

GCSE MATHS • GRADE 7

MATHS



MODEL ANSWERS

CONDITIONAL PROBABILITY

SCORE

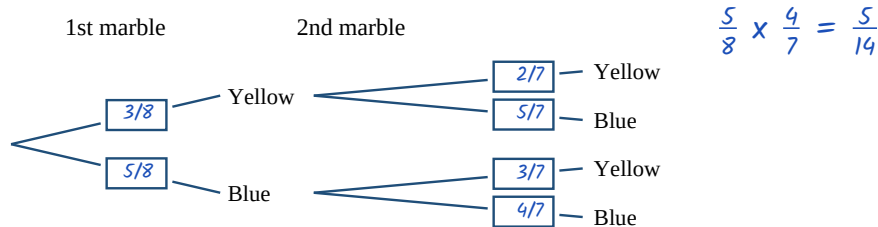
/92

PERCENTAGE

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STEMUP

- 1 A bag contains 3 yellow marbles and 5 blue marbles.
Hannah takes a marble at random from the bag and does not put it back.
Hannah then takes a second marble at random.
(a) Complete the probability tree diagram.
(b) Work out the probability that both marbles are blue.

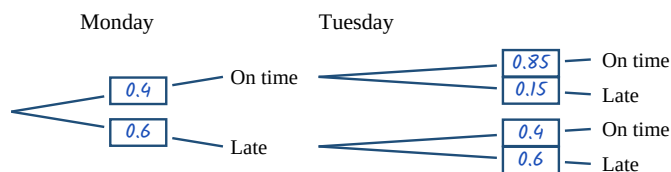


$$\frac{5}{8} \times \frac{4}{7} = \frac{5}{14}$$

(b) $\frac{5}{14}$

1 / 1

- 2 A train is either on time or late each morning. On Monday the probability that the train is on time is 0.4.
If the train is on time on Monday, the probability that it is on time on Tuesday is 0.85. If the train is late on Monday, the probability it is on time on Tuesday is 0.4.
(a) Complete the probability tree diagram.
(b) Work out the probability that the train is on time on Tuesday.



$$1 - 0.4 = 0.6, 1 - 0.85 = 0.15, 1 - 0.4 = 0.6$$

$$0.4 \times 0.85 + 0.6 \times 0.4 = 0.58$$

(b) 0.58

1 / 1

- 3 The table shows information about 102 people.
One person is chosen at random.
Given that the person chose hockey, work out the probability that the person is a boy.

	Football	Netball	Hockey	Total
boys	8	30	18	56
girls	13	23	10	46
Total	21	53	28	102

28 people chose hockey

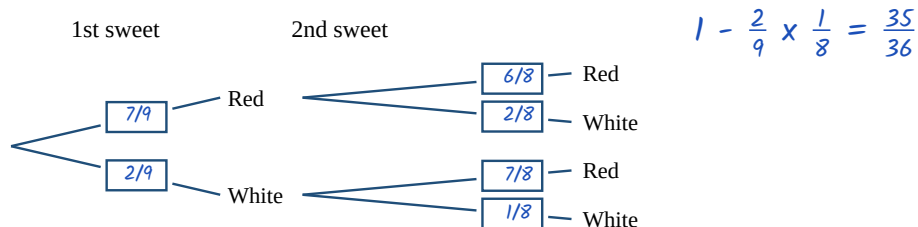
18 of them are a boy

$$\frac{18}{28} = \frac{9}{14}$$

$\frac{9}{14}$

1 / 1

- 4 A bag contains 7 red sweets and 2 white sweets.
Michael takes a sweet at random from the bag and does not put it back.
Michael then takes a second sweet at random.
(a) Complete the probability tree diagram.
(b) Work out the probability that at least one of the sweets is red.

