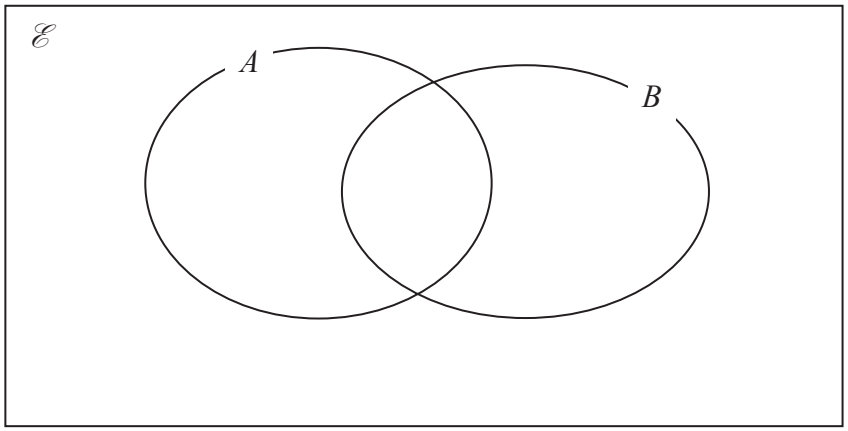
Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
$A = \{1, 5, 6, 8, 9\}$
$B = \{2, 6, 9\}$

KZ1A



(a) Complete the Venn diagram to represent this information.

(3)

A number is chosen at random from the universal set $\mathscr{E}$.

(b) Find the probability that the number is in the set $A \cap B$

.....

(2)

(Total for Question 1 is 5 marks)

DO NOT WRITE IN THIS AREA
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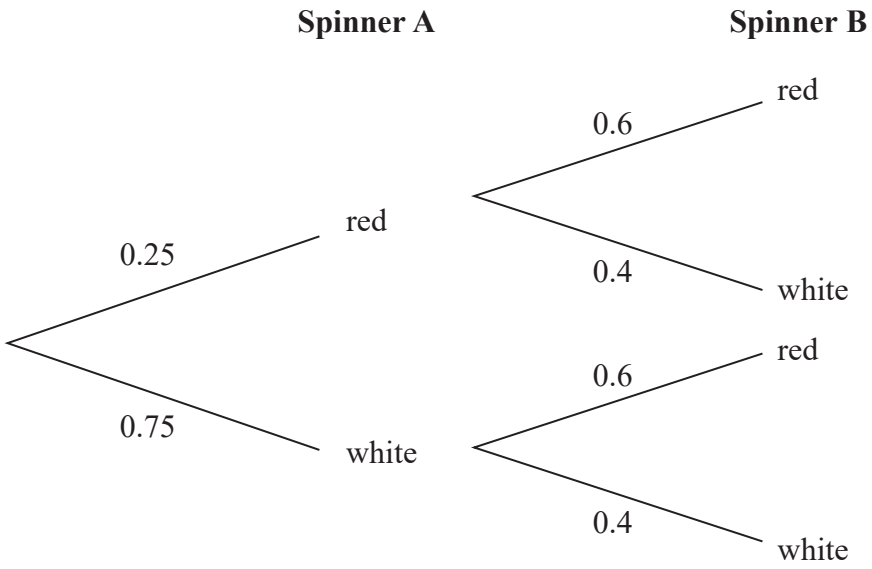
DO NOT WRITE IN THIS AREA

12 Alan has two spinners, spinner **A** and spinner **B**.
Each spinner can land on only red or white.

BM12A

The probability that spinner **A** will land on red is 0.25
The probability that spinner **B** will land on red is 0.6

The probability tree diagram shows this information.



Alan spins spinner **A** once and he spins spinner **B** once.
He does this a number of times.

The number of times **both** spinners land on red is 24

Work out an estimate for the number of times **both** spinners land on white.

.....

(Total for Question 12 is 3 marks)

DO NOT WRITE IN THIS AREA
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DO NOT WRITE IN THIS AREA

Answer ALL questions.

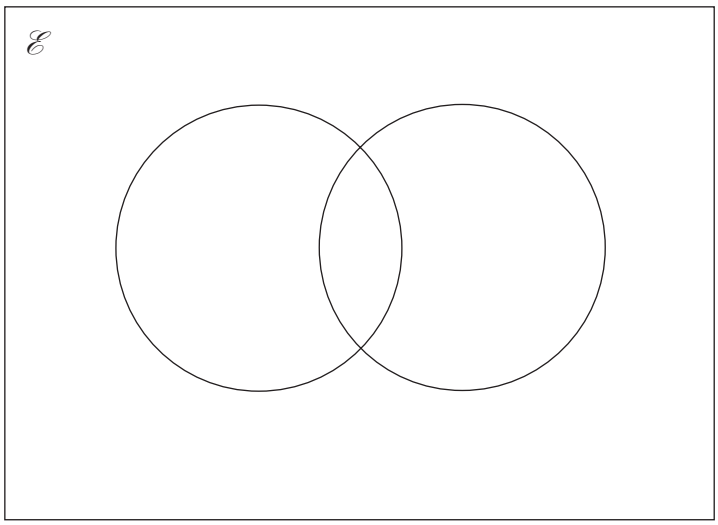
Write your answers in the spaces provided.

You must write down all the stages in your working.

