Name	Date started	Target end date

WJEC GCSE Mathematics and Numeracy (Double Award) — Question Pack

Foundation probability vocabulary and scale: locating events on a 0-to-1 probability scale (impossible, unlikely, even chance, likely, certain), compu

REVISE
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F2.18 — Probability vocabulary, scale & single events

Spec 4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.3.6 — Unit 2 (no calculator)

Foundation probability vocabulary and scale: locating events on a 0-to-1 probability scale (impossible, unlikely, even chance, likely, certain), computing P(event) = number of favourable outcomes / total number of equally likely outcomes, and using P(not A) = 1 − P(A). Sourced from legacy WJEC GCSE Mathematics-Numeracy Foundation papers (3300U10/U20) and accessible content from Intermediate papers (3300U30/U40), organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~4 hours 44 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (189 marks across 90 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. Questions are organised against the 2025 specification.

Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

*A calculator is **not** permitted on any question in this pack (Unit 2 is the non-calculator paper).*

Probability vocabulary, scale & single events — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 2: non-calculator.

Vocabulary and scale 4.3.1

- Use the words impossible, unlikely, even chance, likely, certain.
- Place events on a 0–1 probability scale.

Single-event probability 4.3.2

- Compute P(event) = favourable/total.
- Express probabilities as fractions, decimals or percentages.

Complement and exhaustion 4.3.3

- Use P(not A) = 1 − P(A).
- Recognise that probabilities of all outcomes sum to 1.

Listing outcomes 4.3.4

- List the sample space for one or two simple events.
- Identify mutually exclusive events and add their probabilities.

Crib sheet »

Probability vocabulary, scale & single events in one page

Quick-reference notes — revisit before each question. Don't use during the questions.

Probability scale

Probabilities run from **0 (impossible)** to **1 (certain)**.

0.5 = even chance. Write as a fraction, decimal or percentage — never as "1 in 3" in a final answer.

Single-event formula

P(event) = (favourable outcomes) ÷ (total outcomes), provided outcomes are equally likely.

Complement

P(not A) = 1 − P(A).

Useful when "at least one" is faster done backwards.

Mutually exclusive

If events cannot both happen at once, **P(A or B) = P(A) + P(B)**.

The probabilities of all possible outcomes sum to 1.

Listing outcomes

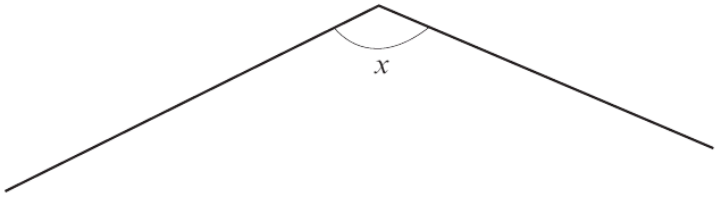
For two events list all pairs (HH, HT, TH, TT) — then count the favourable ones.

Common traps

- Giving a probability greater than 1.
- Using "1 in 4" or "4 out of 1" instead of a clean fraction.
- Forgetting the outcomes must be equally likely before counting.

Examiner only

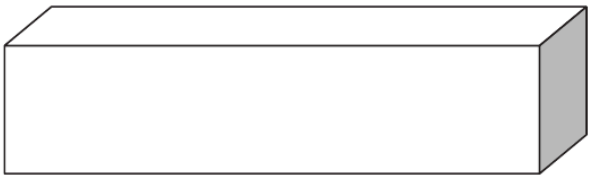
4. *(a)*



What type of angle is x in the diagram above?
Circle your answer. [1]

right angle reflex obtuse acute

(b)



What is the special name of the shape drawn above?
Circle your answer. [1]

sphere cube cone cuboid cylinder

Examiner only

4. *(a)* A fair, six-sided dice is rolled.
What is the probability that a 4 is shown on the dice?
Circle your answer. [1]

6% $\frac{1}{5}$ $\frac{1}{4}$ 6:1 $\frac{1}{6}$

(b) 50 raffle tickets were sold at a charity event.
Sian has a 20% chance of winning the top prize.
How many tickets did Sian buy?
Circle your answer. [1]

1 2 4 10 20

(c) A bag contains a mixture of blue beads, yellow beads and pink beads.
One bead is taken at random from the bag.

The probability that the bead is pink is $\frac{1}{5}$.

Which of the following sets of beads could have been in the bag?
Circle your answer. [1]

Examiner only

6. David, Jane and Mary are beach inspectors.
Three beaches, Harlech, Rhyl and Porthcawl, are all to be inspected on a certain day.
It is decided to share the work so that the inspectors will visit one beach each, chosen at random.

(a) List all the possible different ways they could share the work.
One has been done for you. [2]

David ⟶ Harlech, Jane ⟶ Rhyl and Mary ⟶ Porthcawl

(b) What is the probability that one of the female inspectors will visit Rhyl? [2]

.....

.....

Examiner only

6. *(a)* Write down the first three terms of the sequence whose nth term is given by $2n - 5$. [2]

.....

.....

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.....

The first three terms are ..... , ... and .....

(b) Write down an expression for the nth term of the following sequence. [2]

7, 11, 15, 19, ...

.....

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Examiner only

9. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

In the diagram below,

- *ABCD* is a rectangle, and
- *PQ* is parallel to *AD*.

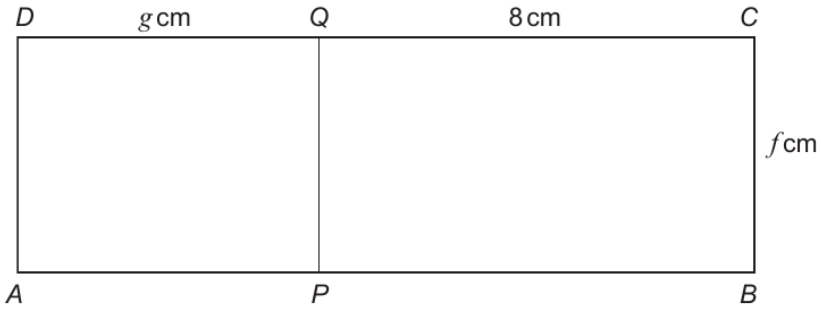

Diagram not drawn to scale

The area of *ABCD* is 52 cm^2.
The area of *APQD* is 20 cm^2.

Calculate the values of f and g.
You must show all your working. [5 + 2 OCW]

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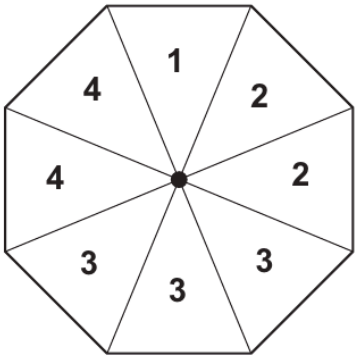
Examiner only

11. Seren has a fair 8-sided spinner.
The sections of the spinner are numbered 1, 2, 2, 3, 3, 3, 4, 4.



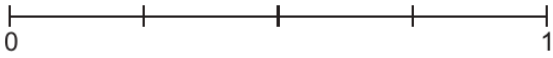
(a) Which number is the spinner most likely to land on? [1]

.....

(b) Circle one term from the list below that describes the probability of the spinner landing on a 2. [1]

impossible **unlikely** **even chance** **likely** **certain**

(c) On the probability scale below, mark with an arrow the probability of the spinner landing on a 3. [1]



Examiner only

14. *(a)* A fair, six-sided dice is rolled.
What is the probability that a 4 is shown on the dice?
Circle your answer. [1]

6% $\frac{1}{5}$ $\frac{1}{4}$ 6:1 $\frac{1}{6}$

(b) 50 raffle tickets were sold at a charity event.
Sian has a 20% chance of winning the top prize.
How many tickets did Sian buy?
Circle your answer. [1]

1 2 4 10 20

(c) A bag contains a mixture of blue beads, yellow beads and pink beads.
One bead is taken at random from the bag.

The probability that the bead is pink is $\frac{1}{5}$.

Which of the following sets of beads could have been in the bag?
Circle your answer. [1]

Examiner only

16. David, Jane and Mary are beach inspectors.
Three beaches, Harlech, Rhyl and Porhcawl, are all to be inspected on a certain day.
It is decided to share the work so that the inspectors will visit one beach each, chosen at random.

List all the possible different ways they could share the work.
One has been done for you. [2]

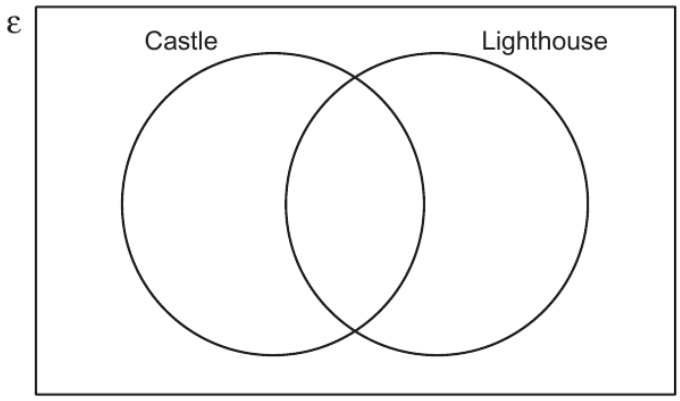
David → Harlech, Jane → Rhyl and Mary → Porthcawl

Examiner only

16. A group of 20 people visited Anglesey for a weekend break.

- 10 of the group visited Beaumaris Castle.
- 13 of the group visited South Stack Lighthouse.
- 4 of the group did not visit either of these places.

(a) Complete the Venn diagram below to show this information.
The universal set, ε, contains all of the 20 people in the group. [3]



(b) One person is chosen at random from the group.
What is the probability that this person visited only one of the two places? [2]

Examiner only

17. 100 boxes each contain 10 balls.

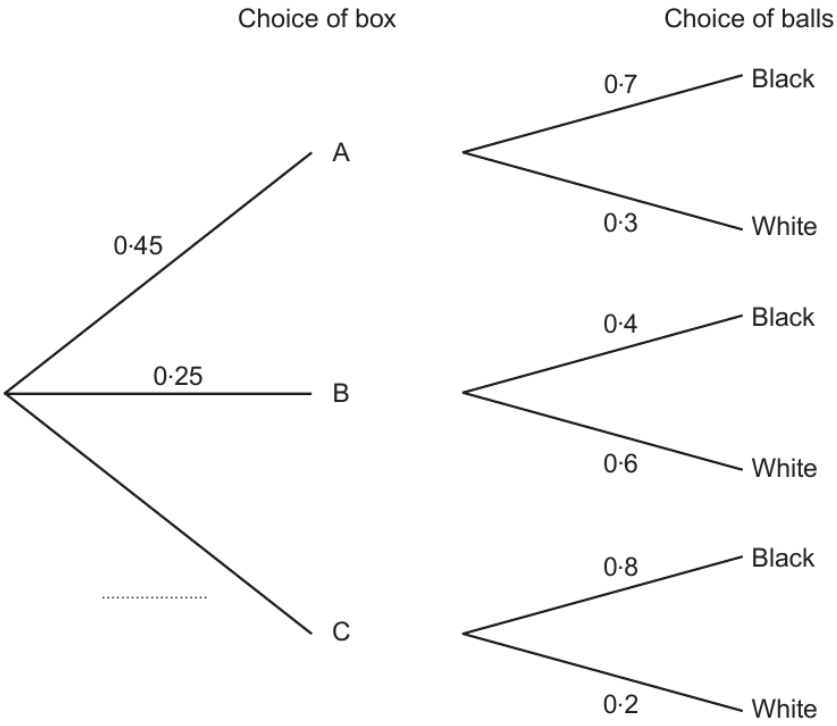
45 of the boxes are labelled A.
They each contain 7 black balls and 3 white balls.

25 of the boxes are labelled B.
They each contain 4 black balls and 6 white balls.

The rest of the boxes are labelled C.
They each contain 8 black balls and 2 white balls.

In a game, a player chooses a box at random, and then chooses a ball at random from that box.

(a) Complete the tree diagram shown below. [1]



(b) What is the probability that a player will select a black ball? [3]

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Examiner only

18. A dice is thrown 50 times.
The number shown on the dice is recorded after each throw.
The table below shows the results recorded.

Number shown on dice	1	2	3	4	5	6
Frequency	9	7	8	7	6	13

(a) The relative frequency of throwing a 1 was calculated as $\frac{9}{50} = 0{\cdot}18$.