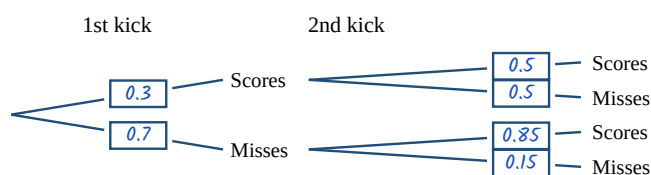


$$1 - \frac{2}{9} \times \frac{1}{8} = \frac{35}{36}$$

(b) $\frac{35}{36}$

$\frac{1}{1}$

- 5 Perrie takes two penalty kicks. The probability that Perrie scores the 1st kick is 0.3.
If Perrie scores the 1st kick, the probability of scoring the 2nd is 0.5. If Perrie misses the 1st kick, the probability of scoring the 2nd is 0.85.
(a) Complete the probability tree diagram.
(b) Work out the probability that Perrie scores the 2nd kick.



$$1 - 0.3 = 0.7, 1 - 0.5 = 0.5, \\ 1 - 0.85 = 0.15 \\ 0.3 \times 0.5 + 0.7 \times 0.85 = 0.745$$

(b) 0.745

$\frac{1}{1}$

- 6 The table shows information about 82 people.
One person is chosen at random.
Given that the person is in Year 10, work out the probability that the person chose coffee.

	Tea	Coffee	Juice	Total
Year 10	13	5	22	40
Year 11	18	8	16	42
Total	31	13	38	82

40 people are in Year 10

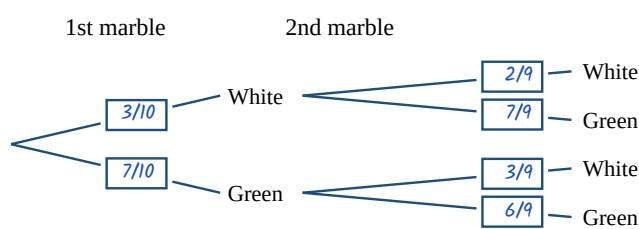
5 of them chose coffee

$$\frac{5}{40} = \frac{1}{8}$$

$\frac{1}{8}$

$\frac{1}{1}$

- 7 A bag contains 3 white marbles and 7 green marbles.
Zara takes a marble at random from the bag and does not put it back.
Zara then takes a second marble at random.
(a) Complete the probability tree diagram.
(b) Work out the probability that the second marble is white.

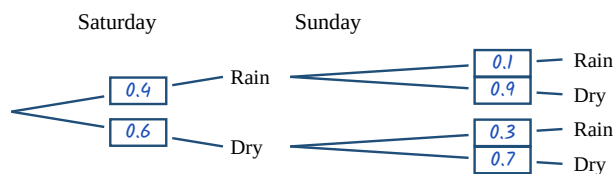


$$\frac{3}{10} \times \frac{2}{9} + \frac{7}{10} \times \frac{3}{9} = \frac{3}{10}$$

(b) $\frac{3}{10}$

1 / 1

- 8 The weather at the weekend is either rain or dry. The probability that it rains on Saturday is 0.4.
If it rains on Saturday, the probability that it rains on Sunday is 0.1. If it is dry on Saturday, the probability that it rains on Sunday is 0.3.
(a) Complete the probability tree diagram.
(b) Work out the probability that it rains on Sunday.



$$1 - 0.4 = 0.6, 1 - 0.1 = 0.9, 1 - 0.3 = 0.7$$

$$0.4 \times 0.1 + 0.6 \times 0.3 = 0.22$$

(b) 0.22

1 / 1

- 9 The table shows information about 96 people.
One person is chosen at random.
Given that the person chose hockey, work out the probability that the person is in Class B.