1 $\mathscr{E}$ = {odd numbers less than 30}
A = {3, 9, 15, 21, 27}
B = {5, 15, 25}

BP1A

(a) Complete the Venn diagram to represent this information.



(4)

A number is chosen at random from the universal set, $\mathscr{E}$.

(b) What is the probability that the number is in the set $A \cup B$?

.....

(2)

(Total for Question 1 is 6 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

11 Jeff is choosing a shrub and a rose tree for his garden.
At the garden centre there are 17 different types of shrubs and some rose trees.

BP11A

Jeff says,

"There are 215 different ways to choose one shrub and one rose tree."

Could Jeff be correct?
You must show how you get your answer.

(Total for Question 11 is 2 marks)

12 The points A, B, C and D lie in order on a straight line.

BP12A

$$AB : BD = 1 : 5$$
$$AC : CD = 7 : 11$$

Work out $AB : BC : CD$

..... : ..... : .....

(Total for Question 12 is 3 marks)

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

PE14A

14 Saffron wants to work out an estimate for the total number of fish in a lake.

On Friday, Saffron catches 180 fish from the lake.
She puts a tag on each of these fish and puts them back into the lake.

On Saturday, Saffron catches 305 fish from the same lake.
She finds that 45 of the 305 fish are tagged.

Work out an estimate for the total number of fish in the lake.

.....

(Total for Question 14 is 3 marks)

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

PE16A

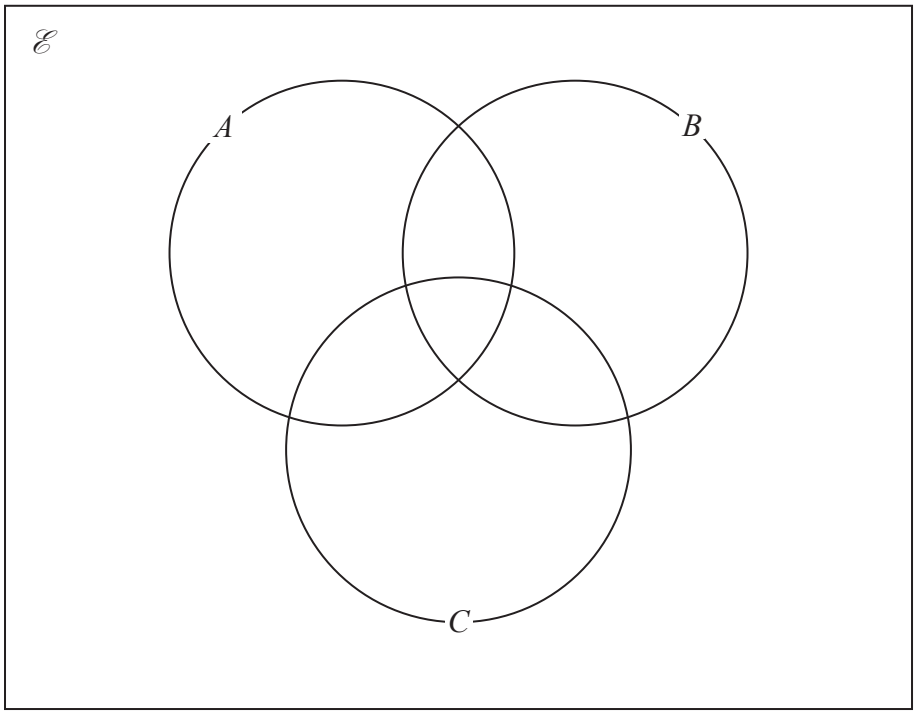
16 A shop manager wants to advertise special offers on social media platforms.

The manager asks 100 customers which of type A, type B or type C they use.

Of these customers,

4 use all three types
16 do not use any of type A, type B or type C
8 use both type A and type B, but not type C
14 use both type B and type C
62 in total use type A
all 20 who use type C also use at least one of type A and type B.

(a) Complete the Venn diagram for this information.



(4)

One of the customers is chosen at random.

Given that this customer uses type A,

(b) find the probability that this customer also uses type B.

.....

(2)

(Total for Question 16 is 6 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

PF11A

11 Rayheem has

16 shirts
5 pairs of jeans
3 jackets

Rayheem chooses an outfit to wear.
An outfit is 1 shirt, 1 pair of jeans and 1 jacket.

Work out how many different outfits Rayheem can choose.

.....

(Total for Question 11 is 2 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

21 Ray has nine cards numbered 1 to 9

1	2	3	4	5	6	7	8	9

Ray takes at random three of these cards.

He works out the sum of the numbers on the three cards and records the result.

Work out the probability that the result is an even number.

PF21A

.....

(Total for Question 21 is 4 marks)

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

PL10A

10 A biased dice is thrown 60 times.

The table shows information about the number that the dice lands on each time.

Number on dice	1	2	3	4	5	6
Frequency	12	7	8	9	9	15

Gethin throws the dice twice.

(a) Work out an estimate for the probability that the dice will land on 6 both times.

.....

(3)

Sally is going to throw the same dice n times and record the number it lands on each time.

She will use her results to work out a more reliable estimate for the probability in part (a).

(b) What can you say about the value of n?

.....

.....

.....

(1)

(Total for Question 10 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

22 There are only blue pens and red pens in a box.

The number of blue pens is four times the number of red pens.

