



DOWNHAM MARKET
ACADEMY

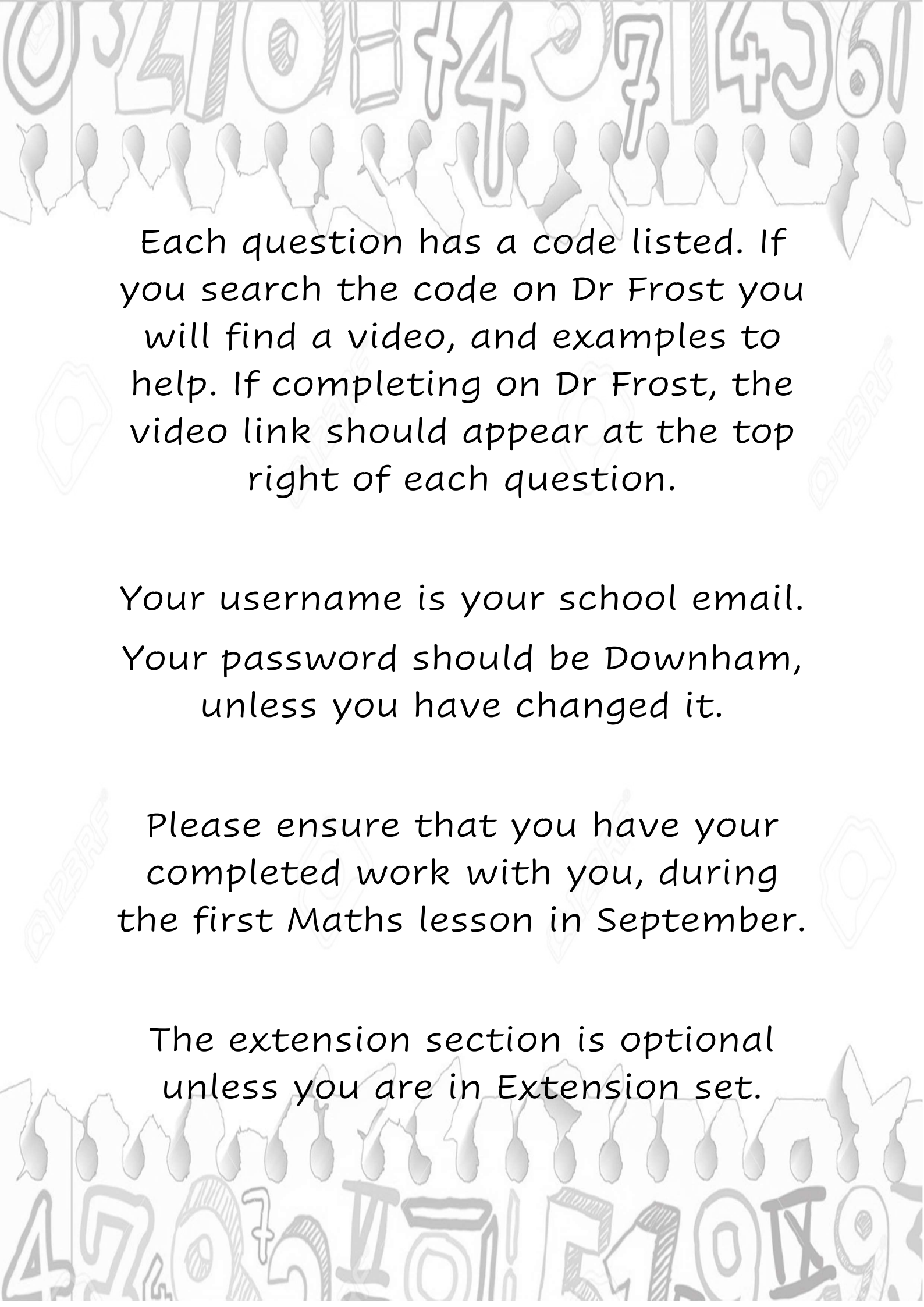
Preparing for Year 10 Higher Maths



DOWNHAM MARKET
ACADEMY

This booklet contains all of the key topics you need to be confident with, in order to succeed at GCSE maths.

You must complete all of the questions. You can print and complete this booklet or complete the work in your exercise books. Alternatively, all documents that form this booklet have been set to you on Dr Frost.

A decorative border at the top of the page features a row of stylized, hand-drawn numbers (0, 2, 1, 0, 4, 7, 1, 4, 5, 6) above a row of stylized human figures. The background is white with faint, repeating patterns of these numbers and figures.

Each question has a code listed. If you search the code on Dr Frost you will find a video, and examples to help. If completing on Dr Frost, the video link should appear at the top right of each question.

