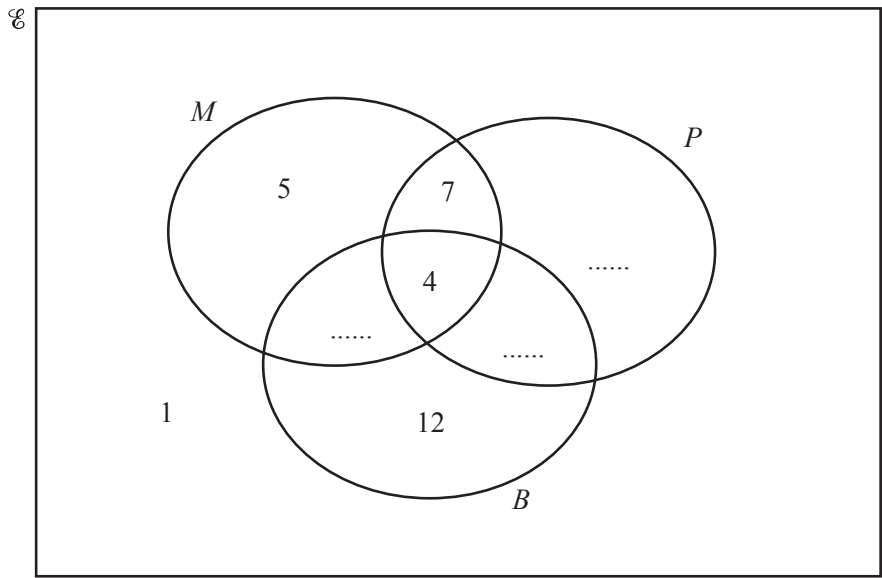


1. Question part 1/2 | 0580 Feb-March 2016 P4 V2 Q3

3 (a) Davinder asked some people if they ate mangoes, pineapples or bananas last week.

- $M = \{ \text{people who ate mangoes} \}$
- $P = \{ \text{people who ate pineapples} \}$
- $B = \{ \text{people who ate bananas} \}$

The Venn diagram shows some of the information.



- 19 people said they ate mangoes.
- 6 people said they ate **only** pineapples.
- 18 people said they ate **exactly two** of the three types of fruit.

(i) Write the three missing values in the Venn diagram. [3]

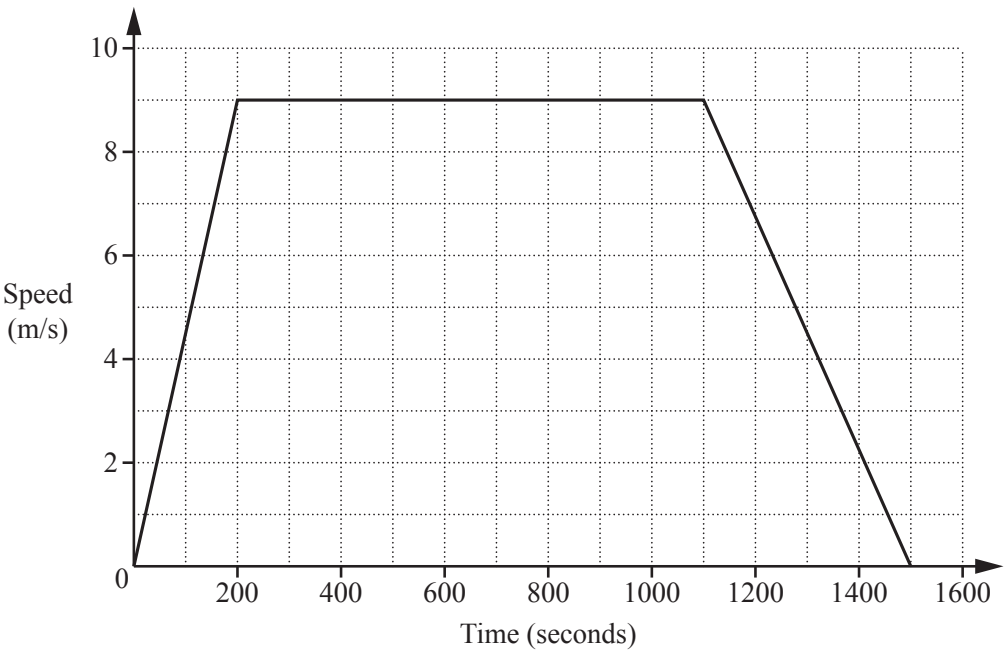
(ii) Find the total number of people Davinder asked.
..... [1]

(iii) Find $n(M \cap P)$.
..... [1]

(iv) One person is chosen at random from the people who ate mangoes.
Write down the probability that this person also ate bananas.
..... [2]

1. Question part 2/2 | 0580 Feb-March 2016 P4 V2 Q3

(b) Davinder draws a speed-time graph for his bus journey to the market.



Find

(i) the acceleration of the bus during the first 200 seconds,

..... m/s² [1]

(ii) the total distance travelled by the bus,

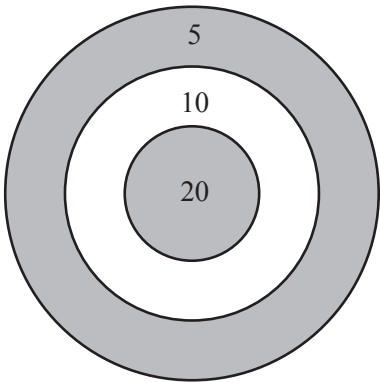
..... m [3]

(iii) the average speed of the bus for the whole journey.

..... m/s [1]

2. Question part 1/2 | 0580 May-June 2016 P4 V2 Q5

- 5 Kiah plays a game.
The game involves throwing a coin onto a circular board.
Points are scored for where the coin lands on the board.



If the coin lands on part of a line or misses the board then 0 points are scored.
The table shows the probabilities of Kiah scoring points on the board with one throw.

Points scored	20	10	5	0
Probability	x	0.2	0.3	0.45

- (a) Find the value of x .

$x =$ [2]

- (b) Kiah throws a coin fifty times.

Work out the expected number of times she scores 5 points.

..... [1]

- (c) Kiah throws a coin two times.

Calculate the probability that

- (i) she scores either 5 or 0 with her first throw,

..... [2]

- (ii) she scores 0 with her first throw and 5 with her second throw,

..... [2]

2. Question part 2/2 | 0580 May-June 2016 P4 V2 Q5

(iii) she scores a total of 15 points with her two throws.

..... [3]

(d) Kiah throws a coin three times.

Calculate the probability that she scores a total of 10 points with her three throws.

..... [5]

3. Question part 1/2 | 0580 May-June 2016 P4 V3 Q4

4 Coins are put into a machine to pay for parking cars.
The probability that the machine rejects a coin is 0.05 .

(a) Adhira puts 2 coins into the machine.

(i) Calculate the probability that the machine rejects **both** coins.

..... [2]

(ii) Calculate the probability that the machine accepts at **least one** coin.

..... [1]

(b) Raj puts 4 coins into the machine.

Calculate the probability that the machine rejects **exactly one** coin.

..... [3]

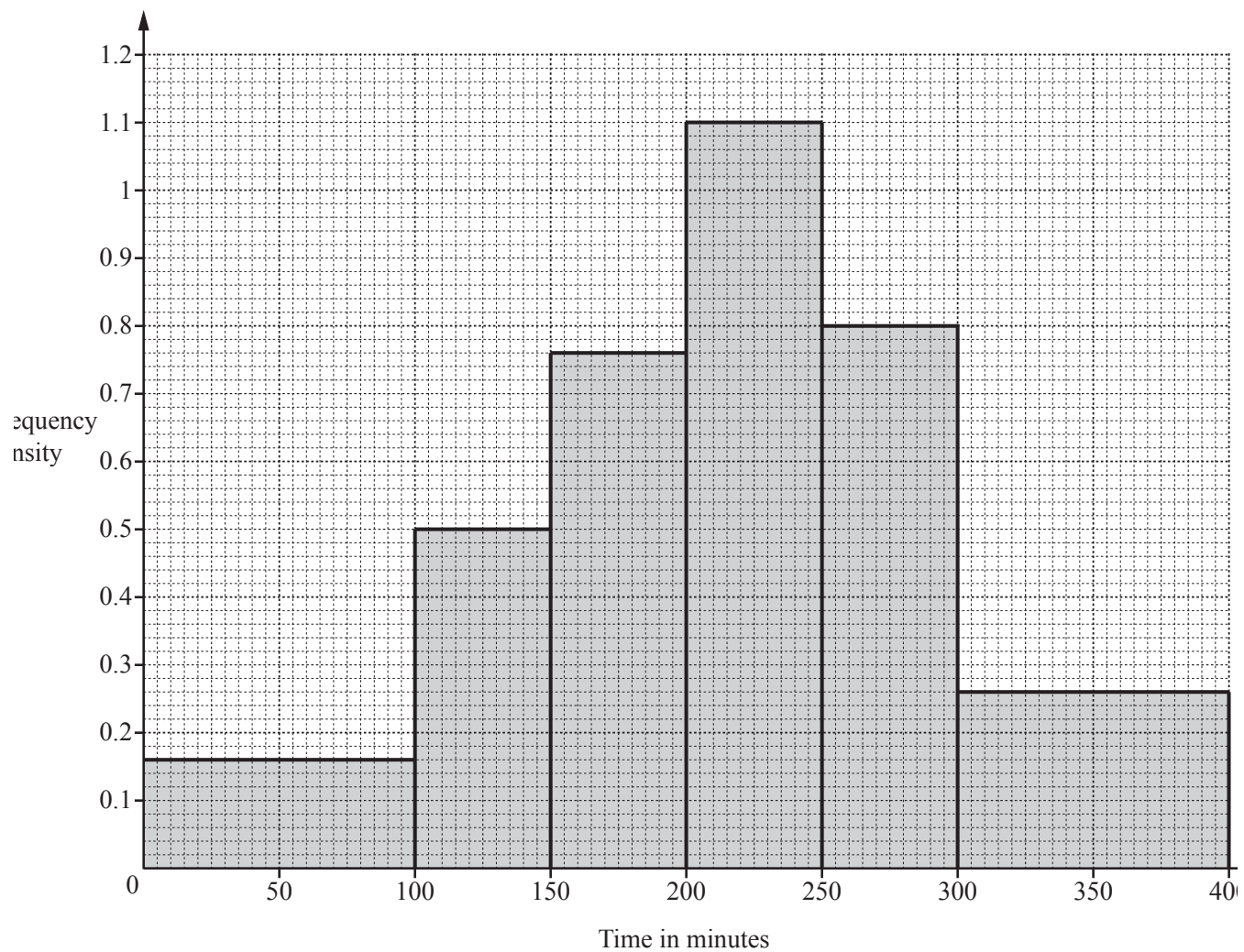
(c) The table shows the amount of money, \$*a*, received for parking each day for 200 days.