What was the relative frequency of throwing a 6?
Give your answer as a decimal. [1]

(b) The number 4 was thrown 7 times in the first 50 throws.
Using **this fact**, calculate how many times you would expect a 4 to be thrown when this dice is thrown 3000 times. [2]

(c) How many times would you expect a 4 to be thrown when a **fair** dice is thrown 3000 times? [2]

Examiner only

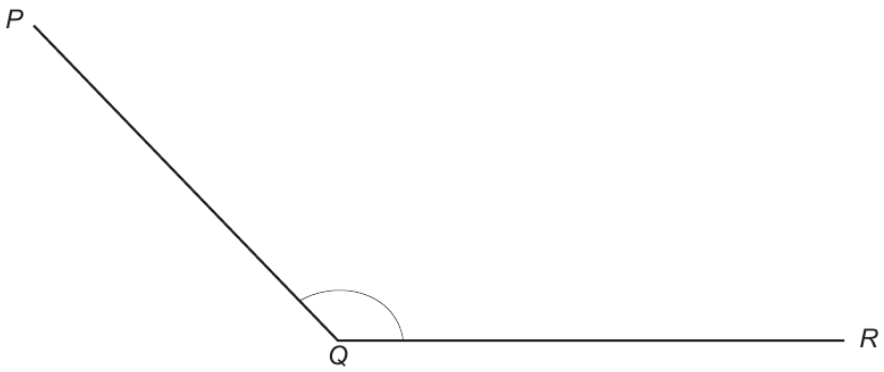
1. *(a)* Measure the length of the line *AB*.
Write your answer in centimetres. [1]

AB ..... cm

(b) In the space below, draw a circle with a radius of 6 cm. [1]

Examiner only

(c) Measure and write down the size of $P\hat{Q}R$. [1]



$P\hat{Q}R$ = ... °

Examiner only

3. The table below shows some values of $y = x - 3$ for values of x from -4 to 6.

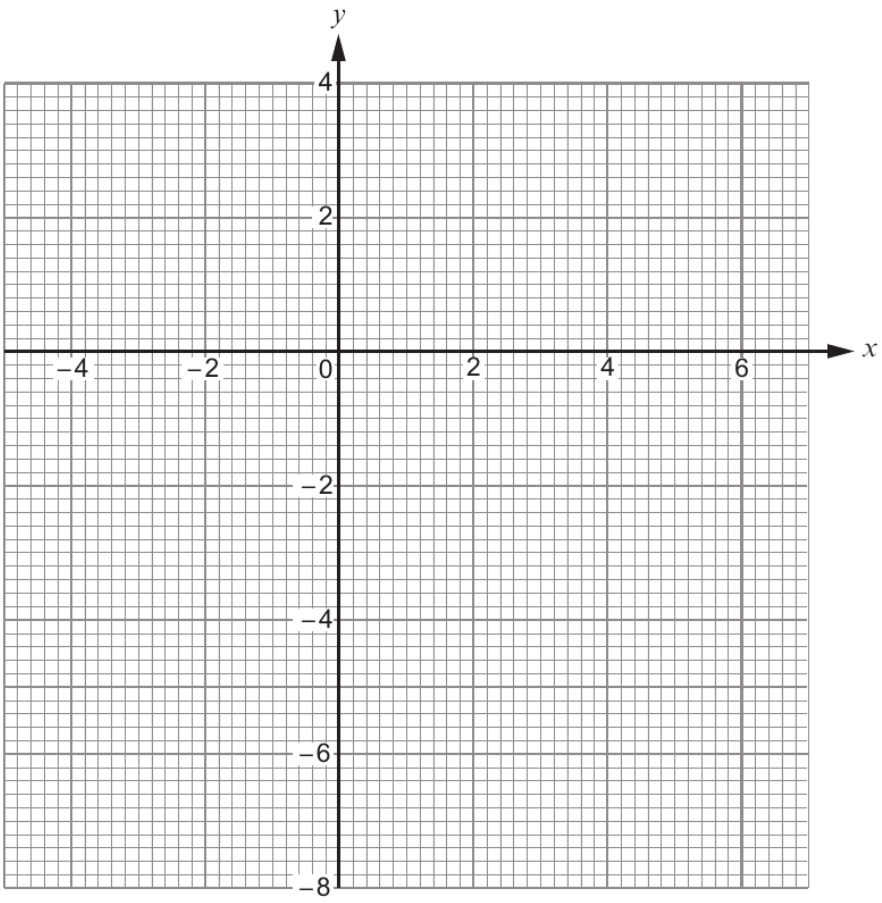
x	-4	-2	0	2	4	6
$y = x - 3$	-7		-3			3

(a) Complete the table above. [2]

.....

.....

(b) On the graph paper below, draw the graph of the straight line $y = x - 3$ for values of x **from -4 to 6 only**. [2]



Examiner only

3. A travel company offers the following holiday options.

Time	Accommodation	Transport
Summer or Winter	Cottage or Hotel	Train or Bus or Car

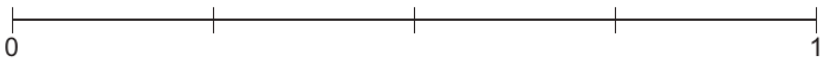
(a) List all the possible different combinations of holiday options that the company offers. One has been done for you. [3]

Time	Accommodation	Transport
Summer	Cottage	Train

(b) A holiday is chosen at random from all the different combinations on offer.
P is the probability that the chosen holiday is a

Summer holiday, staying in a Cottage and travelling by Train.

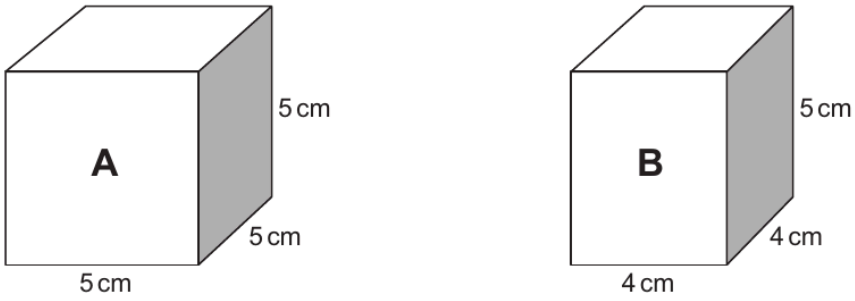
Mark the point **P** on the probability scale shown below. [1]



Examiner only

8. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Cube **A** and cuboid **B** are shown below.



Diagrams not drawn to scale

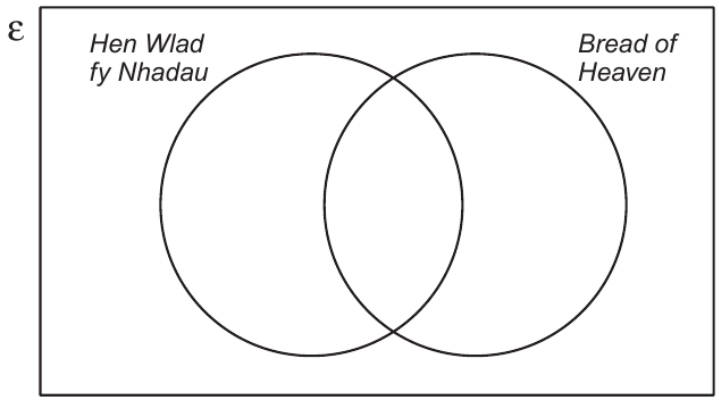
Express the volume of **B** as a percentage of the volume of **A**.
You must show all your working. [4 + 2 OCW]

Examiner only

11. 30 rugby supporters travel to Cardiff on a coach.
They decide to investigate how many of them can sing one, or both, of the songs *'Hen Wlad fy Nhadau'* and *'Bread of Heaven'*.

- 12 say they can sing both songs.
- 18 say they can sing *'Bread of Heaven'*.
- 5 say they cannot sing either of the songs.

(a) Complete the Venn diagram below to show this information.
The universal set, ε, contains all of the 30 supporters on the coach. [3]



(b) One of these supporters is chosen at random.
What is the probability that this person can sing *'Hen Wlad fy Nhadau'*? [2]

Examiner only

12. *(a)* Expand and simplify the following expression. [4]

$$x(5x - 2) - 3(x^2 - 2x + 7)$$

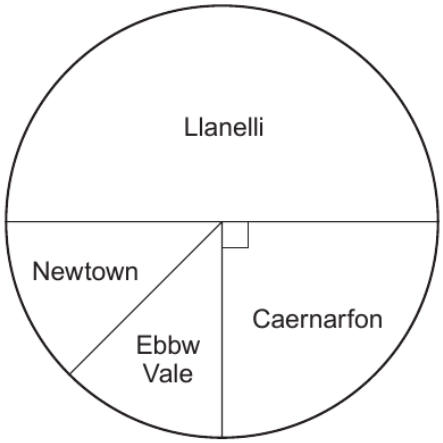
(b) Solve $\frac{22 - f}{3} = 6$. [3]

13. *(a)* A fair, six-sided dice is thrown twice.
What is the probability that a 3 is thrown on both occasions? [2]

Examiner only

(b) A company has offices in Llanelli, Caernarfon, Newtown and Ebbw Vale.
Its national committee is made up of workers from these four offices.

The pie chart below shows what fraction of the committee members come from each office.



There is an equal number of members from Newtown and Ebbw Vale.

A member is chosen at random from this committee to be its chairperson.

(i) The probability that the chosen member works at the Llanelli office is shown in the table below.

Complete the table. [2]

Office	Llanelli	Caernarfon	Newtown	Ebbw Vale
Probability	$\frac{1}{2}$			

(ii) What is the probability that the member chosen as chairperson works at either the Llanelli or the Ebbw Vale office?
You must show all your working. [2]

Examiner only

(c) The straight line you have drawn on the graph for values of x **from –4 to 6** is a diagonal of a square.

Write down the coordinates of the four corners of this square. [2]

(..... , ...) (..... , ...) (..... , ...) (..... , ...)

13. A bag contains a number of different coloured balls.
A ball is selected at random from the bag.
The probability of selecting a blue ball is 0·3.

(a) Why is the following statement incorrect?
Explain your answer clearly. [1]

'More than half the balls in the bag are blue.'

.....

.....

(b) What is the probability that a ball selected at random from the bag is not blue? [1]

.....

(c) There are 50 balls in the bag.
How many of them are blue? [2]

.....

.....

Examiner only

14. A travel company offers the following holiday options.

Time	Accommodation	Transport
Summer or Winter	Cottage or Hotel	Train or Bus or Car

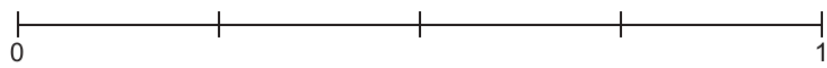
(a) List all the possible different combinations of holiday options that the company offers. One has been done for you. [3]

Time	Accommodation	Transport
Summer	Cottage	Train

(b) A holiday is chosen at random from all the different combinations on offer. **P** is the probability that the chosen holiday is a

Summer holiday, staying in a Cottage and travelling by Train.

Mark the point **P** on the probability scale shown below. [1]



Examiner only

15. *PQR* is a right-angled triangle, as shown below.
PQ = 1·41 m and *PR* = 0·89 m.

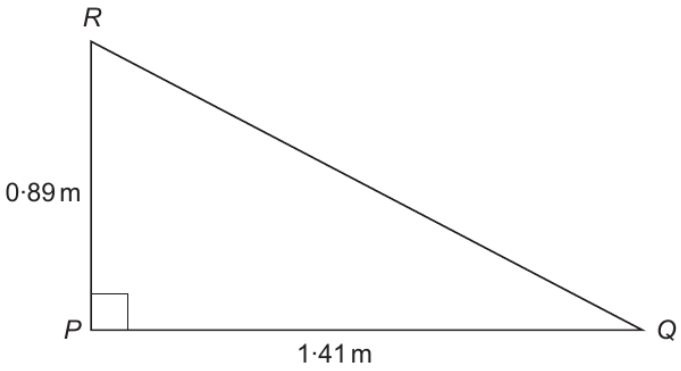


Diagram not drawn to scale

Calculate the length of *QR*. [3]

Examiner only

20. A box contains many discs, identical in shape and size.
A picture of one of four Welsh castles is printed on each disc.

(a) A disc is chosen at random from the box.
Complete the table below to find the probability of choosing a disc showing Dinefwr Castle. [2]

Picture	Caernarfon Castle	Harlech Castle	Rhuddlan Castle	Dinefwr Castle
Probability	0·36	0·12	0·24	

(b) In the box, there were 522 discs showing a picture of Caernarfon Castle.
How many of the discs showed a picture of Harlech Castle? [2]

END OF PAPER

Examiner only

8. *(a)* Mark has some cards. Each card has a number written on it.
These are Mark's cards.
The number on the last card is missing.

3	4	3	5	4	7	3	4	

Write a number on the last card so that the mode of these numbers is an odd number. [1]

.....

.....

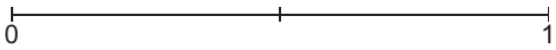
(b) Jane has a different set of cards.
These are Jane's cards.

