Probability
Difficulty: Easy

Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Probability
Sub-Topic	Probability
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

Time allowed: **46 minutes**

Score: **/36**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

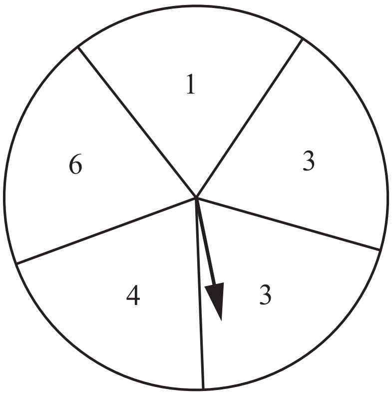
A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

~~Assembled by AS~~

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

The diagram shows a fair spinner.



Anna spins it twice and adds the scores.

(a) Complete the table for the total scores.

		Score on first spin				
		1	3	3	4	6
Score on second spin	1	2	4	4	5	7
	3	4	6	6	7	9
	3	4	6	6	7	9
	4	**5**	**7**	**7**	**8**	**10**
	6	**7**	**9**	**9**	**10**	**12**

[1]

(b) Write down the most likely total score. [1]

7

(c) Find the probability that Anna scores [2]

(i) a total less than 6,

$$\frac{7}{25} = 0.28$$

(ii) a total of 3. [1]

0

The probability that Stephanie wins her next tennis match is 0.85 .

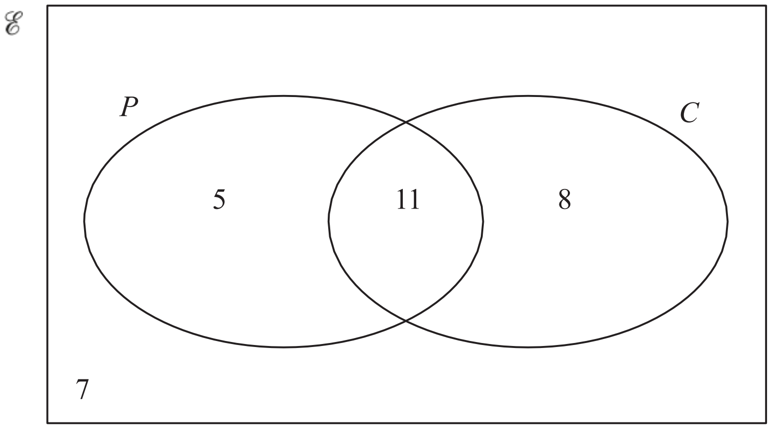
Find the probability that Stephanie does not win her next tennis match. [1]

$1 - 0.85$

$= \mathbf{0.15}$

(a) $\mathscr{E}$ = {students in a class}
P = {students who study physics}
C = {students who study chemistry}

The Venn diagram shows numbers of students.



(i) Find the number of students who study physics or chemistry. [1]

24

(ii) Find n $(P \cap C')$ [1]

5

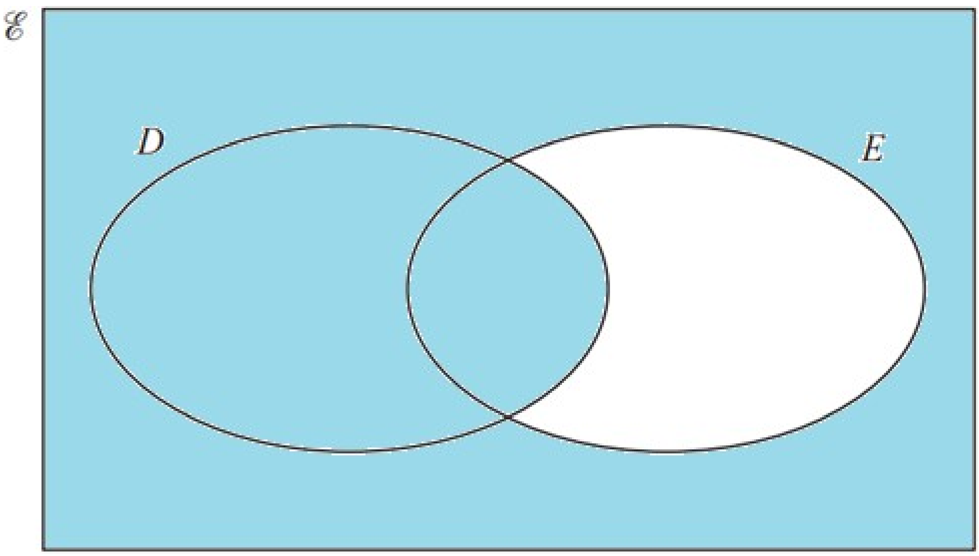
(iii) A student who does not study chemistry is chosen at random.

Find the probability that this student does not study physics. [1]

$$\frac{7}{7+5}$$

$$= \frac{7}{12}$$

(b) On the Venn diagram below, shade the region $D \cup E'$. [1]



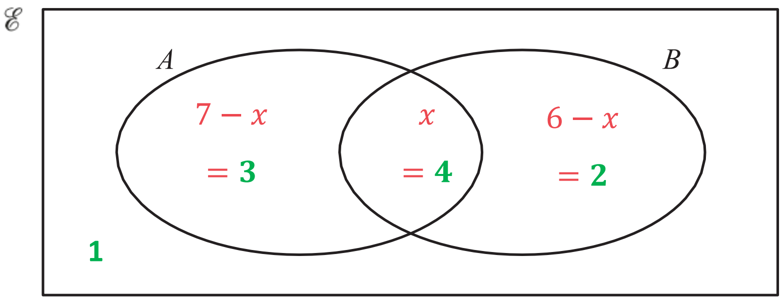
The probability that Pedro scores a goal in any match is $\frac{2}{5}$
.
Calculate the probability that Pedro scores a goal in each of the next two matches. [2]

$$\frac{2}{5} \times \frac{2}{5}$$

$$= \mathbf{\frac{4}{25}}$$

Question 5

(a) $n(\mathscr{E}) = 10$, $n(A) = 7$, $n(B) = 6$, $n(A \cup B)' = 1$.



(i) Complete the Venn diagram by writing the number of elements in each subset. [2]

First use $n(A \cup B)' = 1$ to put the 1 outside the circles

($n(A \cup B)'$ is the number of elements not in $A \cup B$)

Let $n(A \cap B) = x$, then fill in $7 - x$ and $6 - x$ in the "other" bits of A and B respectively.

To find x solve: $7 - x + x + 6 - x = 9$ to get $x = 4$ and complete the diagram as shown.

(ii) An element of $\mathscr{E}$ is chosen at random.

Find the probability that this element is an element of $A' \cap B$. [1]

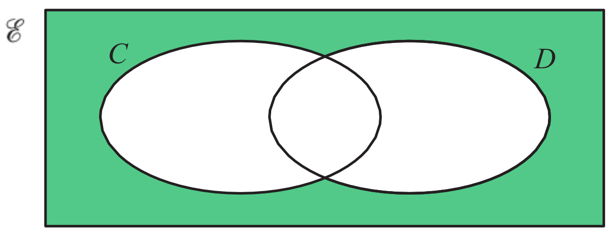
$$P(A' \cap B) = \frac{n(A' \cap B)}{n(\mathcal{E})}$$

$$\mathbf{P(A' \cap B) = \frac{2}{10} = \frac{1}{5}}$$

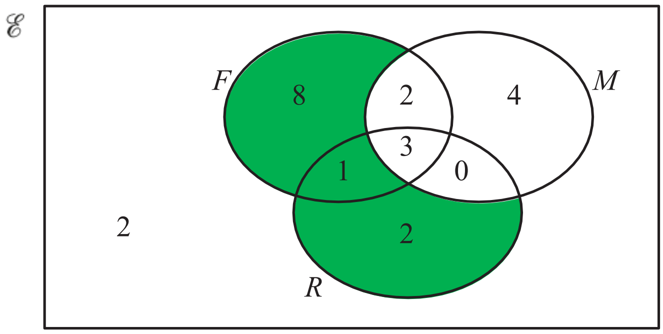
(b) On the Venn diagram below, shade the region $C' \cap D'$.

