



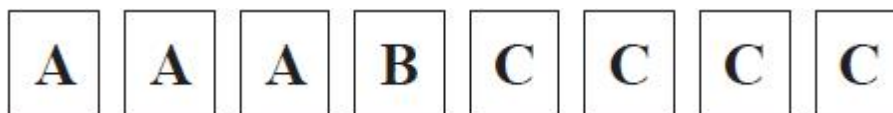
Unit 1 Revision Sheet F Probability Venn Diagrams and Handling Data Higher

Note: Higher tier students must also revise using the foundation tier revision worksheets as this content can also be assessed on higher tier papers.

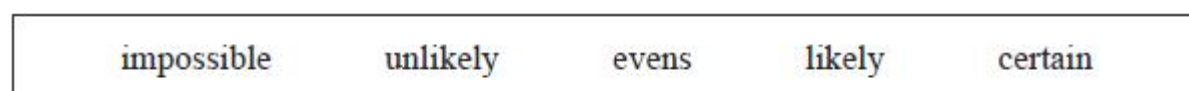
Questions

Q1.

Here are 8 cards.
Each card has a letter on it.



Malik takes at random one of these cards.



(a) Write down the word from the box that best describes the likelihood that Malik takes

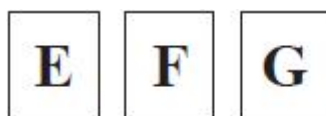
- (i) a card with the letter **B**,
- (ii) a card with the letter **D**.

(2)

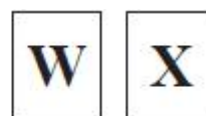
(b) Find the probability that Malik takes a card with the letter **A**.

(2)

Sunil has two sets of cards, Set 1 and Set 2
Each card has a letter on it.



Set 1



Set 2

Sunil takes one card from Set 1
He then takes one card from Set 2

(c) List all the possible combinations of cards he could get.

(2)

(Total for question = 6 marks)



Q2.

Sophie takes an examination.
If she fails the examination, she will resit.

The probability that Sophie passes the examination on her first attempt is 0.7
If she fails the examination on any attempt, the probability she passes on the next attempt is 0.9

Work out the probability that Sophie takes at most 2 attempts to pass the examination.

(Total for question = 3 marks)

Q3.

A bowl contains n pieces of fruit.
Of these, 4 are oranges and the rest are apples.

Two pieces of fruit are going to be taken at random from the bowl.

The probability that the bowl will then contain $(n - 6)$ apples is $\frac{1}{3}$

Work out the value of n
Show your working clearly.

(Total for question = 6 marks)

Q4.

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

Boris takes at random 2 sweets from the bag.

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

Originally there were 3 red sweets in the bag.

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

(Total for question = 5 marks)