2	2	4	7	9	15	15	21

Jane chooses a card at random from her set of cards.
On the probability scale below, mark the points A and B where:

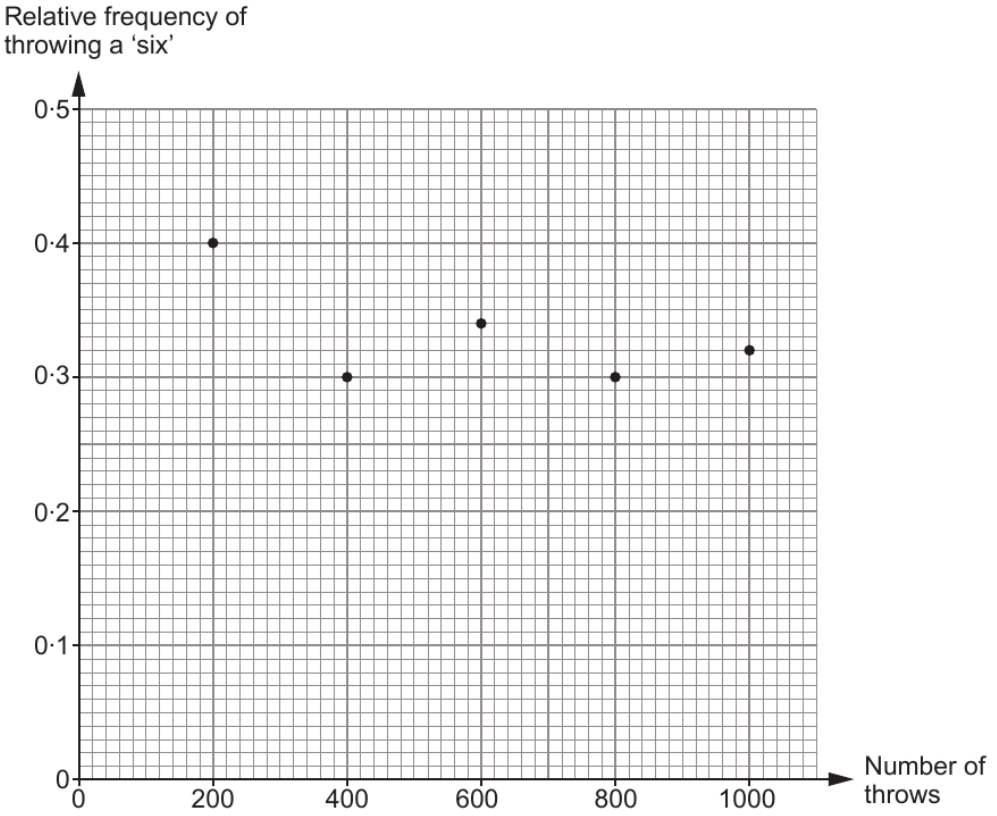
(i) A is the probability of Jane choosing a number less than 10, [1]

(ii) B is the probability of Jane choosing the number 15. [1]



Examiner only

17. A biased six-sided dice is thrown a total of 1000 times.
The graph shows the relative frequency of throwing a 'six' after 200, 400, 600, 800 and 1000 throws.



(a) Which of the following is the best estimate for the probability of throwing a 'six' with this dice?
Circle your answer. [1]

0·4 0·3 0·5 0·32 0·34

(b) (i) How many 'sixes' were thrown in the first 600 throws of the dice? [2]

.....

.....

(ii) How many **more** 'sixes' were recorded for these 600 throws than you would expect when a **fair** six-sided dice is thrown 600 times? [2]

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.....

Examiner only

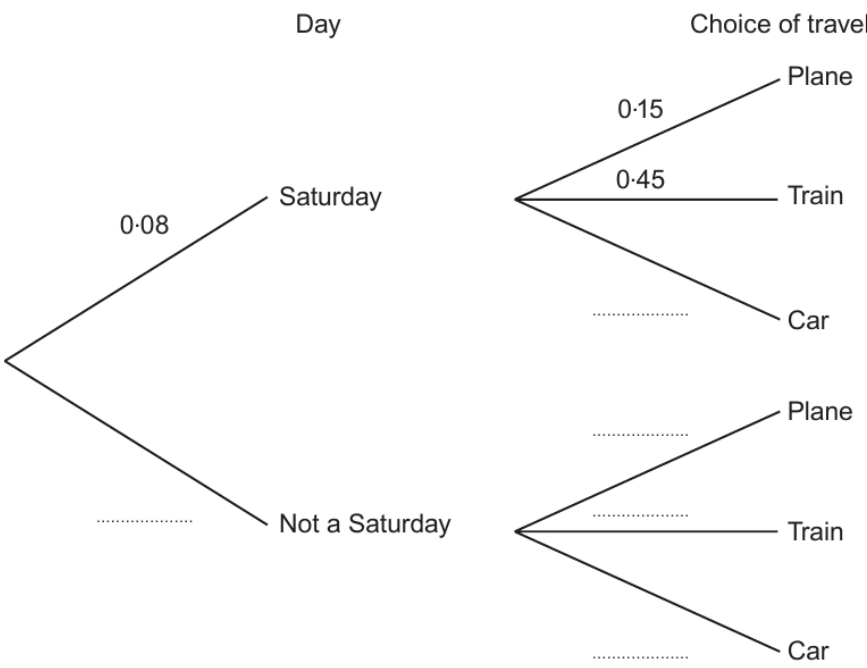
17. Alwena regularly travels from Anglesey to Cardiff to attend meetings.
For each meeting, she chooses one of three ways to travel: by plane, train or car.

The probability of a meeting being held on a Saturday is 0·08.

The probability that Alwena travels by plane to a meeting is 0·15.
The probability that she travels by train is 0·45.

Her decision on how to travel is independent of the day on which the meeting is held.

(a) Complete the following tree diagram. [3]



(b) A meeting is chosen at random.
Calculate the probability that the meeting is held on a Saturday and that Alwena travels by plane or by car. [3]

Examiner only

18. A box contains five identical balls numbered 1 to 5 respectively.
One ball is chosen at random from the box.
Its number is recorded and the ball is replaced in the box.

This process was carried out 75 times in total.

How many times would you expect an **even-numbered** ball to have been chosen?
You must show all your working. [3]

Examiner only

2. Twenty-five balls have numbers printed on them.
Some of the balls are coloured yellow (Y), the others are coloured blue (B).
The list below shows both the colour of each ball and the number printed on it.

Y 76	Y 217	B 54	B 126	Y 21
Y 438	Y 32	B 561	B 194	Y 69
B 37	B 518	Y 94	Y 157	Y 208
Y 382	B 56	B 234	Y 72	B 84
Y 68	Y 271	Y 53	B 100	Y 321

(a) Complete the frequency table. [2]

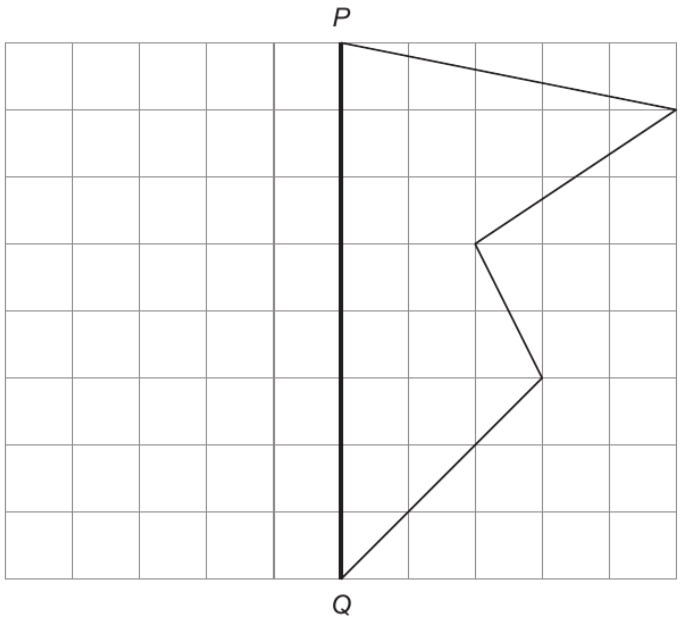
Type of ball	Yellow		Blue	
	Number < 100	Number $\geqslant 100$	Number < 100	Number $\geqslant 100$
Frequency	8			

(b) How can you use your table to check that all the balls have been counted? [1]

(c) The 25 balls are placed in a box.
One ball is chosen at random.
What is the probability that it is a yellow ball numbered less than 100? [2]

Examiner only

(b) Draw a reflection of this shape in the line PQ. [1]



3. (a) Jac has a box of 100 cards.
50 of the cards are blue.
Jac chooses a card at random from his box of cards.

Describe the chance that Jac chooses a blue card.
Circle the correct expression from those given below. [1]

impossible **unlikely** **an even chance** **likely** **certain**

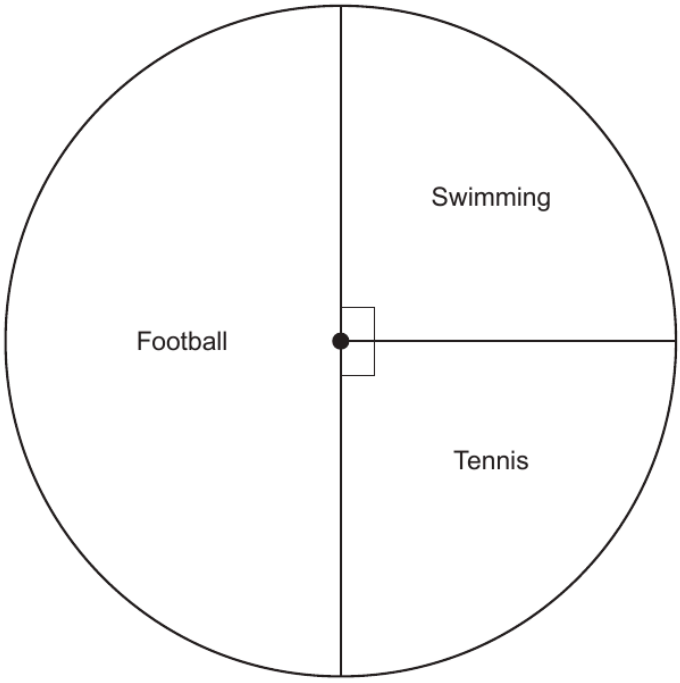
(b) Mair has a different box of 100 cards.
All the cards are either red or yellow.
Mair chooses a card at random from her box of cards.

Describe the chance that Mair chooses a green card.
Circle the correct expression from those given below. [1]

impossible **unlikely** **an even chance** **likely** **certain**

Examiner only

6. The pie chart below shows the favourite sport of 60 people.



(a) Which is the modal sport? [1]

.....

(b) One person is chosen at random.

What is the probability that this person said swimming is their favourite sport? [1]

.....

.....

(c) How many people said tennis is their favourite sport? [2]

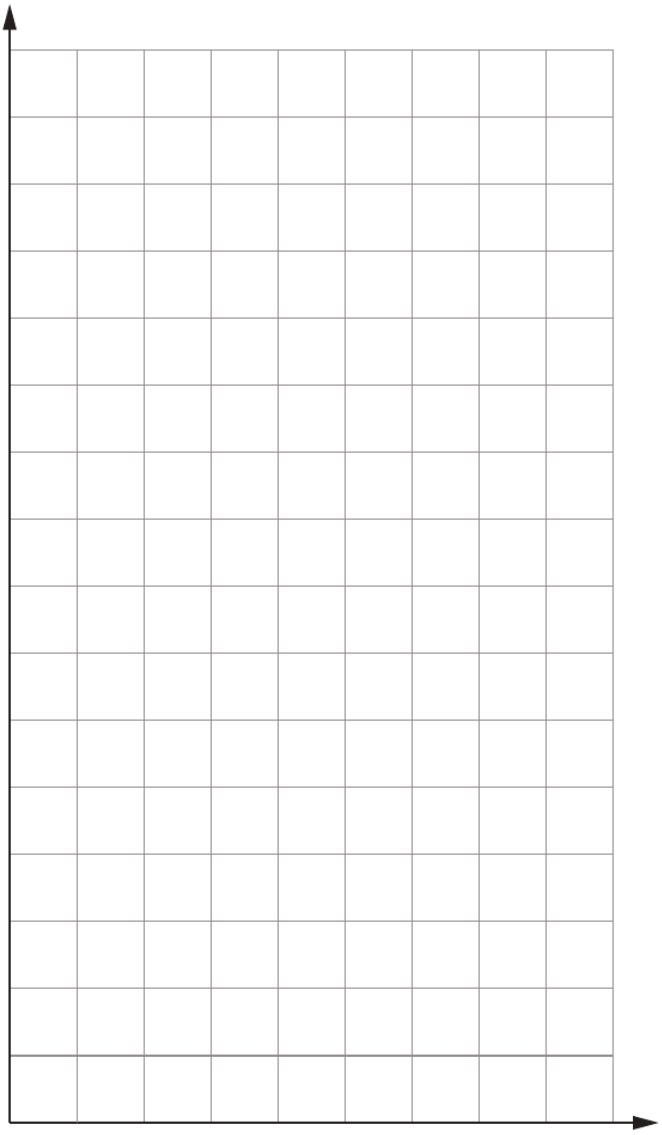
.....

.....

.....

Examiner only

(d) Draw a bar chart to display the favourite sports of the 60 people.
Use the grid below. [3]



Space for working:

Examiner only

10. Twenty-five balls have numbers printed on them.
Some of the balls are coloured yellow (Y), the others are coloured blue (B).
The list below shows both the colour of each ball and the number printed on it.