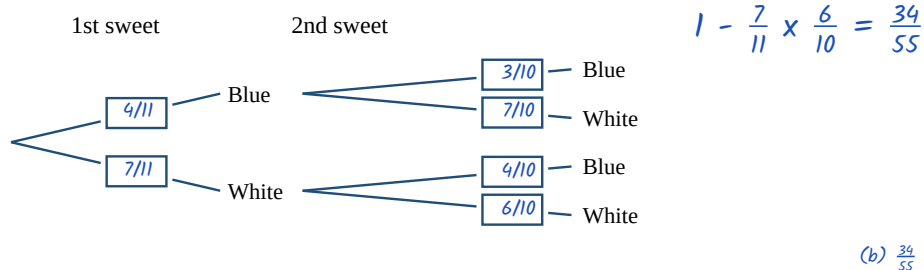
	Football	Netball	Hockey	Total
Class A	17	28	7	52
Class B	16	8	20	44
Total	33	36	27	96

27 people chose hockey
20 of them are in Class B
 $\frac{20}{27} = \frac{20}{27}$

$\frac{20}{27}$

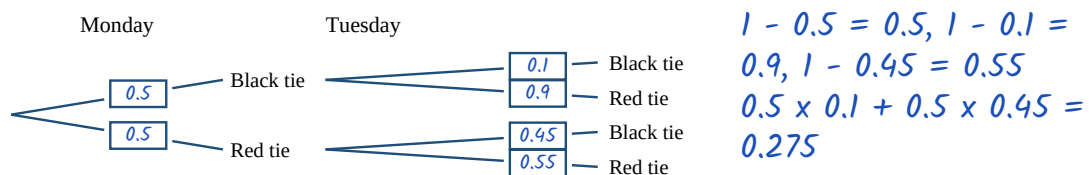
1 / 1

- 10** A bag contains 4 blue sweets and 7 white sweets.
 Maya takes a sweet at random from the bag and does not put it back.
 Maya then takes a second sweet at random.
 (a) Complete the probability tree diagram.
 (b) Work out the probability that at least one of the sweets is blue.



1 / 1

- 11** Each day Mason wears either a black tie or a red tie to work. On Monday the probability that Mason wears a black tie is 0.5.
 If Mason wears a black tie on Monday, the probability of a black tie on Tuesday is 0.1. If Mason wears a red tie on Monday, the probability of a black tie on Tuesday is 0.45.
 (a) Complete the probability tree diagram.
 (b) Work out the probability that Mason wears a black tie on Tuesday.



1 / 1

- 12** The table shows information about 115 people.
 One person is chosen at random.
 Given that the person chose netball, work out the probability that the person is in Class B.

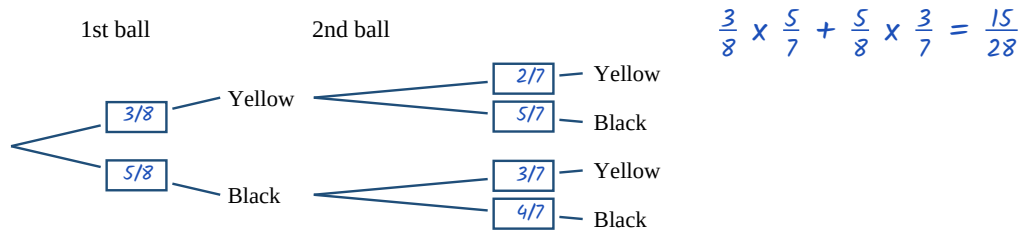
	Football	Netball	Hockey	Total
Class A	27	23	20	70
Class B	25	8	12	45
Total	52	31	32	115

31 people chose netball
8 of them are in Class B
 $\frac{8}{31} = \frac{8}{31}$

$\frac{8}{31}$

1 / 1

- 13** A bag contains 3 yellow balls and 5 black balls.
 Ethan takes a ball at random from the bag and does not put it back.
 Ethan then takes a second ball at random.
 (a) Complete the probability tree diagram.
 (b) Work out the probability that the two balls are different colours.



$$\frac{3}{8} \times \frac{5}{7} + \frac{5}{8} \times \frac{3}{7} = \frac{15}{28}$$