Amount (\$ <i>a</i>)	$200 < a \leq 250$	$250 < a \leq 300$	$300 < a \leq 350$	$350 < a \leq 400$	$400 < a \leq 450$	$450 < a \leq 500$
Frequency	13	19	27	56	62	23

Calculate an estimate of the mean amount of money received each day.

\$..... [4]

(d) The histogram shows the length of time that 200 cars were parked.



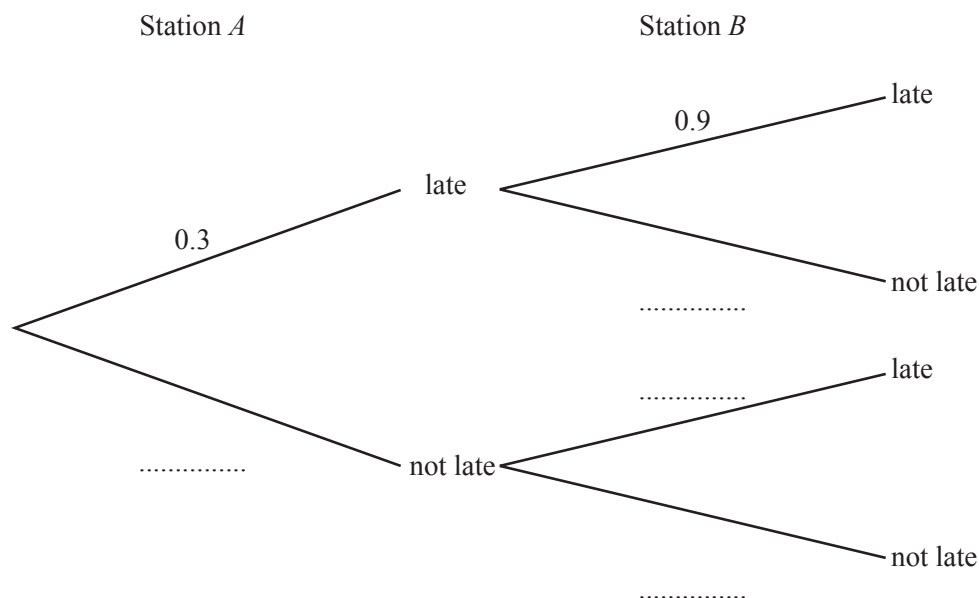
(i) Calculate the number of cars that were parked for 100 minutes or less.

..... [1]

(ii) Calculate the percentage of cars that were parked for more than 250 minutes.

.....% [2]

- (a) Complete the tree diagram.



- [2]

..... [3]

- Find the number of journeys that the train is expected to be late at one or both of the stations.

..... [1]

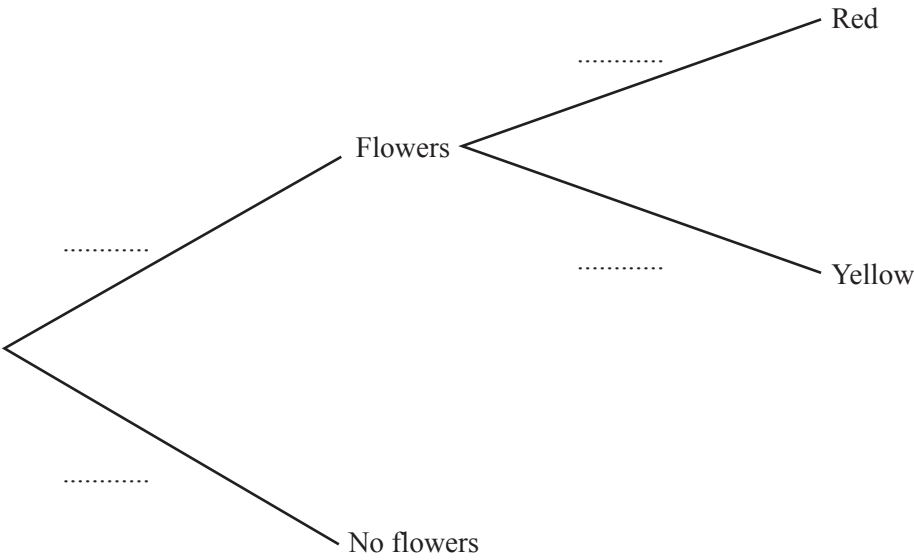
- Describe briefly what this probability shows.

 [1]

5. Question part 1/2 | 0580 Oct-Nov 2016 P4 V2 Q5

- 5 The probability that a plant will produce flowers is $\frac{7}{8}$.
The flowers are either red or yellow.
If the plant produces flowers, the probability that the flowers are red is $\frac{3}{4}$.

(a) (i) Complete the tree diagram by writing a probability beside each branch.



[2]

- (ii) Calculate the probability that a plant, chosen at random, will produce red flowers.

..... [2]

(iii) Two plants are chosen at random.

Calculate the probability that both will produce red flowers.

..... [2]

(b) Alphonse buys 200 of these plants.

Calculate the number of plants that are expected to produce flowers.

..... [2]

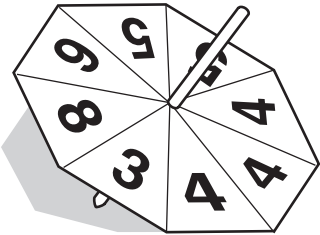
(c) Gabriel has 1575 plants with red flowers.

Estimate the total number of plants that Gabriel has.

..... [2]

6. Question part 1/2 | 0580 Oct-Nov 2016 P4 V3 Q5

- 5
- Sandra has a fair eight-sided spinner.
The numbers on the spinner are 3, 4, 4, 4, 5, 5, 6 and 8.
Sandra spins the spinner twice and records each number it lands on.



Find the probability that

- (a)
- both numbers are 8,

..... [2]

- (b)
- the two numbers are not both 8,

..... [1]

- (c)
- one number is odd and one number is even,

..... [2]

6. Question part 2/2 | 0580 Oct-Nov 2016 P4 V3 Q5

(d) the total of the two numbers is at least 13,

..... [3]

(e) the second number is bigger than the first number.

..... [3]

7. Question | 0580 Feb-March 2017 P4 V2 Q4

- 4 Ravi spins a biased 5-sided spinner, numbered 1 to 5.
The probability of each number is shown in the table.

Number	1	2	3	4	5
Probability	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{1}{3}$	x	x

- (a) Find the value of x .

$x =$ [3]

- (b) Ravi spins the spinner once.

Find the probability that the number is 2 or 3.

..... [2]

- (c) Ravi spins the spinner twice.

Find the probability that

- (i) the number is 2 both times,

..... [2]

- (ii) the sum of the numbers is 3.

..... [3]

- (d) Ravi spins the spinner 72 times.

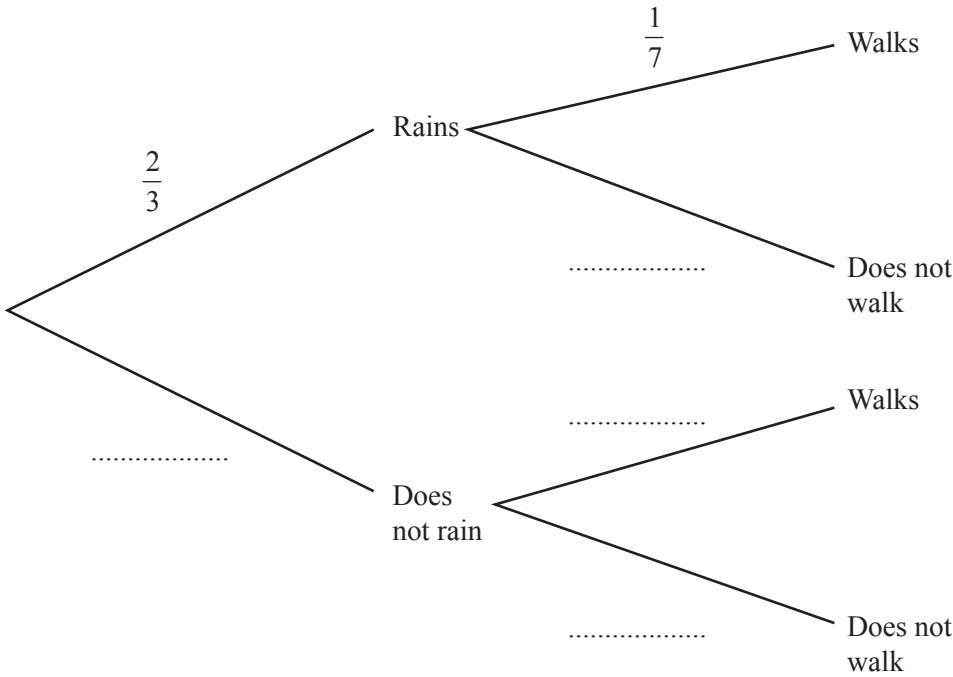
Calculate how many times he expects the number 1.

..... [1]

8. Question part 1/2 | 0580 May-June 2017 P4 V2 Q6

- 6
- Each morning the probability that it rains is $\frac{2}{3}$.
- If it rains, the probability that Asha walks to school is $\frac{1}{7}$.
- If it does not rain, the probability that Asha walks to school is $\frac{4}{7}$.

(a) Complete the tree diagram.