Your username is your school email.
Your password should be Downham,
unless you have changed it.

Please ensure that you have your completed work with you, during the first Maths lesson in September.

The extension section is optional unless you are in Extension set.

Preparing for Year 10 - Higher. Number. Fraction Arithmetic.

Question 7

Skill involved: 57b: Calculate two-thirds of a given quantity.

The gift shop also sells pencils.

The price of a pencil is $\frac{2}{3}$ of the price of a pen.

Work out the price of a pencil.

| Gift shop | |
|-------------|-------|
| Price list | |
| Key ring | £3.20 |
| Hat | £3.99 |
| Pencil case | £2.70 |
| Ruler | 45p |
| Pen | 60p |
| Pencil | |

..... p

(2 marks)

Question 8

Skill involved: 167a: Multiply mixed numbers.

Show that $3\frac{1}{5} \times 2\frac{5}{8} = 8\frac{a}{b}$, where a and b are integers to be found.

$a = \dots\dots\dots, b = \dots\dots\dots$

(3 marks)

Question 9

Skill involved: E101: Converting between mixed numbers and improper fractions

Andrea's petrol tank holds up to 44 litres of fuel. She goes to the garage when her tank is a quarter full and puts more petrol in the tank until it is two-thirds full. How many litres of petrol does she put in the tank?

..... litres

Question 10

Skill involved: 57e: Calculate a non-unit fraction of a given quantity (with denominator up to 12).

Ali is paid £20 000 a year.

He saves three-eighths of this amount.

How much does he save?

£

(2 marks)

Preparing for Year 10 - Higher. Number. Ratio

Question 1

Skill involved: 224e: Write a ratio in the form 1 : n or n : 1.

Write 20 : 45 in the form 1 : n.

..... :

Question 2

Skill involved: 224e: Write a ratio in the form 1 : n or n : 1.

Write 40 : 45 in the form 1 : n.

..... :

Question 3

Skill involved: 224h: Determine the percentage that a number within a ratio represents.

There are boys and girls in a class in the ratio 8 : 17

What percentage of the pupils are boys?

..... %

Question 7

Skill involved: 224j: Convert an equation involving two variables into a ratio.

Given that $5q = 6p$, work out the ratio $p : q$

..... :

Question 4

Skill involved: 224h: Determine the percentage that a number within a ratio represents.

There are boys and girls in a class in the ratio 2 : 3

What percentage of the pupils are boys?

..... %

Question 5

Skill involved: 225b: Share an amount into a ratio with three parts.

Divide 126 in the ratio 2 : 5 : 7

Question 6

Skill involved: 225b: Share an amount into a ratio with three parts.

Divide 144 in the ratio 3 : 8 : 5

Preparing for Year 10 - Higher. Number. Ratio

Question 8

Skill involved: 225e: Determine a value in a ratio when the difference between two amounts is given.

Henry and Adam share a sum of money in the ratio 4 : 15

Adam got £110 more than Henry.

How much did Adam receive?

£

Question 9

Skill involved: 227a: Combine two ratios to form one.

There are only Year 11 pupils, Year 12 pupils and Year 13 pupils in a group

The ratio of Year 11 to Year 12 is 10 : 3

The ratio of Year 12 to Year 13 is 1 : 6

Find the ratio Year 11 : Year 12 : Year 13

Give your ratio in its simplest form with integer parts.

..... : :

Question 10

Skill involved: 464b: Form and solve an equation using equivalent ratios, where one is algebraic.

Given that

$$7x - 5 : 5x - 1 = 1 : 2$$

find the value of x .

$x = \dots\dots\dots$

Preparing for Year 10: Higher. Number. Percentages

Question 1

Skill involved: 219f: Calculate simple interest.

Adam invests £1975 into an account that pays 4.75% simple interest per year.
Work out the total interest Adam gets after 17 years.

£

Question 2

Skill involved: 215a: Calculate a percentage change with a calculator.

The price of a train ticket increases from £460 to £547.40
Find the percentage increase.

..... %

Question 3

Skill involved: 223d: Calculate the original value given the value of a percentage increase or decrease, using decimal multipliers.

In a 22% sale, the price of a phone reduced by \$18.70.
Find the original price of the phone.

\$

Question 4

Skill involved: 359d: Calculate a value after several compound percentage changes.

Rami bought a house on 1st January 2015.

In 2015, the house increased in value by 15%

In 2016, the house decreased in value by 8%

On 1st January 2017, the value of the house was \$687700

What was the value of the house on 1st January 2015?

\$

Question 5

Skill involved: 218a: Rewrite a percentage calculation using an equivalent fraction.