Rita takes at random one pen from the box.
She records the colour of the pen and then replaces it in the box.
Rita does this n times, where $n \geqslant 2$

Write down an expression, in terms of n, for the probability that Rita gets a blue pen at least once and a red pen at least once.

.....

(Total for Question 22 is 2 marks)

PL22A

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

PM24A

24 There is a total of y counters in a box.

There are x pink counters and 5 blue counters in the box.
The rest of the counters are green.

$$x : y = 1 : 3$$

Freda takes at random two counters from the box.

Find, in terms of x, an expression for the probability that Freda takes two counters of the same colour.

Give your answer as a fraction in the form $\dfrac{ax^2 + bx + c}{dx^2 + ex}$ where a, b, c, d and e are integers.

.....

(Total for Question 24 is 5 marks)

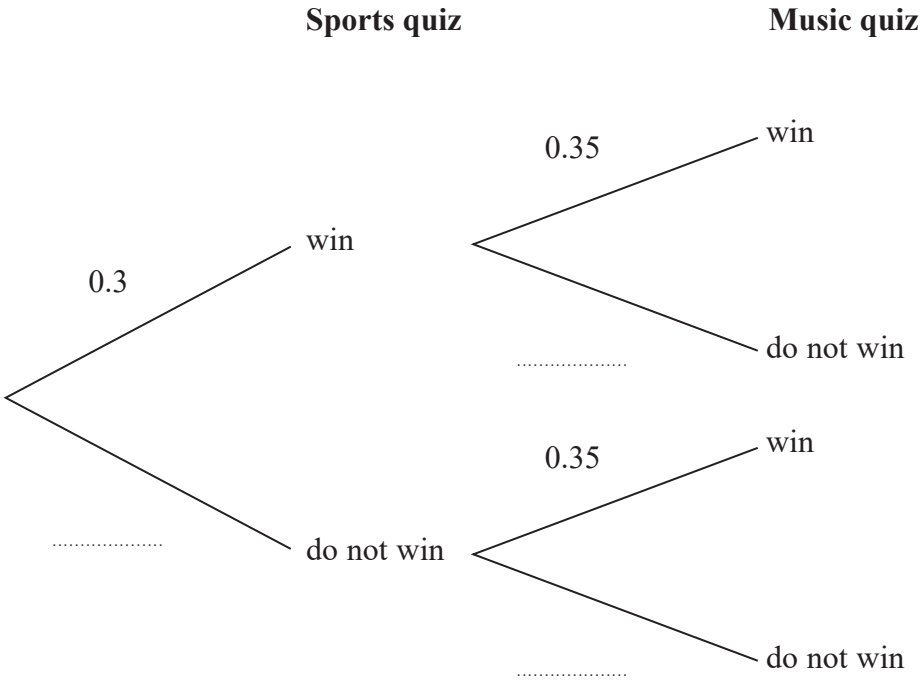
TOTAL FOR PAPER IS 80 MARKS

PJ6A

6 One weekend the Keddie family is going to do a sports quiz and a music quiz.

The probability that the family will win the sports quiz is 0.3
The probability that the family will win the music quiz is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that the Keddie family will win both the sports quiz and the music quiz.

.....

(2)

(Total for Question 6 is 4 marks)

DO NOT WRITE IN THIS AREA
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15 A pet shop has

7 guppy fish
13 tetra fish
5 angel fish.

David is going to choose one of the following combinations of fish

a guppy fish and an angel fish
or a tetra fish and an angel fish
or a guppy fish, a tetra fish and an angel fish.

Show that there are 555 different ways for David to choose his fish.

(Total for Question 15 is 2 marks)

PJ15A

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

18 Shape **A** is reflected in the line with equation $x = 2$ to give shape **B**.
Shape **B** is reflected in the line with equation $x = 6$ to give shape **C**.

Describe fully the **single** transformation that maps shape **A** onto shape **C**.

PJ18A

.....

.....

.....

(Total for Question 18 is 2 marks)

19 There are only blue counters, red counters and green counters in a box.

The probability that a counter taken at random from the box will be blue is 0.4
The ratio of the number of red counters to the number of green counters is 7 : 8

Sameena takes at random a counter from the box.
She records its colour and puts the counter back in the box.
Sameena does this a total of 50 times.

Work out an estimate for the number of times she takes a green counter.

PJ19A

.....

(Total for Question 19 is 3 marks)

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DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