[2]

(b) Find the probability that it rains and Asha walks to school.

..... [2]

(c) (i) Find the probability that Asha does not walk to school.

..... [3]

0580 Mathematics Paper 4 - Probability

Topical questions | 51 questions

8. Question part 2/2 | 0580 May-June 2017 P4 V2 Q6

(ii) Find the expected number of days Asha does not walk to school in a term of 70 days.

..... [2]

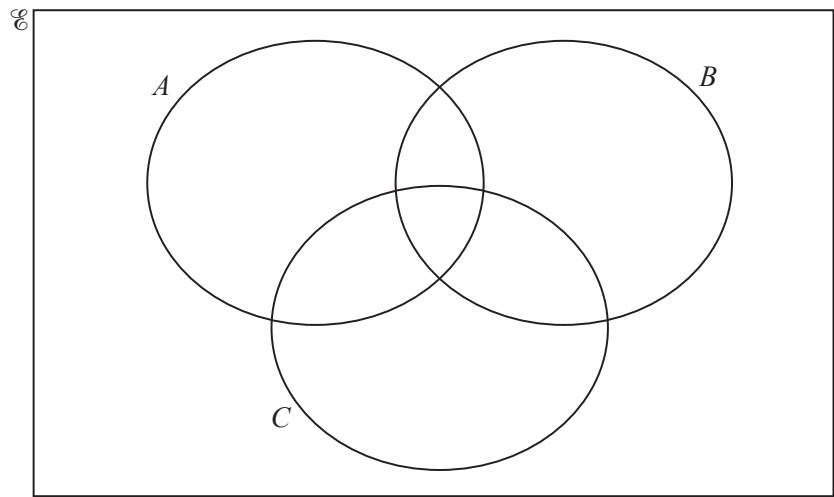
(d) Find the probability that it rains on exactly one morning in a school week of 5 days.

..... [2]

9. Question | 0580 May-June 2017 P4 V3 Q10

- 10
- $\mathcal{U} = \{21, 22, 23, 24, 25, 26, 27, 28, 29, 30\}$
 $A = \{x : x \text{ is a multiple of } 3\}$
 $B = \{x : x \text{ is prime}\}$
 $C = \{x : x \leq 25\}$

(a) Complete the Venn diagram.



[4]

(b) Use set notation to complete the statements.

(i)

26 B

[1]

(ii)

$A \cap B =$

[1]

(c) List the elements of $B \cup (C \cap A)$.

..... [2]

(d) Find

(i)

$n(C),$

..... [1]

(ii)

$n(B' \cup (B \cap C)).$

..... [1]

(e) $(A \cap C)$ is a subset of $(A \cup C)$.

Complete this statement using set notation.

$(A \cap C)$ $(A \cup C)$ [1]

10. Question part 1/2 | 0580 Oct-Nov 2017 P4 V1 Q9

- 9 (a) A bag contains red beads and green beads.
There are 80 beads altogether.
The probability that a bead chosen at random is green is 0.35 .

(i) Find the number of red beads in the bag.

..... [2]

- (ii) Marcos chooses a bead at random and replaces it in the bag.
He does this 240 times.

Find the number of times he would expect to choose a green bead.

..... [1]

- (b) A different bag contains 2 blue marbles, 3 yellow marbles and 4 white marbles.
Huma chooses a marble at random, notes the colour, then replaces it in the bag.
She does this three times.

Find the probability that

(i) all three marbles are yellow,

..... [2]

- (ii) all three marbles are different colours.

..... [3]

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10. Question part 2/2 | 0580 Oct-Nov 2017 P4 V1 Q9

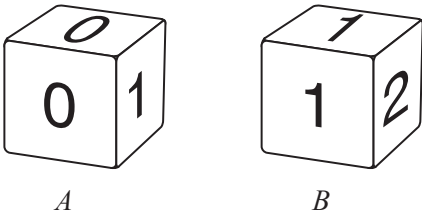
- (c) Another bag contains 2 green counters and 3 pink counters.
Teresa chooses three counters at random **without** replacement.

Find the probability that she chooses more pink counters than green counters.

..... [4]

11. Question part 1/2 | 0580 Oct-Nov 2017 P4 V2 Q7

7



The diagram shows two fair dice.
The numbers on dice *A* are 0, 0, 1, 1, 1, 3.
The numbers on dice *B* are 1, 1, 2, 2, 2, 3.
When a dice is rolled, the score is the number on the top face.

(a) Dice *A* is rolled once.

Find the probability that the score is not 3.

..... [1]

(b) Dice *A* is rolled twice.

Find the probability that the score is 0 both times.

..... [2]

(c) Dice *A* is rolled 60 times.

Calculate an estimate of the number of times the score is 0.

..... [1]

11. Question part 2/2 | 0580 Oct-Nov 2017 P4 V2 Q7

(d) Dice A and dice B are each rolled once.
The product of the scores is recorded.

(i) Complete the possibility diagram.

Dice B	3	0	0				
	2	0	0				
	2	0	0				
	2	0	0				
	1	0	0				
	1	0	0	1	1	1	3
		0	0	1	1	1	3
		Dice A					

[2]

(ii) Find the probability that the product of the scores is

(a) 2,

..... [1]

(b) greater than 3.

..... [1]

(e) Eva keeps rolling dice B until 1 is scored.

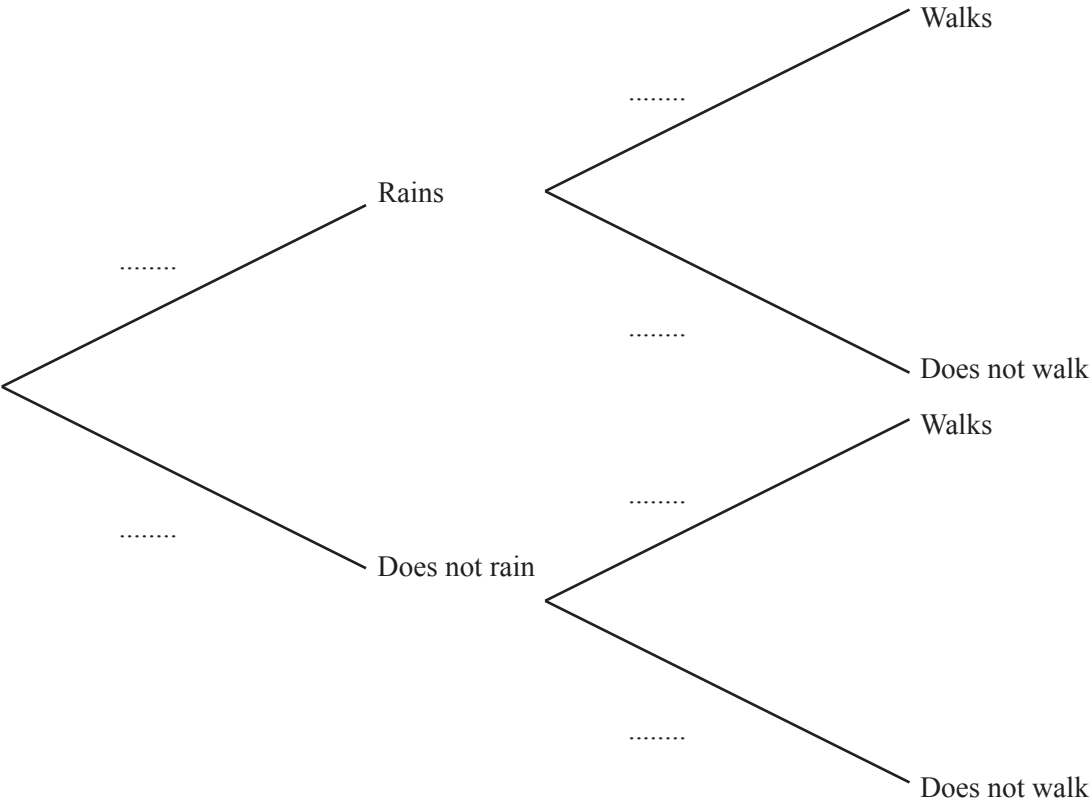
Find the probability that this happens on the 5th roll.

..... [2]

12. Question | 0580 May-June 2018 P4 V1 Q9

- 9 The probability that it will rain tomorrow is $\frac{5}{8}$.
- If it rains, the probability that Rafael walks to school is $\frac{1}{6}$.
- If it does not rain, the probability that Rafael walks to school is $\frac{7}{10}$.

(a) Complete the tree diagram.



[3]

(b) Calculate the probability that it will rain tomorrow and Rafael walks to school.

..... [2]

(c) Calculate the probability that Rafael does not walk to school.

..... [3]

13. Question | 0580 May-June 2018 P4 V1 Q10

- 10 (a) In 2017, the membership fee for a sports club was \$79.50 .
This was an increase of 6% on the fee in 2016.

Calculate the fee in 2016.

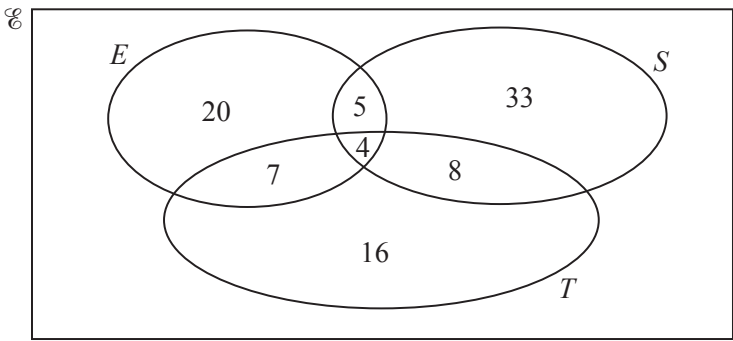
\$ [3]

- (b) On one day, the number of members using the exercise machines was 40, correct to the nearest 10.
Each member used a machine for 30 minutes, correct to the nearest 5 minutes.

Calculate the lower bound for the number of minutes the exercise machines were used on this day.

..... min [2]

- (c) On another day, the number of members using the exercise machines (E), the swimming pool (S) and the tennis courts (T) is shown on the Venn diagram.



- (i) Find the number of members using only the tennis courts.

..... [1]

- (ii) Find the number of members using the swimming pool.

..... [1]

- (iii) A member using the swimming pool is chosen at random.

Find the probability that this member also uses the tennis courts and the exercise machines.

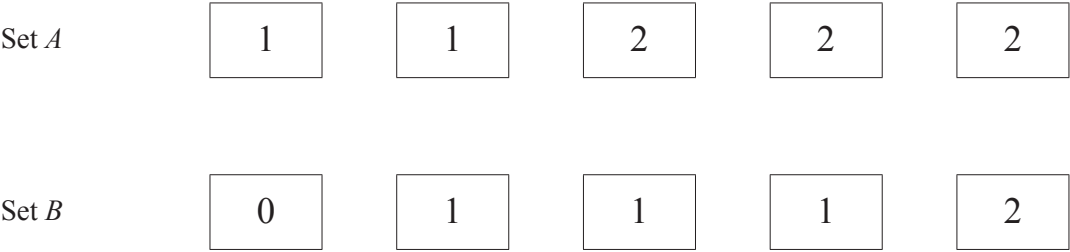
..... [2]

- (iv) Find $n(T \cap (E \cup S))$.

..... [1]

14. Question part 1/2 | 0580 May-June 2018 P4 V3 Q4

4 (a) The diagram shows two sets of cards.



(i) Jojo chooses two cards at random from Set *A* without replacement.

Find the probability that the two cards have the same number.

..... [3]

(ii) Jojo replaces the two cards.
Kylie then chooses one card at random from Set *A* and one card at random from Set *B*.

Find the probability that the two cards have the same number.

..... [3]

(iii) Who is the most likely to choose two cards that have the same number?
Show all your working.

..... [1]

14. Question part 2/2 | 0580 May-June 2018 P4 V3 Q4

(b)

Set C

4

4

5

5

5

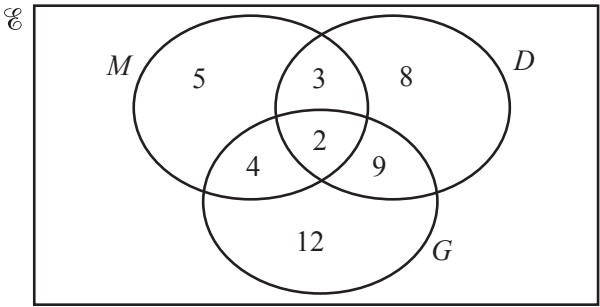
Lena chooses three cards at random from Set C without replacement.

Find the probability that the third card chosen is numbered 4.

..... [3]

15. Question | 0580 Oct-Nov 2018 P4 V1 Q6

6 (a)



The Venn diagram above shows information about the number of students who study Music (M), Drama (D) and Geography (G).

(i) How many students study Music? [1]

(ii) How many students study exactly two subjects? [1]

(iii) Two students are chosen at random from those who study Drama.

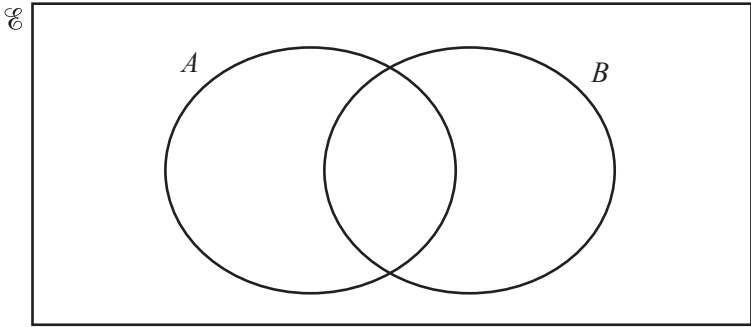
Calculate the probability that they both also study Music.

..... [3]

(iv) In the Venn diagram above, shade $M \cap D'$. [1]

- (b) (i) $\mathcal{E} = \{x : x \text{ is an integer and } 1 \leq x \leq 10\}$
 $A = \{x : x \text{ is even}\}$
 $4 \in A \cap B$
 $n(A \cap B) = 1$
 $(A \cup B)' = \{1, 7, 9\}$

Complete the Venn diagram below using this information.



[4]

(ii) Use your Venn diagram to complete the statement.

$B = \{.....\}$ [1]

12 A box contains 20 packets of potato chips.

- 6 packets contain barbecue flavoured chips.
- 10 packets contain salt flavoured chips.
- 4 packets contain chicken flavoured chips.

(a) Maria takes two packets at random **without replacement**.

(i) Show that the probability that she takes two packets of salt flavoured chips is $\frac{9}{38}$.

[2]

(ii) Find the probability that she takes two packets of different flavoured chips.

..... [4]

(b) Maria takes three packets at random, **without replacement**, from the 20 packets.

Find the probability that she takes **at least two** packets of chicken flavoured chips.

..... [3]

17. Question part 1/2 | 0580 Oct-Nov 2018 P4 V3 Q7

7



Bag A contains 3 black balls and 2 white balls.
Bag B contains 1 black ball and 3 white balls.

- (a) A ball is taken at random from each bag.
- (i) Show that a black ball is more likely to be taken from bag A than from bag B .

[1]

- (ii) Find the probability that the two balls have different colours.

..... [3]

17. Question part 2/2 | 0580 Oct-Nov 2018 P4 V3 Q7

- (b) The balls are returned to their original bags.
Three balls are taken at random from bag A , without replacement.

Find the probability that

- (i) they are all black,

..... [2]

- (ii) they are all white.

..... [1]

- (c) The balls are returned to their original bags.

A ball is taken at random from bag A and its colour is recorded.
This ball is then placed in bag B .
A ball is then taken at random from bag B .

Find the probability that the ball taken from bag B has a different colour to the ball taken from bag A .

..... [3]

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18. Question | 0580 Feb-March 2019 P4 V2 Q3

3 Sushila, Ravi and Talika each have a bag of balls.
Each of the bags contains 10 red balls and 8 blue balls.

(a) Sushila takes one ball at random from her bag.

Find the probability that she takes a red ball.

..... [1]

(b) Ravi takes two balls at random from his bag, without replacement.

Find the probability that one ball is red and one ball is blue.

..... [3]

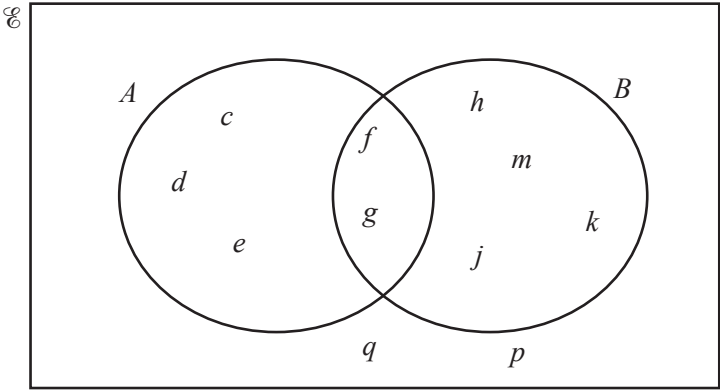
(c) Talika takes three balls at random from her bag, without replacement.

Calculate the probability that the three balls are the same colour.

..... [4]

19. Question part 1/2 | 0580 Feb-March 2019 P4 V2 Q9

9 (a) The Venn diagram shows two sets, A and B .



(i) Use set notation to complete the statements.

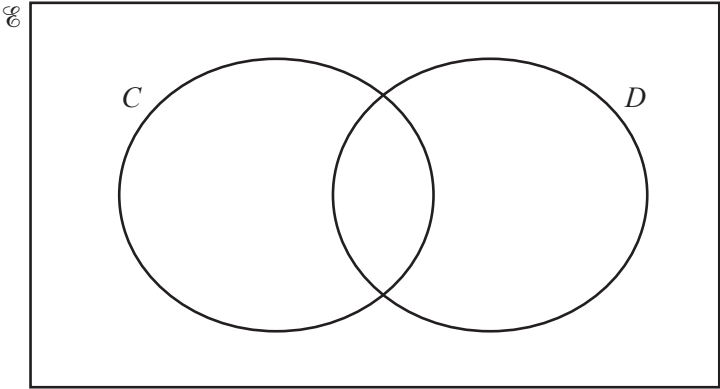
(a) d A [1]

(b) $\{f, g\} =$ [1]

(ii) Complete the statement.

n (.....) = 6 [1]

(b) In the Venn diagram below, shade $C \cap D'$.

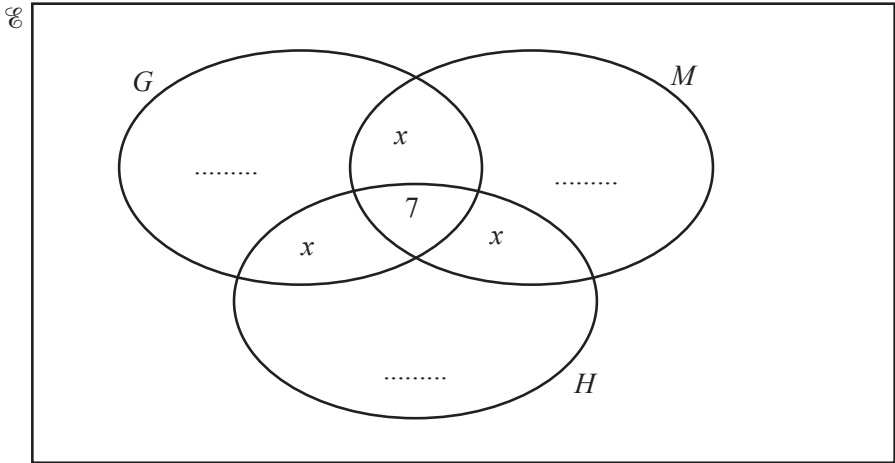


[1]

(c) 50 students study at least one of the subjects geography (G), mathematics (M) and history (H).

- 18 study only mathematics.
- 19 study two or three of these subjects.
- 23 study geography.

The Venn diagram below is to be used to show this information.



(i) Show that $x = 4$.

[2]

(ii) Complete the Venn diagram.

[2]

(iii) Use set notation to complete this statement.

$(G \cup M \cup H)' = \dots\dots\dots$

[1]

(iv) Find $n(G \cap (M \cup H))$.

$\dots\dots\dots$ [1]

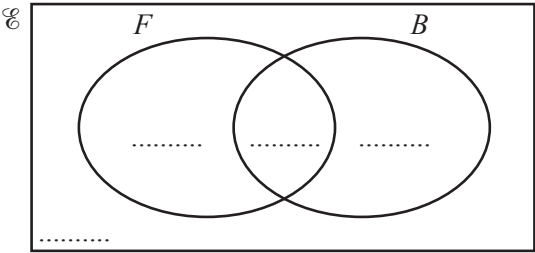
20. Question | 0580 May-June 2019 P4 V1 Q6

- 6
- $\mathcal{C} = \{\text{students in a school}\}$
 $F = \{\text{students who play football}\}$
 $B = \{\text{students who play baseball}\}$

There are 240 students in the school.

- 120 students play football
- 40 students play baseball
- 90 students play football but not baseball.

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



[2]

(b) Find $n(F' \cap B')$.

..... [1]

(c) A student in the school is chosen at random.

Find the probability that this student plays baseball but not football.

..... [1]

(d) Two students who play baseball are chosen at random.

Find the probability that they both also play football.

..... [3]

21. Question | 0580 May-June 2019 P4 V2 Q3

3 The probability that Andrei cycles to school is r .

(a) Write down, in terms of r , the probability that Andrei **does not** cycle to school.

..... [1]

(b) The probability that Benoit **does not** cycle to school is $1.3 - r$.
The probability that both Andrei and Benoit **do not** cycle to school is 0.4 .

(i) Complete the equation in terms of r .

(.....) $\times$ (.....) = 0.4 [1]

(ii) Show that this equation simplifies to $10r^2 - 23r + 9 = 0$.

[3]

(iii) Solve by factorisation $10r^2 - 23r + 9 = 0$.

$r =$ or $r =$ [3]

(iv) Find the probability that Benoit **does not** cycle to school.

..... [1]

22. Question part 1/2 | 0580 May-June 2019 P4 V3 Q8

- 8 (a) Angelo has a bag containing 3 white counters and x black counters.
He takes two counters at random from the bag, without replacement.

(i) Complete the following statement.

The probability that Angelo takes two black counters is

$$\frac{x}{x+3} \times \frac{\dots\dots\dots}{\dots\dots\dots}$$

[2]

- (ii) The probability that Angelo takes two black counters is $\frac{7}{15}$.

(a) Show that $4x^2 - 25x - 21 = 0$.

[4]

(b) Solve by factorisation.

$$4x^2 - 25x - 21 = 0$$

$x = \dots\dots\dots \text{ or } x = \dots\dots\dots$

[3]

(c) Write down the number of black counters in the bag.

$\dots\dots\dots$

[1]

- (b)** Esme has a bag with 5 green counters and 4 red counters.
She takes three counters at random from the bag without replacement.

Work out the probability that the three counters are all the same colour.

..... [4]

8



The diagram shows 5 cards.

(a) Donald chooses a card at random.

(i) Write down the probability that the number of dots on this card is an even number.

..... [1]

(ii) Write down the probability that the number of dots on this card is a prime number.

..... [1]

(b) Donald chooses two of the five cards at random, without replacement.
He works out the total number of dots on these two cards.

(i) Find the probability that the total number of dots is 5.

..... [3]

(ii) Find the probability that the total number of dots is an odd number.

..... [3]

24. Question | 0580 Oct-Nov 2019 P4 V3 Q8

- 8** **(a)** A bag contains 4 red marbles and 2 yellow marbles.
Behnaz picks two marbles at random without replacement.

Find the probability that

- (i)** the marbles are both red,

..... [2]

- (ii)** the marbles are not both red.

..... [1]

- (b)** Another bag contains 5 blue marbles and 2 green marbles.
Bryn picks one marble at random without replacement.
If this marble is not green, he picks another marble at random without replacement.
He continues until he picks a green marble.

Find the probability that he picks a green marble on his first, second or third attempt.

..... [4]

- 6 Suleika has six cards numbered 1 to 6.



- (a) She takes one card at random, records the number and replaces the card.

- (i) Write down the probability that the number is 5 or 6.

..... [1]

- (ii) Suleika does this 300 times.

Find how many times she expects the number 5 or 6.

..... [1]

- (b) Suleika takes two cards at random, without replacement.

- (i) Find the probability that the sum of the numbers on the two cards is 5.

..... [3]

- (ii) Find the probability that at least one of the numbers on the cards is a square number.

..... [3]

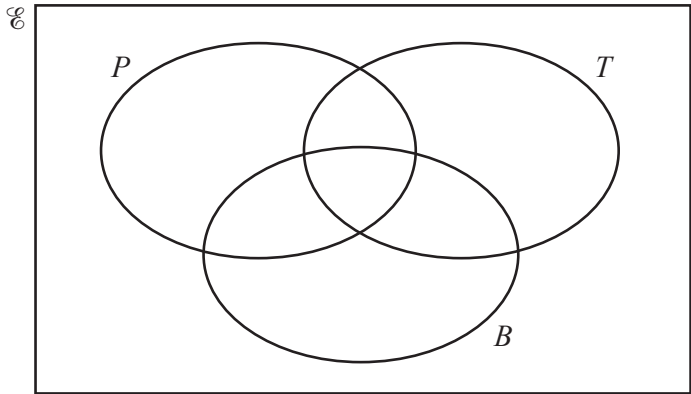
9 This year, 40 students have each travelled by one or more of plane (P), train (T) or boat (B).

- 7 have travelled only by plane.
- 11 have travelled only by train.
- 9 have travelled only by boat.

$n(P \cap T) = 8$

$n(B \cap T) = 3$

$n(B \cap P) = 6$



(a) Complete the Venn diagram. [3]

(b) Find $n((P \cup B)')$.
..... [1]

(c) Use set notation to complete the statement.

$(P \cup T \cup B)' =$ [1]

(d) Two students are chosen at random.

Calculate the probability that they both have travelled only by plane.

..... [2]

(e) Two students are chosen at random from those who have travelled by train.

Calculate the probability that they both have also travelled by plane.

..... [2]

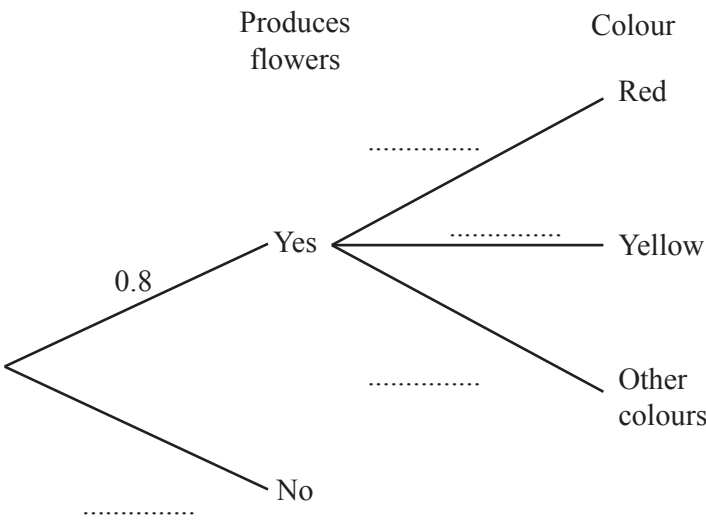
7 Tanya plants some seeds.
The probability that a seed will produce flowers is 0.8 .
When a seed produces flowers, the probability that the flowers are red is 0.6 and the probability that the flowers are yellow is 0.3 .

(a) Tanya has a seed that produces flowers.

Find the probability that the flowers are not red and not yellow.

..... [1]

(b) (i) Complete the tree diagram.



[2]

(ii) Find the probability that a seed chosen at random produces red flowers.

..... [2]

(iii) Tanya chooses a seed at random.

Find the probability that this seed does not produce red flowers and does not produce yellow flowers.

..... [3]

(c) Two of the seeds are chosen at random.

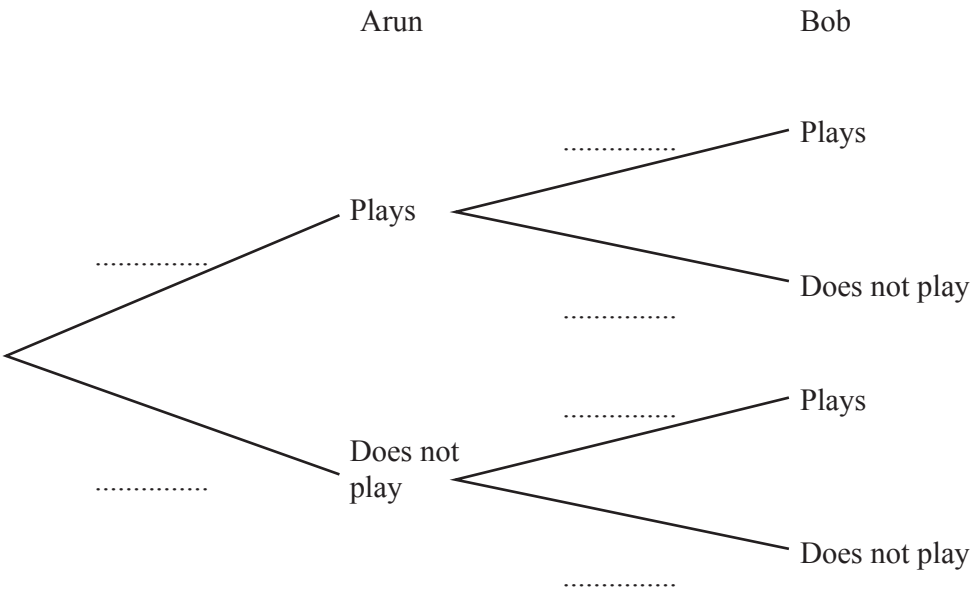
Find the probability that one produces flowers and one does not produce flowers.

..... [3]

28. Question part 1/2 | 0580 May-June 2020 P4 V3 Q7

- 7 On any Saturday, the probability that Arun plays football is $\frac{3}{4}$.
On any Saturday, the probability that Bob plays football is $\frac{2}{5}$.

(a) (i) Complete the tree diagram.



[2]

(ii) Calculate the probability that, one Saturday, Arun and Bob both play football.

..... [2]

(iii) Calculate the probability that, one Saturday, either Arun plays football or Bob plays football, but not both.

..... [3]

(b) Calculate the probability that Bob plays football for 2 of the next 3 Saturdays.

..... [3]

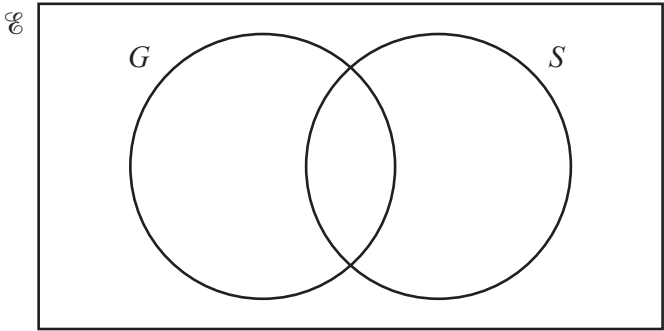
(c) When Arun plays football, the probability that he scores the winning goal is $\frac{1}{7}$.

Calculate the probability that Arun scores the winning goal one Saturday.

..... [2]

9 (a) There are 32 students in a class.

- 5 do not study any languages.
- 15 study German (G).
- 18 study Spanish (S).



(i) Complete the Venn diagram to show this information. [2]

(ii) A student is chosen at random.

Find the probability that the student studies Spanish but not German.

..... [1]

(iii) A student who studies German is chosen at random.

Find the probability that this student also studies Spanish.

..... [1]

- (b) A bag contains 54 red marbles and some blue marbles.
36% of the marbles in the bag are red.

Find the number of blue marbles in the bag.

..... [2]

- (c) Another bag contains 15 red beads and 10 yellow beads.
Ariana picks a bead at random, records its colour and replaces it in the bag.
She then picks another bead at random.

(i) Find the probability that she picks two red beads.

..... [2]

(ii) Find the probability that she does not pick two red beads.

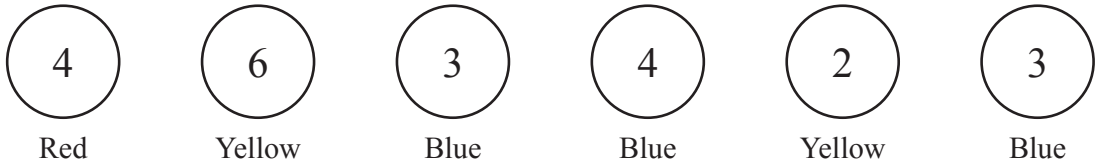
..... [1]

- (d) A box contains 15 red pencils, 8 yellow pencils and 2 green pencils.
Two pencils are picked at random without replacement.

Find the probability that at least one pencil is red.

..... [3]

6



The diagram shows six discs.
Each disc has a colour and a number.

(a) One disc is picked at random.

Write down the probability that

- (i) the disc has the number 4,
..... [1]
- (ii) the disc is red and has the number 3,
..... [1]
- (iii) the disc is blue and has the number 4.
..... [1]

(b) Two of the six discs are picked at random **without** replacement.

Find the probability that

- (i) both discs have the number 3,
..... [2]
- (ii) both discs have the same colour.
..... [3]

30. Question part 2/2 | 0580 Oct-Nov 2020 P4 V2 Q6

- (c) Two of the six discs are picked at random **with** replacement.

Find the probability that both discs have the same colour.

..... [3]

4



Morgan picks two of these letters, at random, **without** replacement.

(a) Find the probability that he picks

(i) the letter Y first,

..... [1]

(ii) the letter B then the letter Y,

..... [2]

(iii) two letters that are the same.

..... [3]

(b) Morgan now picks a third letter at random.

Find the probability that

(i) all three letters are the same,

..... [2]

31. Question part 2/2 | 0580 Oct-Nov 2020 P4 V3 Q4

7

(ii) exactly two of the three letters are the same,

..... [5]

(iii) all three letters are different.

..... [2]

32. Question | 0580 Feb-March 2021 P4 V2 Q4

- 4 (a) A shop gives each of 1000 people a voucher.
28 people use their voucher.
The shop now gives each of 16 500 people a voucher.

Calculate how many of these 16 500 people are expected to use their voucher.

..... [1]

- (b) In a class activity, all the 15 students wear hats.
7 students wear red hats, 6 students wear green hats and 2 students wear white hats.

- (i) One of these students is picked at random.
Find the probability that this student wears a red hat.

..... [1]

- (ii) Two of the 15 students are picked at random.
Show that the probability that these two students wear hats of the same colour is $\frac{37}{105}$.

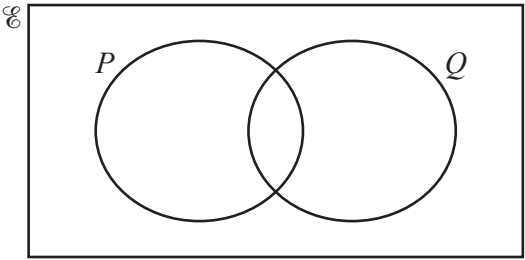
[3]

- (iii) Three of the 15 students are picked at random.
Find the probability that at least two of these three students wear red hats.

..... [4]

33. Question part 1/2 | 0580 May-June 2021 P4 V1 Q6

- 6 (a) In the Venn diagram, shade the region $P' \cup Q$.

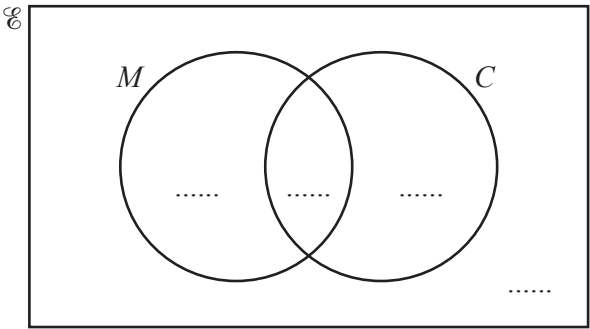


[1]

- (b) There are 50 students in a group.

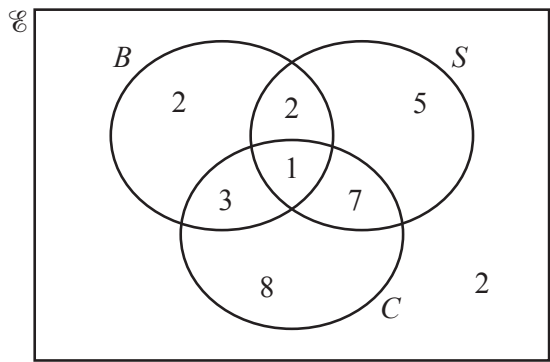
- 34 have a mobile phone (M).
- 39 have a computer (C).
- 5 have no mobile phone and no computer.

Complete the Venn diagram to show this information.



[2]

(c) The Venn diagram shows the number of students in a group of 30 who have brothers (B), sisters (S) or cousins (C).



(i) Write down the number of students who have brothers.
..... [1]

(ii) Write down the number of students who have cousins but do not have sisters.
..... [1]

(iii) Find $n(B \cup S \cup C)'$.
..... [1]

(iv) Use set notation to describe the set of students who have both cousins and sisters but do not have brothers.
..... [1]

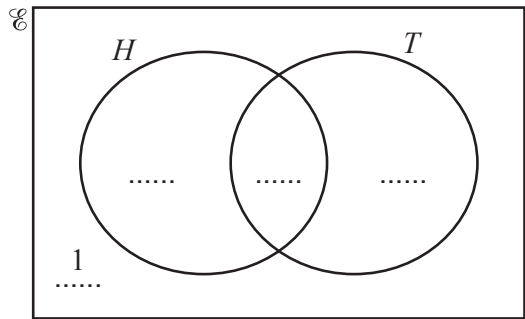
(v) One student is picked at random from the 30 students.
Find the probability that this student has cousins.
..... [1]

(vi) Two students are picked at random from the students who have cousins.
Calculate the probability that both these students have brothers.
..... [3]

(vii) One student is picked at random from the 30 students.
Event A This student has sisters.
Event B This student has cousins but does not have brothers.
Explain why event A and event B are equally likely.
.....
..... [1]

34. Question | 0580 May-June 2021 P4 V3 Q6

- 6 In a class of 24 students, 18 students like homework (H), 15 students like tests (T) and 1 student does not like homework and does not like tests.
- (a) Complete the Venn diagram to show this information.



[2]

- (b) Write down the number of students who like both homework and tests.

..... [1]

- (c) Find $n(H' \cap T)$.

..... [1]

- (d) A student is picked at random from the class.

Write down the probability that this student likes tests but does not like homework.

..... [1]

- (e) Two students are picked at random from the class.

Find the probability that both students do not like homework and do not like tests.

..... [1]

- (f) Two of the students who like homework are picked at random.

Find the probability that both students also like tests.

..... [3]

10 (a) Sarah spins a fair four-sided spinner numbered 0, 1, 1 and 3.

(i) What number is the spinner most likely to land on?

..... [1]

(ii) Sarah spins the spinner twice.

Find the probability that it lands on the number 1 both times.

..... [2]

(iii) Sarah spins the spinner until it lands on the number 3.

The probability that this happens on the n th spin is $\frac{729}{16384}$.

Find the value of n .

$n =$ [2]

35. Question part 2/2 | 0580 Oct-Nov 2021 P4 V3 Q10

- (b) Scott takes an examination.
The examination is in two parts, a theory test and a practical test.
Both parts must be passed to pass the examination.

The probability that Scott passes the theory test is 0.9 .
The probability that Scott passes the practical test is 0.8 .

Find the probability that

- (i) Scott passes the examination,

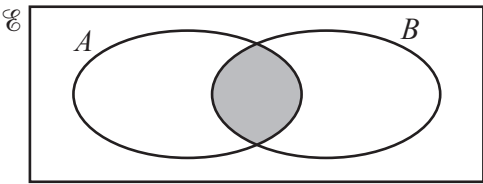
..... [2]

- (ii) Scott passes the theory test or the practical test but not both.

..... [3]

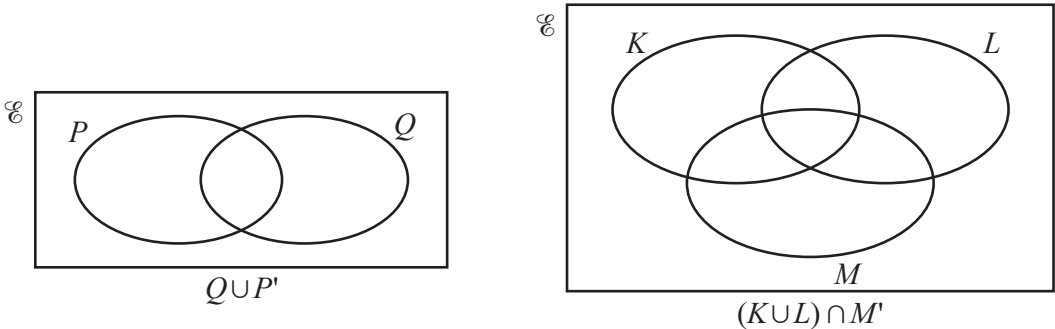
36. Question part 1/2 | 0580 May-June 2022 P4 V1 Q8

8 (a) (i) Use set notation to describe the shaded region in the Venn diagram.



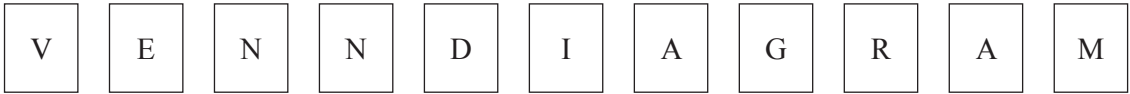
..... [1]

(ii) Shade the correct region in each Venn diagram.



[2]

(b)



The diagram shows 11 cards.

(i) One of these cards is chosen at random.

Write down the probability that the letter on the card is **not** A.

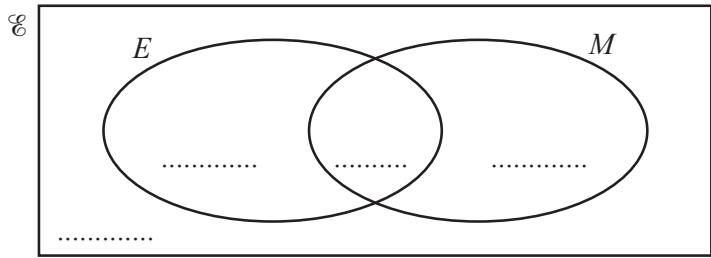
..... [1]

(ii) A card is chosen at random from these 11 cards and then replaced.
A second card is then chosen at random.

Find the probability that exactly one card has the letter N.

..... [3]

(c)



50 students are asked if they like English (E) and if they like mathematics (M).
3 say they do not like English and do not like mathematics.
33 say they like English.
42 say they like mathematics.

(i) Complete the Venn diagram. [2]

(ii) A student is chosen at random.

Find the probability that this student likes English and likes mathematics.

..... [1]

(iii) Two students are chosen at random.

Find the probability that they both like mathematics.

..... [2]

(iv) Two students who like English are chosen at random.

Find the probability that they both also like mathematics.

..... [2]

37. Question part 1/2 | 0580 May-June 2022 P4 V2 Q6

- 6 (a) At a festival, 380 people out of 500 people questioned say that they are camping.
There are 55 300 people at the festival.

Calculate an estimate of the total number of people camping at the festival.

..... [2]

- (b) 12 friends travel to the festival.
5 travel by car, 4 travel by bus and 3 travel by train.
Two people are chosen at random from the 12 friends.

Calculate the probability that they travel by different types of transport.

..... [4]

- (c) Arno buys a student ticket for \$43.68 .
This is a saving of 16% on the full price of a ticket.

Calculate the full price of a ticket.

\$ [2]

- (d) At a football match, there are 29 800 people, correct to the nearest 100.
- (i) At the end of the football match, the people leave at a rate of 400 people per minute, correct to the nearest 50 people.

Calculate the lower bound for the number of minutes it takes for all the people to leave.

..... min [3]

- (ii) At a cricket match there are 27 500 people, correct to the nearest 100.
Calculate the upper bound for the difference between the number of people at the football match and at the cricket match.

..... [2]

7 Regan is playing a game with these six number cards.

-3

-2

2

3

5

7

(a) She takes two cards at random, without replacement, and **multiplies** the two numbers to give a score.

Find the probability that

(i) the score is 35

..... [3]

(ii) the score is a positive number.

..... [3]

38. Question part 2/2 | 0580 Oct-Nov 2022 P4 V3 Q7

- (b) Regan now takes three cards at random from the six cards, without replacement, and **adds** the three numbers to give a total.

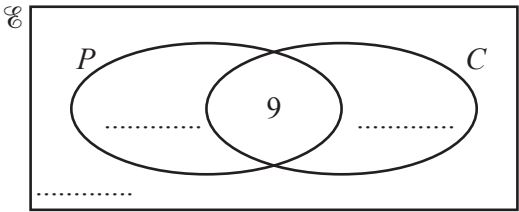
Find the probability that her total is 5.

..... [4]

39. Question | 0580 Feb-March 2023 P4 V2 Q7

7 $\mathcal{C} = \{\text{students in a class}\}$ $P = \{\text{students who study Physics}\}$ $C = \{\text{students who study Chemistry}\}$
 $n(\mathcal{C}) = 24$ $n(P) = 17$ $n(C) = 14$ $n(P \cap C) = 9$

(a) Complete the Venn diagram.



[2]

(b) (i) Find $n(P \cap C')$.

..... [1]

(ii) Find $n(P \cup C')$.

..... [1]

(c) Two students are picked from the class at random.

Find the probability that one student studies both subjects and one student studies Chemistry but not Physics.

..... [3]

(d) Two of the students who study Physics are picked at random.

Find the probability that they both study Chemistry.

..... [2]

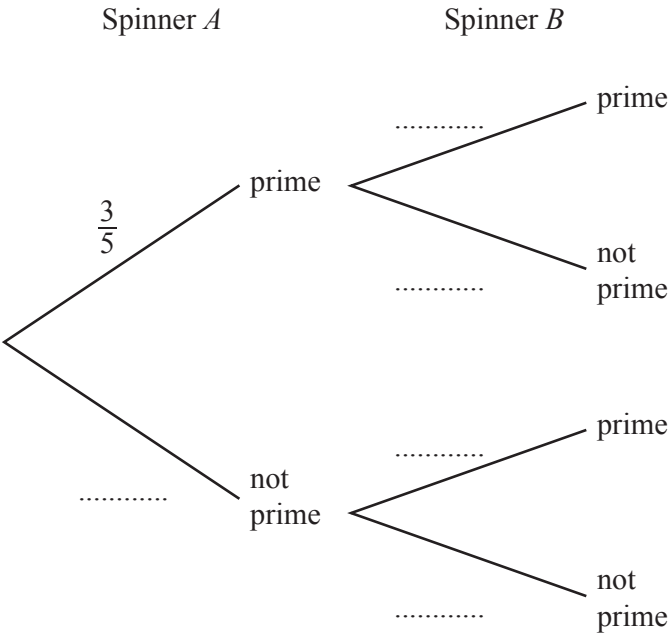
40. Question part 1/2 | 0580 Oct-Nov 2023 P4 V1 Q4

- 4
- (a)

Lucia has two fair spinners.
Spinner *A* is five-sided and is numbered 1, 2, 3, 4, 5.
Spinner *B* is nine-sided and is numbered 3, 3, 3, 4, 4, 4, 4, 5, 5.

Lucia spins the two spinners and records whether they land on a prime number.

- (i)
- Complete the tree diagram.



[2]

- (ii)
- Find the probability that
- (a)

the two numbers are both prime

..... [2]

- (b)

the two numbers are **not** both prime.

..... [1]

(b) Lucia spins Spinner A 120 times.

Find the expected number of times the spinner lands on a prime number.

..... [1]

(c) Lucia spins Spinner B twice.

Find the probability that the two numbers it lands on add up to 9 or more.

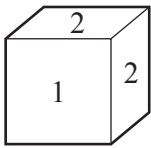
..... [3]

(d) Lucia keeps spinning Spinner B until it lands on a 4.

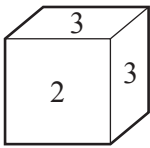
Find an expression, in terms of n , for the probability that this happens on the n th spin.

..... [2]

8



Dice A



Dice B

The diagram shows two fair dice.
Dice A is numbered 1, 2, 2, 2, 3, 6.
Dice B is numbered 2, 3, 3, 4, 4, 4.

(a) (i) Dice A is rolled once.

Write down the probability that it lands on the number 6.

..... [1]

(ii) Dice A is rolled 150 times.

Find the number of times it is expected to land on the number 6.

..... [1]

(b) Dice A and Dice B are each rolled once.

(i) Find the probability that the two numbers they land on have a total of 6.

..... [3]

(ii) Find the probability that when the two numbers they land on have a total of 6, both numbers are 3.

..... [2]

(c) Dice B is rolled n times.

The probability that on the n th roll it first lands on a number 3 is $\frac{32}{729}$.

Find the value of n .

$n =$ [2]

9



The diagram shows 7 cards.

(a) Amir picks a card at random.

Find the probability that the card shows

(i) the letter H

..... [1]

(ii) the letter B.

..... [1]

(b) Fumika picks one of the 7 cards at random.
She replaces it and picks a second card at random.

Find the probability that both cards show the letter I.

..... [2]

(c) Marcos picks two of the 7 cards at random, **without** replacement.

(i) Find the probability that one card shows the letter I and the other card shows the letter N.

..... [3]

(ii) Find the probability that the two cards show different letters.

..... [3]



- (d) Nina picks one of the 7 cards at random without replacement.
She continues picking cards at random without replacement until she picks a card that shows the letter A.

The probability that this occurs when she picks the n th card is $\frac{4}{21}$.

Find the value of n .

$n = \dots\dots\dots$ [2]



43. Question part 1/2 | 0580 Oct-Nov 2024 P4 V1 Q5

5 A box contains 3 blue pens and 5 red pens.

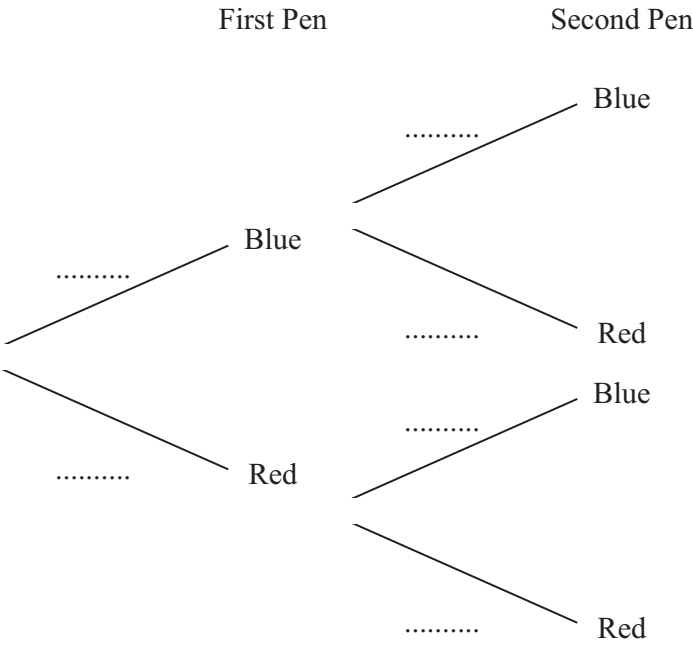
(a) Mia picks a pen from the box at random.

Find the probability that she picks a red pen.

..... [1]

(b) Mia puts the pen back into the box.
She then picks a pen at random and replaces it.
She then picks a second pen at random.

(i) Complete the tree diagram.



[2]

(ii) Find the probability that Mia picks two pens that have the same colour.

..... [3]

43. Question part 2/2 | 0580 Oct-Nov 2024 P4 V1 Q5



(c) Mia now picks 3 of the 8 pens in the box at random **without** replacement.

Find the probability that she picks 2 blue pens and 1 red pen.

..... [3]

44. Question | 0580 Oct-Nov 2024 P4 V2 Q8

- 8 (a) A bag contains 24 coloured beads.
Some are red, some are blue and 10 are yellow.
One bead is picked at random from the bag.

Find the probability that

- (i) the bead is yellow

..... [1]

- (ii) the bead is not yellow.

..... [1]

- (b) Another bag contains 5 green marbles, 6 white marbles and 4 black marbles.
Meera picks 2 marbles at random from the bag, without replacement.

Find the probability that

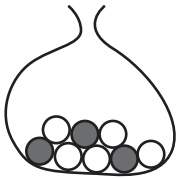
- (i) the first marble is black and the second marble is white

..... [2]

- (ii) both marbles have different colours.

..... [4]

9



A bag contains 5 white balls and 3 black balls.

- (a) (i) Marwan picks a ball from the bag at random and then replaces it.

Find the probability that the ball is white.

..... [1]

- (ii) Naomi picks a ball from the bag at random and then replaces it.
She repeats this 120 times.

Find the number of times the ball is expected to be white.

..... [1]

- (b) Oscar picks a ball from the bag at random.
He replaces it and then picks a second ball from the bag at random.

- (i) Find the probability that the balls are the same colour.

..... [3]

- (ii) Find the probability that the balls are not the same colour.

..... [1]

- (c) Priya picks 3 of the 8 balls from the bag at random without replacement.

Find the probability that she picks two white balls and one black ball.

..... [3]

16 On any day, the probability that the weather will be sunny is 0.7 .

(a) Find the probability that on any day the weather will not be sunny.

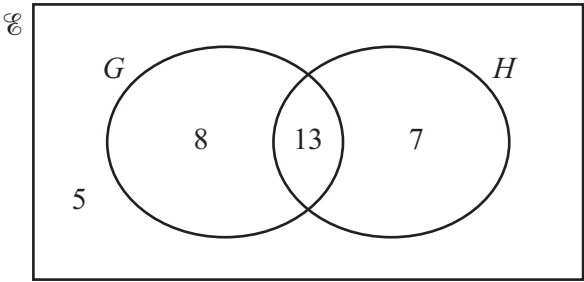
..... [1]

(b) When the weather is sunny, the probability that Rohit goes for a walk is 0.9 .
When the weather is not sunny, the probability that Rohit goes for a walk is 0.2 .

Find the probability that on any day Rohit goes for a walk.

..... [3]

22



$\mathcal{E}$ = {number of students in a class}
 G = {number of students who study geography}
 H = {number of students who study history}

The Venn diagram shows information about the 33 students in a class.

(a) One of the students in the class is picked at random.

Find the probability that this student

(i) does not study geography and does not study history

..... [1]

(ii) studies geography and studies history.

..... [1]

(b) Two of the students who study history are picked at random.

Find the probability that one student also studies geography
and one student does not study geography.

..... [3]

48. Question | 0580 May-June 2025 P4 V3 Q20

-
- 20** Stephan has two bags, A and B , each containing red sweets and yellow sweets only. He picks two sweets at random, one from bag A and the other from bag B . The probability that Stephan picks a red sweet from bag A is $\frac{3}{5}$. The probability that Stephan picks a red sweet from bag A and a red sweet from bag B is $\frac{2}{15}$.
- (a)** Find the probability that Stephan picks a red sweet from bag B .

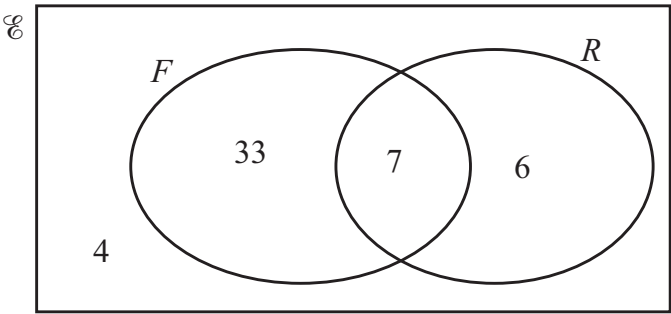
..... [2]

- (b)** Find the probability that Stephan picks a yellow sweet from bag A and a yellow sweet from bag B .

..... [3]

49. Question | 0580 Oct-Nov 2025 P4 V1 Q12

- 12 Some students are asked if they like football (F) or rugby (R).
The Venn diagram shows the results.



- (a) Find the number of students who do not like rugby.

..... [1]

- (b) Use set notation to describe the region containing students who like rugby but not football.

..... [1]

50. Question | 0580 Oct-Nov 2025 P4 V3 Q12

- 12 A vase contains flowers that are red or pink or white.
Ruth picks a flower at random from the vase.
The probability that the flower is **not** red is 0.9 .
The probability that the flower is **not** pink is 0.65 .

Find the probability that the flower is white.

..... [2]

51. Question | 0580 Specimen 2025 P4 Q7

7 On any day the probability that it rains is $\frac{1}{3}$.

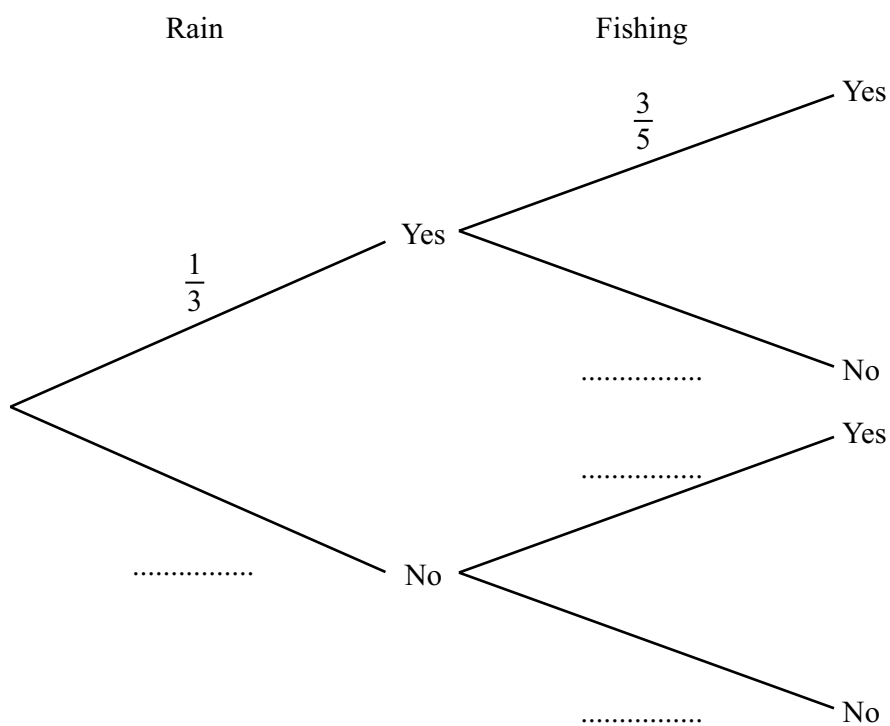
When it rains the probability that Amira goes fishing is $\frac{3}{5}$.

When it does not rain the probability that Amira goes fishing is $\frac{3}{4}$.

(a) In a period of 60 days on how many days is it expected to rain?

..... [1]

(b) Complete the tree diagram.



[2]

(c) Find the probability that on any day Amira goes fishing.

..... [3]