(b) $\frac{15}{28}$

$\frac{1}{1}$

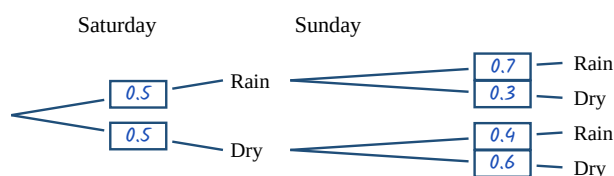
- 14** There are 7 sweets in a bag.
 4 of the sweets are pink.
 3 of the sweets are white.
 Amelia takes two sweets at random from the bag without replacement.
 Work out the probability that both sweets are pink.

$$\frac{4}{7} \times \frac{3}{6} = \frac{2}{7}$$

$\frac{2}{7}$

$\frac{1}{1}$

- 15** The weather at the weekend is either rain or dry. The probability that it rains on Saturday is 0.5.
 If it rains on Saturday, the probability that it rains on Sunday is 0.7. If it is dry on Saturday, the probability that it rains on Sunday is 0.4.
 (a) Complete the probability tree diagram.
 (b) Work out the probability that the weather is different on Saturday and Sunday.



$$1 - 0.5 = 0.5, 1 - 0.7 = 0.3, 1 - 0.4 = 0.6$$

$$0.5 \times 0.3 + 0.5 \times 0.4 = 0.35$$

(b) 0.35

$\frac{1}{1}$

- 16** The letters of the word COFFEE are written on 6 cards, one letter on each card.
The cards are put in a bag.
Tia takes two cards at random without replacement.
Work out the probability that the two letters are the same.

6 cards

4 ways out of $6 \times 5 = 30$

$$\frac{2}{15}$$

1 / 1

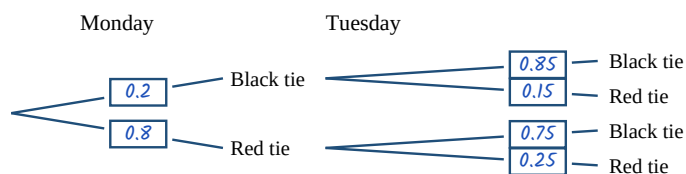
- 17** There are 6 sweets in a bag.
4 of the sweets are blue.
2 of the sweets are white.
Sofia takes two sweets at random from the bag without replacement.
Work out the probability that one sweet of each colour is taken.

$$\frac{4}{6} \times \frac{2}{5} + \frac{2}{6} \times \frac{4}{5} = \frac{8}{15}$$

$$\frac{8}{15}$$

1 / 1

- 18** Each day Dev wears either a black tie or a red tie to work. On Monday the probability that Dev wears a black tie is 0.2.
If Dev wears a black tie on Monday, the probability of a black tie on Tuesday is 0.85. If Dev wears a red tie on Monday, the probability of a black tie on Tuesday is 0.75.
(a) Complete the probability tree diagram.
(b) Work out the probability that Dev wears a black tie on at least one of the two days.



$$1 - 0.2 = 0.8, 1 - 0.85 = 0.15, 1 - 0.75 = 0.25$$

$$1 - 0.8 \times 0.25 = 0.8$$

(b) 0.8

1 / 1

- 19 The letters of the word PROBABILITY are written on 11 cards, one letter on each card.
The cards are put in a bag.
Alice takes two cards at random without replacement.
Work out the probability that both letters are vowels.

11 cards

12 ways out of $11 \times 10 = 110$

$$\frac{6}{55}$$

1 / 1

- 20 There are 4 marbles in a bag.
2 of the marbles are yellow.
2 of the marbles are blue.
Leo takes two marbles at random from the bag without replacement.
Work out the probability that at least one of the marbles is blue.

$$1 - \left(\frac{2}{4} \times \frac{1}{3}\right) = \frac{5}{6}$$

$$\frac{5}{6}$$

1 / 1

- 21 Here are 5 number cards.
Fearne takes a card at random. Fearne does not replace the card.
Fearne then takes another card at random.
(a) Work out the probability that both cards have the same number on them.
(b) Work out the probability that the sum of the two numbers is even.
You must show your working.

