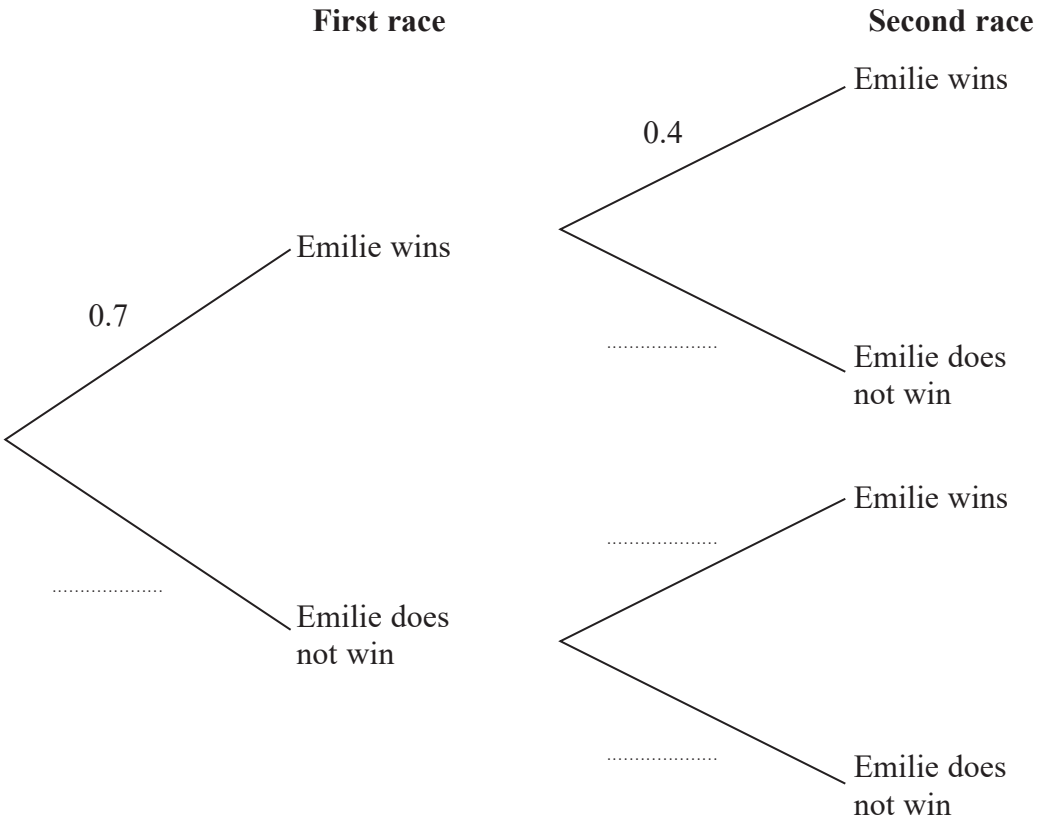
13 Emilie takes part in two races.

The probability that she wins the first race is 0.7
The probability that she wins the second race is 0.4
The outcomes of the two races are independent.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Emilie wins exactly one of the two races.

.....

(3)

Emilie is going to take part in a third race.

If she wins both of the first two races, the probability that she will win the third race is 0.6

If she wins exactly one of the first two races, the probability that she will win the third race is 0.3

(c) Work out the probability that Emilie will win exactly two of the three races.

.....

(3)

(Total for Question 13 is 8 marks)

14 Ciara throws **four** fair six-sided dice.

The faces of each dice are labelled with the numbers 1, 2, 3, 4, 5, 6

Work out the probability that at least one of the dice lands on an even number.

.....

(Total for Question 14 is 3 marks)

14 Adriana is going to roll a biased dice and spin a biased coin.

The probability that the coin will land on Heads is 0.8
The probability that the dice will land on 6 and the coin will land on Heads is 0.24

Work out the probability that the dice will land on 6 and the coin will land on Tails.

.....