This is the overlap (intersection) between everything outside C and everything outside D.

[Or think about it as $C' \cap D' = (C \cup D)'$]



[1]



The Venn diagram shows the number of people who like films (F), music (M) and reading (R).

(a) Find

(i) $n(M)$, Add up the numbers in M to get: [1]

$$n(M) = 2 + 3 + 4 + 0 = \mathbf{9}$$ [1]

(ii) $n(R \cup M)$. Add up the numbers in R and M to get:

$$n(R \cup M) = 1 + 2 + 3 + 0 + 2 + 4 = \mathbf{12}$$

(b) A person is chosen at random from the people who like films. [1]

Write down the probability that this person also likes music.

The conditional probability of A given B is $P(A \mid B) = \dfrac{n(A \cap B)}{n(B)}$

"given"

$$P(M \mid F) = \frac{n(M \cap F)}{n(F)}$$

$$= \frac{2 + 3}{8 + 1 + 2 + 3 + 4 + 0} = \mathbf{\frac{5}{14}}$$

(c) On the Venn diagram, shade $M' \cap (F \cup R)$. [1]

This is the overlap (intersection) of "everything outside M" and "everything inside F and R"

The table shows the probability that a person has blue, brown or green eyes.

Eye colour	Blue	Brown	Green
Probability	0.4	0.5	0.1

Use the table to work out the probability that two people, chosen at random,

(a) have blue eyes, [2]

In order to get probability that two people, chosen at random have both blue eyes, we need to multiply the probabilities that a random person has blue eyes.

$$Both\ have\ blue\ eyes = blue\ eyes \times blue\ eyes$$

From the table, the probability that a person has blue eyes is 0.4

$$Both\ have\ blue\ eyes = 0.4 \times 0.4$$

$$Both\ have\ blue\ eyes = \mathbf{0.16}$$

(b) have different coloured eyes. [4]

To calculate the probability that two people, chosen at random have both different coloured eyes, we can use the fact that all probabilities must add up to 1 (which represents 100%).

The probability that the eye colour is different, we subtract from 1 the cases, when the eye colours are the same.

We have already calculated the probability that both people have blue eyes in part a). The probability that both people have brown eyes are both have green eyes is calculated the same way.

$$Both\ have\ brown = brown \times brown = 0.5 \times 0.5 = 0.25$$

$$Both\ have\ green = green \times green = 0.1 \times 0.1 = 0.01$$

Subtract the probabilities from 1.

$$Probability\ of\ different\ colours = 1 - both\ blue - both\ brown - both\ green$$

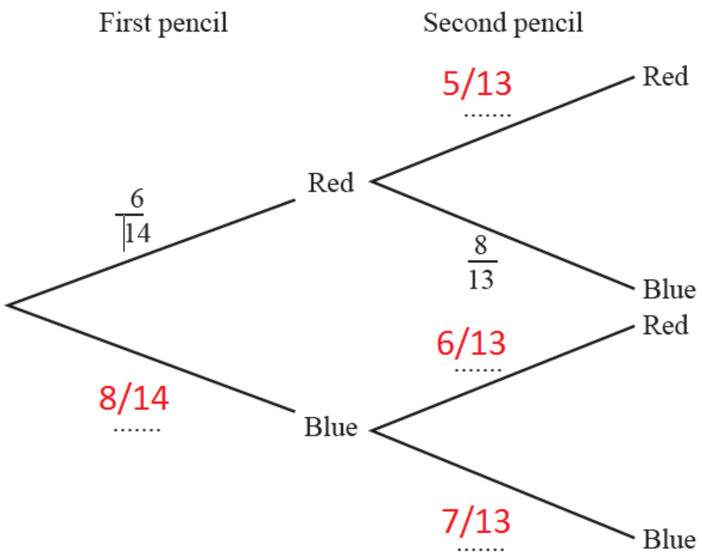
$$Probability\ of\ different\ colours = 1 - 0.16 - 0.25 - 0.01$$

$$Probability\ of\ different\ colours = \mathbf{0.58}$$

Question 8

A box contains 6 red pencils and 8 blue pencils.
A pencil is chosen at random and not replaced.
A second pencil is then chosen at random.

(a) Complete the tree diagram. [2]



The total probability must be 1 at each branching point (1 represents 100%).

Using this fact, we can calculate the probability that the first pencil is blue and the probability that the second pencil is red, given that the first one was red.

$$1-\frac{6}{14}=\frac{8}{14}$$

$$1-\frac{8}{13}=\frac{5}{13}$$

If the first pencil was blue, there are 13 pencils left in total, of which 6 are red (as no red pencil was chosen). The probability of picking a red pencil given that the first one was blue is therefore 6/13.

The probability that the second one is blue, given that the first one was blue as well is calculated using a similar method as mentioned above.

$$1-\frac{6}{13}$$

$$=\frac{7}{13}$$

(b) Calculate the probability that

(i) both pencils are red, [2]

The probability that both pencils are red can be calculated by multiplying the probabilities that the first one is red and the probability that the second one is red, given that the first one was red as well.

$$both\ red = first\ red \times second\ red\ given\ first\ red = \frac{6}{14}\times\frac{5}{13}$$

$$=\mathbf{\frac{30}{182}}$$

(ii) at least one of the pencils is red. [3]

The probability that at least one is red can be calculated, by subtracting the probability that both are blue from 1 (which represents 100%) as this is the only case, when the condition is not satisfied.

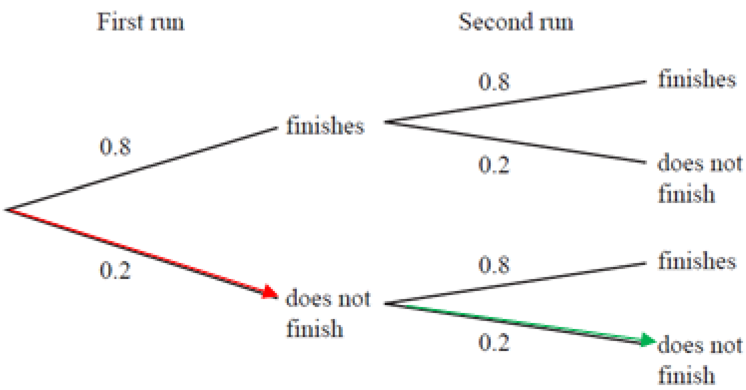
The probability that both are blue is calculated using the same method as in part b)i).

$$at\ least\ one\ red = 1 - first\ blue \times second\ blue\ given\ first\ blue$$

$$at\ least\ one\ red = 1-\frac{8}{14}\times\frac{7}{13} = 1-\frac{56}{182}$$

$$=\mathbf{\frac{126}{182}}$$

Samira takes part in two charity runs.
The probability that she finishes each run is 0.8 .