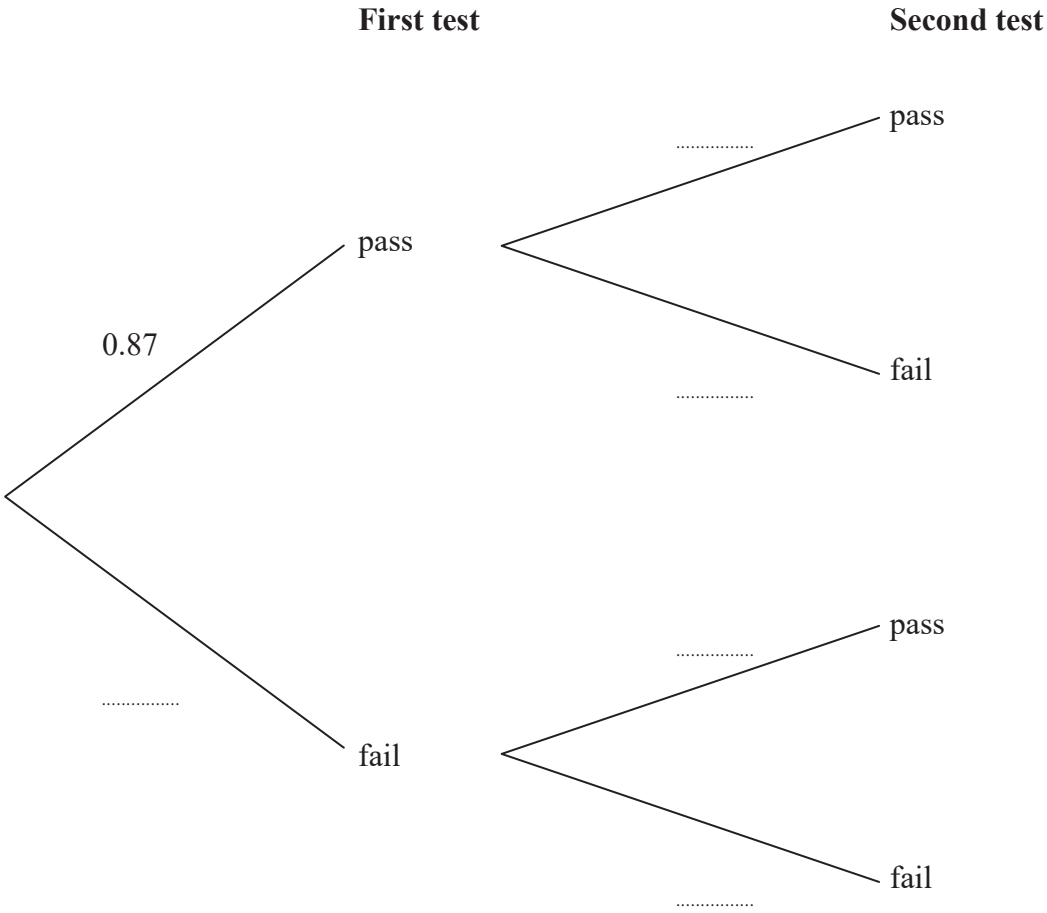
PP10A

10 Shakir has to complete two tests.
He can either pass or fail each test.

The probability that he will pass the first test is 0.87

If he passes the first test the probability he will pass the second test is 0.94
If he fails the first test the probability he will pass the second test is 0.73

(a) Complete the probability tree diagram for this information.



(2)

(b) Work out the probability that Shakir passes at least one of the tests.

(3)

(Total for Question 10 is 5 marks)

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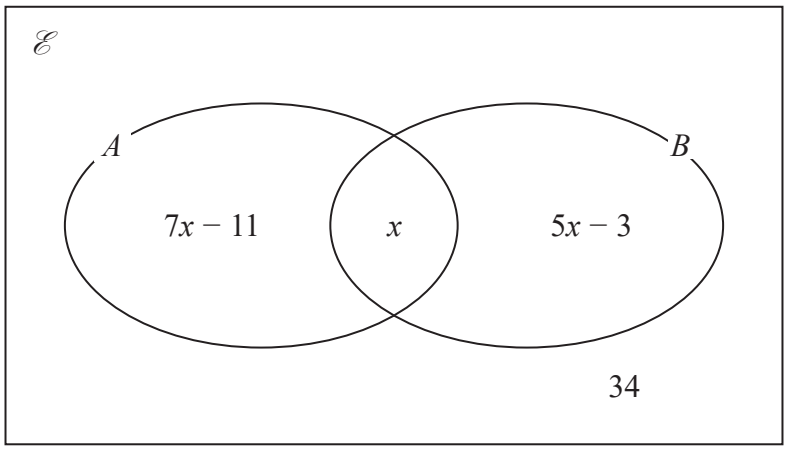
PP21A

21 Vicky has a collection of medals.

The Venn diagram gives information about the number of medals in her collection where

$\mathscr{E}$ = {all medals}
A = {English medals}
B = {gold medals}



Vicky is going to take at random a medal from her collection.

Given that the medal is gold, the probability that the medal is English is $\frac{2}{11}$

Work out the number of medals in Vicky's collection.

.....

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

DO NOT WRITE IN THIS AREA
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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

PQ1A

1 (a) Write 468 000 in standard form.

.....

(1)

(b) Write 5.037×10^{-4} as an ordinary number.

.....

(1)

(Total for Question 1 is 2 marks)

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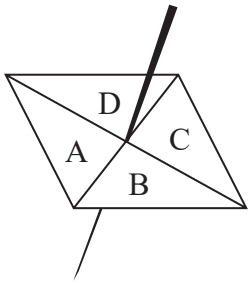
PQ2A

2 Here is a biased spinner.



The table shows the probabilities that when the spinner is spun it will land on A, on B, on C and on D.

Letter	A	B	C	D
Probability	0.4	0.21	0.32	0.07

Luka will spin the spinner 200 times.

Work out an estimate for the number of times the spinner will land on A.

.....