Peter, Jack and Colin share a flat. They pay the rent monthly.

Peter pays 30% of the monthly rent.

Jack pays $\frac{3}{8}$ of the monthly rent.

Colin pays £520 of the monthly rent.

Calculate the total monthly rent for the flat.

£

Preparing for Year 10: Higher. Number. Percentages

Question 6

Skill involved: 221a: Determine the decimal multiplier that would lead to a percentage increase or decrease.

A company bought a new truck.

Each year the value of the truck depreciates by 20%.

The value of the new truck can be multiplied by a single number to find its value at the end of four years.

Find this single number as a decimal.

.....

Question 7

Skill involved: 361a: Determine time before a value reaches a given value given some known compound percentage change.

£1800 is invested at 4% compound interest per year.

How many years will it take for the investment to be worth £2000?

..... years

Question 8

Skill involved: 361b: Determine the time before a value reaches some multiple of the original, given some known compound percentage change.

Jack bought a new boat for £12 500.

The value, £ V , of Jack's boat at the end of n years is given by the formula

$$V = 12500 \times (0.85)^n$$

At the end of how many years was the value of Jack's boat first less than 50% of the value of the boat when it was new?

..... years

Question 9

Skill involved: 361a: Determine time before a value reaches a given value given some known compound percentage change.



This motorcycle depreciates by 16% per annum.

After how many whole years will this motorcycle be worth less than £1000?

Motorcycle will be worth less than £1000 after

..... whole years.

Question 10

Skill involved: 361d: Determine the value of the percentage during a compound percentage change.

Jan invests \$8000 in a savings account.

The account pays compound interest at a rate of x % per year.

At the end of 6 years, there is a total of \$8877.62 in the account.

Work out the value of x .

Give your answer correct to 2 decimal places.

$x =$

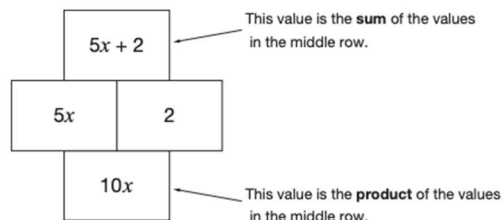
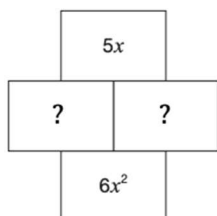
Preparing for Year 10 - Higher. Algebra. Simplify

Question 1

Skill involved: 191e: Multiply algebraic terms with positive coefficients (maximum power of 2).

Here are the rules for an algebra grid.

Use these rules to complete the algebra grids below.
Write your expressions as simply as possible.



? =

or ? =

Question 2

Skill involved: 193e: Collect like terms with powers.

Simplify

$$3q^3 - 5q + 5q + 3y^3$$

.....

Question 3

Skill involved: 387a: Simplify a factorised algebraic fraction.

Simplify

$$\frac{(4b - 6)(3b - 9)}{5(4b - 6)}$$

.....

Question 4

Skill involved: 193f: Collect like terms with powers and combinations of two variables within each term.

Simplify

$$3x^2 + 7y^2 - 9x^2y - 3y^2$$

.....

Question 5

Skill involved: 387b: Simplify algebraic fractions where linear factorisation of one of the numerator or denominator is required.

Simplify

$$\frac{x - 3}{2x - 6}$$

.....

Preparing for Year 10 - Higher. Algebra. Simplify

Question 6

Skill involved: 387c: Simplify algebraic fractions where linear factorisation of both the numerator and denominator is required.

Simplify

$$\frac{5x - 5}{3x^2 - 3x}$$

.....

Question 7

Skill involved: 158d: Use laws of indices for multiplying and dividing powers requiring two steps.

Simplify

$$\frac{8^2 \times 8^6}{8^3}$$

.....

Question 8

Skill involved: 194h: Simplify an expression using multiple index laws with a single algebraic variable.

Simplify

$$\frac{(q^4)^3}{q^3}$$

.....

Question 9

Skill involved: 192f: Combine multiplication and division of algebraic terms.

Simplify the expression below.

$$3y \times 9z \div 3y$$

.....

Question 10

Skill involved: 388a: Multiply algebraic fractions with single terms on the numerators and denominators.

Simplify

$$\frac{10p^4}{9q^3} \times \frac{3q^3}{10p}$$

.....

Preparing for Year 10 - Higher. Algebra. Expand & Factorise

Question 1

Skill involved: 252d: Expand a single bracket with an algebraic term at the front.

Expand

$$4e(e + 2)$$

.....

Question 2

Skill involved: 252h: Expand and simplify expressions involving subtraction of a bracket with a term or bracket before.