Find the probability that Samira finishes at least one run. [3]

The total probability must add up to 1 (which represents 100%).

By subtracting the probability that she does not finish either run from 1, we are left with the probability that Samira finishes at least one run.

$$1 - (does\ not\ finish\ first) \times (does\ not\ finish\ second\ given\ first\ not\ finished)$$

$$1 - 0.2 \times 0.2 = 1 - 0.04 = 0.96$$

The probability that Samira finishes at least one run is **0.96**.

Probability
Difficulty: Easy

Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Probability
Sub-Topic	Probability
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

Time allowed: **43 minutes**

Score: **/33**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

Paul and Sammy take part in a race.

The probability that Paul wins the race is $\frac{9}{35}$

The probability that Sammy wins the race is 26%.

Who is more likely to win the race?
Give a reason for your answer. [2]

Covert 9/35 into percentage (use a calculator):

$$\frac{9}{35} \times 100\% = 25.7\%$$

This is the probability that Paul wins the race.

Since 26% (Sammy's probability) is more than 25.7%, Sammy is more likely to win.

A biased 4-sided dice is rolled.
The possible scores are 1, 2, 3 or 4.
The probability of rolling a 1, 3 or 4 is shown in the table.

Score	1	2	3	4
Probability	0.15		0.3	0.35

Complete the table. [2]

Let p be the unknown probability.

The sum of all probabilities must be 1 (which corresponds to 100%).

$$1 = 0.15 + p + 0.3 + 0.35$$

$$1 = 0.8 + p$$

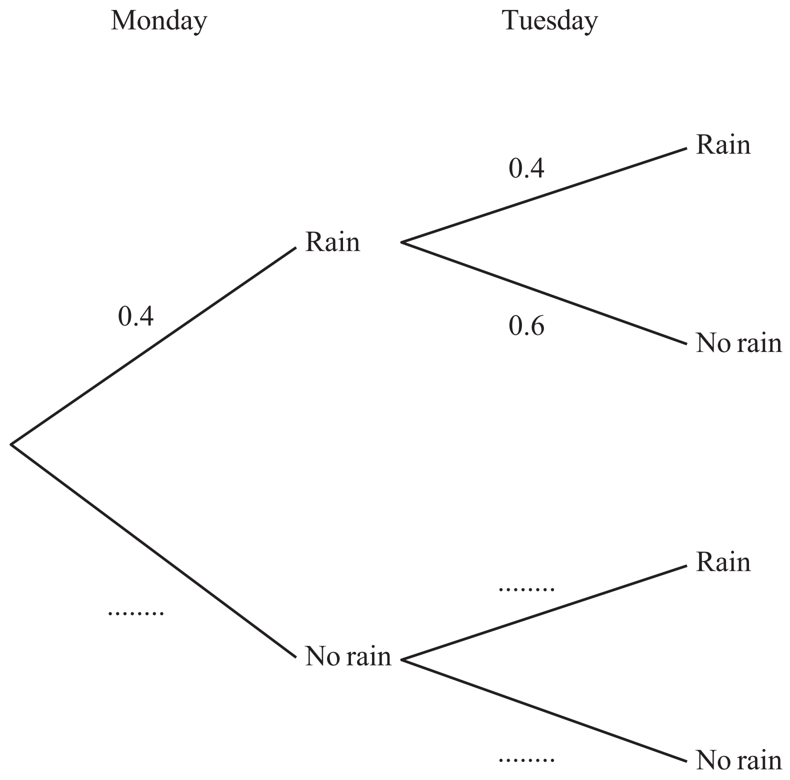
Subtract 0.8 from both sides to get the value of *p*.

$$\boldsymbol{p = 0.2}$$

If it rains today the probability that it will rain tomorrow is 0.4 .
If it does not rain today the probability that it will rain tomorrow is 0.2 .
On Sunday it rained.

(a) Complete the tree diagram for Monday and Tuesday.

[2]



The two sides of each branch of a tree diagram must always add to exactly 1.0

Chance of no rain on Monday = 1 – 0.4 = 0.6

Chance of rain on Tuesday = 0.2 (using 2nd statement from question)

Chance of no rain on Tuesday = 1 – 0.2 = 0.8

(b) Find the probability that it rains on at least one of the two days shown in the tree diagram. [3]

We can find the probability it rains at least once like this:

The easiest way to do a question like this is to use the concept that

$Probability\ (at\ least\ once) = 1 - Probability\ (never)$

In this question, the probability that the event does not happen at all is the probability that it doesn't rain on Monday and it doesn't rain on Tuesday:

$P(no\ rain\ on\ monday\ AND\ no\ rain\ on\ Tuesday) = 0.6 \times 0.8$

$P(no\ rain\ on\ monday\ AND\ no\ rain\ on\ Tuesday) = 0.48$

So therefore, the probability that there will be some rain is:

$\boldsymbol{P(rains\ at\ least\ once) = 1 - 0.48}$

$\boldsymbol{P(rains\ at\ least\ once) = 0.52}$

S	P	A	C	E	S

One of the 6 letters is taken at random.

(a) Write down the probability that the letter is S. [1]

There are 6 letters and 2 of the letters are S's

Therefore:

$$probability\ of\ choosing\ S = \frac{2}{6}$$

$$= \mathbf{\frac{1}{3}}$$

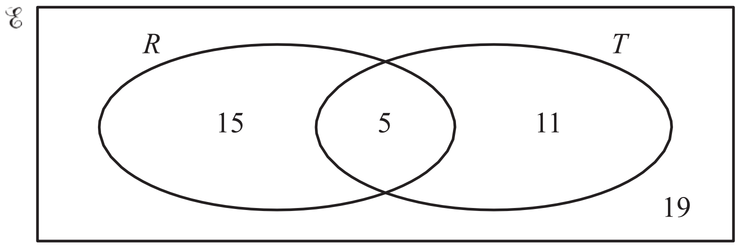
(b) The letter is replaced and again a letter is taken at random.
This is repeated 600 times.

How many times would you expect the letter to be S? [1]

Since there is a 1/3 chance of choosing S, if it is done 600 times then:

$$600 \times \frac{1}{3} = \mathbf{200\ times}$$

$$= \mathbf{200\ times}$$



The Venn diagram shows the number of red cars and the number of two-door cars in a car park.
There is a total of 50 cars in the car park.
R = {red cars} and T = {two-door cars}.

(a) A car is chosen at random.

Write down the probability that

(i) it is red and it is a two-door car, [1]

There are 5 cars that are red and have two doors out of the 50 cars present.

Therefore:

$$\boldsymbol{probability\ (red + 2\ door) = \frac{5}{50} = \frac{1}{10}}$$

$$\boldsymbol{= \frac{1}{10}}$$

(ii) it is not red and it is a two-door car. [1]

The number of cars that are not red and but have two doors is 11.

$$\boldsymbol{probability\ (not\ red, 2\ door) = \frac{11}{50}}$$

(b) A two-door car is chosen at random.

Write down the probability that it is not red. [1]

There are 16 two door cars present.

There are 11 two door cars that aren't red.

Therefore:

$$\boldsymbol{probability(2\ door, not\ red) = \frac{11}{16}}$$

(c) Two cars are chosen at random.

Find the probability that they are both red. [2]

There are 20 red cars present, out of 50.

The first time we choose there is a 20/50 chance of choosing red.

There are now 49 cars remaining of which 19 are red.