(Total for Question 2 is 2 marks)

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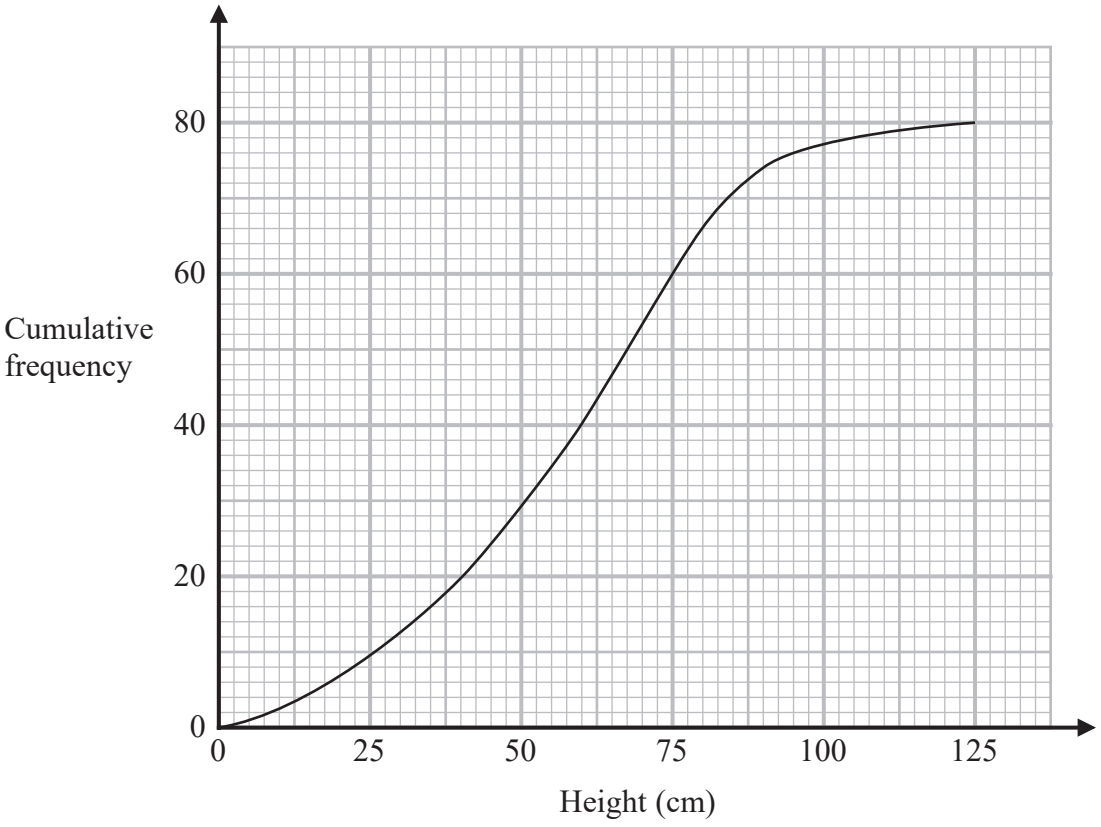
PQ13A

13 Alan grew 80 plants of the same type outside.
The cumulative frequency graph shows information about the heights, in cm, of these plants.



One of the plants is chosen at random.

(a) Find an estimate for the probability that this plant will have a height greater than 90 cm.

.....

(2)

(b) Use the graph to find an estimate for the median height.

..... cm

(1)

DO NOT WRITE IN THIS AREA
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(c) Use the graph to find an estimate for the interquartile range of the heights.

..... cm

(2)

Alan also grew plants of the same type inside.

The interquartile range of the heights of these plants is 30 cm.

(d) Give one comparison between the distribution of the heights of the plants grown inside with the distribution of the heights of the plants grown outside.

.....

.....

.....

.....

(1)

(Total for Question 13 is 6 marks)

14 Here are the first six terms of a quadratic sequence.

5 11 21 35 53 75

Find an expression, in terms of n, for the nth term of this sequence.

PQ14A

.....

(Total for Question 14 is 2 marks)

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PQ16A

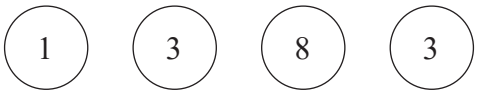
16 Zia has to set a 4-digit security passcode on her phone.

Each digit of the passcode is a number from 1 to 9
She can use each number more than once.

Zia tells her friend Amber that

the first digit is a cube number
the second digit is a prime number
the third digit is greater than 6
the fourth digit is an odd number.

The diagram shows one possible 4-digit passcode.



Amber is going to have one attempt at guessing Zia's passcode.

Work out the probability that Amber guesses Zia's passcode on the first attempt.

.....

(Total for Question 16 is 3 marks)

8 60 people were asked if they prefer to go on holiday in Britain or in Spain or in Italy.

BI8A

38 of the people were male.
11 of the 32 people who said Britain were female.
8 males said Italy.
12 people said Spain.

One of the females is chosen at random.

What is the probability that this female said Spain?

.....