1	1	2	2	4
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$$(a) \frac{2}{5} \times \frac{1}{4} + \frac{2}{5} \times \frac{1}{4} = \frac{1}{5}$$

$$(b) 8 \text{ pairs out of } 5 \times 4 = 20: \frac{2}{5}$$

$$(a) \frac{1}{5} \quad (b) \frac{2}{5}$$

2 / 2

- 22 The letters of the word LETTERS are written on 7 cards, one letter on each card.
The cards are put in a bag.
Leo takes two cards at random without replacement.
Work out the probability that the two letters are different.
You must show your working.

7 cards

38 ways out of $7 \times 6 = 42$

$$\frac{19}{21}$$

2 / 2

- 23 There are 12 marbles in a bag.
4 of the marbles are black.
3 of the marbles are white.
5 of the marbles are yellow.
Hannah takes two marbles at random from the bag without replacement.
Work out the probability that the two marbles are the same colour.
You must show your working.

$$\frac{4}{12} \times \frac{3}{11} + \frac{3}{12} \times \frac{2}{11} + \frac{5}{12} \times \frac{4}{11} = \frac{19}{66}$$

$$\frac{19}{66}$$

2 / 2

- 24 Here are 6 number cards.
Oscar takes a card at random. Oscar does not replace the card.
Oscar then takes another card at random.
(a) Work out the probability that the number on the second card is less than the number on the first card.
(b) Work out the probability that the number on the second card is greater than the number on the first card.
You must show your working.

1	2	2	3	4	6
---	---	---	---	---	---

(a) 14 pairs out of $6 \times 5 = 30$: $\frac{7}{15} = \frac{7}{15}$

(b) 14 pairs out of $6 \times 5 = 30$: $\frac{7}{15}$

(a) $\frac{7}{15}$ (b) $\frac{7}{15}$

2 / 2

- 25 40 people were asked if they like football, rugby and hockey.

Every person liked at least one of the sports.

8 of the people like all three sports.

26 of the people like hockey.

22 of the people like football.

11 of the people like football and rugby.

7 of the people like football and hockey but not rugby.

5 of the people like rugby and hockey but not football.

Two of the 40 people are chosen at random.

Work out the probability that they both like rugby.

You must show your working.

$$\frac{23}{40} \times \frac{22}{39} = \frac{253}{780}$$

$$\frac{253}{780}$$

2 / 2

- 26 There are 12 balls in a bag.

3 of the balls are blue.

6 of the balls are white.

3 of the balls are pink.

Greg takes two balls at random from the bag without replacement.

Work out the probability that the two balls are the same colour.

You must show your working.

$$\frac{3}{12} \times \frac{2}{11} + \frac{6}{12} \times \frac{5}{11} + \frac{3}{12} \times \frac{2}{11} = \frac{7}{22}$$

$$\frac{7}{22}$$

2 / 2

- 27 Here are 5 number cards.

Jack takes a card at random. Jack does not replace the card.

Jack then takes another card at random.

(a) Work out the probability that the sum of the two numbers is odd.

(b) Work out the probability that the number on the second card is less than the number on the first card.

You must show your working.

1	2	3	4	6
---	---	---	---	---

(a) 12 pairs out of $5 \times 4 = 20$: $\frac{3}{5} = \frac{3}{5}$

(b) 10 pairs out of $5 \times 4 = 20$: $\frac{1}{2}$

(a) $\frac{3}{5}$ (b) $\frac{1}{2}$

2 / 2

- 28 45 people were asked if they like football, rugby and hockey.
 Every person liked at least one of the sports.
 11 of the people like all three sports.
 27 of the people like hockey.
 28 of the people like football.
 18 of the people like football and rugby.
 7 of the people like football and hockey but not rugby.
 6 of the people like rugby and hockey but not football.
 Two of the 45 people are chosen at random.
 Work out the probability that they both like hockey.
 You must show your working.

$$\frac{27}{45} \times \frac{26}{44} = \frac{39}{110}$$

$$\frac{39}{110}$$

2 / 2

- 29 There are 8 beads in a bag.
 2 of the beads are green.
 3 of the beads are pink.
 3 of the beads are white.
 Charles takes two beads at random from the bag without replacement.
 Work out the probability that exactly one of the beads is green.
 You must show your working.

$$\frac{2}{8} \times \frac{3}{7} + \frac{3}{8} \times \frac{2}{7} + \frac{2}{8} \times \frac{3}{7} + \frac{3}{8} \times \frac{2}{7} = \frac{3}{7}$$

$$\frac{3}{7}$$

2 / 2

- 30 Here are 8 number cards.
 Ava takes a card at random. Ava does not replace the card.
 Ava then takes another card at random.
 (a) Work out the probability that the sum of the two numbers is even.
 (b) Work out the probability that both cards have the same number on them.
 You must show your working.

1	1	2	3	4	4	5	6
---	---	---	---	---	---	---	---

(a) 24 pairs out of $8 \times 7 = 56$: $\frac{3}{7} = \frac{3}{7}$

(b) $\frac{2}{8} \times \frac{1}{7} + \frac{2}{8} \times \frac{1}{7}$

(a) $\frac{3}{7}$ (b) $\frac{1}{14}$

2 / 2

- 31 A bag contains 5 blue sweets and 3 white sweets.
Albert takes three sweets at random from the bag without replacement.
Work out the probability that at least one of the sweets is blue.
You must show your working.

$$1 - \frac{3}{8} \times \frac{2}{7} \times \frac{1}{6} = \frac{55}{56}$$

$$\frac{55}{56}$$

2 / 2

- 32 There are 13 counters in a bag.
6 of the counters are red.
2 of the counters are blue.
5 of the counters are white.
Chloe takes two counters at random from the bag without replacement.
Work out the probability that at least one of the counters is blue.
You must show your working.

$$1 - \left(\frac{6}{13} \times \frac{5}{12} + \frac{6}{13} \times \frac{5}{12} + \frac{5}{13} \times \frac{6}{12} + \frac{5}{13} \times \frac{4}{12} \right) = \frac{23}{78}$$

$$\frac{23}{78}$$

2 / 2

- 33 Here are 8 number cards.
Fearne takes a card at random. Fearne does not replace the card.
Fearne then takes another card at random.
(a) Work out the probability that the sum of the two numbers is odd.
(b) Work out the probability that the number on the second card is less than the number on the first card.
You must show your working.

1	2	2	3	4	5	6	6
---	---	---	---	---	---	---	---

(a) 30 pairs out of $8 \times 7 = 56$: $\frac{15}{28} = \frac{15}{28}$

(b) 26 pairs out of $8 \times 7 = 56$: $\frac{13}{28}$

(a) $\frac{15}{28}$ (b) $\frac{13}{28}$

2 / 2

- 34 A bag contains 5 red marbles and 5 green marbles.
 Alex takes three marbles at random from the bag without replacement.
 Work out the probability that the third marble is green.
 You must show your working.

the third marble has the same chance as the first: $\frac{5}{10}$

$$\frac{1}{2}$$

2 / 2

- 35 There are 12 balls in a bag.
 3 of the balls are black.
 3 of the balls are white.
 6 of the balls are green.
 Alex takes two balls at random from the bag without replacement.
 Work out the probability that at least one of the balls is white.
 You must show your working.

$$1 - \left(\frac{3}{12} \times \frac{2}{11} + \frac{3}{12} \times \frac{6}{11} + \frac{6}{12} \times \frac{3}{11} + \frac{6}{12} \times \frac{5}{11} \right) = \frac{5}{11}$$

$$\frac{5}{11}$$

2 / 2

- 36 30 people were asked which foods they liked from pizza, pasta and curry.
 4 people like all three foods.
 17 people like pizza.
 7 people like pizza and pasta but not curry.
 7 people like pasta and curry.
 4 of the people do not like any of the foods.
 All 10 people who like curry like at least one other of the foods.
 Two of the 30 people are chosen at random.
 Work out the probability that they both like pizza.
 You must show your working.

*Venn diagram
 17 like pizza
 $\frac{17}{30} \times \frac{16}{29} = \frac{136}{435}$*

$$\frac{136}{435}$$

2 / 2

- 37 A bag contains 4 yellow beads and 6 white beads.
 Leigh-Anne takes three beads at random from the bag without replacement.
 Work out the probability that the third bead is white.
 You must show your working.

the third bead has the same chance as the first: $\frac{6}{10}$

$$\frac{3}{5}$$

2 / 2

- 38 There are n balls in a bag.
 6 of the balls are red and the rest are white.
 Two balls are taken at random without replacement.

The probability that both balls are red is $\frac{3}{11}$.

(a) Show that $n^2 - n - 110 = 0$

(b) Solve $n^2 - n - 110 = 0$ to find the value of n .

$$(a) \frac{6}{n} \times \frac{5}{n-1} = \frac{3}{11}$$

$$\frac{30}{n(n-1)} = \frac{3}{11}$$

$$n(n-1) = 110$$

$$n^2 - n - 110 = 0$$

$$(b) (n-11)(n+10) = 0$$

(a) Shown (b) $n = 11$

2 / 2

- 39 40 people were asked which drinks they liked from tea, coffee and hot chocolate.
 7 people like all three drinks.
 21 people like tea.
 4 people like tea and coffee but not hot chocolate.
 12 people like coffee and hot chocolate.
 6 of the people do not like any of the drinks.
 All 15 people who like hot chocolate like at least one other of the drinks.
 Two of the 40 people are chosen at random.
 Work out the probability that they both like coffee.
 You must show your working.

Venn diagram

24 like coffee

$$\frac{24}{40} \times \frac{23}{39} = \frac{23}{65}$$

$$\frac{23}{65}$$

3 / 3

- 40 A bag contains 6 black beads and 6 blue beads.
 Leo takes three beads at random from the bag without replacement.
 Work out the probability that all three beads are the same colour.
 You must show your working.

$$\frac{6}{12} \times \frac{5}{11} \times \frac{4}{10} + \frac{6}{12} \times \frac{5}{11} \times \frac{4}{10} = \frac{2}{11}$$

$$\frac{2}{11}$$

3 / 3

- 41 There are n marbles in a bag.
 3 of the marbles are red and the rest are blue.
 Two marbles are taken at random without replacement.

The probability that both marbles are red is $\frac{3}{28}$.

(a) Show that $n^2 - n - 56 = 0$

(b) Solve $n^2 - n - 56 = 0$ to find the value of n .

$$(a) \frac{3}{n} \times \frac{2}{n-1} = \frac{3}{28}$$

$$\frac{6}{n(n-1)} = \frac{3}{28}$$

$$n(n-1) = 56$$

$$n^2 - n - 56 = 0$$

$$(b) (n-8)(n+7) = 0$$

(a) Shown (b) $n = 8$

3 / 3

- 42 A bag contains 3 white marbles and 2 green marbles.
 Rosalind takes two marbles at random from the bag without replacement.
 Given that the two marbles are different colours, work out the probability that the second marble is white.
 You must show your working.

$$P(\text{both events}) = \frac{3}{10}$$

$$P(\text{given event}) = \frac{3}{5}$$

$$\frac{3}{10} \div \frac{3}{5} = \frac{1}{2}$$

$$\frac{1}{2}$$

3 / 3

- 43 A bag contains 4 white sweets and 5 red sweets.
Charles takes three sweets at random from the bag without replacement.
Work out the probability that exactly two of the sweets are white.
You must show your working.

$$3 \times \frac{4}{9} \times \frac{3}{8} \times \frac{5}{7} = \frac{5}{14}$$

$$\frac{5}{14}$$

3 / 3

- 44 There are n beads in a bag.
3 of the beads are blue and the rest are yellow.
Two beads are taken at random without replacement.