Now there is a 19/49 chance of choosing red

Therefore, the probability of choosing red both times is:

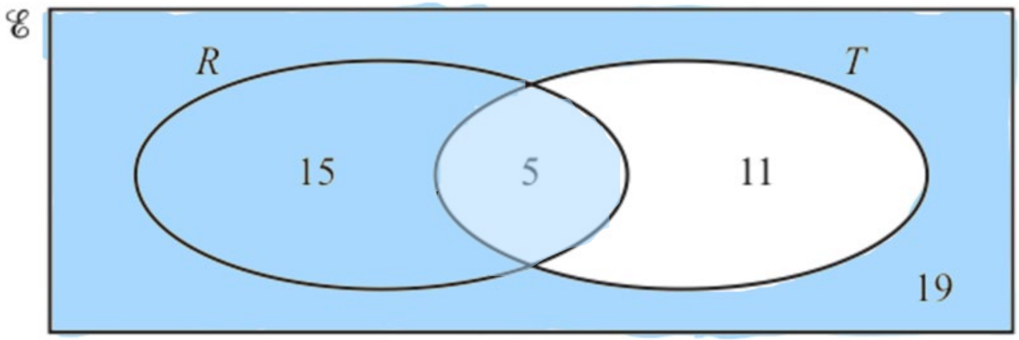
$$\frac{20}{50} \times \frac{19}{49}$$

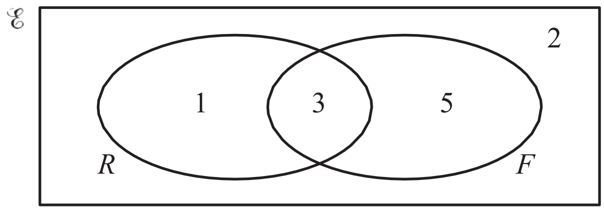
$$= \boldsymbol{\frac{38}{245}}$$

(d) On the Venn diagram, shade the region $R \cup T'$. [1]

This region is where red cars and anything that isn't a two-door car exists.

This includes both the region outside the Venn diagram and the red car region, including the intersection. This is shown below.





11 students are asked if they like rugby (R) and if they like football (F).
The Venn diagram shows the results.

(a) A student is chosen at random.

What is the probability that the student likes rugby **and** football? [1]

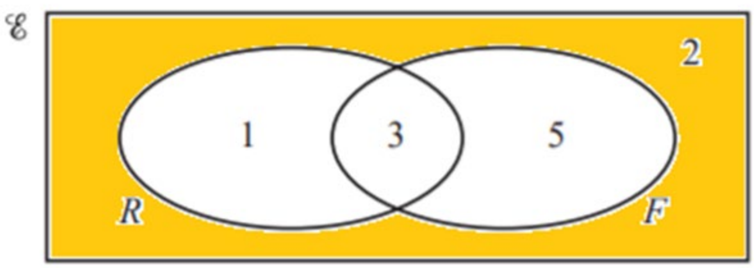
The Venn diagram shows that where R and F (liking Rugby and liking Football) cross, there are 3 students. In total there are 11 students, so the probability of a student being picked liking both is

$$3 \div 11$$

$$= \frac{\mathbf{3}}{\mathbf{11}}$$

(b) On the Venn diagram shade the region $R' \cap F'$. [1]

$R' \cap F'$ represents the area where the students do NOT like football AND do NOT like Rugby, as shown below.



The Ocean View Hotel has 300 rooms numbered from 100 to 399.
A room is chosen at random.

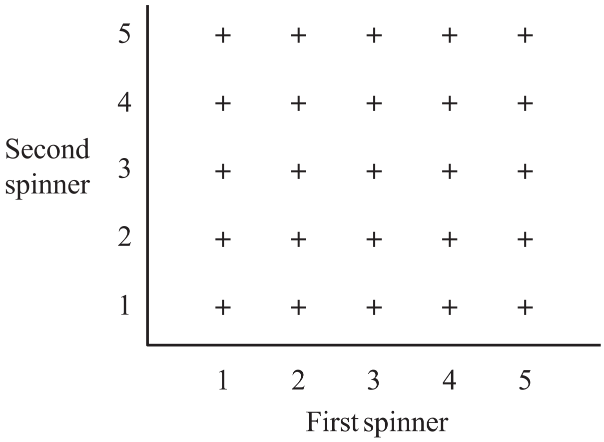
Find the probability that the room number ends in zero. [2]

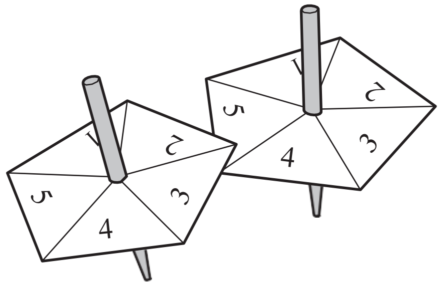
From 100 to 399 there are 30 numbers which are multiples of 10 and therefore end in 0.

$$\frac{30}{300} = \frac{1}{10}$$

Question 8

Two spinners have sections numbered from 1 to 5.
Each is spun once and each number is equally likely.
The possibility diagram is shown below.





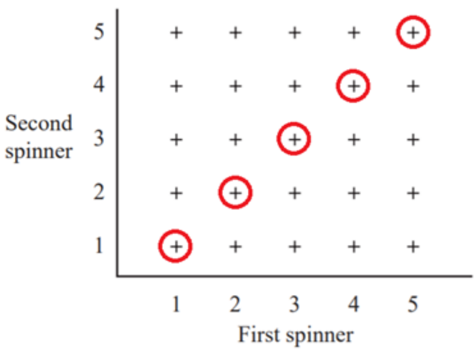
Find the probability that

For both parts there are 25 possible outcomes from spinning both spinners simultaneously. Use the possibility diagram to find the number of possible outcomes required to then calculate the probability.

(a) both spinners show the same number, [2]

There are 5 outcomes when the same numbers are shown:

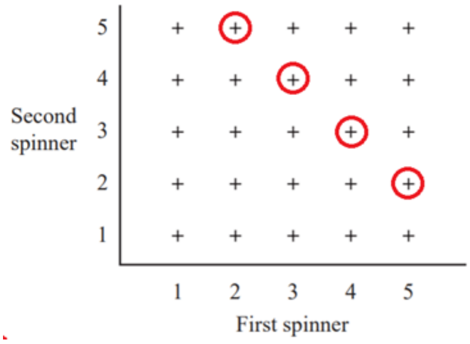
$$\frac{5}{25} = \mathbf{\frac{1}{5}}$$



(b) the sum of the numbers shown on the two spinners is 7. [2]

There are 4 outcomes where the numbers add to 7:

$$\frac{4}{25}$$



In this question, give all your answers as fractions.

A box contains 3 red pencils, 2 blue pencils and 4 green pencils.
Raj chooses 2 pencils at random, without replacement.

