ELIJAH MATHS
GCSE and A Level Maths

PROBABILITY

QUESTION 1

There are only blue counters and green counters in a box.

$\frac{2}{5}$ of the counters are blue.

Selena takes at random two counters from the box.

The probability that the two counters are the same colour is $\frac{18}{35}$

Work out the number of green counters in the box.
You must show all your working.

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(5 marks)

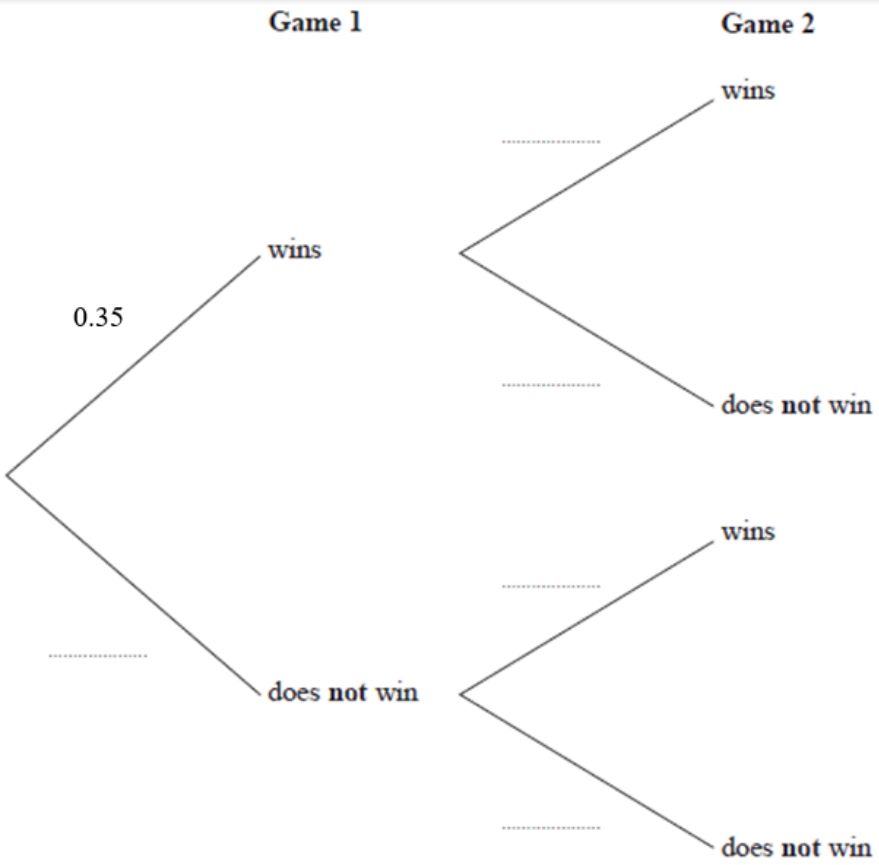
QUESTION 2

Don is playing Dungeons and Dragons.

The probability that he will win a game of Dungeons and Dragons is 0.35

Don plays two games of Dungeons and Dragons.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Don wins both games.

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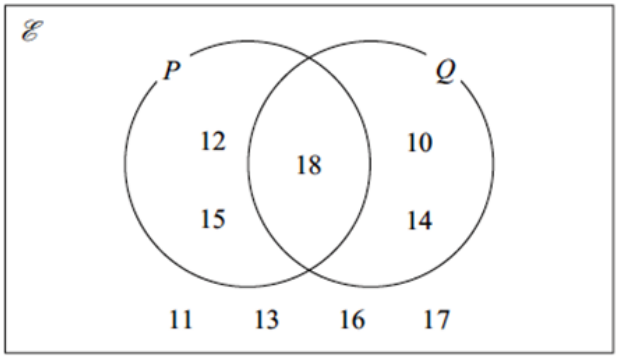
(2)

QUESTION 3

Here is a Venn diagram.



(a) Write down the numbers that are in set Q'

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(1)

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

(b) Find the probability that this number is in the set $(P \cup Q)'$

.....

(2)

QUESTION 4

There are only n yellow sweets and 1 orange sweet in a bag.

Sandra takes at random a sweet from the bag and eats the sweet.
She then takes at random another sweet from the bag and eats this sweet.

Show that the probability that Sandra eats one yellow sweet and one orange sweet is $\frac{2}{n+1}$

(2 marks)

QUESTION 5

There are only 3 red counters, 3 yellow counters and 2 green counters in a bag.

Tina takes at random three counters from the bag.

Work out the probability that there are now more red counters than yellow counters in the bag.
You must show all your working.