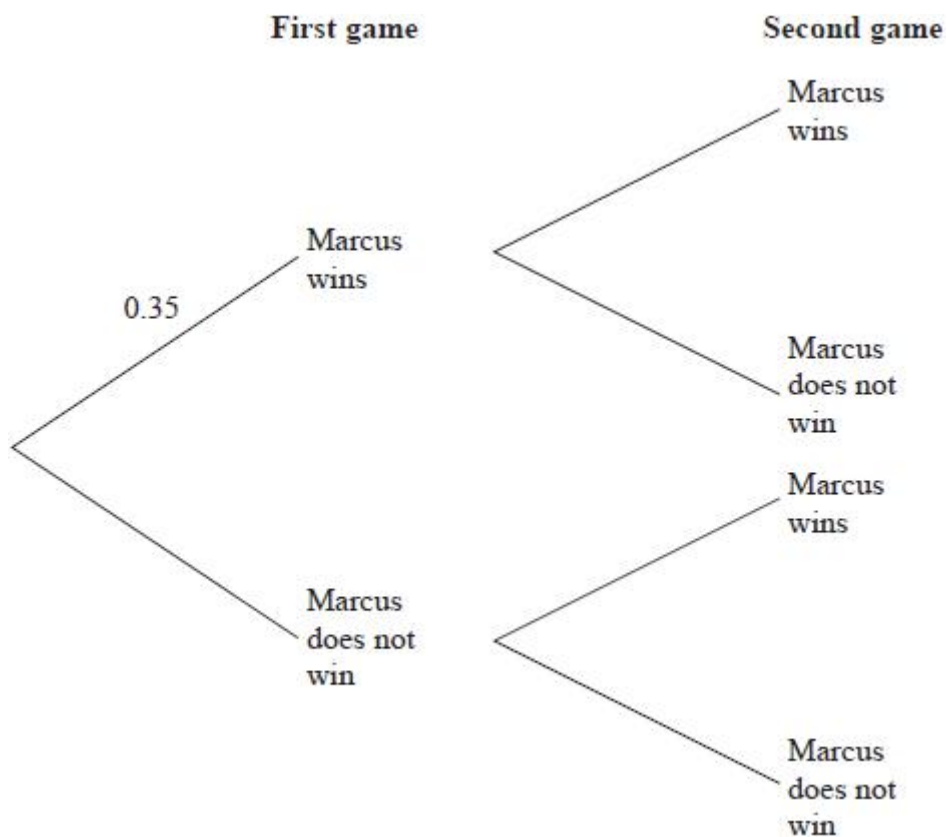


Q5.

Marcus plays two games of tennis.

For each game, the probability that Marcus wins is 0.35

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Marcus wins at least one of the two games of tennis.

(3)

(Total for question = 5 marks)



Q6.

30 adults booked to stay in a hotel.

19 adults booked breakfast

15 adults booked dinner

4 adults did not book breakfast or dinner

Some adults booked breakfast **and** dinner.

Meihui chooses at random two of the 30 adults.

Work out the probability that these two adults each booked breakfast **and** dinner.

(Total for question = 4 marks)

Q7.

The two-way table shows some information about the 60 noodle meals eaten in a noodle bar by each of 60 people last Friday.

Type of noodle				
	Ramen	Soba	Udon	Total
Boiled	18			31
Fried		12	7	
Total			15	60

(a) Complete the two-way table.

(3)

One of the 60 people is selected at random.

(b) Write down the probability that this person ate Fried Udon noodles.

(1)

(Total for question = 4 marks)

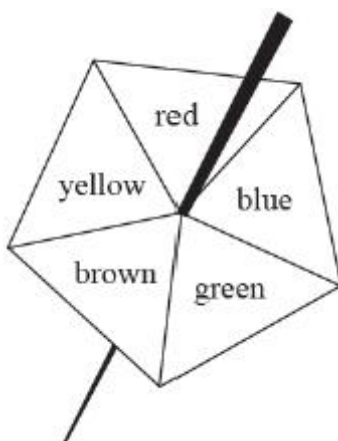


Q8.

Write your answers in the spaces provided.

You must write down all the stages in your working.

Here is a biased 5-sided spinner.



Kenny spins the spinner once.

The table gives the probabilities that the spinner lands on red or on blue or on green.

Colour	red	blue	green	brown	yellow
Probability	0.15	0.26	0.33		

(a) Work out the probability that the spinner lands on red or blue.

(1)

When the spinner is spun once, the probability that the spinner lands on brown is 0.06 more than the probability that the spinner lands on yellow.

Jenine spins the spinner 150 times.

(b) Work out an estimate for the number of times the spinner lands on yellow

(4)

(Total for question = 5 marks)



Q9.

100 farmers are asked if they have goats (G), sheep (S) or chickens (C) on their farms.