The probability that both beads are blue is $\frac{1}{5}$.

(a) Show that $n^2 - n - 30 = 0$

(b) Solve $n^2 - n - 30 = 0$ to find the value of n .

$$(a) \frac{3}{n} \times \frac{2}{n-1} = \frac{1}{5}$$

$$\frac{6}{n(n-1)} = \frac{1}{5}$$

$$n(n-1) = 30$$

$$n^2 - n - 30 = 0$$

$$(b) (n-6)(n+5) = 0$$

(a) Shown (b) $n = 6$

3 / 3

- 45 A bag contains 7 white sweets and 4 blue sweets.
Greg takes two sweets at random from the bag without replacement.
Given that the two sweets are different colours, work out the probability that the second sweet is white.
You must show your working.

$$P(\text{both events}) = \frac{14}{55}$$

$$P(\text{given event}) = \frac{28}{55}$$

$$\frac{14}{55} \div \frac{28}{55} = \frac{1}{2}$$

$$\frac{1}{2}$$

3 / 3

- 46 There are n counters in a bag.
4 of the counters are white and the rest are red.
Two counters are taken at random without replacement.

The probability that both counters are white is $\frac{1}{11}$.

- (a) Show that $n^2 - n - 132 = 0$
(b) Solve $n^2 - n - 132 = 0$ to find the value of n .

$$(a) \frac{4}{n} \times \frac{3}{n-1} = \frac{1}{11}$$

$$\frac{12}{n(n-1)} = \frac{1}{11}$$

$$n(n-1) = 132$$

$$n^2 - n - 132 = 0$$

$$(b) (n-12)(n+11) = 0$$

(a) Shown (b) $n = 12$

3 / 3

- 47 There are n balls in a bag.
7 of the balls are red and the rest are white.
Two balls are taken at random without replacement.

The probability that both balls are red is $\frac{7}{26}$.

- (a) Show that $n^2 - n - 156 = 0$
(b) Solve $n^2 - n - 156 = 0$ to find the value of n .

$$(a) \frac{7}{n} \times \frac{6}{n-1} = \frac{7}{26}$$

$$\frac{42}{n(n-1)} = \frac{7}{26}$$

$$n(n-1) = 156$$

$$n^2 - n - 156 = 0$$

$$(b) (n-13)(n+12) = 0$$

(a) Shown (b) $n = 13$

3 / 3

- 48 A bag contains 6 black balls and 3 green balls.
Noah takes two balls at random from the bag without replacement.
Given that the two balls are different colours, work out the probability that the second ball is black.
You must show your working.

$$P(\text{both events}) = \frac{1}{4}$$

$$P(\text{given event}) = \frac{1}{2}$$

$$\frac{1}{4} \div \frac{1}{2} = \frac{1}{2}$$

$\frac{1}{2}$

3 / 3

- 49 A bag contains 4 blue sweets and 3 green sweets.
Jesy takes two sweets at random from the bag without replacement.
Given that exactly one of the sweets is blue, work out the probability that the first sweet is blue.

You must show your working.

$$P(\text{both events}) = \frac{2}{7}$$

$$P(\text{given event}) = \frac{4}{7}$$

$$\frac{2}{7} \div \frac{4}{7} = \frac{1}{2}$$

$$\frac{1}{2}$$

$$\boxed{3} / 3$$

- 50 A bag contains 3 black beads and 6 red beads.
Alex takes two beads at random from the bag without replacement.
Given that the two beads are different colours, work out the probability that the second bead is black.

You must show your working.

$$P(\text{both events}) = \frac{1}{4}$$

$$P(\text{given event}) = \frac{1}{2}$$

$$\frac{1}{4} \div \frac{1}{2} = \frac{1}{2}$$

$$\frac{1}{2}$$

$$\boxed{3} / 3$$