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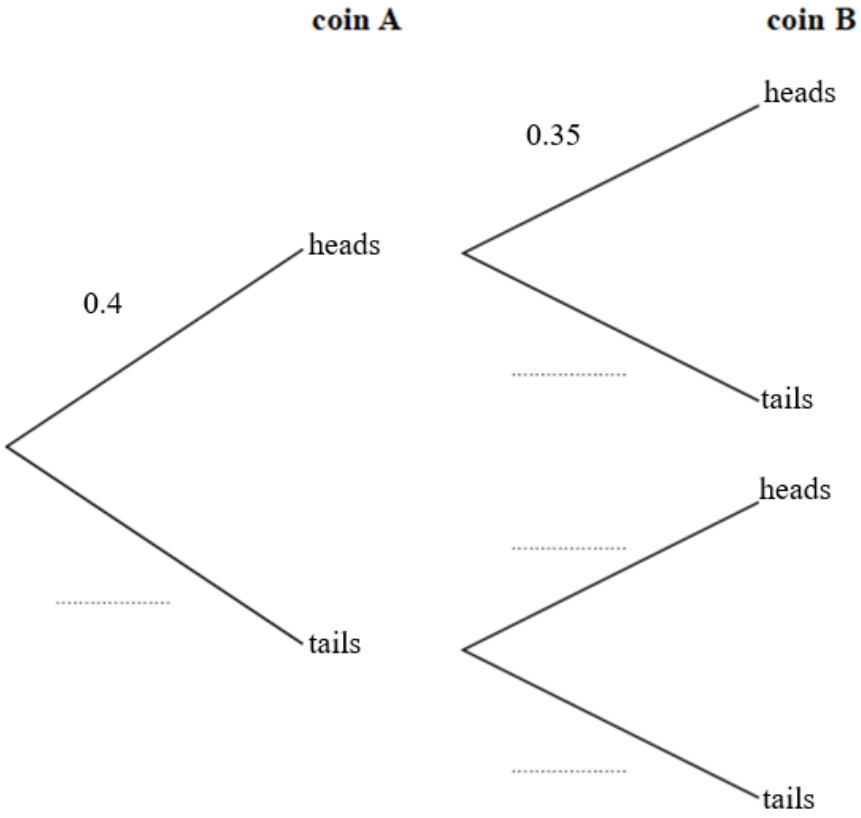
(5 marks)

QUESTION 6

Tom has two biased coins, coin **A** and coin **B**.
He is going to throw both coins. The coins will land on either heads or tails.

The probability that coin **A** will land on heads is 0.4
The probability that coin **B** will land on heads is 0.35

(a) Complete the probability tree diagram.



(2)

Tom throws coin **A** once and he throws coin **B** once.

(b) Work out the probability that both coins land on heads.

.....

(2)

QUESTION 7

Spinner **A** and spinner **B** are each spun once.

The probability that spinner **A** lands on blue is $\frac{1}{6}$

The probability that both spinner **A** and spinner **B** land on blue is $\frac{1}{18}$

Work out the probability that one spinner lands on blue and the other spinner does **not** land on blue.

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(4 marks)