Calculate the probability that

(a) they are both red, [2]

$$\frac{3}{9} \times \frac{2}{8}$$

$$= \frac{2}{24}$$

$$= \mathbf{\frac{1}{12}}$$

(b) they are both the same colour, [3]

Both red plus both blue plus both green

$$\frac{1}{12} + \frac{2}{9} \times \frac{1}{8} + \frac{4}{9} \times \frac{3}{8}$$

$$= \frac{1}{12} + \frac{1}{36} + \frac{1}{6}$$

$$= \frac{10}{36}$$

$$= \mathbf{\frac{5}{18}}$$

(c) exactly one of the two pencils is green. [3]

Probability that the first is green and the second isn't plus the probability that the first isn't green and the second is

$$\frac{4}{9}\times\frac{5}{8}+\frac{5}{9}\times\frac{4}{8}$$

$$=\frac{5}{9}$$

Probability
Difficulty: Easy

Model Answers 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Probability
Sub-Topic	Probability
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 3

Time allowed: **40 minutes**

Score: **/31**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

In a survey of 60 cars, the type of fuel that they use is recorded in the table below.

Each car only uses one type of fuel.

Petrol	Diesel	Liquid Hydrogen	Electricity
40	12	2	6

(a) Write down the mode. [1]

The mode in this case is the type of fuel more frequently used,

Petrol,

since it has been used 40 times.

(b) Olav drew a pie chart to illustrate these figures.

Calculate the angle of the sector for Diesel. [2]

The sum of the angles for all the sectors in the pie chart is 360°. This represents the total number of cars, 60.

There are 12 cars which use Diesel, so we can calculate:

If 60 cars are represented by 360°, then 12 cars will be represented by:

$$\frac{12 \text{ x } 360°}{60} = 12 \text{ x } 6°$$

= 72°

(c) Calculate the probability that a car chosen at random usesElectricity.

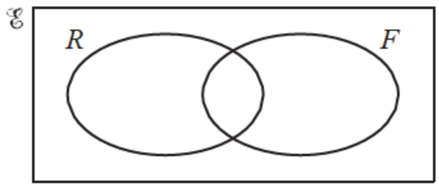
Write your answer as a fraction in its simplest form. [2]

$$\text{Probability} = \frac{\text{number of favourbale cases}}{\text{number of total cases}}$$

The number of favourable cases here is the number of cars which use electricity as fuel, 6. The number of total cases is the total number of cars, 60.

Therefore, the probability that a randomly chosen car is electric is:

$$P = \frac{6}{60} = \frac{1}{10}$$



In the Venn diagram, $\mathscr{E}$ = {students in a survey}, R = {students who like rugby} and F = {students who like football}.

$n(\mathscr{E}) = 20$ $n(R \cup F) = 17$ $n(R) = 13$ $n(F) = 11$

(a) Find

(i) $n(R \cap F)$, [1]

n(R ∪ F) represents all the elements which are only in R, only in F and their intersection.

Elements only in R = n(R) – n(R ∩ F)

Elements only in F = n(F) – n(R ∩ F)

n(R ∪ F) = n(R) – n(R ∩ F) + n(F) – n(R ∩ F) + n(R ∩ F)

17 = 13 + 11 – n(R ∩ F)

n(R ∩ F) = 24 – 17

n(R ∩ F) = 7

(ii) $n(R' \cap F)$. [1]

n(R' ∩ F) represents the intersection of the elements which are NOT in Set R with the elements in Set F.

This could be written as:

$n(R \cup F) - n(R) = n(R' \cap F)$

$n(R' \cap F) = 17 - 13$

$n(R' \cap F) = 4$

(b) A student who likes rugby is chosen at random.

Find the probability that this student also likes football. [1]

probability = $\frac{\textbf{nr of favourable cases}}{\textbf{nr of total cases}}$

In our case, the number of favourable cases would be the number of students which like both rugby and football, therefore, the intersection between the sets R and F.

From a)i), we know that:

$n(R \cap F) = 7$

The number of total cases would represent the total number of students which like rugby.

$n(R) = 13$

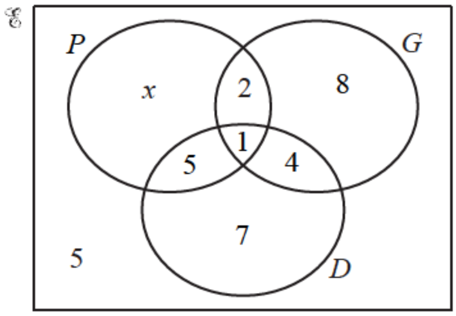
Therefore, the probability will be:

$P = \frac{7}{13}$

A teacher asks 36 students which musical instruments they play.

P = {students who play the piano}
G = {students who play the guitar}
D = {students who play the drums}

The Venn diagram shows the results.



(a) Find the value of x. [1]

The number of students represented in each part ofthe Venn diagram must sum up to 36 (total number of students).

$$36 = 5 + 5 + 7 + 4 + 1 + 8 + 2 + x$$

$$36 = 32 + x$$

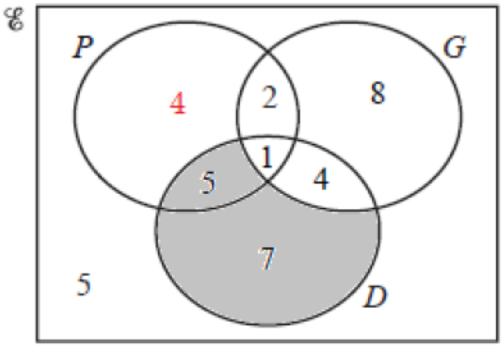
$$\boldsymbol{x = 4}$$

(b) A student is chosen at random.

Find the probability that this student

(i) plays the drums but not the guitar, [1]

There are (5+7=) 12 students who play the drums but not the guitar (inside D, but outside G).



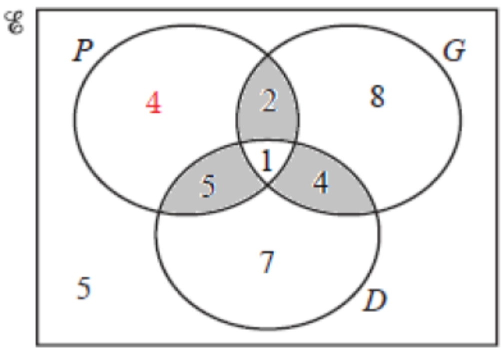
The total number of students is 36 so the probability:

$$probability\ that\ plays\ the\ drum\ but\ not\ the\ guitar = \frac{12}{36}$$

= **0.333**

(ii) plays only 2 different instruments. [1]

Find the number of students who play two different instruments by summing up the numbers in the regions that belong to (exactly!) two different groups.



Hence there are (5+2+4=) 11 students who play 2 different instruments.

The total number of students is 36 so the probability:

$$probability\ that\ plays\ only\ 2\ different\ instruments = \frac{11}{36}$$

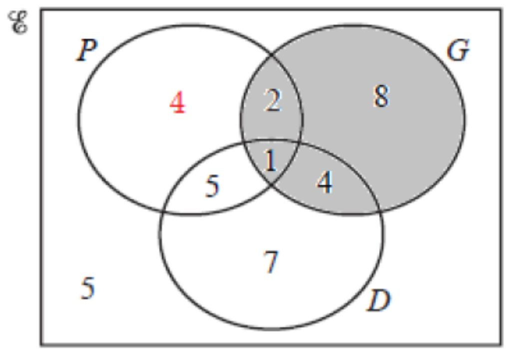
=0.3056

(c) A student is chosen at random from those who play the guitar.