(Total for Question 14 is 3 marks)

15 Abraham is going to play a computer game.
Abraham can win the game, draw the game or lose the game.

For any game that Abraham plays

the probability that he wins the game is 0.3
the probability that he draws the game is 0.5
the probability that he loses the game is 0.2

When Abraham wins a game, he scores +10 points.
When Abraham draws a game, he scores 0 points.
When Abraham loses a game, he scores −5 points.

Abraham plays 3 games and the points he scores in each of the 3 games are added together to get his total score.

Work out the probability that when he has played 3 games his total score is 0 points.

.....

(Total for Question 15 is 4 marks)

15 Osvaldo has a biased coin.
He spins the coin three times.

The probability that the coin lands on a head three times is $\frac{27}{64}$

Work out the probability that the coin will land on a tail three times.

.....

(Total for Question 15 is 3 marks)

15 Magnus and Garry play 2 games of chess against each other.

The probability that Magnus beats Garry in any game is $\frac{2}{9}$

The probability that any game between Magnus and Garry is drawn is $\frac{4}{9}$

The result of any game is independent of the result of any other game.

(a) Complete the probability tree diagram.

(2)

For each game of chess,

the winner gets 2 points and the loser gets 0 points,
when the game is drawn, each player gets 1 point.

(b) Work out the probability that, after 2 games, Magnus and Garry have the same number of points.

.....

(3)

Magnus and Garry now play a third game of chess.

(c) Work out the probability that, after 3 games, Magnus and Garry have the same number of points.

.....

(3)

(Total for Question 15 is 8 marks)

15 Barney has a biased coin.

When the coin is thrown once, the probability that the coin will land heads is 0.3

Barney throws the coin 4 times.

(a) Work out the probability that the coin will land heads exactly 3 times.

.....

(3)

(b) Work out the probability that the coin will land heads at least once.

.....

(2)

(Total for Question 15 is 5 marks)

16 There are 20 sweets in a box.

15 of the sweets are red
5 of the sweets are yellow

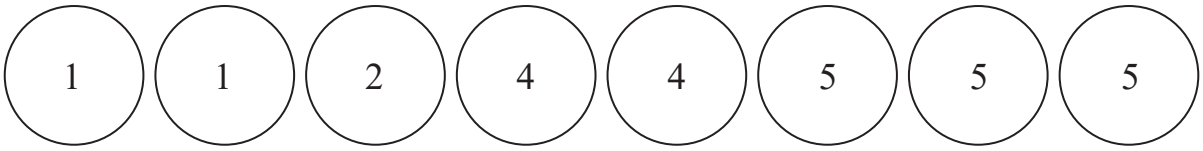
Fred takes at random 3 sweets from the box.

Work out the probability that Fred takes at least one sweet of each colour from the box.

.....

(Total for Question 16 is 4 marks)

16 There are 8 counters in a bag.
There is a number on each counter.



Fiona takes at random **three** of the counters.
She adds the numbers on the **three** counters to get her total.

Work out the probability that her total is an odd number.

.....

(Total for Question 16 is 4 marks)

16 Steffi is going to play one game of tennis and one game of chess.

The probability that she will win the game of tennis is 0.6
The probability that she will win **both** games is 0.42

Work out the probability that she will **not** win either game.

.....

(Total for Question 16 is 4 marks)

16 There are 12 beads in a bag.

7 of the beads are red.
3 of the beads are green.
2 of the beads are yellow.

Lucy takes at random a bead from the bag and keeps it.
Then Julian takes at random a bead from the bag.

(a) Work out the probability that they each take a yellow bead.

.....

(2)

(b) Work out the probability that the beads they take are **not** the same colour.

.....

(3)

(Total for Question 16 is 5 marks)

16 A box contains 15 counters.

There are 4 red counters, 5 green counters and the rest are yellow counters.

Niklas takes at random a counter from the box and writes down the colour of his counter.
He then puts the counter back into the box.

Sasha then takes at random a counter from the box and writes down the colour of her counter.

Work out the probability that the counters taken by Niklas and Sasha both have the same colour.

.....