Expand and simplify.

$$4(2x - 3) - 2(x - 5)$$

.....

Question 3

Skill involved: E299: Expanding two brackets

Expand and simplify

$$(x + 3)(x + 4)$$

.....

Question 4

Skill involved: 299e: Expand two brackets given in the form $(ax \pm b)(cx \pm d)$

Expand and simplify

$$(2x + 1)(2 - x)$$

.....

Question 5

Skill involved: 299d: Expand an expression given in the form $(x \pm a)^2$

Expand and simplify:

$$(x - 1)^2$$

.....

Question 6

Skill involved: 253b: Factorise by taking an algebraic factor out with single variable.

Factorise fully

$$4p + 6pq$$

.....

Preparing for Year 10 - Higher. Algebra. Expand & Factorise

Question 7

Skill involved: 253c: Factorise by taking a common algebraic factor out involving index laws.

Factorise fully

$$2x^3y^2z^3 - 4x^5y^3z^2$$

.....

Question 8

Skill involved: 362b: Factorise quadratic expressions given in the form $x^2 - bx + c$

Factorise the following quadratic:

$$x^2 - 9x + 20$$

.....

Question 9

Skill involved: 362c: Factorise quadratic expressions given in the form $x^2 + bx - c$

Factorise the following quadratic:

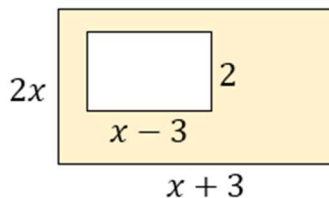
$$x^2 + x - 30$$

.....

Question 10

Skill involved: E198: Forming linear algebraic expressions and formulae from a given context

Find a simplified expression for the shaded area of the shape drawn below.



.....

Question 1

Skill involved: 199d: Solve a two-step equation where the solution is a negative integer.

Solve for x :

$$-26 = 4x - 6$$

$$x = \dots\dots\dots$$

Question 2

Skill involved: 254b: Solve a linear equation with brackets and positive fractional solutions.

Solve for q :

$$98 = 3(3q + 13)$$

$$q = \dots\dots\dots$$

Question 3

Skill involved: 254e: Solve an equation with brackets and a possible negative coefficient of the unknown.

Solve for x :

$$-12 = -2(7x + 4) + 4x$$

$$x = \dots\dots\dots$$

Question 4

Skill involved: 257f: Solve a linear equation with two sets of brackets on one side requiring simplification.

Solve for x :

$$5(5 + x) = 2(2 + x) + 3(5x - 3)$$

$$x = \dots\dots\dots$$

Question 5

Skill involved: 200g: Solve a two-step equation involving a power of a variable.

Solve:

$$y^3 + 15 = -12$$

$$y = \dots\dots\dots$$

Question 6

Skill involved: 258a: Solve a two step equation with a fraction on one side.

Solve for x :

$$5 = \frac{9x}{4}$$

$$x = \dots\dots\dots$$

Question 7

Skill involved: 258b: Solve an equation with one fraction equal to a linear expression.

Solve for x :

$$\frac{3x+3}{5} = 2x - 2$$

$$x = \dots\dots\dots$$

Question 9

Skill involved: 258d: Solve an equation with one fraction equal to another fraction.

Solve for x :

$$\frac{2x+1}{3} = \frac{x-5}{2}$$

$$x = \dots\dots\dots$$

Question 8

Skill involved: 258f: Solve an equation with the unknown within an expression in denominator.

Solve for x :

$$\frac{2}{6x+7} = 10$$

$$x = \dots\dots\dots$$

$$x = \dots\dots\dots$$

Question 10

Skill involved: E257: Solving linear equations where the variable appears on both sides of the equation

$ABCD$ is a trapezium.

$STUV$ is a rectangle.

All measurements are in centimetres.

The two shapes have the same perimeter.

Work out the length of ST .

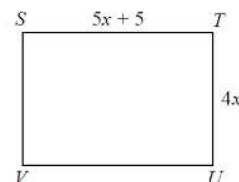
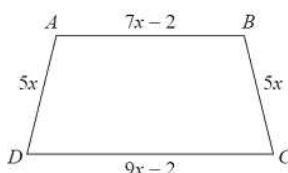


Diagram NOT accurately drawn

..... cm

Preparing for Year 10 – Higher. Data. Probability

Question 1

Skill involved: 250d: Determine probabilities of mutually exclusive events in a table with a given relationship.

