Use the mnemonic SOHCAHTOA to help you remember the 3 trig ratios.

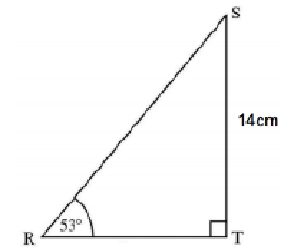
Special triangles: Use these to memorise certain exact values



θ	0°	30°	45°	60°	90°
$\sin\theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos\theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan\theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	Undefined

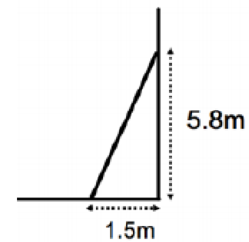
EXAM QUESTIONS

1. Calculate the length of side RT



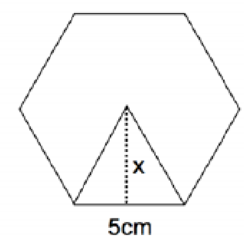
2.

A ladder is placed against a wall.
To be safe, it must be inclined at between 70° and 80° to the ground.



STRETCH

A regular hexagon can be divided into 6 equilateral triangles.
The diagram below shows one of the equilateral triangles.



(a) Calculate the height, **x**, of the equilateral triangle above.

MATHS (Foundation) SP – TOPIC 18

Angles in parallel lines and polygons

INTRODUCTION

The words 'polygon' and 'parallel' comes from the Greeks. 'Poly' means many and 'gon' means angles. Parallel originates from the Greek word 'parállēlos' which means side by side.

KEY WORDS

Polygon	A 2D shape with straight sides that join together
Parallel	Two lines are parallel if the distance between them remains the same
Interior angles	Angles inside a polygon
Exterior angles	The angle between any side of a polygon and a line extended from the next side
Pentagon	A polygon with 5 sides
Hexagon	A polygon with 6 sides
Heptagon	A polygon with 7 sides
Octagon	A polygon with 8 sides
Nonagon	A polygon with 9 sides
Decagon	A polygon with 10 sides
Transversal	A line that passes through a pair of parallel lines

FURTHER LINKS

Hegarty Maths Clips:

Angles in polygons – 561/562/563/564

Angles in polygons with algebra – 565

Angles in parallel lines – 480/481/482/483

EXAM TIPS:

ANGLES IN POLYGONS

Sum of interior angles $= (n-2) \times 180$

n represents the number of sides the polygon has

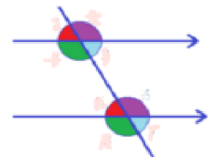
One interior angle of a regular polygon $= Sum\ of\ interior\ angles \div n$

Sum of exterior angles $= 360^{\circ}$

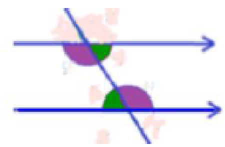
One exterior angle of a regular polygon $= 360 \div n$

ANGLES IN PARALLEL LINES

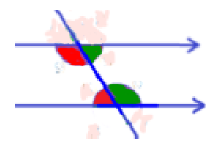
Corresponding Angles:
These are a pair of angles in matching corners and are equal.



Alternate Angles:
A pair of angles between the parallel lines but on opposite sides of the transversal



Co-interior Angles:
A pair of angles between the parallel lines that are on the same side of the transversal



KEY FACTS TO MEMORISE

- Angles around a point add up to 360°
- Angles on a straight line add up to 180°
- Vertically opposite angles are equal
- Angles in a triangle add up to 180°
- Angles in a quadrilateral add up to 360°
- Base angles of an isosceles triangle are equal
- All angles in an equilateral triangle are 60°

EXAM QUESTIONS

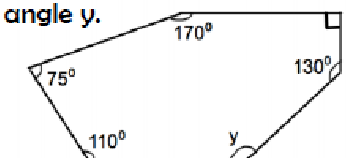
ANGLES IN POLYGONS

1. Work out the size of each interior angle of a regular pentagon

2. A regular polygon has 24 sides. Work out the size of each exterior angle

3. Each interior angle of a regular polygon is 124°. Work out the number of sides

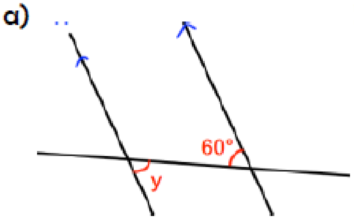
4. Calculate the size of angle y.



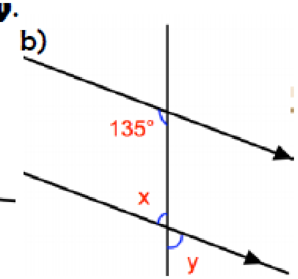
ANLGES IN PARALLEL LINES

1. In each question work out the size of the angles **and give reasons why**.

a)

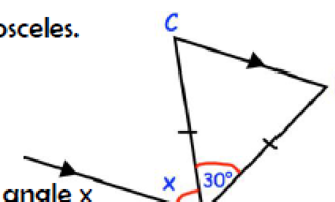


b)



2. Triangle CDE is isosceles.
CD is parallel to FE.
Angle CED = 30°

Work out the size of angle x



STRETCH

Research and complete questions on angles in parallel lines and angles in polygons involving algebra and forming equations.

MATHS (Foundation) SP – TOPIC 19

Compound Measures

INTRODUCTION

You will need to find speed, distance and time using compound measures. You will need to know how to calculate density using mass and volume. You are given the formula for pressure using force and area, but you will need to be able to rearrange the formula.

KEY WORDS

Units	A quantity used as a standard of measurement.
Density	The degree of compactness of a substance. (Mass ÷ Volume)
Volume	The amount of space that a substance or object occupies, or that is enclosed within a container.

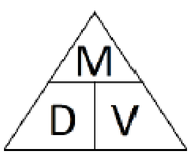
FURTHER LINKS

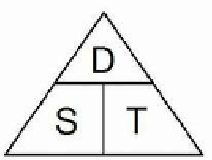
Hegartymaths (Clips)

Corbett Maths (Video clip)

EXAM TIPS:

Use the units within the question to determine if you need to multiply or divide values.





Examples

(A) A car travels 160 miles in 2 hours and 30 minutes. Calculate the average speed of the car in miles per hour (mph)
[Hint: Convert time into a decimal]

Speed = Distance ÷ Time

Speed = 160 ÷ 2.5 = 64 mph

Therefore, the car's average speed is 64mph

(b) Calculate the density of a piece of metal which has a mass of 5kg and a volume of 2.75 m^3

Density = Mass ÷ Volume

Density = 5 ÷ 2.75 = 1.81818181818...

The piece of metal has a density of 1.82kg per m^3 (2 dp)

KEY FACTS TO MEMORISE

Links to speed – km per hour (distance ÷ time)

Links to density – g per cm^3 (mass ÷ volume)

$$speed = \frac{distance}{time}$$

$$density = \frac{mass}{volume}$$

$$pressure = \frac{force}{area}$$

EXAM QUESTIONS

The mass of 4 m^3 of copper is 35 800 kg.
Calculate the density of the copper.

Daniel leaves his house at 07 00.

He drives 87 miles to work.
He drives at an average speed of 36 miles per hour.

At what time does Daniel arrive at work?

STRETCH

John travelled 30 km in 1.5 hours.
Kamala travelled 42 km in 2 hours.

Who had the greater average speed?
You must show your working.

MATHS (Foundation) SP – TOPIC 20

Area and volume

INTRODUCTION

Area – the space inside a 2D shape

Volume – the space inside a 3d shape

KEY WORDS

Area	The area of a 2D shape is the amount of space inside it. Units mm² cm² m²
Compound Shape	A compound shape is a shape that is made up of 2 or more different shapes put together.
Volume	Volume is a measure of the amount of space inside a solid shape. Units mm³ cm³ m³
Cuboid – volume	Base x height x width
Prism	A prism is a 3D shape whose cross section is the same through out
Prism - volume	Area of the cross section x length

FURTHER LINKS

Hegarty maths area 554-559
Volume cuboid568-569
Volume prism 570-571
Volume cylinder 572-575

Corbett maths Area40 – 49
Volume 355 - 361

EXAM TIPS:

What is it about?

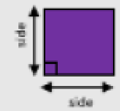
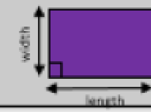
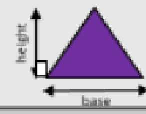
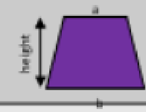
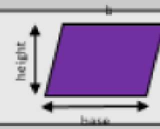
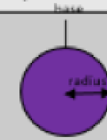
What do you know about it?

What calculations can you perform?

Formula

Always write down the formulas you are using

KEY FACTS TO MEMORISE

Square	Side x side	
Rectangle	Length x width	
Triangle	$\frac{\text{Base x height}}{2}$	
Trapezium	$\frac{(a+b) \text{ x height}}{2}$	
Parallelogram	Base x height	
Circle	π x radius²	
Kite	Width x height	

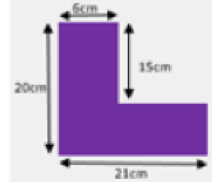
Area is measured in units ² (e.g. cm²)

Volume is measured in units³ (e.g. m³)

EXAM QUESTIONS

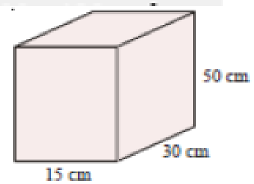
The area of a compound shape can be calculated by adding the areas of the basic shapes it's made from.

Break the compound shape into rectangles and work out each area separately , then add the areas together for the TOTAL area.

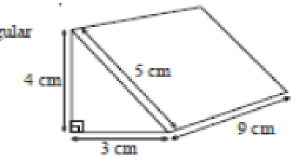


The diagram shows a cuboid.

Work out the volume of the cuboid.

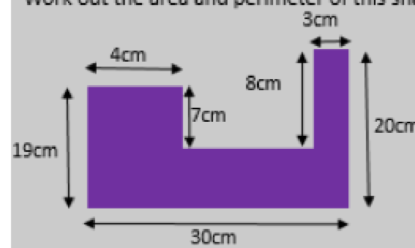


Calculate the volume of this triangular prism.



STRETCH

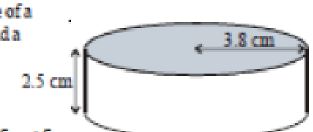
Work out the area and perimeter of this shape.



An ice hockey puck is in the shape of a cylinder with a radius of 3.8 cm and a thickness of 2.5 cm.

Take π to be 3.142

Work out the volume of the puck.
Give your answer correct to 3 significant figures.



MATHS (Foundation) SP – TOPIC 21

Ratio

INTRODUCTION

Ratio compares the size of two or more amounts.

KEY WORDS

Ratio	The quantitative relationship between two amounts

FURTHER LINKS

Hegarty simplify 329
Ratio in the form 1:n 331
Share in the ratio 332-338
Ratio as a fraction 330

EXAM TIPS:

Always show your workings

Draw boxes to calculate a ratio.
Share £45 in the ration 4:5
45 ÷ 9 = 5

5	5	5	5	
5	5	5	5	5

4 : 5
20 : 25 (check your answer 20+25 = 45)

Simplify 15: 35 = 5: 7 (divide both by 5)
16 : 24 = 2:3 (divide both by 8)

KEY FACTS TO MEMORISE

Simplifying ratios

Divide all parts of the ratio by a common factor

Ratio in the form 1:n

Divide both parts of the ratio by one of the numbers to make one part equal 1

Share in a ratio

1 – Add the total parts of the ratio. 2 – Divide the amount shared by this value to find the value of one part 3 – Multiply this value by each part of the ratio.

(use only if you know the total)

EXAM QUESTIONS

1) Simplify a) 5:10 b) 14:21

2) In a class with 13 boys and 9 girls what is the proportion of boys and what is the proportion of girls.

3) Write in the form 1:n 5: 7 = 1:

4) Share £60 in the ratio 3 : 2 : 1

STRETCH

Money was shared in the ratio 3:2:5 between Ann, Bob and Cat. Given that Bob had £16. Found out the total amount of money

MATHS (Foundation) SP – TOPIC 22

Proportion

INTRODUCTION

You will be expected to use directly proportional relationships to find missing values and convert between units. You will also need to be aware of and identity inversely proportional relationships (as one value increases the other decreases).

KEY WORDS

Proportion	Two variables are proportional if there is always a constant ratio between them
Ratio	The quantitative relationship between two amounts
Best Buy/ Best Value	Comparing price and weight of different products to find which offers the best value for money
Unitary Method	Solving a problem by finding the value of a single unit

FURTHER LINKS

Hegarty maths 707-708, 739-742, 763-770

Corbett Maths 210, 214a, 256

EXAM TIPS:

Use the unitary method to find the value of a single unit if there is not an immediately obvious way to reach your answer

Example

Sophie went to Spain.
She changed £225 into euros (€).

The exchange rate was £1 = €1.62

(a) Change £225 into euros (€).

To change from £ to € we need to multiply by 1.62.
£225 x 1.62 = €364.50

Bramley apples cost £4.60 for a 3kg bag at Supervalue supermarket.
The same type of apples cost £11.40 for a 7.5kg bag at Nixon's supermarket.

Where are the apples the best value for value?
You must show your working.

We can work out how much 1kg of apples costs at each supermarket

3kg = £4.60	**7.5kg = £11.40**
÷3 ÷3	÷7.5 ÷7.5
1 kg ≈ £1.53	**1 kg = £1.52**

Nixon's Supermarket is cheaper

EXAM QUESTIONS

James is going on holiday in New York.
James changes £400 into dollars ($).

The exchange rate is £1 = $1.50

(a) Work out how many dollars ($) James will receive.

James notices a watch costs $77.50.
In Manchester, the same watch costs £50.

(b) Work out the difference in cost.
Give your answer in dollars ($).

How much of each ingredient would be needed to serve 3 people?

serves 4
300ml double cream
320ml milk
120g caster sugar
1 vanilla pod
4 egg yolks

STRETCH

It takes 6 people 2 days to paint a wall. How long would it take 4 people to paint the same wall?

edexcel

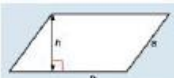
Edexcel GCSE (9-1) Maths: need-to-know formulae

www.edexcel.com/gcsemathsformulae

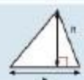
Areas

Rectangle = $l \times w$

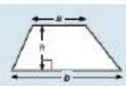
Parallelogram = $b \times h$



Triangle = $\frac{1}{2} b \times h$

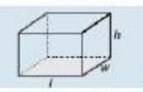


Trapezium = $\frac{1}{2}(a + b)h$

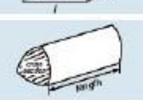


Volumes

Cuboid = $l \times w \times h$

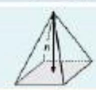


Prism = area of cross section × length



Cylinder = $\pi r^2 h$

Volume of pyramid = $\frac{1}{3} \times$ area of base × h

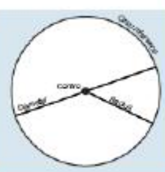


Circles

Circumference = $\pi \times$ diameter, $C = \pi d$

Circumference = $2 \times \pi \times$ radius, $C = 2\pi r$

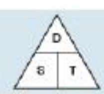
Area of a circle = $\pi \times$ radius squared $A = \pi r^2$



Compound measures

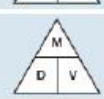
Speed

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$



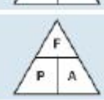
Density

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$



Pressure

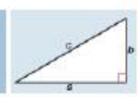
$$\text{pressure} = \frac{\text{force}}{\text{area}}$$



Pythagoras

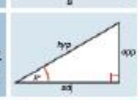
Pythagoras' Theorem

For a right-angled triangle, $a^2 + b^2 = c^2$



Trigonometric ratios (*new to F*)

$\sin x° = \frac{\text{opp}}{\text{hyp}}$, $\cos x° = \frac{\text{adj}}{\text{hyp}}$, $\tan x° = \frac{\text{opp}}{\text{adj}}$

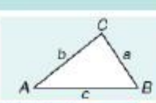


Trigonometric formulae

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2} ab \sin C$



Quadratic equations

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Foundation tier formulae

Higher tier formulae

Notes page

Notes page

Notes page

Y11 GCSE Exam Dates

Y11 Mock(s): ______________________

Y11 PPE(s): ______________________

Final GCSE(s): ______________________

____

____

Success Programme Sessions:

____

____

____

Revision Guide (if applicable):

____

____

____

____

Notes