(Total for Question 16 is 3 marks)

18 There are 16 sweets in a bowl.

4 of the sweets are blackcurrant.
5 of the sweets are lemon.
7 of the sweets are orange.

Anna, Ravi and Sam each take at random one sweet from the bowl.

Work out the probability that the 5 lemon sweets are still in the bowl.

.....

(Total for Question 18 is 4 marks)

19 Jack plays a game with two fair spinners, **A** and **B**.

Spinner **A** can land on the number 2 or 3 or 5 or 7
Spinner **B** can land on the number 2 or 3 or 4 or 5 or 6

Jack spins both spinners.
He wins the game if one spinner lands on an odd number **and** the other spinner lands on an even number.

Jack plays the game twice.
Work out the probability that Jack wins the game both times.

.....

(Total for Question 19 is 4 marks)

20 A bag contains X counters.

There are only red counters and blue counters in the bag.

There are 4 more blue counters than red counters in the bag.

Finty takes at random 2 counters from the bag.

The probability that Finty takes 2 blue counters from the bag is $\frac{3}{8}$

Work out the value of X.
Show clear algebraic working.

.....

(Total for Question 20 is 5 marks)

20 There are 12 counters in a bag.

3 of the counters are red
9 of the counters are green

Ameya, Jack and Ella each take at random one counter from the bag.

Work out the probability that at least one red counter is still in the bag.

.....

(Total for Question 20 is 3 marks)

20 A bag contains only 10 cent coins and 20 cent coins.

Josip takes at random a coin from the bag, records its value and replaces it in the bag. He then takes at random a second coin from the bag, records its value and replaces it in the bag.

Josip finds the mean value of the two coins.

The probability that the two coins have a mean value of 10 cents is $\frac{49}{121}$

Work out the probability that the two coins have a mean value of 15 cents.

.....

(Total for Question 20 is 4 marks)

21 A bag contains n beads.
6 of the beads are red and the rest are blue.

Ravi is going to take at random 2 beads from the bag.

The probability that the 2 beads will be of the same colour is $\frac{9}{17}$

Using algebra, and showing each stage of your working, calculate the value of n.

$n =$ .....

(Total for Question 21 is 6 marks)

21 There are 25 counters in a bag such that

6 counters are blue
x counters are orange, where $x > 9$
the rest of the counters are pink

Maalam takes at random two of the counters from the bag.

The probability that Maalam takes one orange counter and one pink counter is $\frac{22}{75}$

Calculate the probability that Maalam takes 2 pink counters from the bag.
Show clear algebraic working.

.....

(Total for Question 21 is 5 marks)

23 In a bag, there are only

3 blue beads
4 white beads
and x orange beads.

Jean is going to take at random two beads from the bag.

The probability that Jean will take two beads of the same colour is $\frac{3}{8}$

Find the total number of beads in the bag.
Show clear algebraic working.

.....

(Total for Question 23 is 4 marks)

23 Boris has a bag that only contains red sweets and green sweets.

Boris takes at random 2 sweets from the bag.

The probability that Boris takes exactly 1 red sweet from the bag is $\frac{12}{35}$

Originally there were 3 red sweets in the bag.

Work out how many green sweets there were originally in the bag.
Show your working clearly.

.....

(Total for Question 23 is 5 marks)

24 Elliot has x counters.

Each counter has one red face and one green face.

Elliot spreads all the counters out on a table and sees that the number of counters showing a red face is 5

Elliot then picks at random one of the counters and turns the counter over.
He then picks at random a second counter and turns the counter over.

The probability that there are still 5 counters showing a red face is $\frac{19}{32}$

Work out the value of x
Show clear algebraic working.

$x =$ .....

(Total for Question 24 is 5 marks)

24 A box contains marbles.

4 of the marbles are red.
The rest of the marbles are yellow.

Antonia takes at random a marble from the box and does not replace it.
Sergio then takes at random a marble from the box.

The probability that Antonia and Sergio both take a yellow marble is 0.7

Work out how many marbles were originally in the box.
Show your working clearly.

.....

(Total for Question 24 is 5 marks)