(Total for Question 8 is 4 marks)

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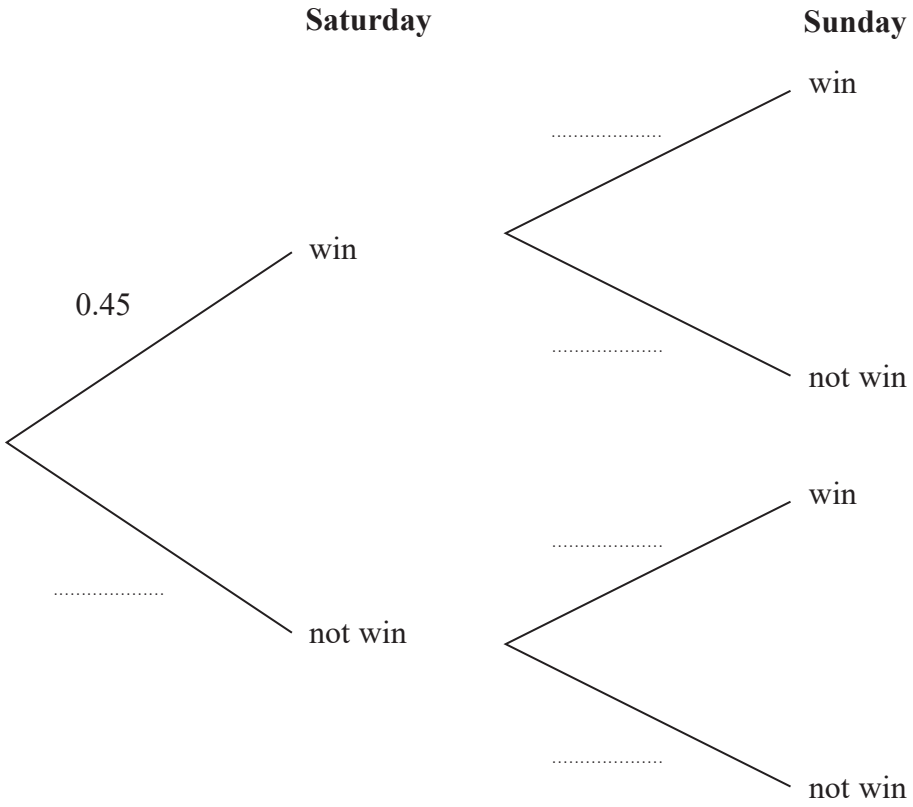
BI15A

15 A darts team is going to play a match on Saturday and on Sunday.
The probability that the team will win on Saturday is 0.45

If they win on Saturday, the probability that they will win on Sunday is 0.67
If they do **not** win on Saturday, the probability that they will win on Sunday is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Find the probability that the team will win exactly one of the two matches.

.....

(3)

(Total for Question 15 is 5 marks)

DO NOT WRITE IN THIS AREA
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DO NOT WRITE IN THIS AREA

Answer ALL questions.

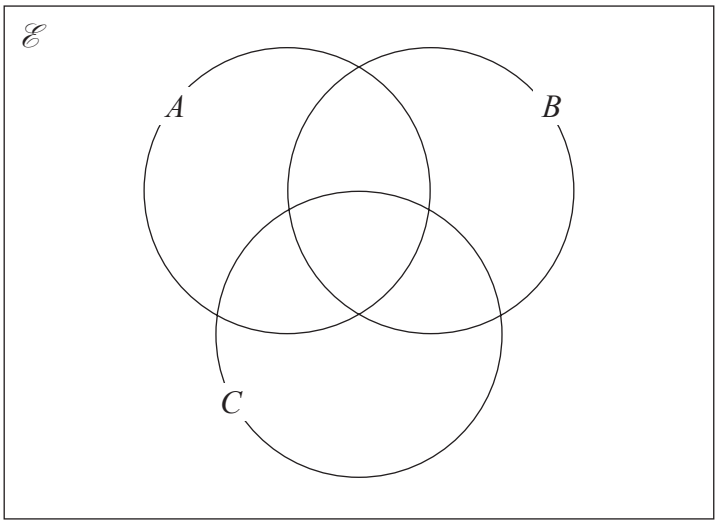
Write your answers in the spaces provided.

You must write down all the stages in your working.

1 $\mathscr{E}$ = {even numbers between 1 and 25}
A = {2, 8, 10, 14}
B = {6, 8, 20}
C = {8, 18, 20, 22}

BF1A

(a) Complete the Venn diagram for this information.



(4)

A number is chosen at random from $\mathscr{E}$.

(b) Find the probability that the number is a member of $A \cap B$.

.....

(2)

(Total for Question 1 is 6 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
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11 In a restaurant there are

9 starter dishes
15 main dishes
8 dessert dishes

BF11A

Janet is going to choose one of the following combinations for her meal.

a starter dish and a main dish
or a main dish and a dessert dish
or a starter dish, a main dish and a dessert dish

Show that there are 1335 different ways to choose the meal.

(Total for Question 11 is 3 marks)

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

15 The equation of a circle is $x^2 + y^2 = 42.25$

Find the radius of the circle.

BF15A

.....

(Total for Question 15 is 1 mark)

16 There are only red counters and blue counters in a bag.

BF16A

Joe takes at random a counter from the bag.
The probability that the counter is red is 0.65
Joe puts the counter back into the bag.

Mary takes at random a counter from the bag.
She puts the counter back into the bag.

(a) What is the probability that Joe and Mary take counters of different colours?

.....

(2)

There are 78 red counters in the bag.

(b) How many blue counters are there in the bag?

.....