Of these farmers

31 have sheep

53 have chickens

6 have goats, sheep and chickens

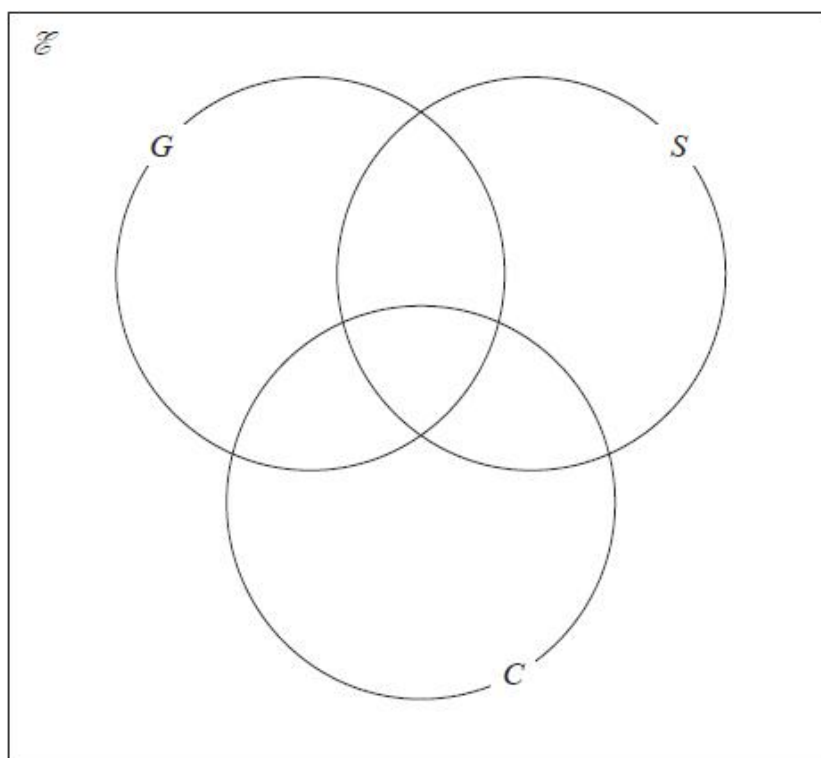
11 have sheep and goats

17 have sheep and chickens

18 have goats and chickens

20 do not have any goats, sheep or chickens

(a) Using this information, complete the Venn diagram to show the number of farmers in each appropriate subset.



(3)

(b) Find

(i) $n(G)$

(1)

(ii) $n([G \cup S]')$

(1)

(iii) $n(G' \cap C)$

(1)

One of the farmers who has chickens is chosen at random.

(c) Find the probability that this farmer also has goats.

(2)

(Total for question = 8 marks)



Q10.

$$\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

$$A = \{2, 3, 5, 7\}$$

$$B = \{1, 3, 5, 7, 9\}$$

(a) List the members of the set

(i) $A \cap B$

(ii) $A \cup B$

(2)

(b) Find $n(A')$

(1)

(Total for question = 3 marks)

Q11.

Some students were asked the following question.

"Which of the subjects Russian (R), French (F) and German (G) do you study?"

Of these students

4 study all three of Russian, French and German

10 study Russian and French

13 study French and German

6 study Russian and German

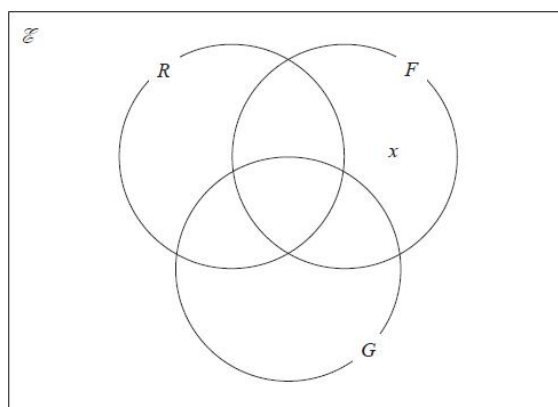
24 study German

11 study none of the three subjects

the number who study Russian only is twice the number who study French only.

Let x be the number of students who study French only.

(a) Show all this information on the Venn diagram, giving the number of students in each appropriate subset, in terms of x where necessary.



(3)

Given that the number of students who were asked the question was 80

(b) Work out the number of these students that study Russian.

(3)

(Total for question = 6 marks)



Q12.

$$\mathcal{E} = \{\text{integers } x \text{ such that } 10 \leq x \leq 25\}$$

$$A = \{x : x < 18\}$$

$$B = \{x : 13 \leq x < 22\}$$

(a) Write down $n(A)$

(1)

(b) List the members of the set $(A \cup B)'$

(2)