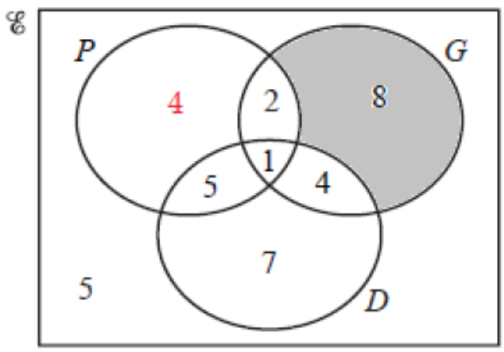
Find the probability that this student plays no other instrument. [1]

Number of students who play guitar:

$$students\ who\ play\ guitar = 2 + 1 + 4 + 8 = 15$$



There are 8 students who play only guitar.



Hence the probability that the student is chosen from those who play the guitar cannot play any other instrument:

$$probability = \frac{8}{15} = 0.533$$

	Boys	Girls	Total
Asia	62	28	
Europe	35	45	
Africa		17	
Total			255

For a small international school, the holiday destinations of the 255 students are shown in the table.

(a) Complete the table. [3]

	Boys	Girls	Total
Asia	62	28	**90**
Europe	35	45	**80**
Africa	**68**	17	**85**
Total	**165**	**90**	255

(b) What is the probability that a student chosen at random is a girl going on holiday to Europe? [1]

$$P = \frac{45}{255}$$

$$= \mathbf{\frac{3}{17} = 0.1764\ldots}$$

Xsara throws a ball three times at a target.
Each time she throws the ball, the probability that she hits the target is 0.2.
Calculate the probability that she does **not** hit the target in any of the three throws. [2]

If the probability to hit the target on one occasion is 0.2, the probability that she will

not hit the target in this occasion is: 1 – 0.2 = 0.8

The probability that she does not hit the target when throwing the ball 3 times is:

$P = 0.8^3$

$P = 0.512$

Two unbiased spinners are used in a game.
One spinner is numbered from 1 to 6 and the other is numbered from 1 to 3.
The scores on each spinner are **multiplied** together. The table below shows the possible outcomes.

First Spinner

		1	2				
	1	1	2			5	
Second Spinner	2	2	4			10	12
	3	3	6		12	15	18

(a) Find the probability that the outcome is even. [1]

There are 12 possible even outcomes and 18 possible outcomes in total, therefore, the probability of an even outcome is:

$$P = \frac{12}{18}$$

(b) When the outcome is even, find the probability that it is also greater than 11. [2]

There are 3 possible outcomes which are even and greater than 11 and 12 possible even numbers, therefore, the probability is:

$$P = \frac{3}{12}$$

Revina has to pass a written test and a driving test before she can drive a car on her own.
The probability that she passes the written test is 0.6.
The probability that she passes the driving test is 0.7.

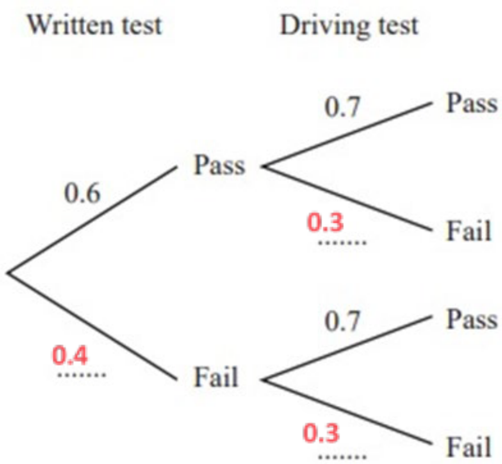
(a) Complete the tree diagram below. [1]

We know that the sum of probabilities for all possible outcomes of an event is 1.

Therefore, the probability to fail the written test is:

1 – 0.6 = 0.4

Similarly, the probability to fail the driving test after passing the written test is: 1 – 0.7 = 0.3 and the probability to fail the driving test after failing the written test is also 1 – 0.7 = 0.3



(b) Calculate the probability that Revina passes only one of the two tests. [3]

The probability of 2 events happening simultaneously is the product of the probabilities of those events happening independently.

To pass only one of the 2 tests, she either needs to pass the written test and fail the driving test or fail the written test and pass the driving test.

For the first possibility, the probability will be:

P = 0.6 x 0.3

P = 0.18

For the second event, the probability will be:

P = 0.4 x 0.7

P = 0.28

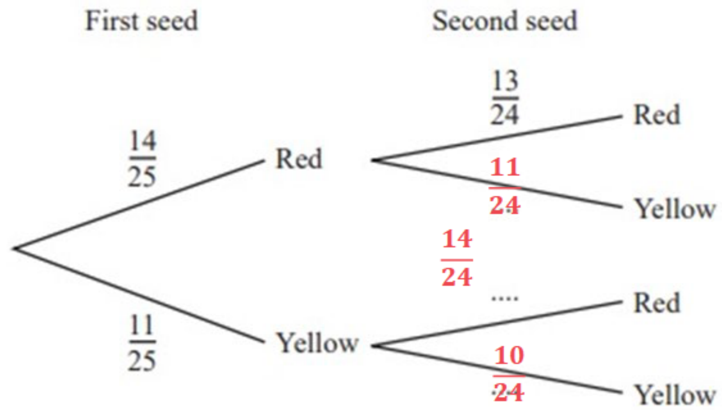
Therefore, the probability that she only passes one of the 2 tests is the some of the probabilities of each of the 2 possibilities.

P = 0.18 + 0.28

P = 0.46

A gardener plants seeds from a packet of 25 seeds.
14 of the seeds will give red flowers and 11 will give yellow flowers.
The gardener chooses two seeds at random.

(a) Write the missing probabilities on the tree diagram below. [2]



We know that the sum of probabilities for all possible outcomes of an event is 1.

Therefore, the probability of the second seed to give a yellow flower when the first seed gave a red one is:

$1 - \frac{13}{24} = \frac{11}{24}$

The probability of a second seed to give a yellow flower is $\frac{10}{24}$.

This is because probability = $\frac{\text{number of favourable cases}}{\text{number of total cases}}$

A first seed has already been chosen from a total of 25 so the remaining number is 24.

If the first seed chosen gives a yellow flower than the total number of seeds giving yellow flowers goes from 11 to 10.

This way, we work out the probability of a second seed to give a yellow flower after the first one chosen giving also a yellow one is $\frac{10}{24}$.

The probabilities of the 2 outcomes add up to 1 so the probability to obtain a red flower from a second seed in this case is:

$$1 - \frac{10}{24} = \frac{14}{24}$$

(b) What is the probability that the gardener chooses two seeds which will give

(i) two red flowers, [2]

The probability of 2 events happening simultaneously is the product of the probabilities of those events happening independently.

Using the tree diagram above, we work out that the probability that both seeds give red flowers is:

$$P = \frac{14}{25} \times \frac{13}{24}$$

$$P = \frac{182}{600}$$

$$P = \frac{91}{300}$$

(ii) two flowers of a different colour? [2]

To pick 2 seeds giving a different colour, we can either have the first seed giving a red flower and the second seed giving a yellow flower or the other way around.

The probability of the first event according to the tree diagram is:

$P = \frac{14}{25} \times \frac{11}{24}$

$P = \frac{154}{600}$

$P = \frac{77}{300}$

For the latter event to happen, the probability is:

$P = \frac{11}{25} \times \frac{14}{24}$

$P = \frac{77}{300}$

We add up the 2 probabilities obtained to work out the probability of having 2 flowers of different colours.

$P = \frac{77}{300} + \frac{77}{300}$

$P = \frac{154}{300}$

$P = \frac{77}{150}$

Probability
Difficulty: Hard

Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Probability
Sub-Topic	Probability
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

Time allowed: **37 minutes**

Score: **/29**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

Simon has two boxes of cards.
In one box, each card has one shape drawn on it that is either a triangle or a square.
In the other box, each card is coloured either red or blue.

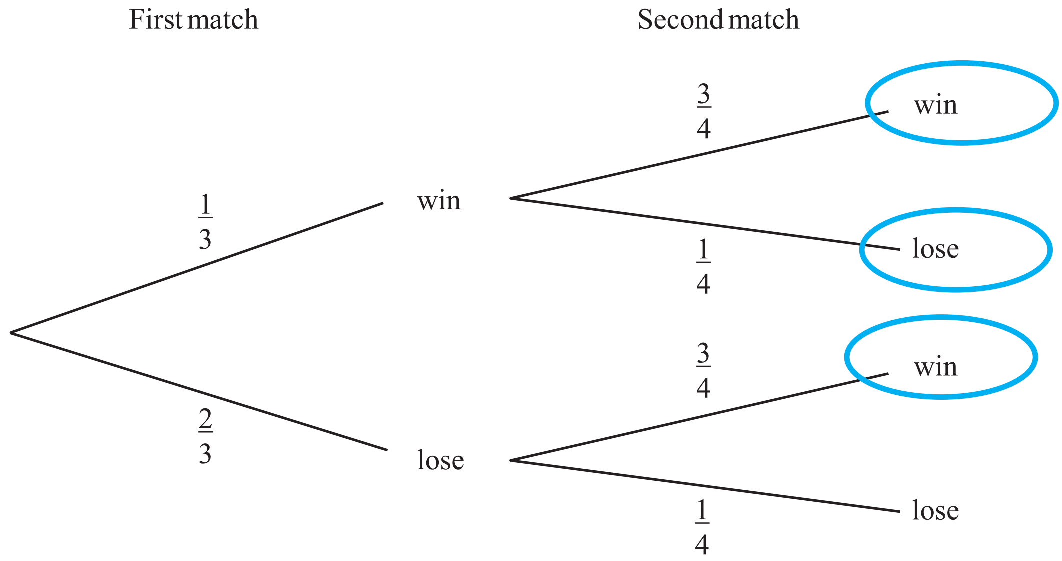
Simon picks a card from each box at random.
The probability of picking a triangle card is t.
The probability of picking a red card is r.

Complete the table for the cards that Simon picks, writing each probability in terms of r and t.

Event	Probability
Triangle and red	$\boldsymbol{tr}$
Square and red	$(1 - t)\,r$
Triangle and blue	$t(1 - r)$
Square and blue	$\boldsymbol{(1 - t)(1 - r)}$

[3]

The probability of a cricket team winning or losing in their first two matches is shown in the tree diagram.



Find the probability that the cricket team wins at least one match. [3]

The branches that result in at least one win for the cricket team are circled below:

The end probability of each branch is the two probabilities multiplied, for example the top branch is

$$\frac{1}{3}\times\frac{3}{4}=\frac{1}{4}$$

We need to add these probabilities together like so

$$\frac{1}{3}\times\frac{3}{4}+\frac{1}{3}\times\frac{1}{4}+\frac{2}{3}\times\frac{3}{4}$$

$$=\frac{1}{4}+\frac{1}{12}+\frac{1}{2}$$

$$=\frac{3}{12}+\frac{1}{12}+\frac{6}{12}$$

$$=\frac{10}{12}$$

$$=\mathbf{\frac{5}{6}}$$

Hattie has a box of coloured pens.
She takes a pen at random from the box.
The probability that she takes a red pen is 0.4 .

(a) Work out the probability that she does not take a red pen. [1]

If the probability she takes red is 0.4 then the probability does not select red must be

$$1 - 0.4$$

$$= \mathbf{0.6}$$

(b) The box contains only blue, red and green pens.
There are 15 blue pens and 15 green pens.

Complete the table. [2]

Colour of pen	Blue	Red	Green
Number of pens	15	**20**	15
Probability	**0.3**	0.4	**0.3**

Blue and green pens are equal in number and so equal in probability. 30% of all the pens is 15 so

$$15 = 0.3 \times P$$

Where P is the total number of pens. Hence

$$P = 15 \div 0.3$$

$$= 50$$

We also have that

$$15 + 15 + R = P$$

Where R is the number of red pens

$$\rightarrow 30 + R = 50$$

$$\rightarrow \boldsymbol{R = 20}$$

Dan either walks or cycles to school.
The probability that he cycles to school is $\frac{1}{3}$.

(a) Write down the probability that Dan walks to school. [1]

If the total probability of Dan going to school is 1, and the two only options of his method of transport is cycling or walking, then if Dan cycling to school has a probability of $\frac{1}{3}$ of occurring, then the probability of walking is:

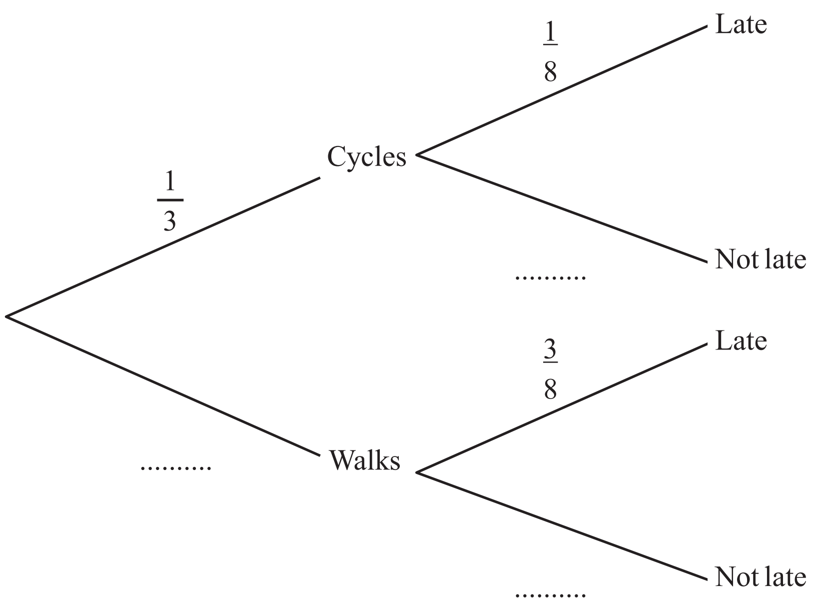
$$1-\frac{1}{3}$$

$$=\frac{2}{3}$$

(b) When Dan cycles to school the probability that he is late is $\frac{1}{8}$.

When Dan walks to school the probability that he is late is $\frac{3}{8}$.

Complete the tree diagram.



[2]

The total probability is always 1. Therefore, The probability that he cycles and that he is not late is equal to:

$$1 - \frac{1}{8}$$

$$= \frac{7}{8}$$

The probability that he walks is $\frac{2}{3}$. This is obtained from part (a)

The probability that he walks and is not late is equal to:

$$1 - \frac{3}{8}$$

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

(c) Calculate the probability that

(i) Dan cycles to school and is late, [2]

He cycles and is late, therefore it is the two probabilities from the tree multiplied by each other.

$$\frac{1}{3} \times \frac{1}{8}$$

$$= \frac{1}{24}$$

(ii) Dan is not late. [3]

There are two possible scenarios of Dan not being late; either he cycles or walks, with both instances leading to him being on time. Therefore the sum of both scenarios gives the overall probability that Dan is not late.

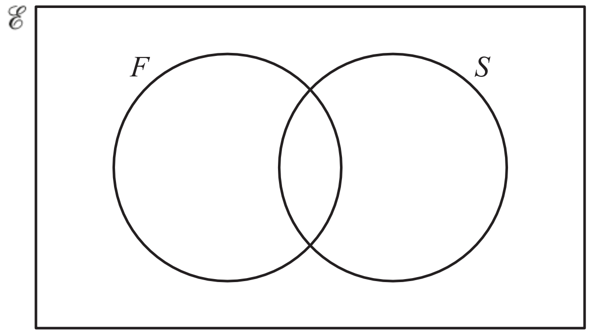
Probability of cycling and is not late + Probability of walking and is not late

$$= \left(\frac{1}{3} \times \frac{7}{8}\right) + \left(\frac{2}{3} \times \frac{5}{8}\right)$$

$$= \left(\frac{7}{24}\right) + \left(\frac{10}{24}\right)$$

$$= \frac{17}{24}$$

(a) In this part, you may use this Venn diagram to help you answer the questions.



In a class of 30 students, 25 study French (F), 18 study Spanish (S).
One student does not study French or Spanish.

(i) Find the number of students who study French and Spanish. [2]

Since there is one student who does not study French or Spanish, there must be 29 students who study at least one of them.

To get the number of students who study French and Spanish, we subtract the number of the students who study at least one of them from the sum of those who study French and those who study Spanish.

$$(Spanish + French) - at\ least\ one\ of\ them$$

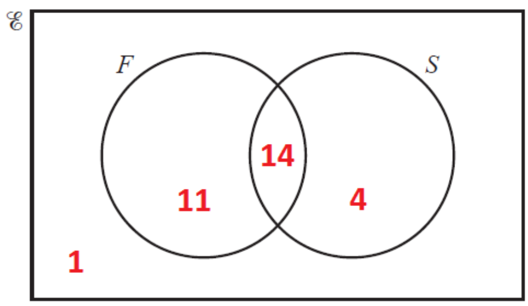
$$(18 + 25) - 29 = 14$$

There are **14 students** who study both French and Spanish.

(ii) One of the 30 students is chosen at random.

Find the probability that this student studies French but not Spanish. [1]

Now we can put the numbers into a Venn diagram.



The probability of picking a student who studies French but not Spanish (inside F but not S) is found by dividing the number of students who study French but not Spanish by the total number of students.

$$\frac{French\ but\ not\ Spanish}{total} = \frac{11}{30}$$

The probability that this student studies French but not Spanish is $\frac{\mathbf{11}}{\mathbf{30}}$

(iii) A student who does not study Spanish is chosen at random.

Find the probability that this student studies French. [1]

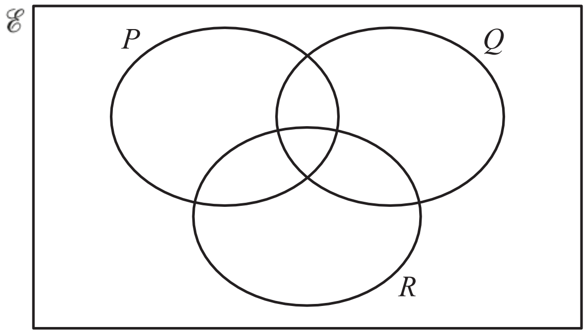
The probability a student who does not Study Spanish also studies French is found by dividing the number of students who only study French (only in F) by the number of students who do not study Spanish (outside S).

$$\frac{only\ French}{not\ Spanish} = \frac{11}{11+1}$$

$$= \frac{11}{12}$$

The probability is $\frac{\mathbf{11}}{\mathbf{12}}$

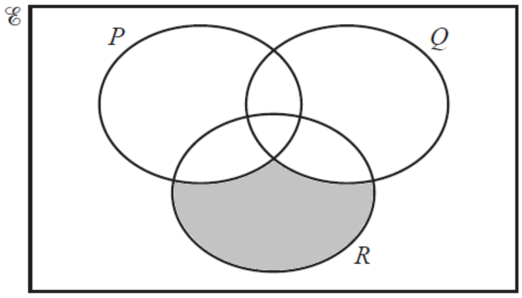
(b)



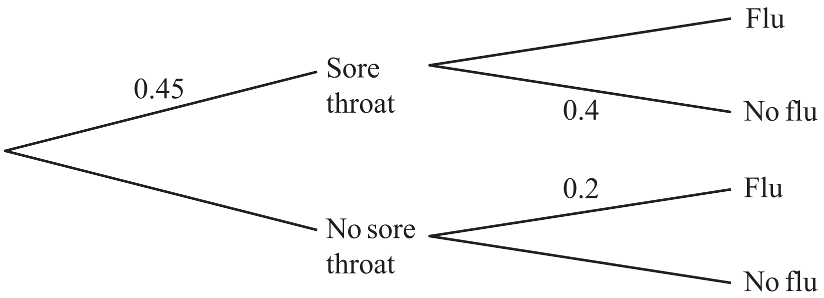
On this Venn diagram, shade the region $R \cap (P \cup Q)'$. [1]

We are looking for an area, which is the intersection of R and not in the union of P and Q.

Therefore this is the part, which only belongs to R and no other group.



In a flu epidemic 45% of people have a sore throat.
If a person has a sore throat the probability of not having flu is 0.4.
If a person does not have a sore throat the probability of having flu is 0.2.



Calculate the probability that a person chosen at random has flu. [4]

We complete the tree diagram to work out the probability that a randomly chosen person has flu.

If 45% of the people have a sore throat, the percentage of people which do not have a sore throat is: 100% - 45% = 55% = 0.55

Out of the people which have a sore throat, if 0.4 of them do not have the flu, the probability of having the flu is 1 – 0.4 = 0.6. This is because the sum of the 2 probabilities for an event adds up to 1.

Similarly, if a person does have a sore throat, the probability that they do not have the flu is:

1 – 0.2 = 0.8

To work out the probability that a randomly chosen person has the flu, we need to add up the probability that people with and without a sore throat have the flu.

For a person to both have a sore throat and flu, both independent events need to happen simultaneously, therefore we need to multiply the probabilities of the events happening alone.

For people which do have a sore throat, the probability of it also having the flu is:

$0.45 \times 0.6 = 0.27$

Similarly, the probability of somebody not having a sore throat and having the flu is:

$0.55 \times 0.2 = 0.11$

The total probability will be:

$P = 0.27 + 0.11$

$P = 0.38$

Rooms in a hotel are numbered from 1 to 19.
Rooms are allocated at random as guests arrive.

(a) What is the probability that the first guest to arrive is given a room which is a prime number?
(1 is not a prime number.) [2]

From 1 to 19, there are 8 prime numbers.

$$\text{Probability} = \frac{\text{number favourable cases}}{\text{number of total cases}}$$

In our case, the number of favourable cases is 8, the number of rooms with prime numbers, and the number of total cases is 19, the total number of rooms.

$P = \frac{8}{19}$

$$= 0.421$$

(b) The first guest to arrive is given a room which is a prime number.
What is the probability that the second guest to arrive is given a room which is a prime number? [1]

If the first guest to arrive is given a room with a prime number, than for the second guest to arrive the number of rooms with prime numbers left will be smaller, as well as the total number of rooms in the hotel.

In this case, the number of favourable cases is 7 and the total number of rooms is 18.

$P = \frac{7}{18} = 0.389$