(2)

(Total for Question 16 is 4 marks)

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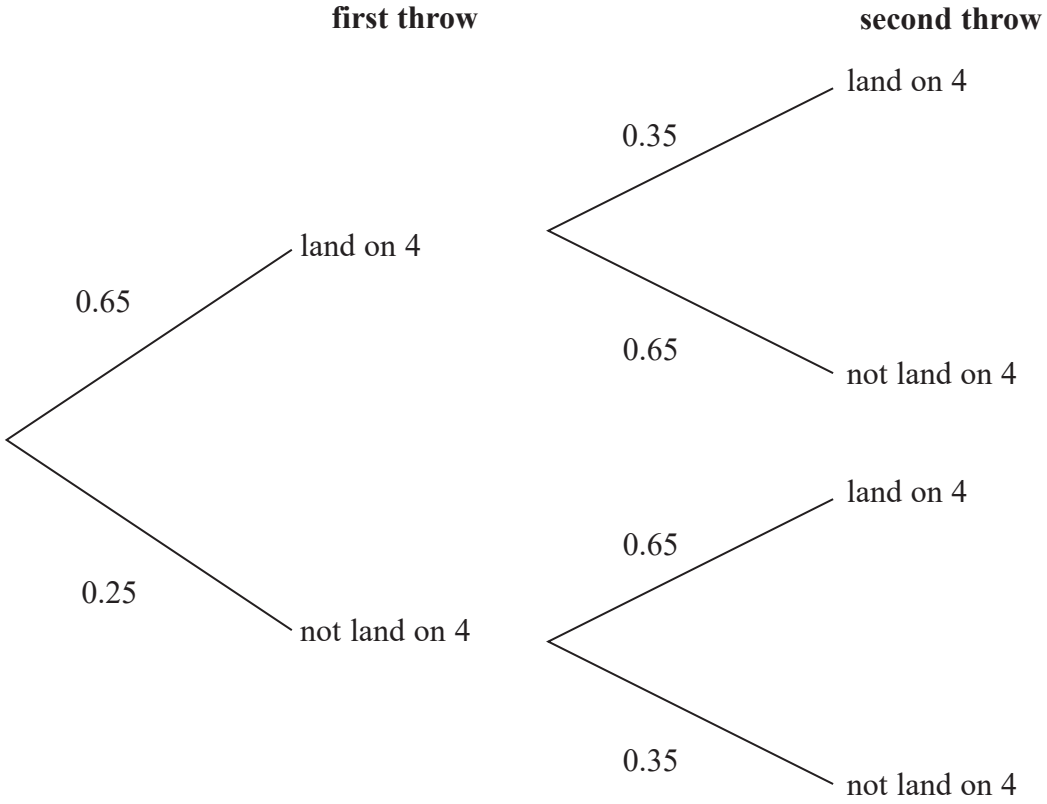
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

BJ4A

4 When a biased 6-sided dice is thrown once, the probability that it will land on 4 is 0.65
The biased dice is thrown twice.

Amir draws this probability tree diagram.
The diagram is **not** correct.



Write down **two** things that are wrong with the probability tree diagram.

1 .....

.....

2 .....

.....

(Total for Question 4 is 2 marks)

14 There are 16 hockey teams in a league.
Each team played two matches against each of the other teams.

Work out the total number of matches played.

BJ14A

.....

(Total for Question 14 is 2 marks)

DO NOT WRITE IN THIS AREA

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20 50 people were asked if they speak French or German or Spanish.

BJ20A

Of these people,

31 speak French
2 speak French, German and Spanish
4 speak French and Spanish but not German
7 speak German and Spanish
8 do not speak any of the languages
all 10 people who speak German speak at least one other language

Two of the 50 people are chosen at random.

Work out the probability that they both only speak Spanish.

.....

(Total for Question 20 is 5 marks)

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The table shows the probabilities that a biased dice will land on 2, on 3, on 4, on 5 and on 6

BO1A

Number on dice	**1**	**2**	**3**	**4**	**5**	**6**
Probability		0.17	0.18	0.09	0.15	0.1

Neymar rolls the biased dice 200 times.

Work out an estimate for the total number of times the dice will land on 1 or on 3

.....

(Total for Question 1 is 3 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
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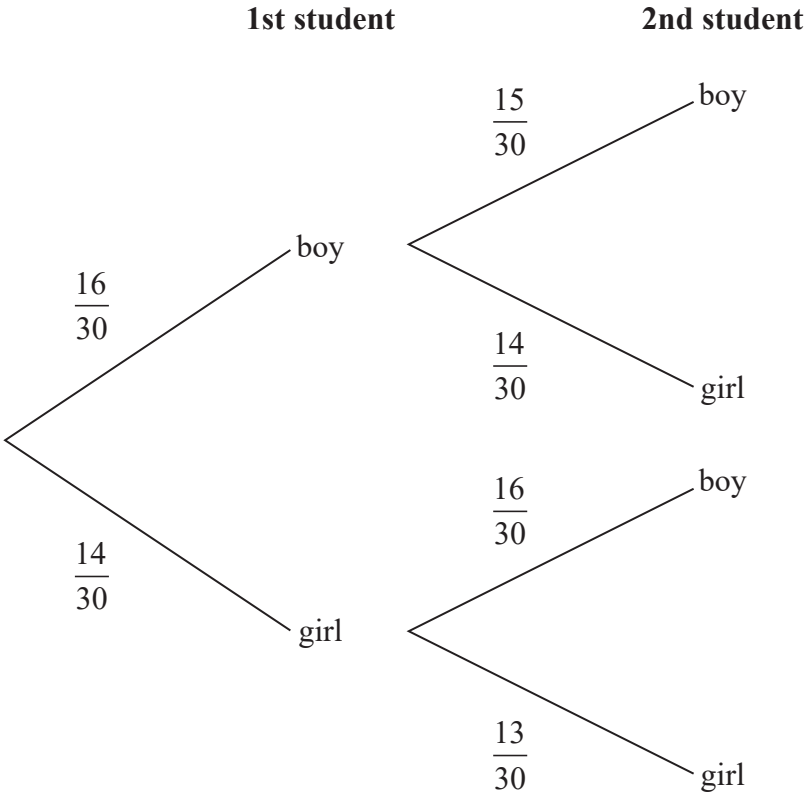
12 There are 30 students in Mr Lear's class.
16 of the students are boys.