Y 76	Y 217	B 54	B 126	Y 21
Y 438	Y 32	B 561	B 194	Y 69
B 37	B 518	Y 94	Y 157	Y 208
Y 382	B 56	B 234	Y 72	B 84
Y 68	Y 271	Y 53	B 100	Y 321

(a) Complete the frequency table. [2]

Type of ball	Yellow		Blue	
	Number < 100	Number $\geqslant 100$	Number < 100	Number $\geqslant 100$
Frequency	8			

(b) How can you use your table to check that all the balls have been counted? [1]

(c) The 25 balls are placed in a box.
One ball is chosen at random.
What is the probability that it is a yellow ball numbered less than 100? [2]

Examiner only

17. Arthur, Sian and Kezia are all given some £1 coins.

Arthur receives £n.
Sian is given five times as much money as Arthur.
Kezia receives three times as much money as Arthur, plus an extra £7.

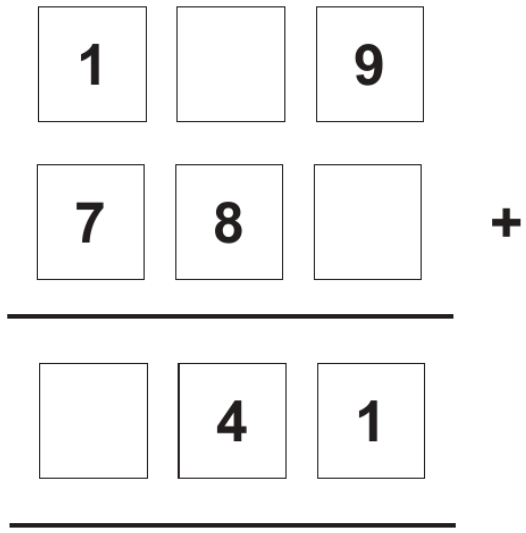
Sian was given less money than Kezia.

(a) Write down an inequality in terms of n that illustrates the fact that Sian received less money than Kezia. [2]

(b) What was the greatest amount of money that Arthur could have been given? [2]

Examiner only

3. Fill in the boxes so that the following addition is correct. [3]



Space for working:

Examiner only

5. *(a)* Sara has 20 balls in a bag.
There are 15 blue balls and 5 red balls.
Sara chooses a ball at random from her bag.

Describe the chance that Sara chooses a red ball from her bag.
Circle the correct expression from those given below. [1]

impossible **unlikely** **an even chance** **likely** **certain**

(b) Gareth has some cards with a number written on each one.
These are Gareth's cards.

125	269	748	731

Gareth chooses one of his cards at random.

Describe the chance that Gareth chooses a card with an odd number on it.
Circle the correct expression from those given below. [1]

impossible **unlikely** **an even chance** **likely** **certain**

Examiner only

5. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

A task takes 6 hours 15 minutes to complete.

$\frac{2}{5}$ of this time is spent on planning.

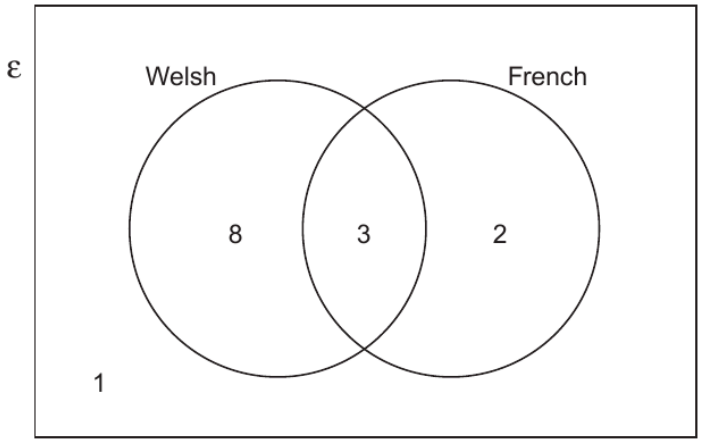
How long was spent on the **rest of the task**?
Give your answer in hours and minutes.

You must show all your working. [5 + 2 OCW]

Examiner only

6. A group of pupils is asked whether they can speak Welsh, French, both languages, or neither language.

Their answers are shown in the Venn diagram below.
The universal set, ε, contains all the pupils in the group.



(a) How many of the pupils cannot speak French? [1]

.....

(b) One pupil from the group is chosen at random.
What is the probability that this pupil can speak both Welsh and French? [2]

.....

.....

.....

Examiner only

11. 200 young people are taking part in a conference held at Aberystwyth.

(a) One of the young people is chosen at random to be the chairperson.

Complete the table below to find the probability that the person chosen lives outside the United Kingdom (UK). [2]

	North Wales	Mid Wales	South Wales	Elsewhere in the UK	Outside the UK
Probability	0·2	0·3	0·25	0·15	

(b) How many of the 200 young people live in Mid Wales? [2]

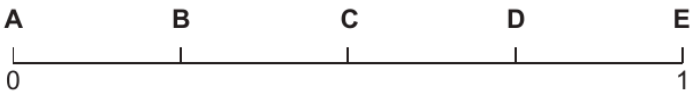
Examiner only

14. *(a)* A person is chosen at random.
Which is the best estimate for the probability that this person was born in the month of March?
Circle the correct answer. [1]

$\frac{1}{30}$ $\frac{1}{31}$ $\frac{12}{365}$ $\frac{1}{12}$ $\frac{12}{31}$

(b) A box contains four coloured cards.
One card is blue, one is red, one is green and one is white.
A card is drawn from the box at random.

Which letter, **A**, **B**, **C**, **D** or **E**, represents the probability that the card drawn is **not** blue?
Circle the correct letter on the probability scale below. [1]



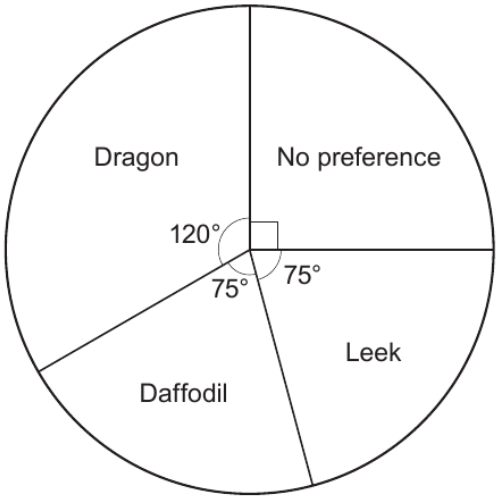
Examiner only

(c) The pupils at a school were asked the following question.

'What design would you like to have on the school's badge?'

Dragon ☐ Daffodil ☐ Leek ☐ No preference ☐

The results of the replies received are shown in the pie chart below.



A pupil who answered the question is chosen at random.
What is the probability that this pupil wanted the design to be a dragon?
Circle the correct answer. [1]

$\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{360}$ 4% $\frac{1}{120}$

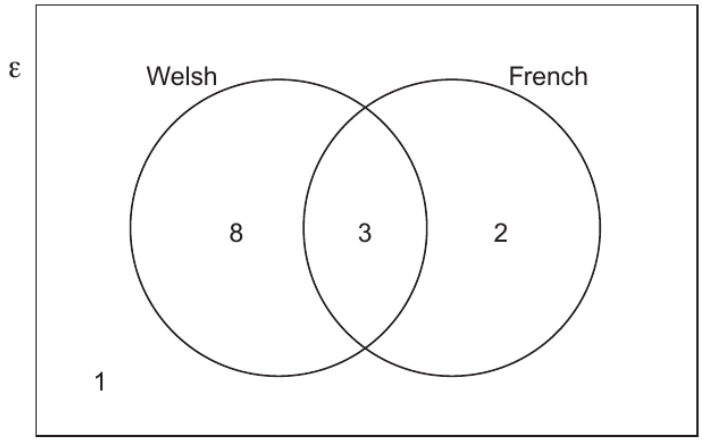
.....

.....

Examiner only

16. A group of pupils is asked whether they can speak Welsh, French, both languages, or neither language.

Their answers are shown in the Venn diagram below.
The universal set, ε, contains all the pupils in the group.



(a) How many of the pupils cannot speak French? [1]

.....

(b) One pupil from the group is chosen at random.
What is the probability that this pupil can speak both Welsh and French? [2]

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Examiner only

16. A coach company runs trips to Llandudno and Aberystwyth.
The information kept by the company about the passengers on these trips includes:

- the destination of the trip,
- their ages.

The table below shows the number of passengers who went to Llandudno or Aberystwyth last Tuesday.

	Llandudno	Aberystwyth
Passengers 60 years old and over	323	217
Passengers under 60 years old	122	58

(a) What was the ratio of passengers 60 years old and over to passengers under 60 years old?
Give your answer in its simplest form. [3]

Passengers 60 years old and over : passengers under 60 years old

= ..... : .....

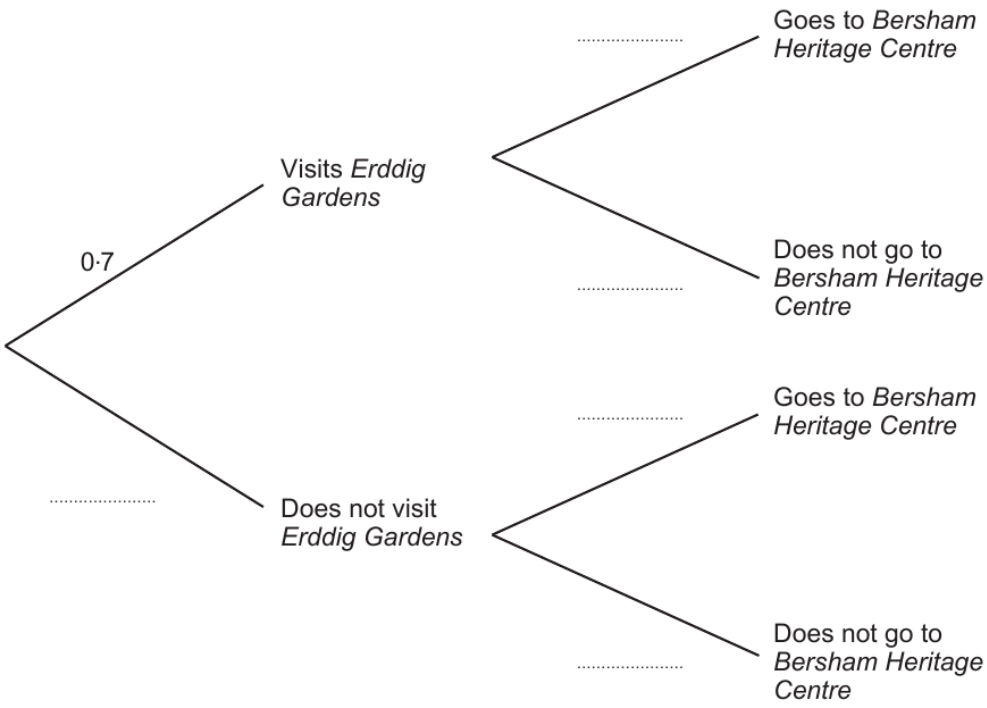
(b) One of these passengers was selected at random.
What is the probability that this passenger went on the trip to Llandudno? [2]

Examiner only

17. Dylan is having a weekend break in Wrexham.
The probability that he will visit *Erddig Gardens* is 0·7.
The probability of Dylan going to the *Bersham Heritage Centre* is independent of him visiting *Erddig Gardens*.

The probability that he visits *Erddig Gardens* **and** goes to the *Bersham Heritage Centre* is 0·28.

(a) Complete the following tree diagram. [4]



(b) Calculate the probability that Dylan visits *Erddig Gardens* but does not go to the *Bersham Heritage Centre*. [2]

Examiner only

19. The diagram below shows a rectangle *ABCF* and a trapezium *CDEF*.
AF = 7 cm, *ED* = 8 cm and the perpendicular distance between *FC* and *ED* is 6 cm.
The area of the rectangle *ABCF* is 91 cm^2.

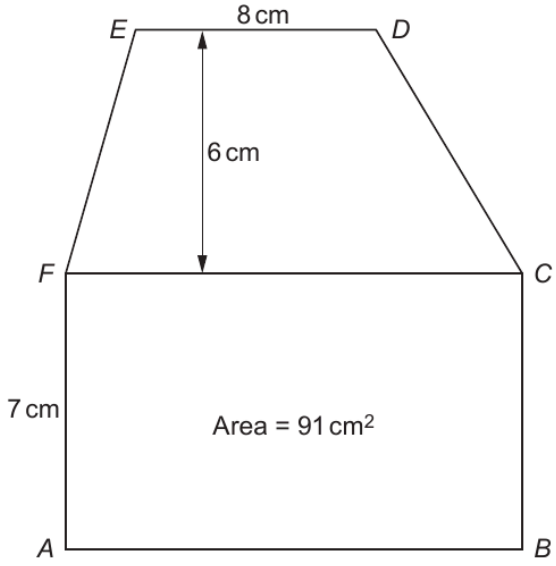


Diagram not drawn to scale

Calculate the area of the trapezium *CDEF*.
You must show all your working. [4]

Examiner only

1. Fill in the boxes below to make each calculation correct. [4]

£1.63	+	35p	=	£ .....
£1.73	+	..... p	=	£2.26
7	×	84p	=	£ .....
17	×	£	=	£6.97

Space for working:

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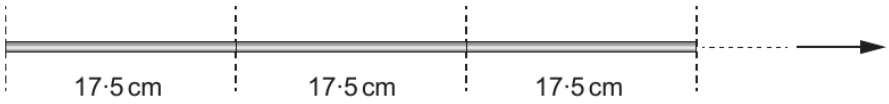
Examiner only

2. *(a)* Write down the next two numbers in the following sequence. [2]

50 39 28 17 ....

(b) Use the formula $x = 4a + 3b$ to find the value of x when $a = 7{\cdot}2$ and $b = -4{\cdot}6$. [2]

3. Identical rods can be placed end to end, as shown below.
Each rod is 17·5 cm long.



How many of these rods can be placed, in this way, between two points 4 metres apart? [4]

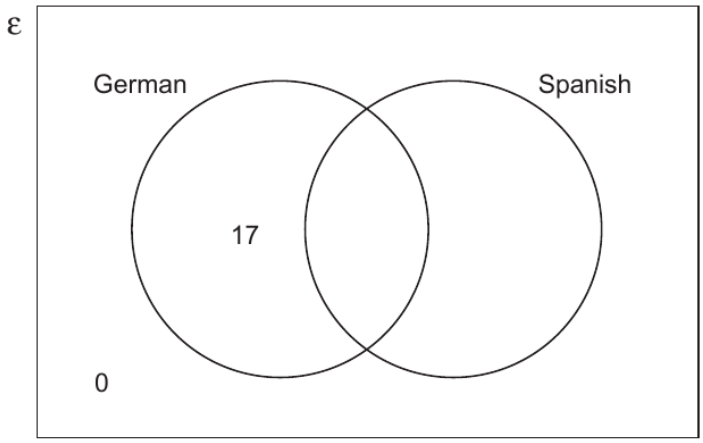
Number of rods = ...

Examiner only

8. Each of 30 students studies German, Spanish or both languages.

A student is chosen at random.
The probability that the student studies both German and Spanish is $\frac{1}{3}$.

Complete the Venn diagram. [2]



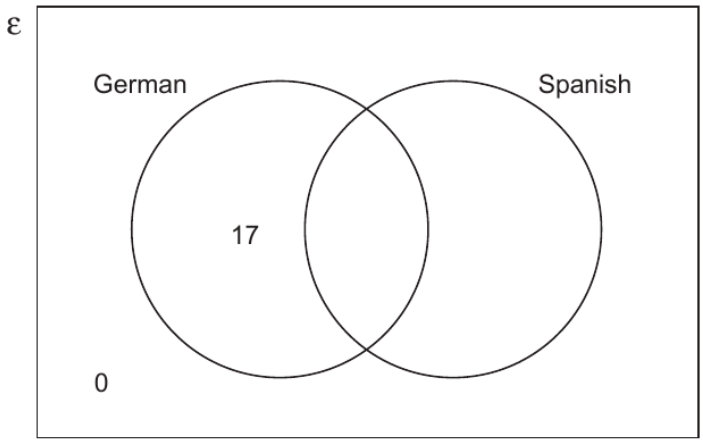
Space for working:

Examiner only

16. Each of 30 students studies German, Spanish or both languages.

A student is chosen at random.
The probability that the student studies both German and Spanish is $\frac{1}{3}$.

Complete the Venn diagram. [2]



Space for working:

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Examiner only

17. Alice works for an engineering company.

A working day is chosen at random.
From keeping a record over the last year, Alice knows that, for this working day,

- the probability that she travels to work by car is 0·7,
- the probability that she arrives at work before 8:00 a.m. is 0·4,
- her time of arrival is independent of how she travels to work.

(a) Using the above information, draw and fully label a complete tree diagram.
You must include all probabilities. [4]

(b) What is the probability that, on the randomly-chosen working day, Alice travels to work by car and arrives before 8:00 a.m.? [2]

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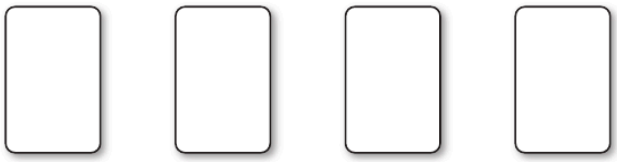
Examiner only

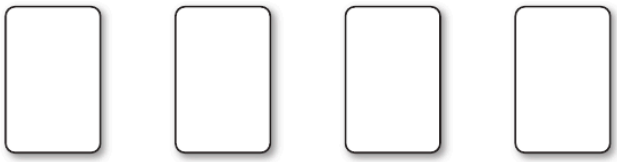
2. A card is chosen at random from a set of four cards.

In each question, **write numbers on the four cards** to make each of the following statements true.

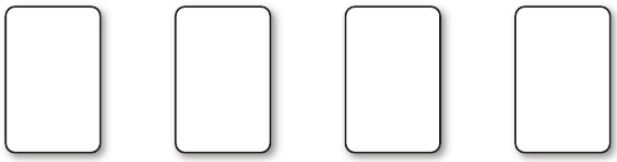
(a) It is certain that the chosen card will be a 5. [1]



(b) It is an even chance that the chosen card will be a 3. [1]



(c) It is unlikely that the chosen card will be a 2. [1]



3. *(a)* Write forty thousand and sixty-five in figures. [1]

.....

(b) Round 5378 to the nearest hundred. [1]

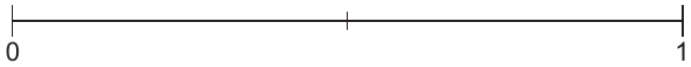
.....

Examiner only

6. Meic has a bag of 20 coloured balls.
14 of the balls are yellow, 4 are blue and the rest are red.
Meic chooses a ball at random from his bag.

On the probability scale below, mark the points **A** and **B** where:

- **A** is the probability of Meic choosing a yellow ball,
- **B** is the probability of Meic choosing a green ball. [2]



Examiner only

14. *(a)* Rearrange the following formula to make k the subject.

$$p = 3k + 2$$ [2]

(b) Does the midpoint of the straight line joining points (3, 15) and (7, 19) lie on the line $y = 3x + 2$?
You must show all your working. [3]

15. *(a)* Express 0·0058 in standard form. [1]

(b) Calculate the value of $\dfrac{1{\cdot}4 \times 10^9}{2 \times 10^3}$.
Give your answer in standard form. [2]

Examiner only

2. (a) Tim chooses one letter at random from the word TOMATO.

Describe the chance that Tim chooses the letter T.
Circle the correct expression from those given below. [1]

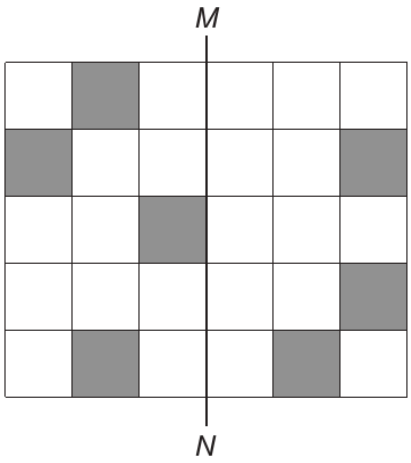
impossible **unlikely** **an even chance** **likely** **certain**

(b) Megan chooses one letter at random from the word BANANA.

Describe the chance that Megan chooses the letter A.
Circle the correct expression from those given below. [1]

impossible **unlikely** **an even chance** **likely** **certain**

3. Shade the smallest number of squares to make *MN* a line of symmetry. [1]



Examiner only

3. By first expressing all the amounts below in litres, calculate the mean of the three amounts. [6]

1·25 litres 2·73 pints 1615 ml

1·25 litres	2·73 pints ≈ ..... litres	1615 ml = ... litres

Mean of the three amounts = ... litres

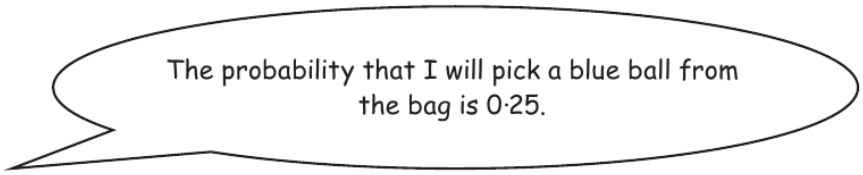
Examiner only

6. (a) A bag contains red balls, green balls and yellow balls.
The number of green balls is equal to the number of yellow balls.

Mali picks one ball from the bag at random.
The probability that she will pick a red ball is 0·3.

Find the probability that Mali will pick a yellow ball. [2]

(b) A different bag contains 10 balls.
Some of the balls in the bag are blue.
All the other balls are white.
Morgan picks a ball from the bag at random.
He says,



Explain why Morgan cannot be correct. [1]

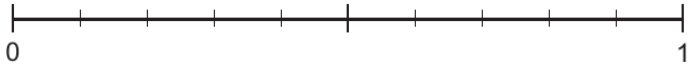
Examiner only

11. Raji chooses one number at random from this list of numbers.

2, 4, 6, 8, 10, 12, 14, 16, 18, 20

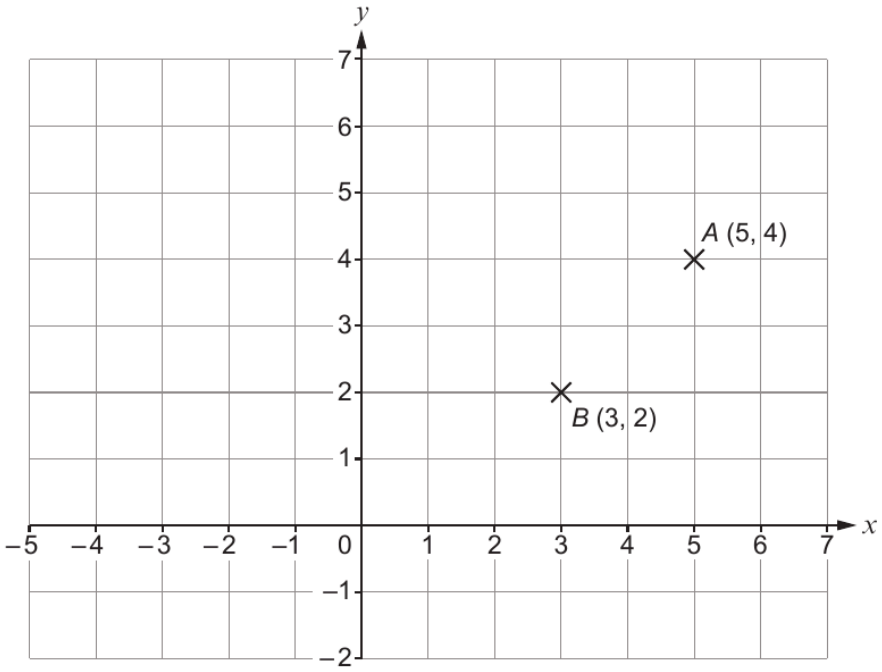
On the probability scale below, mark the points A, B and C where:

- A is the probability of Raji choosing an even number
- B is the probability of Raji choosing a number greater than 8
- C is the probability of Raji choosing a square number. [3]



Examiner only

12.



(a) *B* is the midpoint of the line *AC*.
Find the coordinates of *C*. [2]

.....

.....

C (..... , ...)

(b) *A* and *B* are two vertices of a right-angled triangle.
Point *D* is to be plotted on the grid above so that the triangle *ABD* is a right-angled triangle.
The x-coordinate of *D* is negative.
Give the coordinates of a possible position of the point *D* that can be plotted on the grid above. [2]

.....

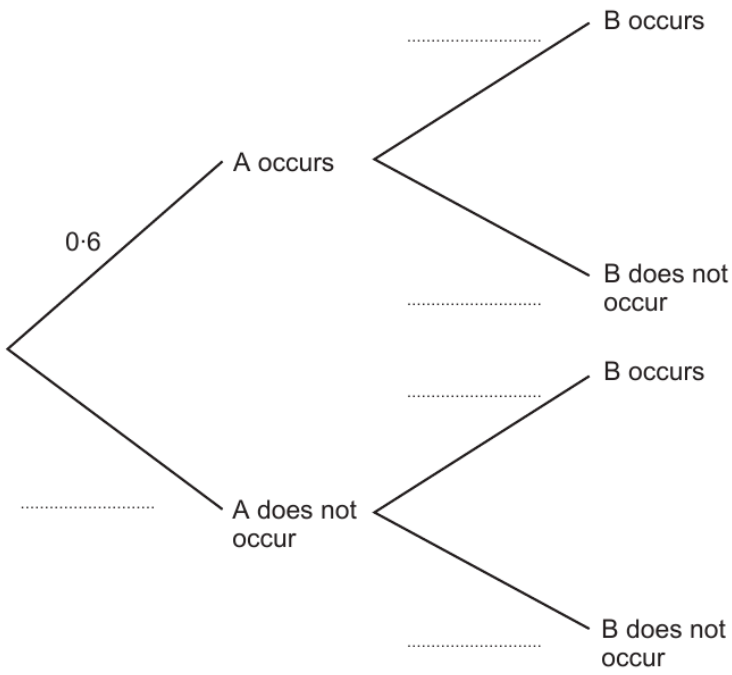
.....

D (..... , ...)

Examiner only

14. A and B are independent events.
The probability of event A occurring is 0·6.
The probability of event A **and** event B occurring is 0·48.

(a) Complete the tree diagram. [4]



(b) Calculate the probability of neither event A nor event B occurring. [2]

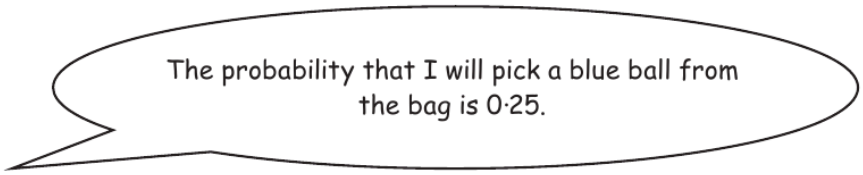
Examiner only

16. (a) A bag contains red balls, green balls and yellow balls.
The number of green balls is equal to the number of yellow balls.

Mali picks one ball from the bag at random.
The probability that she will pick a red ball is 0·3.

Find the probability that Mali will pick a yellow ball. [2]

(b) A different bag contains 10 balls.
Some of the balls in the bag are blue.
All the other balls are white.
Morgan picks a ball from the bag at random.
He says,



Explain why Morgan cannot be correct. [1]

Examiner only

2. Calculate the value of $7p + 6q$ when $p = -9{\cdot}2$ and $q = 4{\cdot}7$. [2]

Examiner only

8. 125 pupils were asked which one of four primary schools they attended.

(a) One of the pupils is chosen at random.

Complete the table below to find the probability that the pupil chosen went to Ysgol Bryn. [2]

	Ysgol Aber	Ysgol Bryn	Ysgol Castell	Ysgol Dewi
Probability	0·08	.....	0·2	0·28

(b) How many of the 125 pupils went to Ysgol Dewi? [2]

Examiner only

12. Samira has a dice. Its faces are numbered 1 to 6.
She wants to know whether her dice is biased or not.
Samira rolled this dice 300 times.
Her results are shown in the table below.

Number shown on dice	1	2	3	4	5	6
Frequency	65	40	52	10	23	110

(a) The relative frequency of throwing a 5 is $\frac{23}{300}$.

What is the relative frequency of throwing a 2?
Give your answer as a fraction in its simplest form. [2]

(b) Do the results in the table suggest that Samira's dice is biased?

Yes ☐ No ☐

Explain your decision. [1]

(c) This dice is thrown 2400 times.
Use Samira's results to calculate the number of times you would expect a 6 to be thrown. [2]

Examiner only

13. Laura puts 90 counters in a bag.
Each counter is red or blue or yellow.

Laura wants to draw a pie chart to show the number of counters of each colour.
The table below shows some of the information that she needs.

	Number of counters	Pie chart angle
Red	25	.....
Blue	.....	180°
Yellow	.....	.....
	Total = 90	

(a) Complete the table.
You must show all your working. [5]

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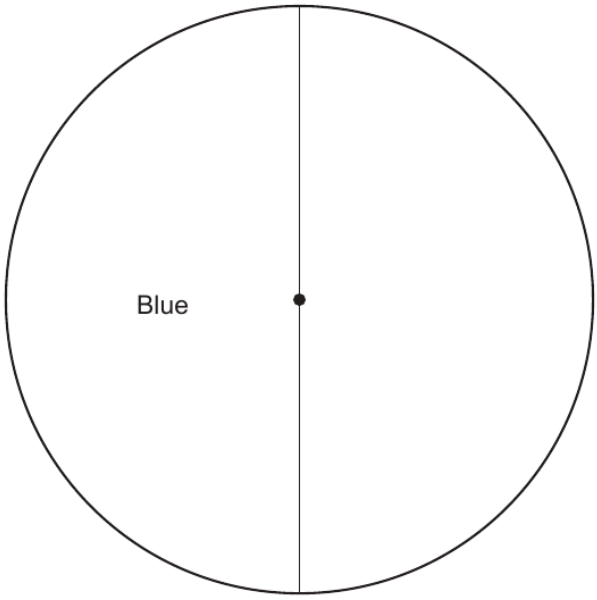
Examiner only

(b) Complete the pie chart to show the results. [2]



(c) Laura chooses a counter at random from the bag.
Calculate the probability that this counter is either red or blue. [2]

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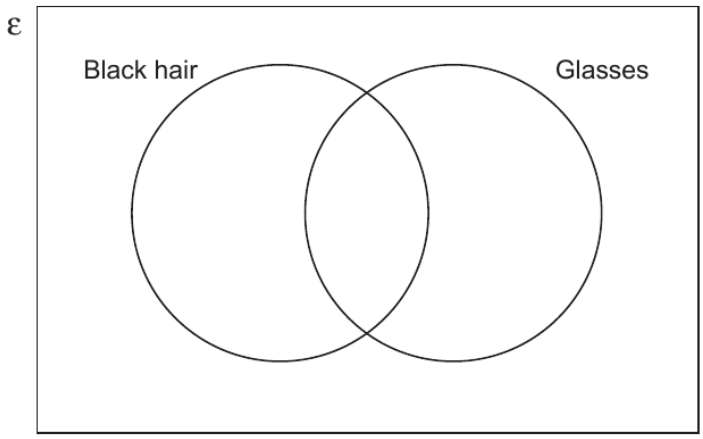
Examiner only

14. In a group of 200 people:

- 105 people do not have black hair and do not wear glasses
- 20 people have black hair and wear glasses
- 70 people have black hair.

(a) Complete the Venn diagram below to show this information.
The universal set, ε, contains all 200 people. [3]



(b) One of these people is chosen at random.
What is the probability that this person wears glasses? [2]

Examiner only

16. 125 pupils were asked which one of four primary schools they attended.

(a) One of the pupils is chosen at random.

Complete the table below to find the probability that the pupil chosen went to Ysgol Bryn. [2]

	Ysgol Aber	Ysgol Bryn	Ysgol Castell	Ysgol Dewi
Probability	0·08	.....	0·2	0·28

(b) How many of the 125 pupils went to Ysgol Dewi? [2]

Examiner only

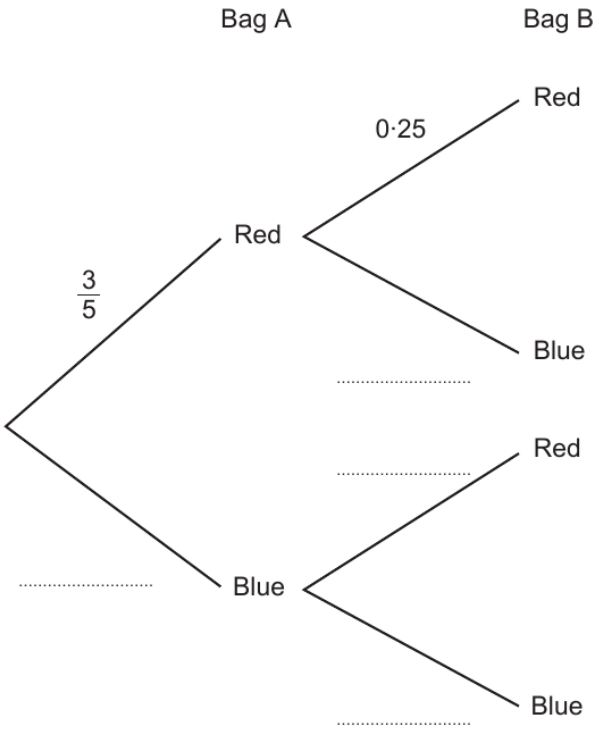
18. Bag A and Bag B contain only red and blue balls.

The probability of choosing a red ball from Bag A is $\frac{3}{5}$.

The probability of choosing a red ball from Bag B is 0·25.

A ball is chosen at random from each bag.

(a) Complete the tree diagram below. [2]



(b) Find the probability that the two balls chosen are the same colour. [3]

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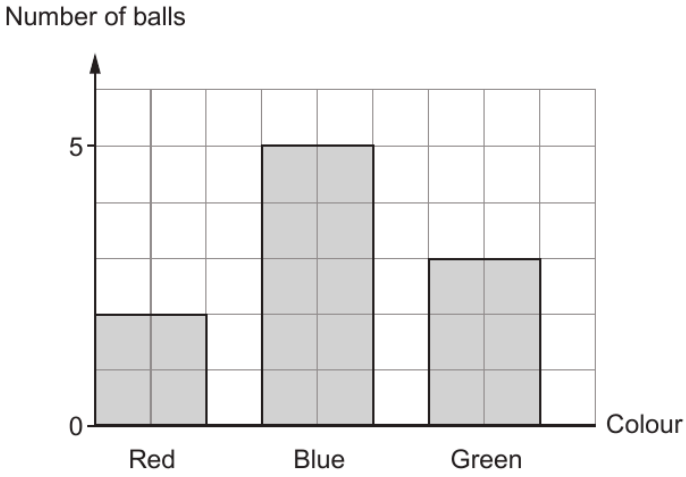
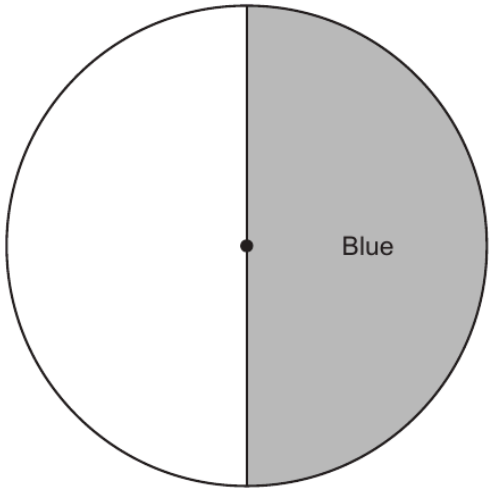
Examiner only

5. (a) A box contains different-coloured balls.
Some are red, some are blue and the others are green.

The bar chart shows how many balls of each colour are in the box.



Draw an accurate pie chart to compare the number of coloured balls in the box.
Part of the pie chart has been completed for you. [3]



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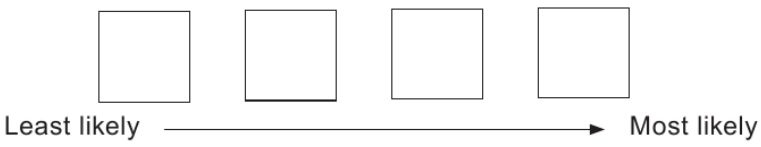
Examiner only

(b) The letters **A**, **B**, **C** and **D** describe four different events.

Experiment	Event	
A fair 6-sided dice is thrown.	**A**	4 is thrown.
A fair coin is thrown.	**B**	A tail is thrown.
Four cards labelled North, East, South and West are placed in a box. One card is chosen at random.	**C**	North is chosen.
Seven cards, each labelled with a different day of the week, are placed in a box. One card is chosen at random.	**D**	Sunday is chosen.

Using the letters **A**, **B**, **C** and **D**, list the events in the order of how likely they are to happen.
Start with the least likely and end with the most likely. [2]

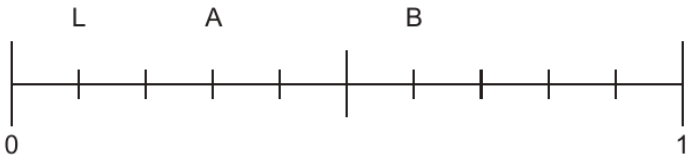


Examiner only

7. Catrin has a bag containing only apples, bananas and lemons.
She has 20 pieces of fruit altogether in her bag.
Catrin chooses one piece of fruit at random from her bag.

The probability that she chooses each type of fruit is shown on the probability scale below, where

- A represents apple
- B represents banana
- L represents lemon.



How many apples does Catrin have in her bag? [2]

.....

.....

.....

8. (a) The cost of one book is £m.
What is the cost of 15 books in pounds (£)? [1]

.....

(b) Ieuan has 20 oranges.
He gives away k oranges.
How many oranges does Ieuan have now? [1]

.....

Examiner only

8. *In this question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

A solid metal cuboid has dimensions 4 cm, 5 cm and 20 cm.

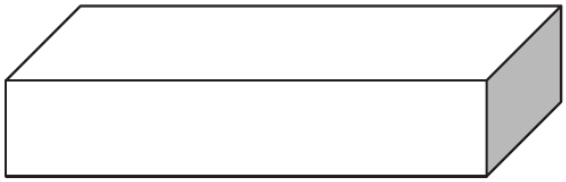


Diagram not drawn to scale

The cuboid is melted down. The metal is used to make solid cubes, each with sides 3 cm.