A school snack bar offers a choice of four snacks.
The four snacks are burgers, pizza, pasta and salad.
Student can choose **one** of these four snacks.

| | | | | |
|-------------|--------|-------|-------|-------|
| Snack | burger | pizza | pasta | salad |
| Probability | 0.35 | 0.15 | | 0.2 |

The table shows the probability that a student will choose burger or pizza or salad.
One student is chosen at random from the students who use the snack bar.
Work out the probability that the student chose pasta.

.....

Question 2

Skill involved: E250: Probabilities of mutually exclusive events

There are 10 balls in a bag.
They are red or blue or yellow.

| | | | |
|-------------|-----|------|--------|
| Colour | Red | Blue | Yellow |
| Probability | | | |

There are twice as many blue balls as red balls. There are more red balls than yellow balls.

A ball is taken at random from the bag.
Fill in the table to show the probability of taking each colour.

Question 3

Skill involved: 250d: Determine probabilities of mutually exclusive events in a table with a given relationship.

The probability that a biased dice will land on a four is 0.2
The probability that the biased dice will land on a six is 0.4
Ted rolls the biased dice once.

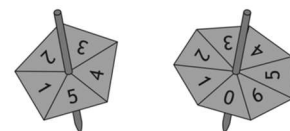
Work out the probability that the dice will land on either a four or a six.

.....

Question 4

Skill involved: 249e: Determine the probability of a combined outcome where the sample space is not given.

Michael runs a stall at the school fayre.
His game requires two spinners to be spun and allowed to come to rest. The spinners are shown.



The numbers on which the spinners come to rest are multiplied together. To win a prize the answer to this multiplication must be less than 5.

Calculate the probability of winning a prize.

| |
|--|
| |
| |

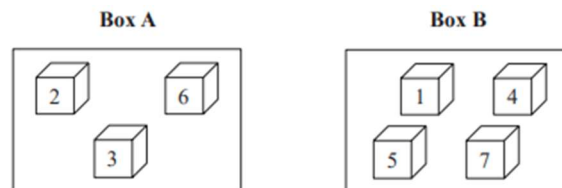
Preparing for Year 10 – Higher. Data. Probability

Question 5

Skill involved: 249e: Determine the probability of a combined outcome where the sample space is not given.

There are some cubes in two boxes.
There is a number on each cube.

Steph plays a game with the cubes.



She takes at random a cube from each box.
She adds the two numbers on the cubes to get her score.

Steph wins the game if she gets a score of 10
Work out the probability that she wins the game on her first attempt.

.....

Question 6

Skill involved: 251d: Work out an expected value for a fair event, with a given number of repeated trials.

Fay is testing an ordinary six-sided dice to see if it is biased.
She throws the dice 120 times.
Work out the number of times the dice is expected to land on 1.

.....

Question 7

Skill involved: 251e: Work out an expected value for a biased event, with a given number of repeated trials.

A machine fills boxes of breakfast cereal.
Each box should weigh 375g.
Jason takes 100 boxes and tests the
accuracy of the machine by weighing them.

| Weight (g) | Less than 375 | Exactly 375 | More than 375 |
|--------------------|------------------|----------------|------------------|
| Number of boxes | 9 | 58 | 33 |

The machine fills 5000 boxes.

Calculate the number of boxes you would expect to weigh less than 375g.

.....

Preparing for Year 10 – Higher. Data. Probability

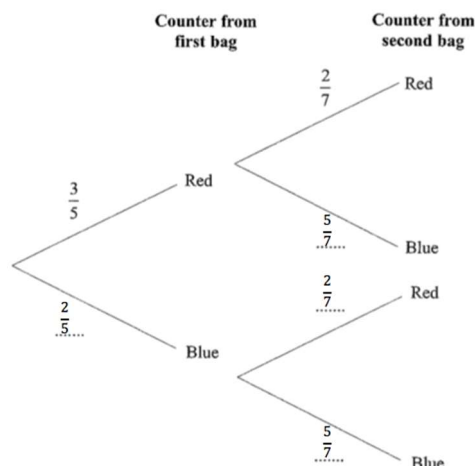
Question 8

Skill involved: 353d: Deal with multiple different chains of outcomes involving successive independent events, using a tree diagram.

Loren has two bags.
 The first bag contains 3 red counters and 2 blue counters.
 The second bag contains 2 red counters and 5 blue counters.

Loren takes one counter at random from each bag.

Work out the probability that Loren takes one counter of each colour.



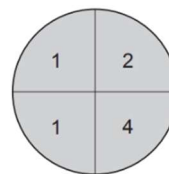
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Question 9

Skill involved: 353b: Deal with a single chain of outcomes involving successive independent events, using a tree diagram.

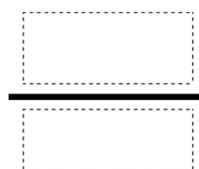
The diagram shows a dartboard with 4 sectors of equal size.

Sanjeev throws 3 darts which all hit this dart board.
 Each dart is equally likely to hit any sector of the dart board.



He **multiplies** his three numbers to find his score.

Work out the probability that his score is an odd number.



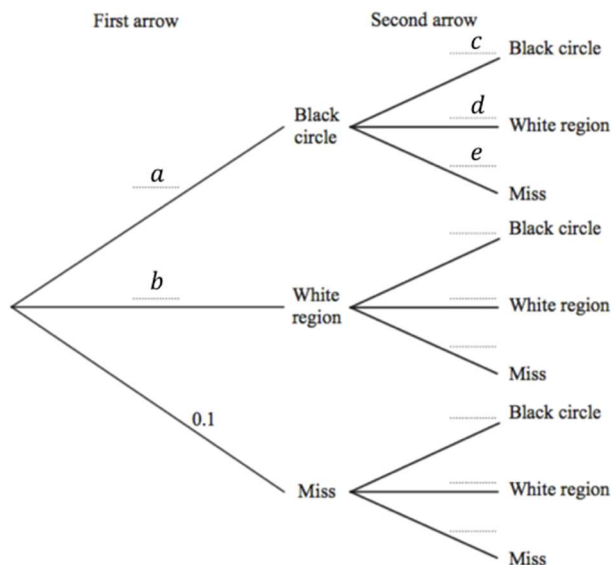
Question 10

Skill involved: 353a: Draw a tree diagram to represent successive independent events.

A target has a black circle and a white region.
 Arrows can hit the black circle, the white region or miss the target.

Peter shoots two arrows at the target.
 On each shot, the probability that Peter's arrow misses the target is 0.1.
 On each shot, the probability that Peter's arrow hits the white region is twice the probability that it hits the black circle.

Complete the probability tree diagram for Peter's two arrows.



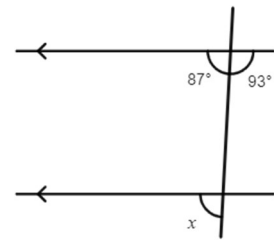
Preparing for Year 10. Higher. Geometry. Angles

Question 1

Skill involved: 262c: Determine an angle using corresponding angles on parallel lines.

Find the value of x .

$x = \dots\dots\dots^\circ$

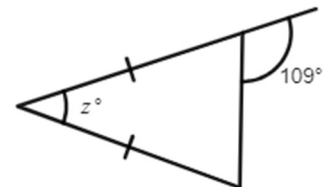


Question 2

Skill involved: 150b: Determine an angle in a diagram involving an isosceles triangle with an extended side.

Find the value of z .

$z = \dots\dots\dots^\circ$

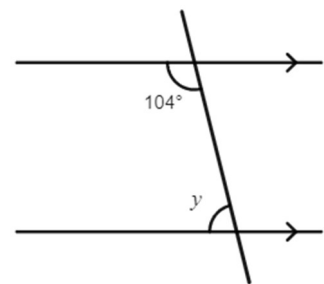


Question 3

Skill involved: 262d: Determine an angle using cointerior (allied) angles on parallel lines.

Find the value of y .

$y = \dots\dots\dots^\circ$

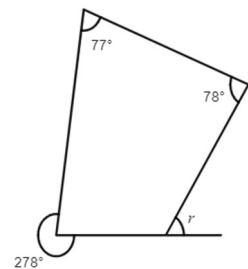


Question 4

Skill involved: 151d: Determine an angle using multiple angle laws in a diagram that involves a quadrilateral.

Calculate the value of r .

$r = \dots\dots\dots^\circ$

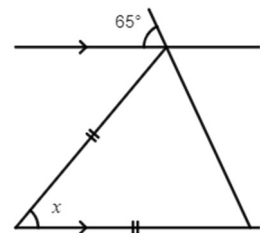


Question 5

Skill involved: 262i: Determine an angle in a triangle using angles on parallel lines.

Find the angle marked x in the diagram below.

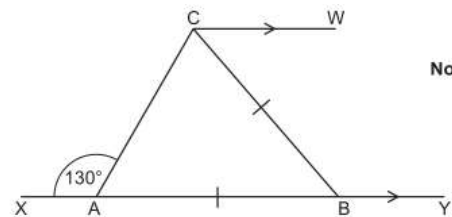
$x = \dots\dots\dots^\circ$



Question 6

Skill involved: 262j: Determine an angle in a complex diagram involving multiple angle laws and parallel lines.

XY and CW are parallel lines.
 $AB = CB$. Angle $CAX = 130^\circ$.
 Work out angle BCW .



$\dots\dots\dots^\circ$

(4 marks)

Preparing for Year 10 - Higher. Shape. Area & Volume

Question 1

Skill involved: 182g: Determine the area of a pentagon formed from a rectangle and a triangle.

The diagram shows a shape.
Work out the area of the shape.

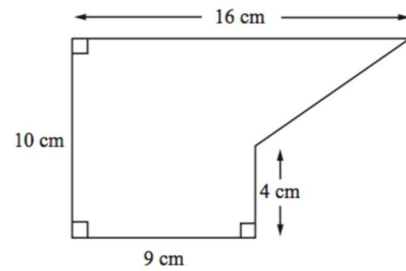


Diagram NOT accurately drawn

..... cm^2

Question 2

Skill involved: 182g: Determine the area of a pentagon formed from a rectangle and a triangle.

The shape $ABCD$ is made from a rectangle $ANCD$ and the right-angled triangle NBC .
 ANB is a straight line.

$AN = 9$ cm.

$NB = 5$ cm.

The area of rectangle $ANCD$ is 36 cm^2

Work out the area of shape $ABCD$.

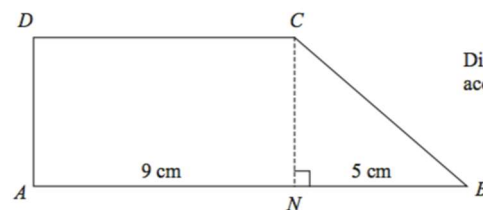


Diagram NOT accurately drawn

..... cm^2

Question 3

Skill involved: 181a: Find the area of a composite rectilinear shape.

The diagram shows 3 small rectangles inside a large rectangle.

The large rectangle is 10 cm by 8 cm.

Each of the 3 small rectangles is 4 cm by 2 cm.

Work out the area of the region shown shaded in the diagram.

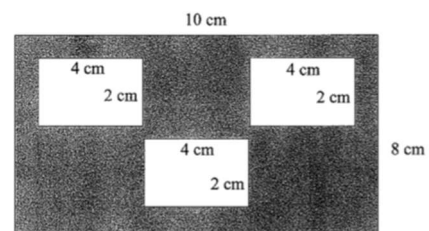


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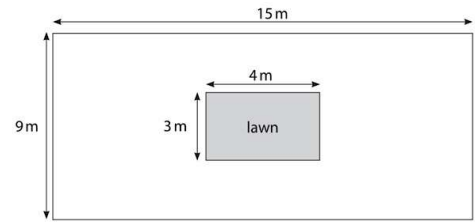
..... cm^2

Preparing for Year 10 - Higher. Shape. Area & Volume

Question 4

Skill involved: 181a: Find the area of a composite rectilinear shape.

Alfie sells flooring for playgrounds.
He has this diagram of a playground.



The playground is rectangular 9 m by 15 m.
The lawn is rectangular 3 m by 4 m.

Alfie will put flooring on all the space inside the playground but not on the lawn.
The flooring costs £36 per square metre.

Work out the total cost of the flooring.

£

Question 5

Skill involved: 213b: Determine the area of a fraction of a ring.

The region, shown shaded in the diagram, is a path.

The boundary of the path is formed by two semicircles, with the same centre O , and two straight lines.

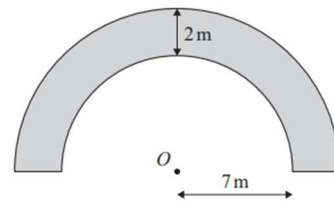


Diagram NOT accurately drawn

the inner semicircle has a radius of 7 metres.
The path has a width of 2 metres.

Work out the perimeter of the path.
Give your answer correct to one decimal place.

..... m

Question 6

Skill involved: E213: Area of composite shapes involving circles

The diagram shows an isosceles triangle ABC and a semicircle with centre O and diameter 12 cm.

The point B lies on the semicircle.

The line OB is the line of symmetry of the diagram.

AC is 1 cm from the diameter of the semicircle and $AC = 8$ cm.

Work out the area of the shaded region.
Give your answer correct to 3 significant figures.

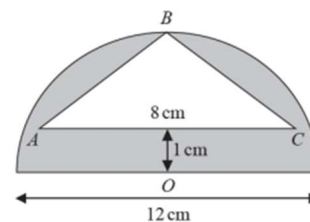


Diagram NOT accurately drawn

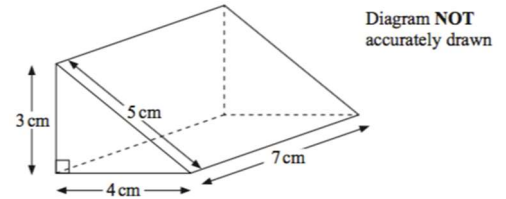
..... cm²

Preparing for Year 10 - Higher. Shape. Area & Volume

Question 7

Skill involved: 232i: Calculate the surface area of a prism.

Work out the total surface area of the triangular prism.



..... cm^2

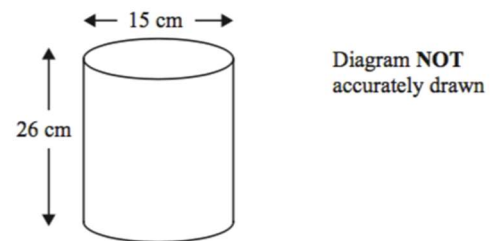
Question 8

Skill involved: 233b: Calculate the volume of a cylinder from its diameter and height.

A cylinder has a diameter of 15 cm and a height of 26 cm.

Work out the volume of the cylinder.

Give your answer correct to 3 significant figures.



..... cm^3

Question 9

Skill involved: 233g: Determine the volume of a solid involving one solid cut out of another, one of them cylindrical.

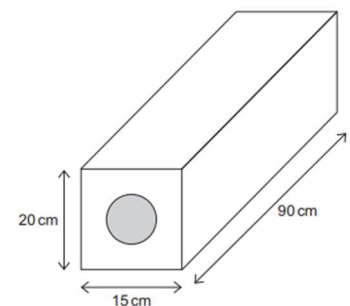
This building block is in the shape of a cuboid.

The block contains one steel cylindrical rod of length 90 cm.

The radius of the rod is 4 cm.

The rest of the block is concrete.

Work out the volume of concrete in the block.



..... cm^3

Year 10. Higher. Extension

Question 1

Skill involved: 299o: Expand an expression given in the form $(ax + b)^2 - (cx + d)^2$

Expand and simplify

$$(2x + 4)^2 - (2x + 1)^2$$

.....

Question 2

Skill involved: 300e: Expand an expression given in the form $(ax \pm b)(cx \pm d)(ex \pm f)$

Expand and simplify:

$$(5x + 6)(x + 1)(2x + 5)$$

.....

Question 3

Skill involved: 364d: Factorise quadratic expressions given in the form $ax^2 - bx - c$

Factorise:

$$3x^2 - 22x + 7$$

.....

Question 4

Skill involved: 364d: Factorise quadratic expressions given in the form $ax^2 - bx - c$

Factorise:

$$4x^2 + 21x + 5$$

.....

Question 5

Skill involved: 363d: Factorise the difference of two squares given in the form $ax^2 - by^2$, where **a** and **b** have a common numeric factor.

Factorise fully

$$32q^2 - 2s^2$$

.....

Year 10. Higher. Extension

Question 6

Skill involved: 394f: Raise a number to the power of a non-unit fraction.

Write down the value of

$$36^{\frac{3}{2}}$$

.....

Question 7

Skill involved: 394j: Raise a number to the power of a negative fraction.

Write down the value of

$$16^{-\frac{1}{2}}$$

.....

Question 8

Skill involved: 394j: Raise a number to the power of a negative fraction.

Find the value of

$$8^{-\frac{4}{3}}$$

.....

Question 9

Skill involved: 358a: Express a power using a different base.

Given that

$$9^5 = 3^z$$

find the value of z .

$z =$

Question 10

Skill involved: 358d: Solve equations involving powers of the same base, leading to a linear equation.

Solve for y :

$$4^{y+9} = 8^{y+4} \times 2^{y+10}$$

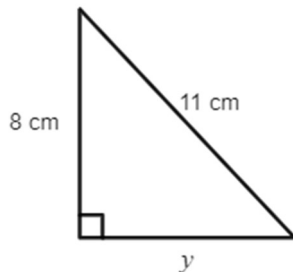
$y =$

Year 10. Higher. Extension

Question 11

Skill involved: 288b: Use Pythagoras' theorem to calculate a shorter side of a right-angled triangle.

Find the value of y .



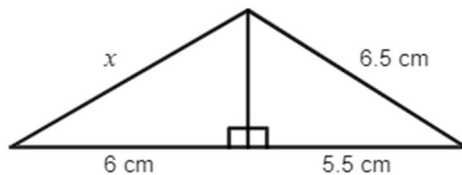
Give your answer correct to 1 decimal place.

..... cm

Question 12

Skill involved: 288j: Use Pythagoras' theorem twice for two triangles with a shared shorter side.

Work out the value of x .



Give your answer correct to 1 decimal place.

$x =$ cm