Two students from the class are chosen at random.

Mr Lear draws this probability tree diagram for this information.



(a) Write down **one** thing that is wrong with the probabilities in the probability tree diagram.

.....

.....

(1)

Owen and Wasim play for the school football team.

The probability that Owen will score a goal in the next match is 0.4
The probability that Wasim will score a goal in the next match is 0.25

Mr Slater says,

"The probability that both boys will score a goal in the next match is 0.4 + 0.25"

(b) Is Mr Slater right?
Give a reason for your answer.

.....

.....

(1)

(Total for Question 12 is 2 marks)

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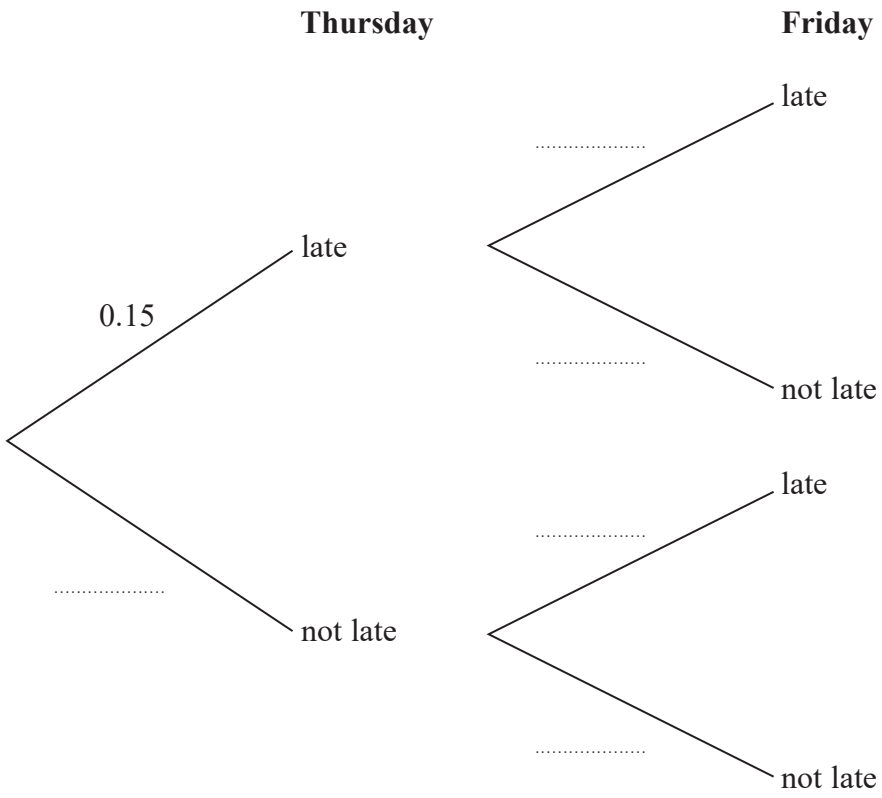
10 Mary travels to work by train every day.
The probability that her train will be late on any day is 0.15

(a) Complete the probability tree diagram for Thursday and Friday.

KY10A



(2)

(b) Work out the probability that her train will be late on at least one of these two days.

(3)

(Total for Question 10 is 5 marks)

4 There are only blue cubes, yellow cubes and green cubes in a bag.

BL4A

There are

twice as many blue cubes as yellow cubes
and four times as many green cubes as blue cubes.

Hannah takes at random a cube from the bag.

Work out the probability that Hannah takes a yellow cube.

.....

(Total for Question 4 is 3 marks)

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

15 Tracey is going to choose a main course and a dessert in a cafe.
She can choose from 8 main courses and 7 desserts.

Tracey says that to work out the number of different ways of choosing a main course and a dessert you add 8 and 7

(a) Is Tracey correct?
You must give a reason for your answer.

.....

.....

(1)

12 teams play in a competition.
Each team plays each other team exactly once.

(b) Work out the total number of games played.

.....

(2)

(Total for Question 15 is 3 marks)

16 Solve $(x - 2)^2 = 3$

Give your solutions correct to 3 significant figures.

.....

(Total for Question 16 is 2 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

21 There are 12 counters in a bag.
There is an equal number of red counters, blue counters and yellow counters in the bag.
There are no other counters in the bag.

BL21A

3 counters are taken at random from the bag.

(a) Work out the probability of taking 3 red counters.

.....

(2)

The 3 counters are put back into the bag.

Some more counters are now put into the bag.
There is still an equal number of red counters, blue counters and yellow counters in the bag.
There are no counters of any other colour in the bag.

3 counters are taken at random from the bag.

(b) Is it now less likely or equally likely or more likely that the 3 counters will be red?
You must show how you get your answer.

(2)

(Total for Question 21 is 4 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA