

<p>apply the four operations, including formal written methods, to integers, simple fractions (proper and improper), and mixed numbers – all both positive and negative</p>	<p>use conventional notation for priority of operations, including brackets, powers, roots and reciprocals</p>	<p>use the concepts and vocabulary of prime numbers, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem</p>	<p>calculate exactly with fractions</p>	<p>interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer</p>	<p>apply systematic listing strategies</p>	<p>work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $7/2$ or 0.375 or $3/8$)</p>	<p>identify and work with fractions in ratio problems</p>	<p>interpret fractions and percentages as operators</p>
<p>round numbers and appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)</p>	<p>use and interpret algebraic notation, including: a^2b in place of $a \times a \times b$, coefficients written as fractions rather than as decimals</p>	<p>substitute numerical values into scientific formulae</p>	<p>understand and use the concepts and vocabulary of factors</p>	<p>simplify and manipulate algebraic expressions by taking out common factors and simplifying expressions involving sums, products and powers, including the laws of indices</p>	<p>rearrange formulae to change the subject</p>	<p>plot graphs of equations that correspond to straight-line graphs in the coordinate plane</p>	<p>identify and interpret gradients and intercepts of linear functions graphically and algebraically</p>	<p>recognise, sketch and interpret graphs of linear functions and simple quadratic functions</p>
<p>plot and interpret graphs of non-standard (piece-wise linear) functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance and speed</p>	<p>solve linear equations with the unknown on both sides of the equation</p>	<p>find approximate solutions to linear equations using a graph</p>	<p>generate terms of a sequence from either a term-to-term or a position-to-term rule</p>	<p>deduce expressions to calculate the nth term of linear sequences</p>	<p>change freely between compound units (e.g. speed, rates of pay, prices) in numerical contexts</p>	<p>use compound units such as speed, rates of pay, unit pricing)</p>	<p>use scale factors, scale diagrams and maps</p>	<p>express the division of a quantity into two parts as a ratio, apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)</p>
<p>express a multiplicative relationship between two quantities as a ratio or a fraction</p>	<p>understand and use proportion as equality of ratios</p>	<p>relate ratios to fractions and to linear functions</p>	<p>compare lengths, areas and volumes using ratio notation</p>	<p>work with percentages greater than 100%</p>	<p>solve problems involving percentage change, including original value problems, and simple interest including in financial mathematics</p>	<p>understand and use alternate and corresponding angles on parallel lines</p>	<p>derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)</p>	<p>identify, describe and construct similar shapes, including coordinate axes, by considering enlargement</p>
<p>interpret plans and elevations of 3D shapes</p>	<p>measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings</p>	<p>identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2</p>	<p>calculate perimeters of 2D shapes, including circles</p>	<p>calculate areas of circles and composite shapes</p>	<p>know and apply formulae to calculate volume of right prisms (including cylinders)</p>	<p>apply statistics to describe a population</p>	<p>use and interpret scatter graphs of bivariate data</p>	<p>recognise correlation</p>
<p>interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers)</p>	<p>interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers)</p>	<p>record describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees</p>	<p>apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments</p>	<p>relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale</p>	<p>construct theoretical possibility spaces for single experiments with equally likely outcomes and use these to calculate theoretical probabilities</p>	<p>apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one</p>	<p>enumerate sets and combinations of sets systematically, using tables, grids and Venn diagrams</p>	<p>construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate theoretical probabilities</p>

Stage 8 Mathematics



1 Calculate

a) 2718×0.67

b) $247.7 \div 15$ to one decimal place

.....

.....

c) $22.167 + 287.4$

d) $32.214 - 714.8$

.....

.....



e) $3\frac{2}{3} + (-2\frac{1}{4})$

f) $1\frac{3}{4} - 4\frac{1}{7}$

.....

.....

g) $2\frac{3}{10} \times (-\frac{2}{5})$

h) $\frac{3}{10} \div (-\frac{7}{13})$

.....

.....

(NSC1, 16 marks)

2 Calculate

a) $2 \times 5 + 4^2$

b) $72 \div (6 - 3)^2$

.....

.....

c) $64 \div (6 - 4)^3 \times 2$

d) $(60 + 12) \div (12 \div 6)^3$

.....

.....



e) $\frac{\sqrt{40+3^2}}{2}$

f) $\sqrt[3]{(64+8) \div 9}$

.....

.....

(NSC2, 12 marks)

3 Express as a product of prime factors:

i) 120

ii) 65

.....

.....

iii) 98

iv) 400

.....

.....



b) Using the unique factorisation theorem, find:

i) The highest common factor of 65 and 120

.....

ii) The lowest common multiple of 65 and 120

.....
(NSC3, 12 marks)

4 Without using a calculator, calculate:

$$\frac{\frac{2}{3} \times 12 - 2\frac{1}{4}}{\frac{1}{2}}$$

.....
(NSC4, 3 marks)

5 Write the numbers in standard form:

a) 456 000:

d) 0.12:

b) 2 million:

e) 0.000056:

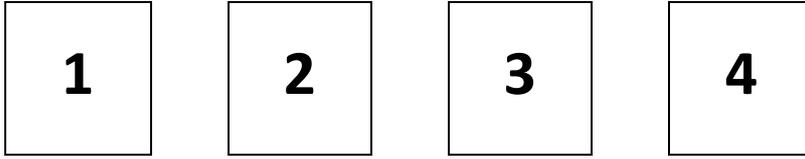
c) 1 234 000:

f) 0.0000000678:

(NSC5, 6 marks)



- 6 Ollie has a set of four digit cards



How many different 4-digit numbers can be created using these digit cards?

.....
(NSC6, 2 marks)



7 a) Express as decimals:

i) $\frac{3}{10} = \dots\dots\dots$

iv) $\frac{5}{40} = \dots\dots\dots$

ii) $\frac{3}{8} = \dots\dots\dots$

v) $\frac{7}{2} = \dots\dots\dots$

iii) $\frac{17}{100} = \dots\dots\dots$

vi) $\frac{9}{4} = \dots\dots\dots$

b) Express as fractions in the simplest form:

i) $0.625 = \dots\dots\dots$

ii) $0.45 = \dots\dots\dots$

iii) $0.0032 = \dots\dots\dots$

(NFDP1, 12 marks)

8 Jack and Jill are splitting some money.

Jack is to receive 4 times as much as Jill.

Jill thinks she should get $\frac{1}{4}$ of the money.

Do you agree with Jill? Explain your answer.