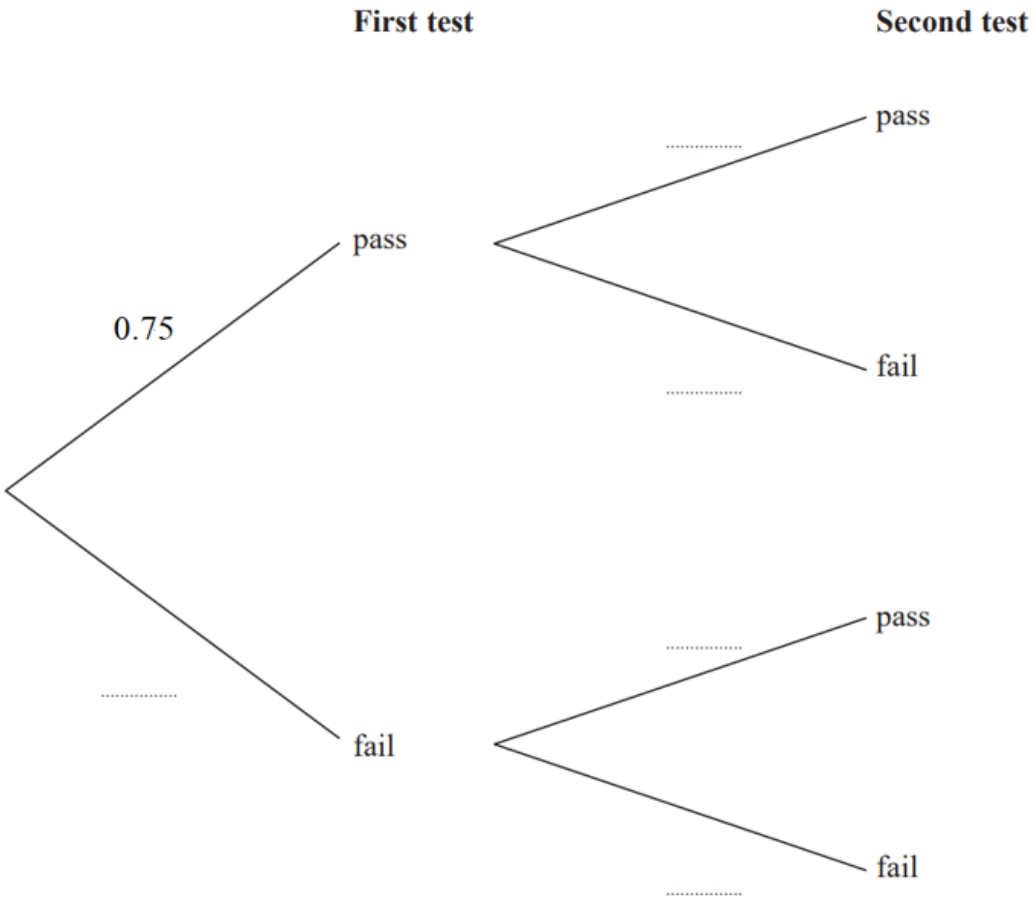
Question 8

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

The probability that he will pass the first test is 0.75

If he passes the first test the probability he will pass the second test is 0.84
If he fails the first test the probability he will pass the second test is 0.56

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



(2)

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

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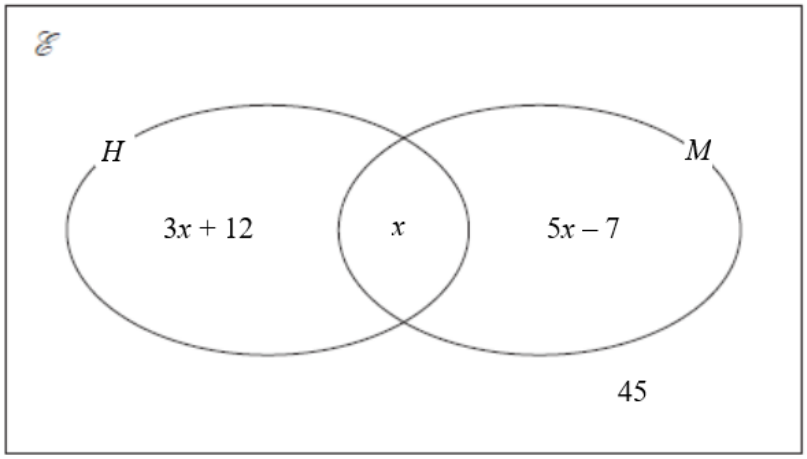
(3)

Question 9

Julia has a library of books.

The Venn diagram gives information about the number of books in her library where

$\mathscr{E}$ = {all books}
H = {hardback books}
M = {maths books}



Julia is going to take at random a book from her library.

Given that the book is a hardback, the probability that the book is a maths book is $\frac{2}{9}$

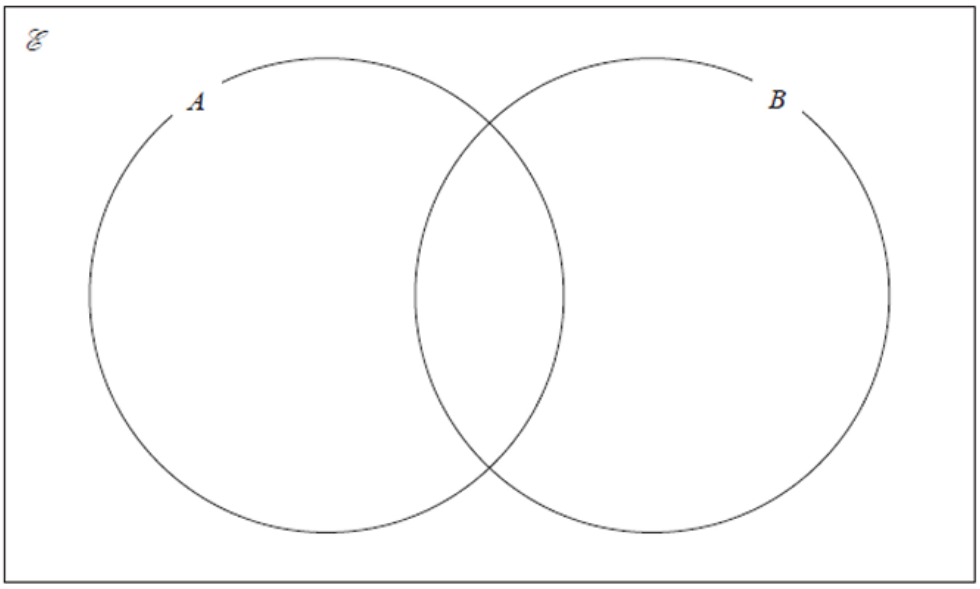
Work out the number of books in Julia's library.

(4)

Question 10

$\mathscr{E} = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{\text{even numbers}\}$
$B = \{\text{square numbers}\}$

(a) Complete the Venn diagram for this information.



(3)

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

(b) Find the probability that this number is in the set A'

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(2)

Question 11

A biased dice is thrown 80 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	15	9	13	11	8	24

George throws the dice twice.

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

(3)

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

He will use his results to work out a more reliable estimate for the probability in part (*a*).

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

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(1)

QUESTION 12

There are only white eggs and brown eggs in a box.

The number of white eggs is three times the number of brown eggs.

Rick takes at random one egg from the box.
He records the colour of the egg and then replaces it in the box.
Rick does this n times, where $n \geq 2$

Write down an expression, in terms of n, for the probability that Rick gets a white egg at least once and a brown egg at least once.

(2)

There is a total of y sweets in a packet.

There are x green sweets and 6 orange sweets in the packet.
The rest of the sweets are yellow.

$$x : y = 1 : 4$$

Hannah takes at random two sweets from the packet.

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

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

.....(4)

Question 13

Ricky has 12 socks in a drawer.

He has

2 blue socks
4 green socks
and 6 white socks.

Ricky takes at random 2 of these socks.

Work out the probability that he takes socks of the same colour.

.....(3)

Question 14

250 people chose one country to visit on holiday.
Each person chose one country from France, Spain or Germany.

Of the 250 people,

110 are men and the rest are women
90 chose Spain
70 of the 114 people who chose France are men
27 women chose German.

Work out how many men chose Spain.

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(3 marks)

Question 15

There are only white marbles, red marbles and black marbles in a bag.

The probability that a marble taken at random from the bag will be white is 0.3
The ratio of the number of red marbles to the number of black marbles is 3 : 7

Jackie takes at random a marble from the bag.
She records its colour and puts the marble back in the bag.
Jackie does this a total of 100 times.

Work out an estimate for the number of times she takes a black marble.

(3)

Question 16

Christine has some sweets in a bag.
The sweets are lime flavoured or strawberry flavoured or orange flavoured.

In the bag

number of lime flavoured sweets	:	number of strawberry flavoured sweets	:	number of orange flavoured sweets	$= 9 : 8 : x$

Christine is going to take at random a sweet from the bag.

The probability that she takes a strawberry flavoured sweet is $\frac{4}{11}$

Work out the value of x.

$x =$ .....

(3 marks)

Question 17

Simon plays two games against Maria.
In each game, Simon could win, draw or lose.

In each game they play,
the probability that Simon will win against Maria is 0.6
the probability that Simon will draw against Maria is 0.2

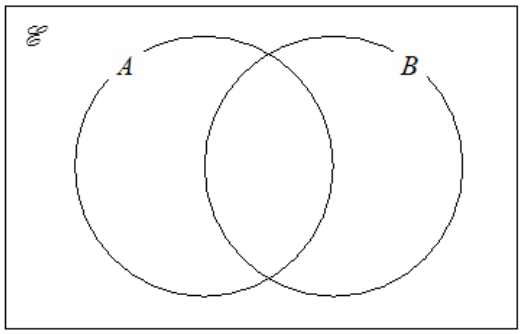
Work out the probability that Simon will win **exactly** one of the two games against Maria.

(3)

QUESTION 18

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
$A = \{\text{even numbers}\}$
$B = \{\text{factors of } 12\}$

(a) Complete the Venn diagram for this information.



(3)

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

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

.....

(2)

QUESTION 19

There are only yellow sweets and orange sweets in a bag.

There are n yellow sweets in the bag.
There are 25 orange sweets in the bag.

Simon is going to take at random a sweet from the bag and eat it.

He says that the probability that the sweet will be yellow is $\frac{7}{10}$

(a) Show why the probability cannot be $\frac{7}{10}$

(3)

After Simon has taken the first sweet from the bag and eaten it, he is going to take at random a second sweet from the bag.

Given that the probability that both the sweets he takes will be yellow is $\frac{3}{8}$

(*b*) work out the number of yellow sweets in the bag.
You must show all your working.

----------(5)