How many complete cubes will be made?
You must show all your working. [5 + 2 OCW]

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09

Examiner only

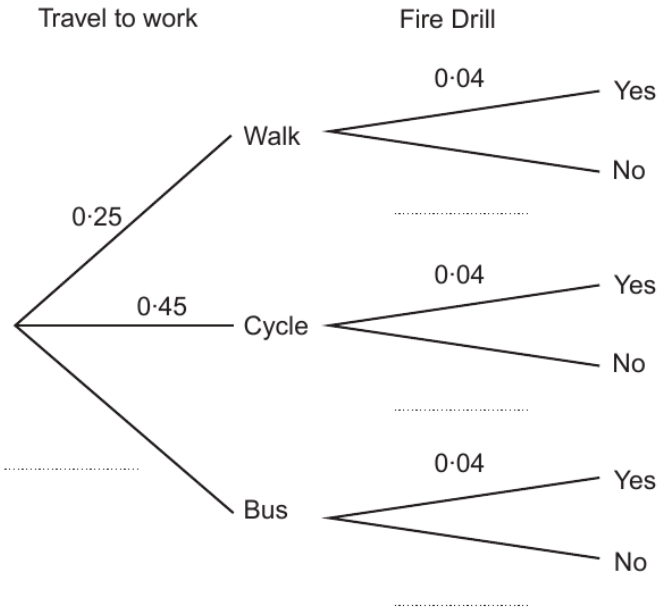
17. Whitney walks, cycles or travels on the bus to work each day.

On any randomly chosen day:
- the probability that she walks to work is 0·25
- the probability that she cycles to work is 0·45.

At work, the probability that there will be a fire drill on any randomly chosen day is 0·04.

How Whitney travels to work is independent of whether or not there is a fire drill.

(a) Complete the tree diagram shown below. [3]



(b) On a randomly chosen day, what is the probability that Whitney walks to work and there is a fire drill? [2]

Examiner only

17. A solid metal cuboid has dimensions 4 cm, 5 cm and 20 cm.

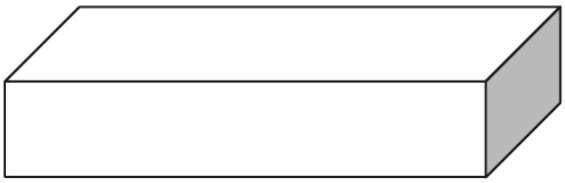


Diagram not drawn to scale

The cuboid is melted down. The metal is used to make solid cubes, each with sides 3 cm.

How many complete cubes will be made?
You must show all your working. [5]

Examiner only

2. (a) Arwyn doubles the number fifty-three thousand.
Write Arwyn's answer in figures. [2]

(b) Write 3572 correct to the nearest 100. [1]

(c) Calculate $6+4\times9$. [1]

(d) Estimate $103\times9\cdot8$. [2]

(e) Can 626 be divided exactly by 3?
You must show working to support your answer. [1]

Yes ☐ No ☐

Examiner only

1. Write down the next term in each of the sequences below.

(a) 53, 80, 107, 134, ... [1]

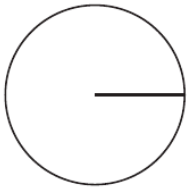
.....

(b) 24, 72, 216, 648, ... [1]

.....

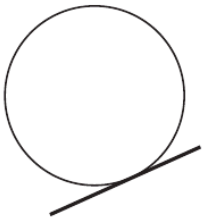
2. Write the special name for the line drawn on each of the circles below.

(a)



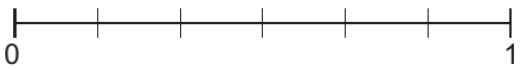
..... [1]

(b)

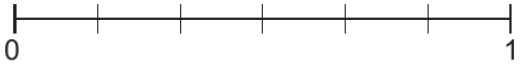


..... [1]

3. (a) A fair coin is thrown once.
On the probability scale below, mark with an arrow the probability of throwing a head. [1]



(b) A fair six-sided dice is thrown once.
On the probability scale below, mark with an arrow the probability of throwing a 5. [1]



Examiner only

5. (a) The mean of four numbers is 9.
What is the total of the four numbers? [1]

.....

.....

(b) Find a set of four numbers such that:
- their mean is 9
- their mode is 11.

Write your four numbers in the boxes below. [2]

.....

.....

.....

.....

Examiner only

9. Write an expression, in terms of x, to represent each of the following.

(a) 5 more than x [1]

(b) x less than 3 [1]

(c) half of x [1]

10. (a) What is 2 litres approximately equal to?
Circle your answer. [1]

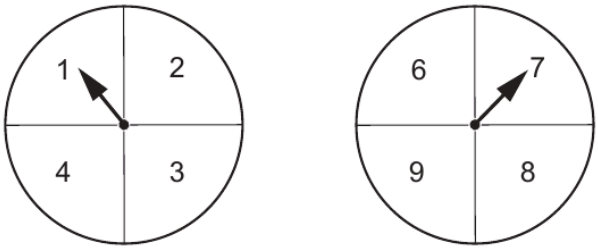
2 pints 3 pints 3·5 pints 4·4 pints 200 pints

(b) What is 32 km approximately equal to?
Circle your answer. [1]

16 miles 20 miles 32 miles 51 miles 64 miles

Examiner only

15. Vera has two fair spinners.
Each spinner is divided into quarters.
One spinner shows the values 1, 2, 3 and 4.
The other spinner shows the values 6, 7, 8 and 9.



Vera spins the two spinners. She then multiplies the two values together to form a product.
For example, the diagram above forms the product $1 \times 7 = 7$.

Consider the ways in which all the possible products can be formed.
Calculate the probability that the spinners will form a product that is a factor of 36.
You must show all your working to justify your answer. [4]

Examiner only

16. There are many socks in a drawer.
The socks are red, green, blue or pink.

(a) A sock is chosen at random from the drawer.
Complete the table below. [2]

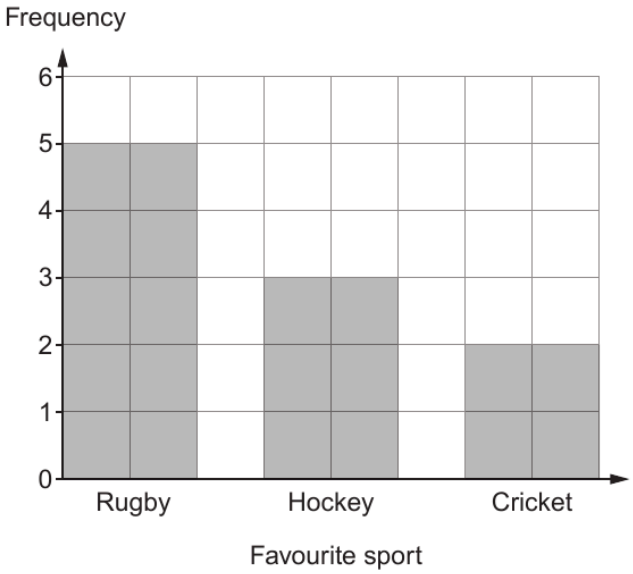
Colour	Red	Green	Blue	Pink
Probability	0·3	0·1		0·25

(b) In the drawer, there are 20 pink socks.
How many red socks are there in the drawer? [2]

Examiner only

4. Matilda asked 10 of her friends which was their favourite sport.

They each chose one of rugby, hockey or cricket.
Matilda showed the results of her survey in the bar chart below.



Matilda chooses one of her friends at random.

(a) Describe the chance that the friend's favourite sport is cricket.
Circle the best expression from those below. [1]

impossible unlikely an even chance likely certain

(b) Describe the chance that the friend's favourite sport is rugby.
Circle the best expression from those below. [1]

impossible unlikely an even chance likely certain

Examiner only

5. In a game, each competitor will have 20 attempts at throwing a ball into a bucket.
They will get 1 point for every ball that lands in the bucket.

Sioned wants to keep a record of the total points for each competitor.
She decides to show the results in a table with the total points recorded in **groups of equal width**.

(a) She starts to draw a table using five groups, as shown below.

Total points	0 to 3	4 to 7	8 to 11	… to …	… to …
Number of competitors					

Explain why these groups will not be suitable. [1]

.....

.....

.....

(b) Sioned considers using the table shown below.
She decides that it is suitable for recording all the total points in **groups of equal width**.
Fill in the two missing numbers in the **top** row. [1]

Total points	0 to 6	7 to	..... to 20
Number of competitors			

.....

.....

Examiner only

(c) Finally, Sioned decides to use the groups shown in the table below.
The results for the first 100 competitors are shown in the table.

Total points	0 to 2	3 to 5	6 to 8	9 to 11	12 to 14	15 to 17	18 to 20
Number of competitors	5	10	17	22	23	12	11

One of these 100 competitors is chosen at random.

(i) What is the probability that this competitor scored 6, 7 or 8 points? [1]

.....

.....

(ii) Explain why the following statement may be incorrect. [1]

The probability that this competitor scored 19 points is $\frac{11}{100}$.

.....

.....

.....

Examiner only

6. A children's play area contains a large number of coloured balls.
Some are yellow, some are red, some are blue and the others are pink.

(a) A ball is chosen at random from the play area.
Complete the table below to find the probability of choosing a pink ball. [2]

Colour	Yellow	Red	Blue	Pink
Probability	0·54	0·12	0·25	

(b) There are 575 blue balls in the play area.

What is the total number of balls in the play area? [2]

7. Use the formula $v = u + at$ to find the value of t when $v = 51{\cdot}3$, $u = 2{\cdot}3$ and $a = 9{\cdot}8$. [3]

Examiner only

11. (a) Evaluate $\sqrt{0{\cdot}9^3 - 0{\cdot}9^4}$. [2]

(b) What is the greatest integer value of n if $2n < 17$? [1]

Greatest integer value of n = ...

(c) What is the least integer value of n if $2^n > 125$? [1]

Least integer value of n = ...

Examiner only

14. A children's play area contains a large number of coloured balls.
Some are yellow, some are red, some are blue and the others are pink.

(a) A ball is chosen at random from the play area.
Complete the table below to find the probability of choosing a pink ball. [2]

Colour	Yellow	Red	Blue	Pink
Probability	0·54	0·12	0·25	

(b) There are 575 blue balls in the play area.

What is the total number of balls in the play area? [2]

15. Use the formula $v = u + at$ to find the value of t when $v = 51{\cdot}3$, $u = 2{\cdot}3$ and $a = 9{\cdot}8$. [3]

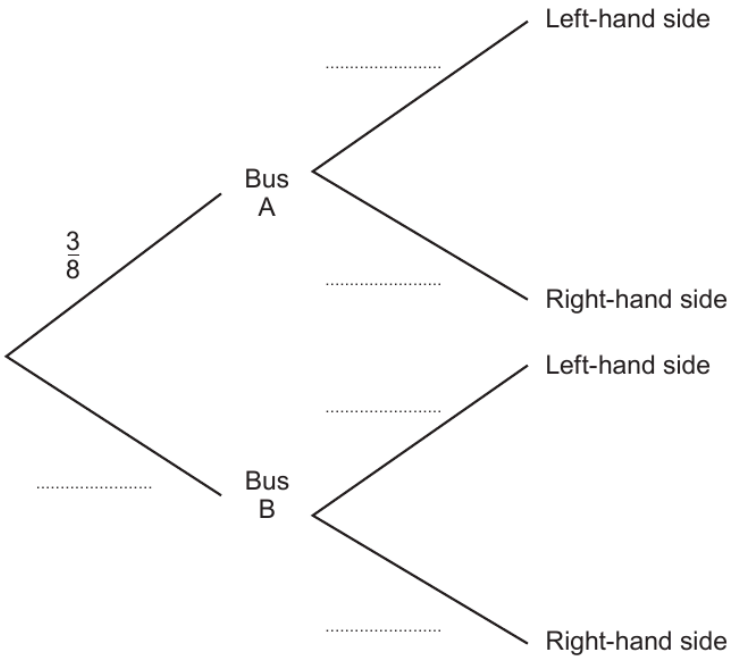
Examiner only

15. A group of people hired two buses, Bus A and Bus B, to take them home from a party.
Bus A left the party at 11:00 p.m.
Bus B left the party at midnight.

A person from the group is chosen at random.
The probability that this person left the party on Bus A is $\frac{3}{8}$.

The probability that this person sat on the left-hand side of the bus is equal to the probability that this person sat on the right-hand side.

(a) Complete the following tree diagram. [2]



(b) What is the probability that this person sat on the right-hand side of the bus that left at midnight? [2]

.....

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Examiner only

16. In a game, each competitor will have 20 attempts at throwing a ball into a bucket.
They will get 1 point for every ball that lands in the bucket.

Sioned wants to keep a record of the total points for each competitor.
She decides to show the results in a table with the total points recorded in **groups of equal width**.

(a) She starts to draw a table using five groups, as shown below.

Total points	0 to 3	4 to 7	8 to 11	… to …	… to …
Number of competitors					

Explain why these groups will not be suitable. [1]

.....

.....

.....

(b) Sioned considers using the table shown below.
She decides that it is suitable for recording all the total points in **groups of equal width**.
Fill in the two missing numbers in the **top** row. [1]

Total points	0 to 6	7 to	..... to 20
Number of competitors			

.....

.....

Examiner only

(c) Finally, Sioned decides to use the groups shown in the table below.
The results for the first 100 competitors are shown in the table.

Total points	0 to 2	3 to 5	6 to 8	9 to 11	12 to 14	15 to 17	18 to 20
Number of competitors	5	10	17	22	23	12	11

One of these 100 competitors is chosen at random.

(i) What is the probability that this competitor scored 6, 7 or 8 points? [1]

.....

.....

(ii) Explain why the following statement may be incorrect. [1]

The probability that this competitor scored 19 points is $\frac{11}{100}$.

.....

.....

.....

Examiner only

2. Kiera goes to the cinema with her friend.

(a) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

A ticket bought **at the cinema** costs £4.50.

Kiera decides to buy the 2 tickets **online in advance**.

When she buys the tickets online:
- she is given 10% off the cost of each ticket
- she has to pay a total booking fee of £1.40.

How much does Kiera pay in total for the 2 tickets? [4 + 2 OCW]

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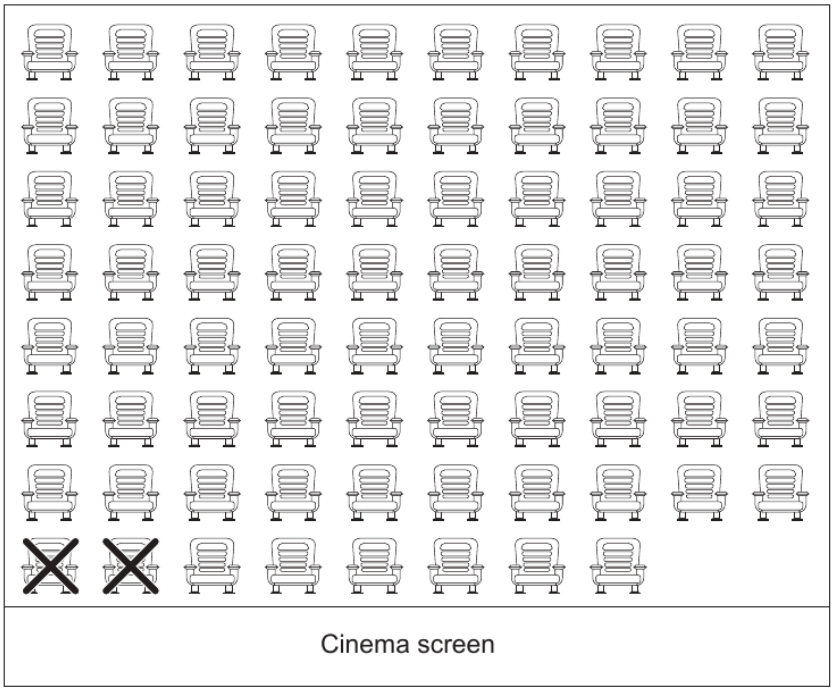
Examiner only

(b) The position of each seat in the cinema is given by a code, for example, seat E5.
Each row of seats is labelled with a letter, A, B, C, D, E, F, G and H.
Each row starts with seat number 1.
Seats A1 and A2 have already been booked.
This is shown by the crosses on the diagram.

Kiera books seats G9 and G10 for herself and her friend.
Draw a cross on each of these 2 seats on the diagram below. [1]



Examiner only

(c) When Kiera arrives at the cinema, she sees the following prices advertised.

Drinks		Snacks	
Small soft drink	£2.99	Regular popcorn	£4.95
Regular soft drink	£3.29	Large popcorn	£5.45
Large soft drink	£3.59	Nachos	£6.00
		Hot dog	£5.60

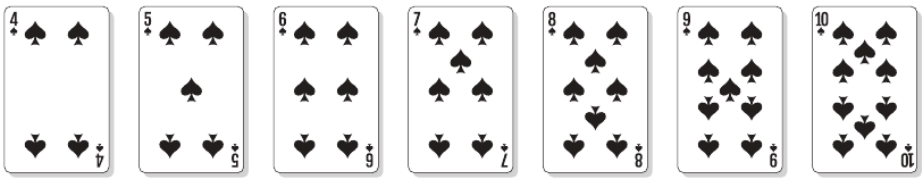
Combos			
Classic Combo: (regular soft drink & regular popcorn)	£6.99	Deluxe Combo: (large soft drink & large popcorn)	£7.60

Kiera decides to buy the Deluxe Combo.
How much will Kiera save by buying the Deluxe Combo instead of buying a large soft drink and a large popcorn separately? [4]

3310U101 09

Examiner only

5. Megan has the following 7 playing cards.



She turned these cards face down.
Megan then chose a card at random and recorded the number.

(a) What is the probability that Megan recorded the number 5?
Circle your answer. [1]

$\frac{5}{7}$ $\frac{1}{7}$ 1 5 $\frac{7}{5}$

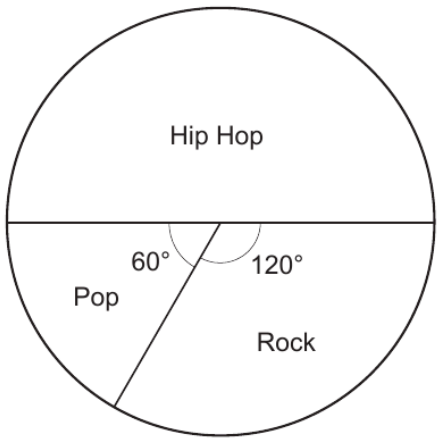
(b) (i) What is the probability that Megan recorded a square number?
Circle your answer. [1]

$\frac{2}{5}$ $\frac{1}{7}$ $\frac{2}{7}$ $\frac{4}{7}$ $\frac{4}{5}$

(ii) Megan chooses a card at random 91 times.
How many times would you expect Megan to record a square number?
You must show all your working. [2]

Examiner only

7. Mrs Lewis asked each student in Year 11 what kind of music they preferred.
She gave the students three options: Hip Hop, Pop and Rock.
The pie chart below shows the results.



(a) Mrs Lewis chooses one of the students at random.
What is the probability that this student chose Hip Hop? [1]

(b) 45 students chose Hip Hop.
How many students are there in total? [2]

(c) What fraction of these students chose Pop? [2]

Examiner only

7. A bag contains 1 yellow counter and 2 pink counters.
Olga puts more yellow counters into the bag.

She takes one counter out of the bag at random.
The probability of taking a yellow counter out of the bag is $\frac{3}{4}$.

How many **more** yellow counters did Olga put into the bag? [2]

Olga put ..... more yellow counters into the bag

Examiner only

(c) Calculate $-13+(-19)$. [1]

.....

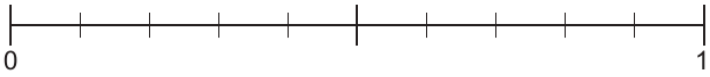
.....

.....

10. Jan has 7 carrots and 3 potatoes in a box.
She chooses one vegetable at random from the box.

On the probability scale below, mark the points C and P, where:

- C is the probability of Jan choosing a carrot
- P is the probability of Jan choosing a potato. [2]



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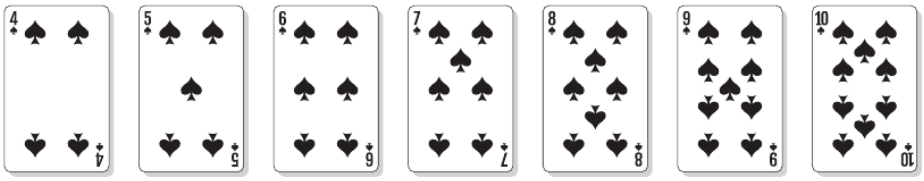
Examiner only

14. Megan has the following 7 playing cards.



She turned these cards face down.
Megan then chose a card at random and recorded the number.

(a) What is the probability that Megan recorded the number 5?
Circle your answer. [1]

$\frac{5}{7}$ $\frac{1}{7}$ 1 5 $\frac{7}{5}$

(b) (i) What is the probability that Megan recorded a square number?
Circle your answer. [1]

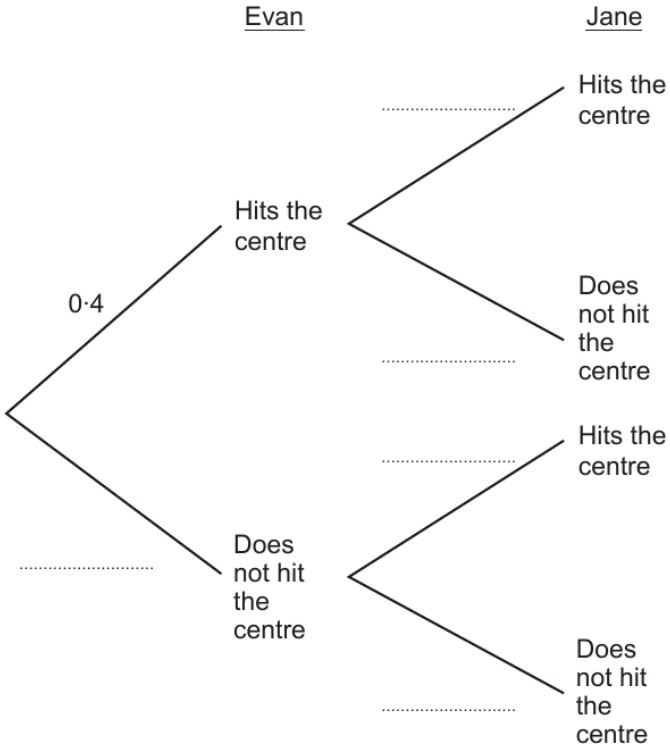
$\frac{2}{5}$ $\frac{1}{7}$ $\frac{2}{7}$ $\frac{4}{7}$ $\frac{4}{5}$

(ii) Megan chooses a card at random 91 times.
How many times would you expect Megan to record a square number?
You must show all your working. [2]

Examiner only

15. Evan and Jane each shoot one arrow at a target.
The probability that Evan hits the centre of the target is 0·4.
The probability that Jane hits the centre of the target is 0·45.

(a) Complete the tree diagram below. [3]



(b) Find the probability that Evan and Jane both hit the centre of the target. [2]

Examiner only

15. Solve each of the following equations.

(a) $3y - 5 = 19$ [2]

(b) $8p + 5 = 3p - 25$ [3]

Examiner only

16. A bag contains 1 yellow counter and 2 pink counters.
Olga puts more yellow counters into the bag.

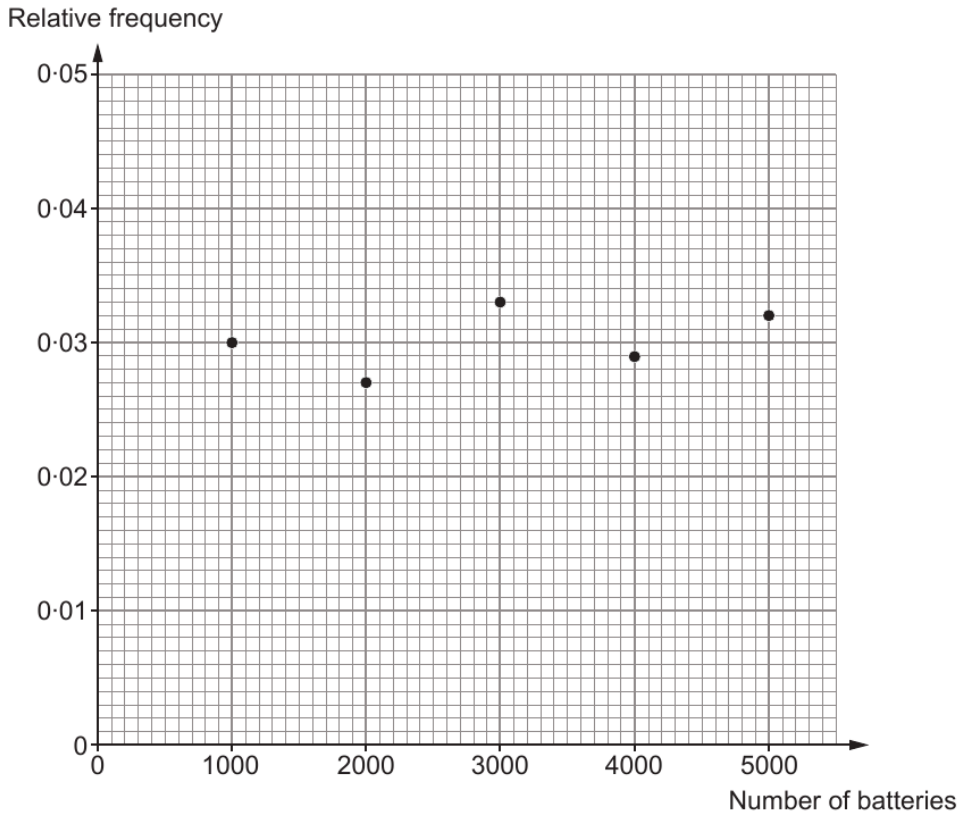
She takes one counter out of the bag at random.
The probability of taking a yellow counter out of the bag is $\frac{3}{4}$.

How many **more** yellow counters did Olga put into the bag? [2]

Olga put ..... more yellow counters into the bag

Examiner only

16. PowrUp is a company that makes batteries.
The quality of the batteries is tested regularly.
PowrUp calculates the relative frequency of faulty batteries after checking a total of 1000, 2000, 3000, 4000 and 5000 batteries.
The results are plotted on the graph below.



(a) One battery is selected at random.
Write down the best estimate for the probability that this battery will be faulty.
You must give a reason for your choice. [2]

Probability = ...

Reason:

.....

.....

.....

.....

Examiner only

(b) It costs the company 2·6p to dispose of each of the faulty batteries.
How much will it cost the company to dispose of all the faulty batteries after testing the first 3000 batteries?
You must show all your working. [3]