(NFDP2, 2 marks)



9 Are the following statements true (T) or false (F)?

a) Increasing an amount by 25% is the same as multiplying by $1\frac{1}{4}$

b) The inverse of increasing an amount by 20% is decreasing by $\frac{1}{5}$

c) The inverse of decreasing an amount by 50 % is increasing by $\frac{1}{2}$

d) The inverse of increasing an amount by 25 % is decreasing by $\frac{1}{5}$

(NFDP3, 4 marks)



10 a) Round 165.5736 to:

165.5736

i) One decimal place:

ii) Two decimal places:

iii) One significant figure:

iv) Two significant figures:

b) Dave rounds 0.573 to 1.0 to one significant figure.

Do you agree with Dave?

Explain your answer

(NMA1, 6 marks)



11 Simplify:

a) $a \times b \times a = \dots\dots\dots$

c) $4a \div 8b = \dots\dots\dots$

b) $4 \times b \times 2 \times a = \dots\dots\dots$

d) $15b \div 3a = \dots\dots\dots$

(ANVM1, 4 marks)

12 Using the formula

$$s = ut + \frac{1}{2}at^2$$

calculate the value of s when:

$u = 4 \text{ m/s}$

$t = 3 \text{ s}$

$a = 10 \text{ m/s}^2$

.....
(ANVM2, 3 marks)

13 Factorise:

a) $4a + ab$

b) $2a + 6b$

c) $5xy + 15x$

d) $12p + 16$

.....
.....
.....
.....
.....

(ANVM3, 6 marks)



14 Simplify:

a) $3a^2b + 4a^2b - a^2b$

.....

b) $3a^2b + 4ab^2 + 2a^2b$

.....

c) $3a^2b + 4a^2 + a^2b + 6a^2$

.....

d) $3a^2b + 4a^2 + a^2b + 6b^2$

.....

(ANVM4, 8 marks)

15 Rearrange the formulae to make x the subject:

a) $y = x + 6$

.....

b) $y = 6x$

.....

c) $y = 6x + 1$

.....

d) $y = \frac{x+1}{6}$

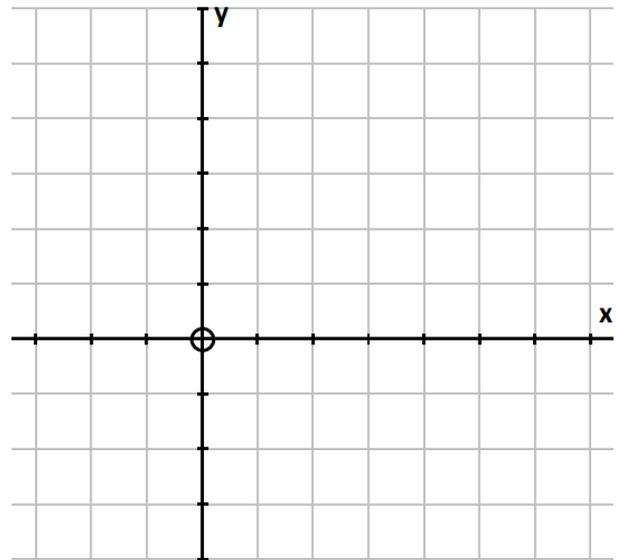
.....

(ANVM5, 8 marks)



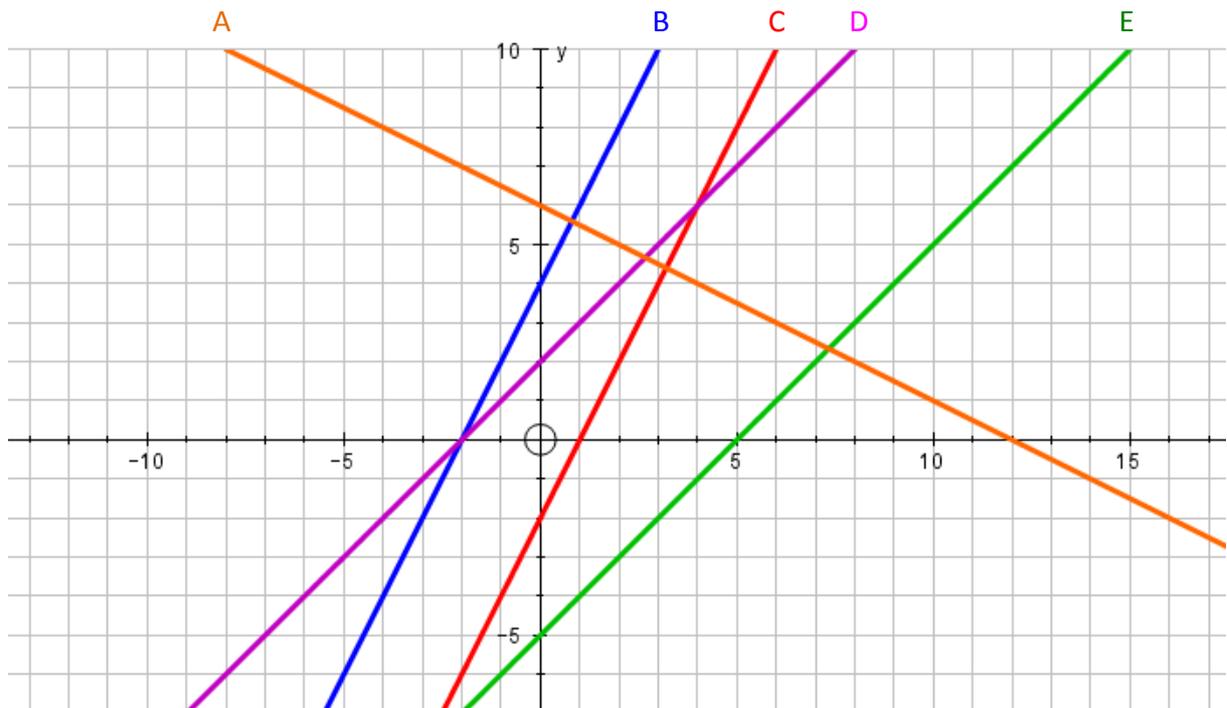
16 Plot **and label** the graphs of

- a) $y = 2x + 1$
- b) $y = 4 - 2x$
- c) $x + y = 4$



(AG1, 6 marks)

17 Look at the graphs here



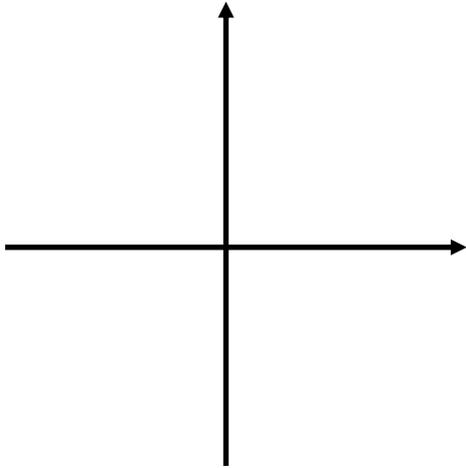
- a) What is the gradient of line B?
.....
- b) Which 2 lines have the same gradient?
..... and
- c) What is the gradient of line A?
.....

(AG2, 4 marks)

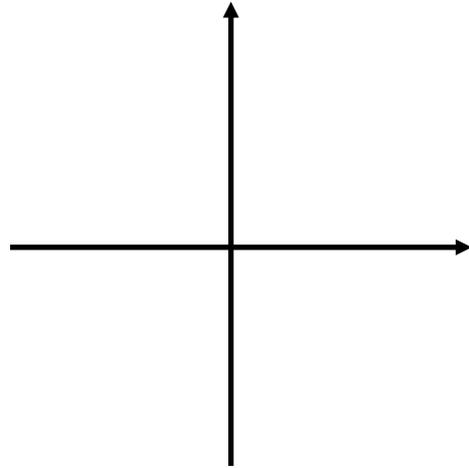


18 Sketch the graphs of the following functions:

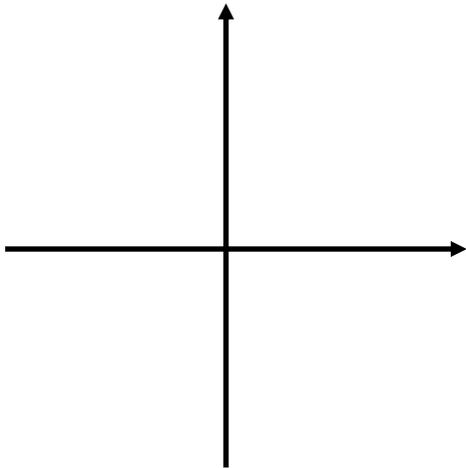
a) $y = x - 5$



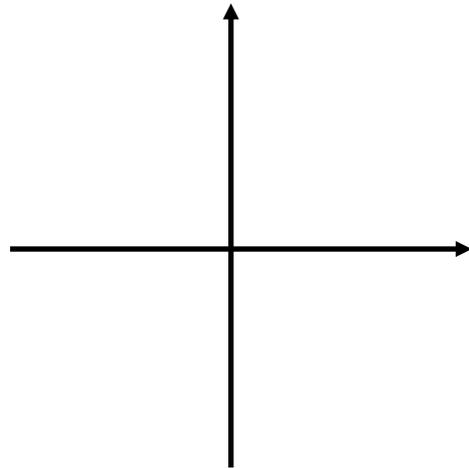
b) $y = 2x + 2$



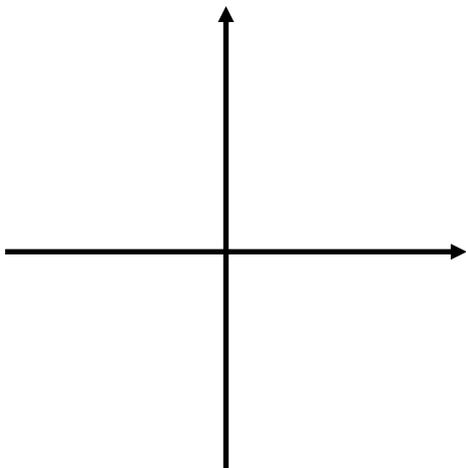
c) $y = 2x - 7$



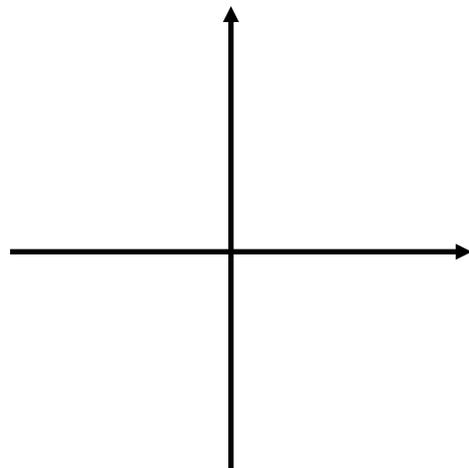
d) $y = 4 - 2x$



e) $x + y = 3$



f) $y = x^2$



(AG3, 6 marks)



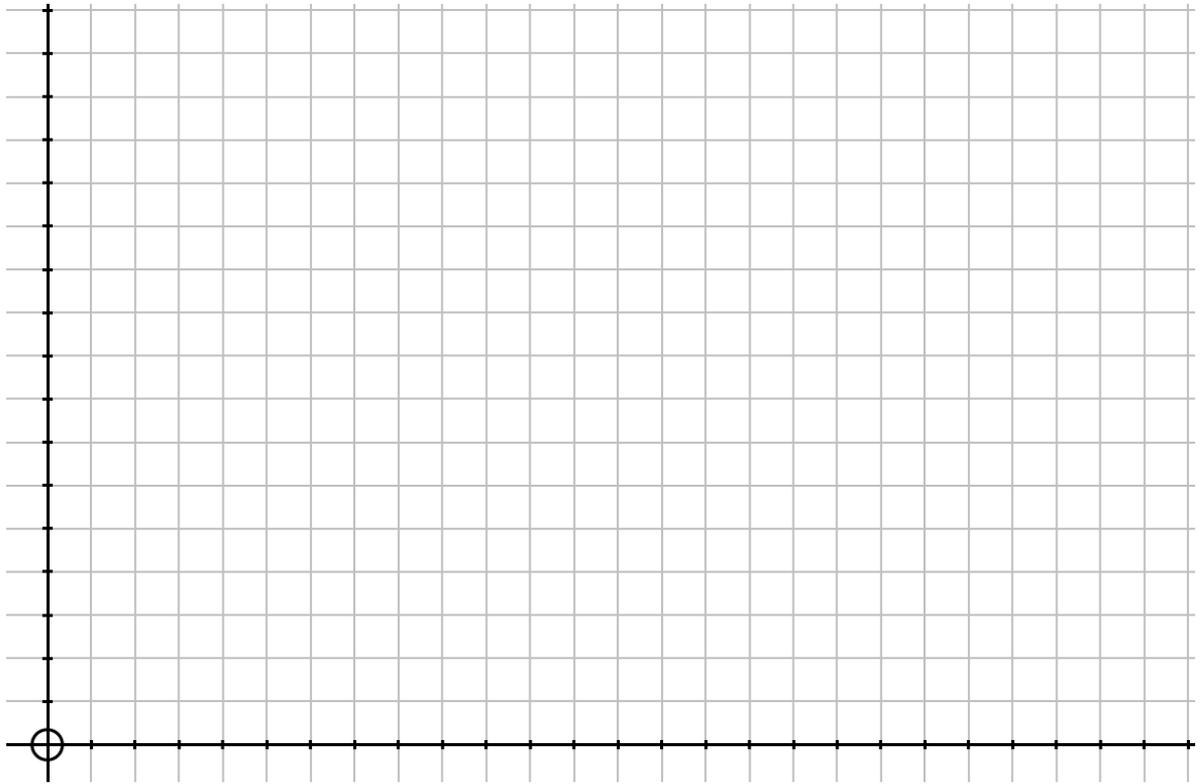
19 Draw a distance time graph to represent Dave's journey:

Dave leaves his house at 1100 and travels at a constant speed of 30 mph for 20 minutes.

He stops at a petrol station for 30 minutes and then continues his journey at a constant speed of 40 mph.

Unfortunately, after 30 minutes, he gets a puncture and has to wait one hour to be rescued.

The tow truck arrives and takes a very sad Dave back home.



(AG4, 4 marks)



20 Solve:

a) $4x + 3 = x + 15$

b) $15 - x = 3x + 7$

.....

.....

c) $5(p + 4) = 3p - 3$

d) $6 - 2a = 12 - 4a$

.....

.....

(ASE1, 10 marks)



21 This is the graph of $y = 4x - 4$.

Use the graph to find approximate solutions to the following equations:

a) $4x - 4 = 2$

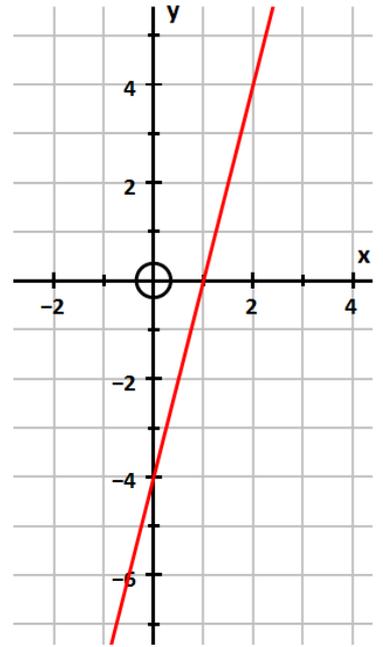
$x = \dots\dots\dots$

b) $4x - 4 = 0$

$x = \dots\dots\dots$

c) $4x - 4 = -7$

$x = \dots\dots\dots$



(ASE2, 3 marks)



22 Generate the first four terms of the sequence described by:

- a) Start number 5. Add 3 each time: , , ,
- b) Start number 12. Subtract 5 each time: , , ,
- c) Start number 3. Double each time: , , ,
- d) $4n - 2$: , , ,
- e) $n^2 + 5$, , ,

(AS1, 5 marks)

23 a) Gill thinks the n^{th} term of the sequence 3, 8, 13, 18, ... is $n + 5$.

Do you agree with Gill?

Explain your answer.

b) Find the n^{th} term of these sequences:

Sequence	n^{th} term
i) 4, 7, 10, 13, ... :
ii) 9, 14, 19, 24, ... :
iii) 8, 19, 30, 41, ... :
iv) 15, 11, 7, 3, ... :

(AS2, 10 marks)



24 Are these statements true (T) or false (F)?

a) 100 km/h is equivalent to 10 km/10 minutes

b) £4 per 500 g is equivalent to £8/kg

c) £24 000 annual salary is equivalent to £2000 per month

d) 60 mph is equivalent to 1 mile/minute

(RPRC1, 4 marks)

25 Which is the best value for money?

Tick the one that is



4 litres
£10

400 ml
£1.10

Explain your answer.

(RPRC2, 2 marks)



26 A map uses the scale 1: 50000.

A road is 4.5 km long.

How long is the road on the map?

.....
(RPRC3, 3 marks)

27 Stan is using a British Pounds (£) to Euro (€) conversion rate of £1 = €1.4 for his holidays.

a) Stan converts £15 into euros. How many euros is this?

€.....

b) Stan converts €28 into pounds. How many pounds is this?

£.....



c) Find the Euro (€) to British Pounds (£) conversion rate.

€1 = £.....
(RPRC4, 6 marks)

28 Kevin is mixing bricklaying mortar

This mortar uses sand and cement in the ratio 5:1

a) What fraction of mortar is sand?

.....

b) What fraction of mortar is cement?

.....

(RPRC5, 2 marks)

29 a) The length and width of a photo are in the ratio 6:4

Karen enlarges this photo so that it is 20 cm wide

This information is shown in the table.

Find the missing multipliers and the height of the photo.

		×
		↘ ↙
×		
	6	4
	20

b) Show that this set of numbers is **not** in proportion

	<i>l</i>	<i>w</i>
	4	6
	8	10

(RPRC6, 2 marks)



30 Ian thinks that £60 split in the ratio 2 : 1 gives the parts:

$$\frac{2}{3} \times 60 \quad \text{and} \quad \frac{1}{3} \times 60$$

Do you agree with Ian?

Explain your answer.

(RPRC7, 2 marks)

31 Simplify fully:

a) 40 cm : 3 m

b) 400 cm² : 8 m²

c) 100 cm³ : 1litre

.....

.....

.....

(RPRC8,6 marks)

32 a) Increase £60 by 120%

b) Bertie increases his test score from 20 marks to 45 marks.

Calculate the percentage increase.

.....

(RPRC9, 4 marks)



- 33 a)** A suit costs £84 in a '30% off' sale.

Find the original price of the suit.

.....

- b)** A bank offers 5% simple interest per annum.

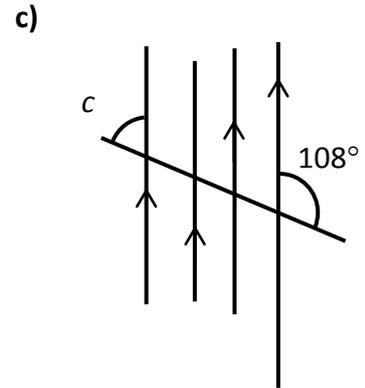
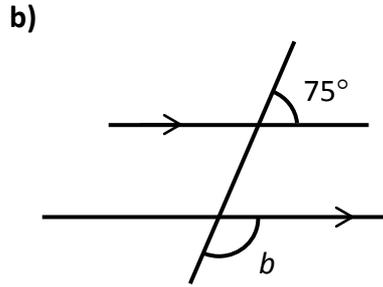
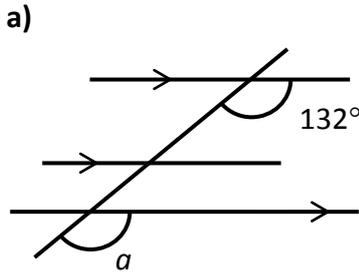
Hannah invests £250 for 4 years.

Calculate the total amount after 4 years.

.....
(RPRC10, 5 marks)



34 Find the size of the missing angle in these diagrams, giving reasons for your answer.



Explanation:

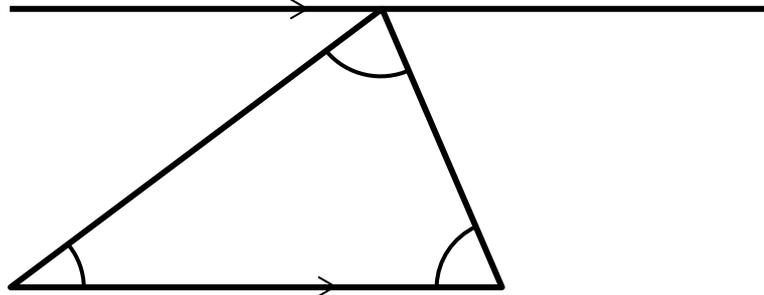
Explanation:

Explanation:

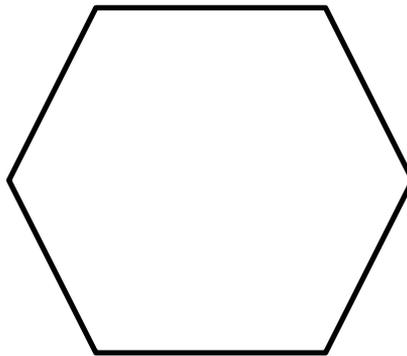
(GMPC1, 6 marks)



35 a) Using the diagram below, deduce that the sum of the angles in a triangle is 180° .



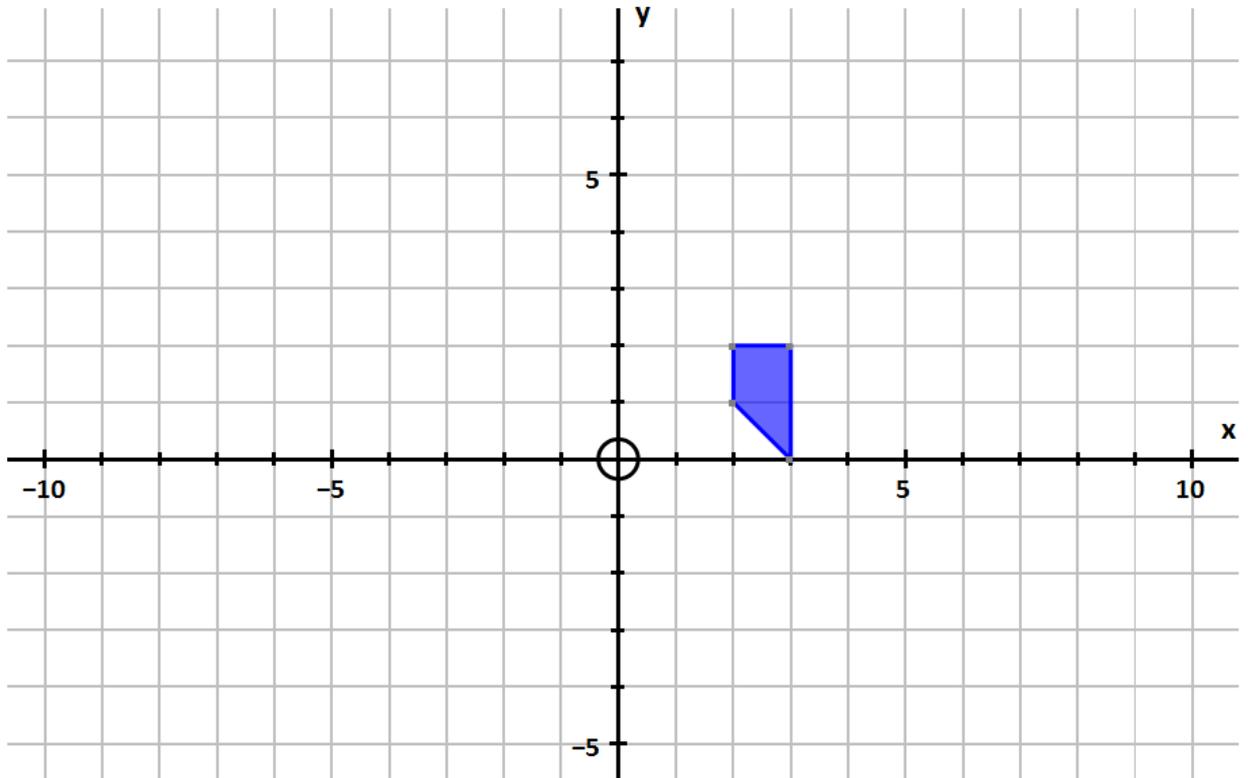
b) Prove the sum of the interior angles of a regular hexagon is 720° .



(GMPC2, 5 marks)



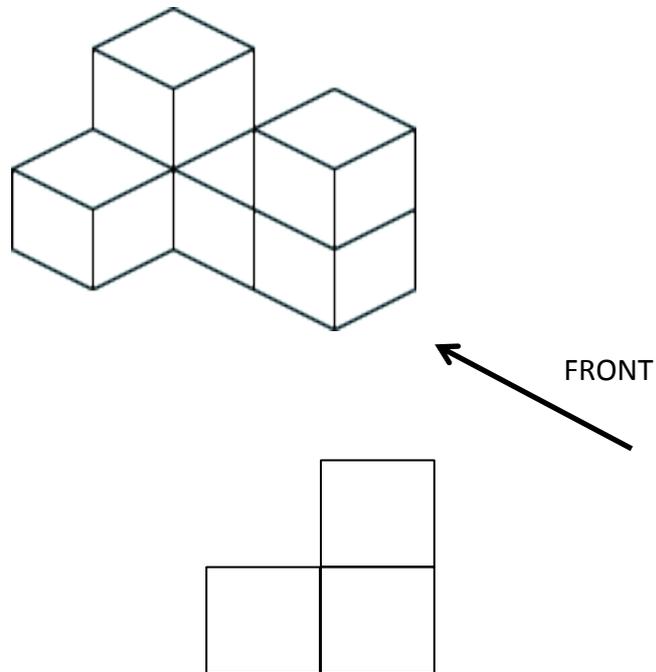
36 Enlarge the shape using a scale factor of 3, and a centre of enlargement (0, 0)



(GMPC3, 3 marks)



37 Nicole is drawing the plan of this solid:

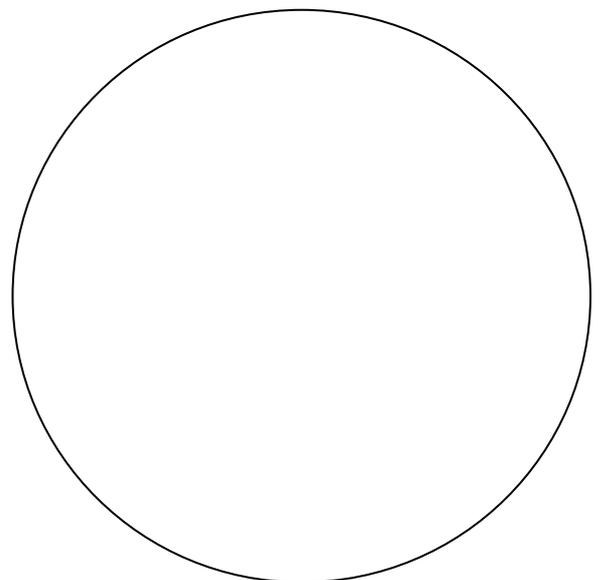


Do you agree with Nicole's plan? Explain your answer.

(GMPC4, 2 marks)

38 On the circle, identify and label:

- a) chord
- b) radius
- c) circumference
- d) centre
- e) diameter



(GMPC5, 5 marks)



39 A ship starts a journey in a harbour

It sails 50 km due East.

The ship then sails on a bearing of 060° for 60 km.

a) Construct a scale drawing of this journey using a scale of 1 cm to 10 km.



b) Using your diagram, Find the new distance, in kilometres, of the ship from the harbour.

..... km

c) Using your diagram, find the bearing of the ship from the harbour.

.....°
(GMMC1, 5 marks)



40 a) Tony thinks that the circumference (C) of a circle can be found using the formula $C = 2\pi r$.

Terri thinks that the circumference (C) of a circle can be found using the formula $C = \pi d$.

Which of the following statements is correct? Tick the one that is.

Only Tony is correct

Only Terri is correct

Both Tony and Terri are correct

Both Tony and Terri are incorrect

b) Angela says:

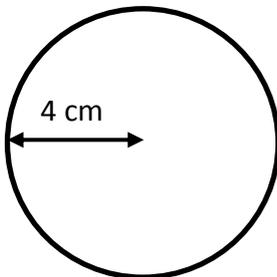
“To find the area of circle, multiply the radius by pi and then square the answer”

Do you agree with Angela? Explain your answer.

(GMMC2, 4 marks)

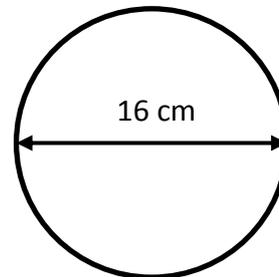
41 Find the perimeter of these shapes

a)



..... cm

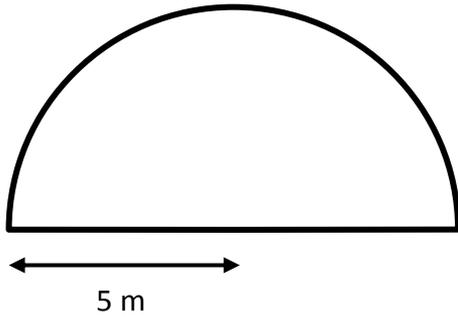
b)



..... cm

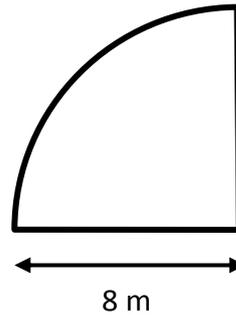


c)



..... m

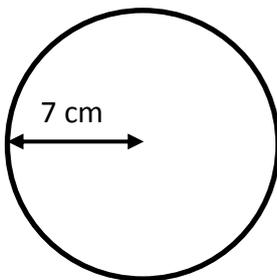
d)



..... m
(GMMC3, 10 marks)

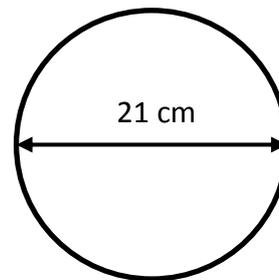
42 Calculate the area of these shapes:

a)



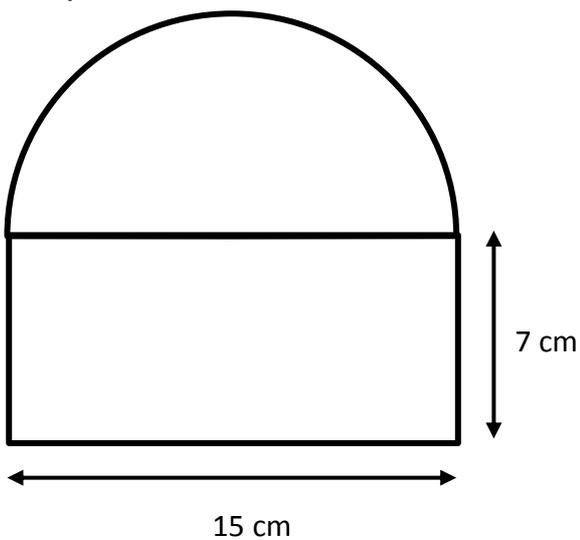
..... cm²

b)



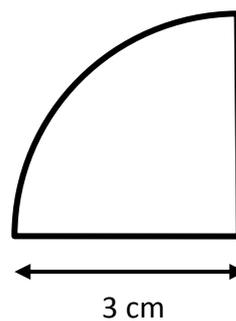
..... cm²

c)



..... cm²

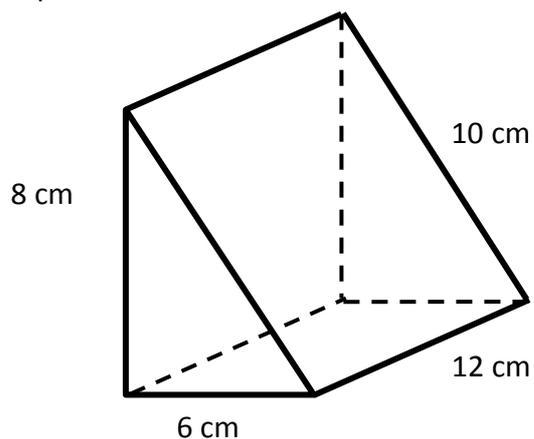
d)



..... cm²
(GMMC4, 12 marks)



43 a) Calculate the volume of this prism:



..... cm³

b) Calculate the volume of a cylinder with base radius of 5 cm and height 10 cm.

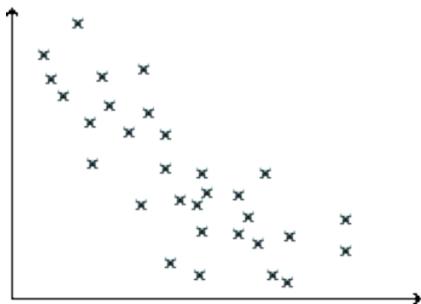
..... cm³
(GMMC5, 6 marks)



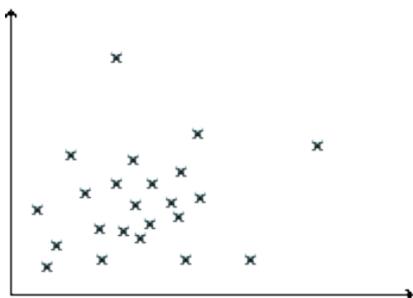
44 Explain the difference between a **population** and a **sample**

(S1, 2 marks)

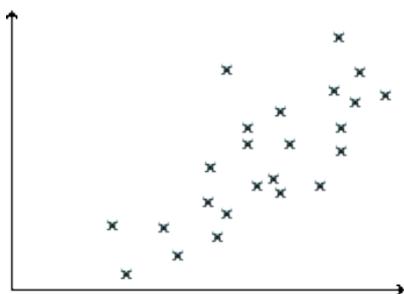
45 Draw lines to match the scatter diagrams with the most appropriate bivariate data.



Distance from school
Shoe size



Time spent practicing
Success rate



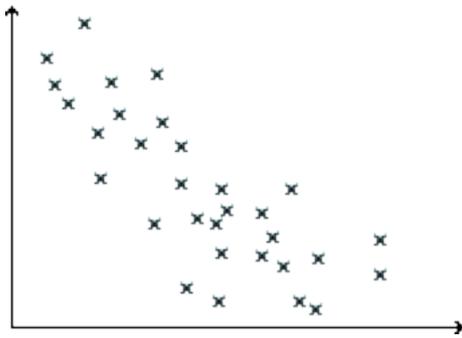
Outdoor temperature
Sales of hot drinks

(S2, 2 marks)



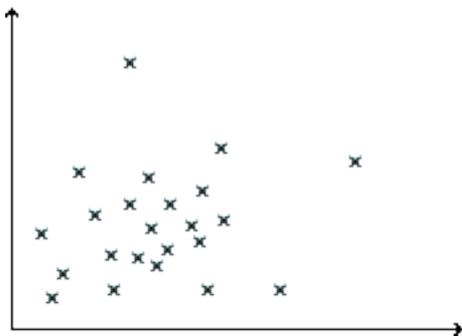
46 Complete the sentences to describe the correlation shown in each scatter graph

a)



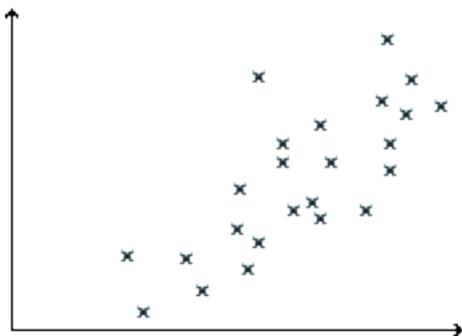
This is an example of correlation

b)



This is an example of correlation

c)



This is an example of correlation

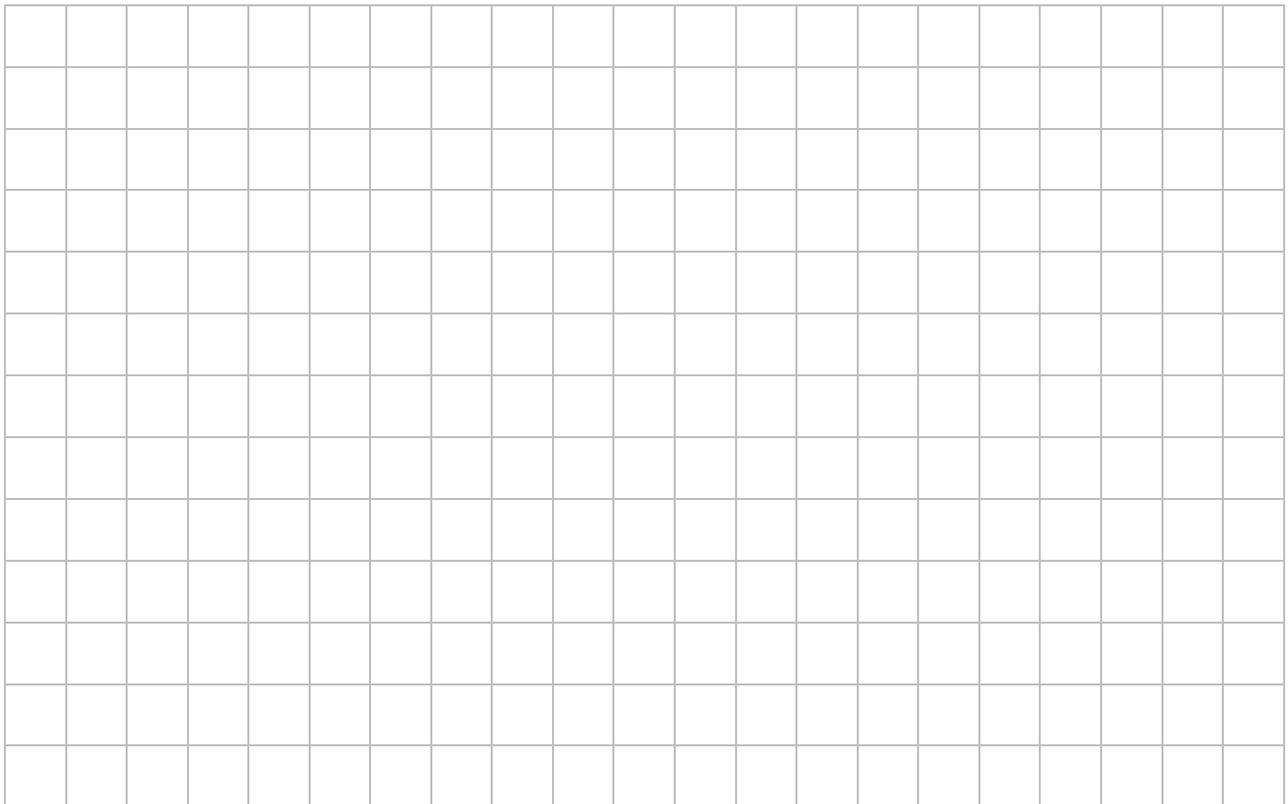
(S3, 3 marks)



47 The table shows the extra time added to a number of football matches.

Extra time (x minutes)	Frequency
$0 \leq x < 2$	4
$2 \leq x < 4$	5
$4 \leq x < 6$	3
$6 \leq x < 8$	1

Construct a histogram to show this information.



(S4, 3 marks)



48 The table shows the number of goals scored in some football matches.

Goals Scored (x)	Frequency
$0 \leq x < 4$	4
$4 \leq x < 6$	5
$6 \leq x < 12$	3
$12 \leq x < 16$	1

i) Estimate the mean number of goals scored.

.....

ii) State the modal class interval.

.....

iii) Estimate the range of the number of goals scored.

.....

iv) Comment on the significance of the range as a reliable measure of the spread of this data.

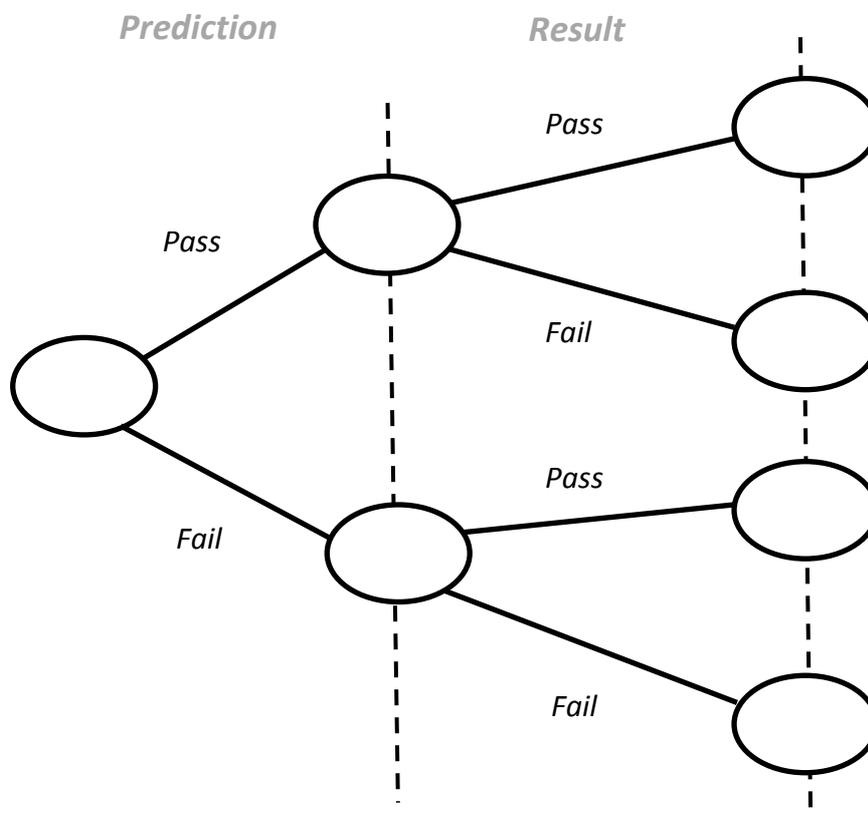
(55, 8 marks)



- 49 60 students took a driving test.
- 35 students predicted they would pass the test.
- 25 students did not pass the test.

Of all the students who passed the test, the number who predicted they would pass was four times greater than the number who predicted they would fail.

Complete the frequency tree.



(P1, 2 marks)

- 50 Ruth is going to roll a die 100 times. She says,

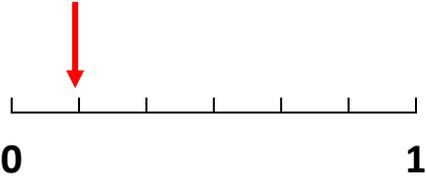
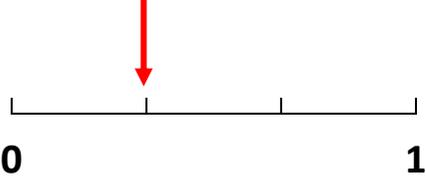
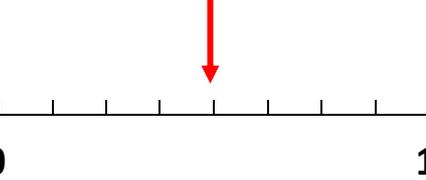
“I will probably get each number between 10 and 20 times”

Do you agree with Ruth? Explain your answer.

(P2, 2 marks)



51 Describe an event that relates to the theoretical probability:

	Probability	Event
a)		<div style="border: 1px solid black; border-radius: 15px; height: 100px; width: 100%;"></div>
b)		<div style="border: 1px solid black; border-radius: 15px; height: 100px; width: 100%;"></div>
c)		<div style="border: 1px solid black; border-radius: 15px; height: 100px; width: 100%;"></div>

(P3, 3 marks)

52 A letter is randomly chosen from the statement:

THIS IS QUESTION FIFTY TWO

a) Find the probability of selecting a vowel (A, E, I, O or U).

.....

b) Find the probability of selecting a letter 'E'.

.....

(P4, 3 marks)



53 A spinner can land on one of three colours: red, orange and blue.

The table shows the probability that the spinner lands on either red or orange.

Colour	Red	Orange	Blue
Probability	0.4	0.25	?

What is the probability of the spinner landing on blue?

.....
(P5, 2 marks)

54 A sport club has 40 members.

10 members only play badminton.

8 members only play table tennis.

16 members don't play badminton or table tennis.

a) Draw a Venn diagram to show this information

b) One of the members is selected at random.

Find the probability that this member plays **both** badminton and table tennis.



- c) Given that a member plays badminton, find the probability that the member also plays table tennis

.....
(P6, 7 marks)

- 55 Simon is rolling two fair dice.

He thinks the probability of getting two sixes is $\frac{1}{36}$.

Do you agree with Simon?

Explain your answer.

(P7, 2 marks)