(c) List the members of the set $A' \cap B$

(2)

$$C \subset A, C \subset B \text{ and } n(C) = 5$$

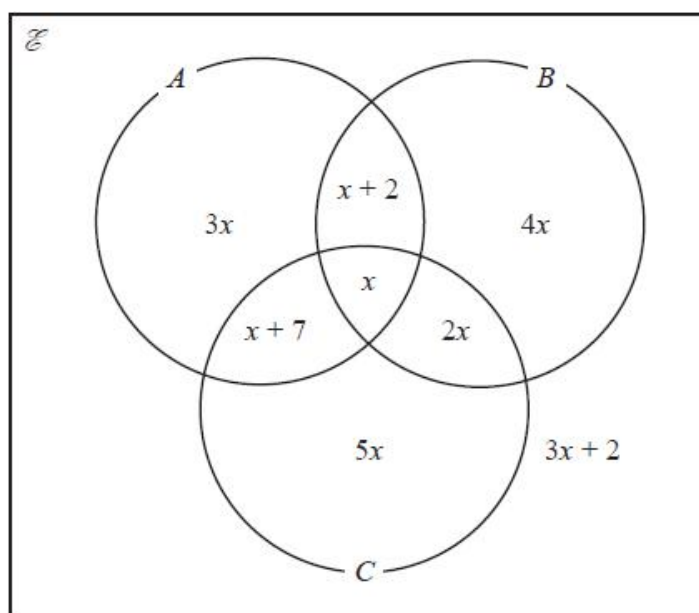
(d) List the members of the set C

(1)

(Total for question = 6 marks)

Q13.

The Venn diagram shows information about the numbers of items in set A , set B and set C , where x is an integer.



$$\text{Given that } n(A \cup B)' = 26$$

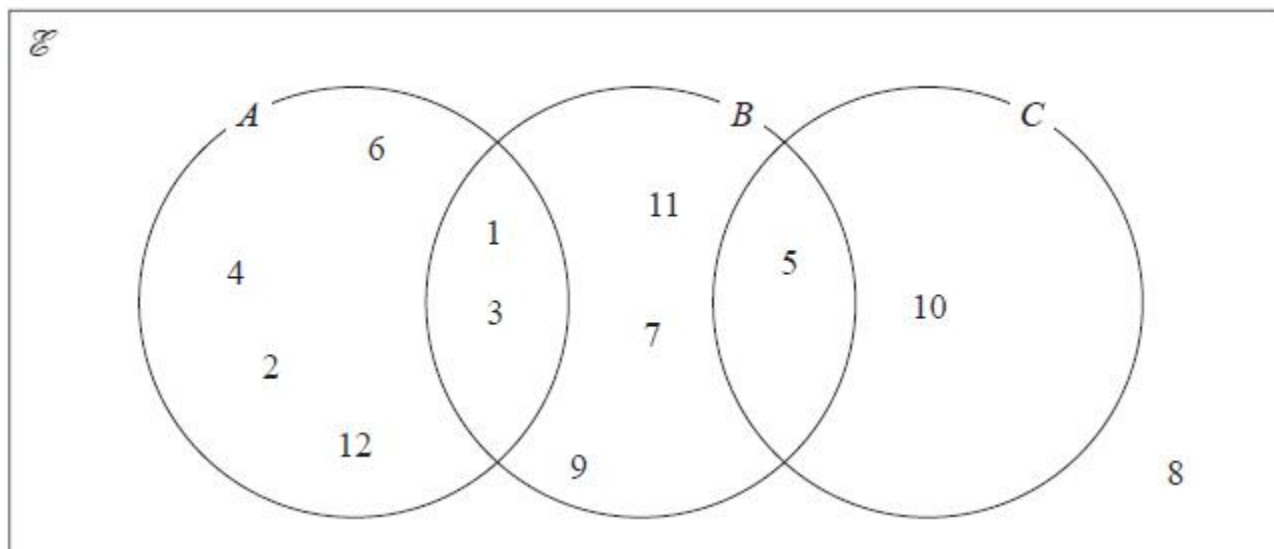
$$\text{find } n(A' \cap C)$$

(Total for question = 4 marks)



Q14.

Here is a Venn diagram.



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

- (i) A
- (ii) $B \cup C$

(2)

Brian writes down the statement $A \cap C = \emptyset$

(b) Is Brian's statement correct?

You must give a reason for your answer.

(1)

One of the numbers in the Venn diagram is picked at random.

(c) Find the probability that this number is in set C

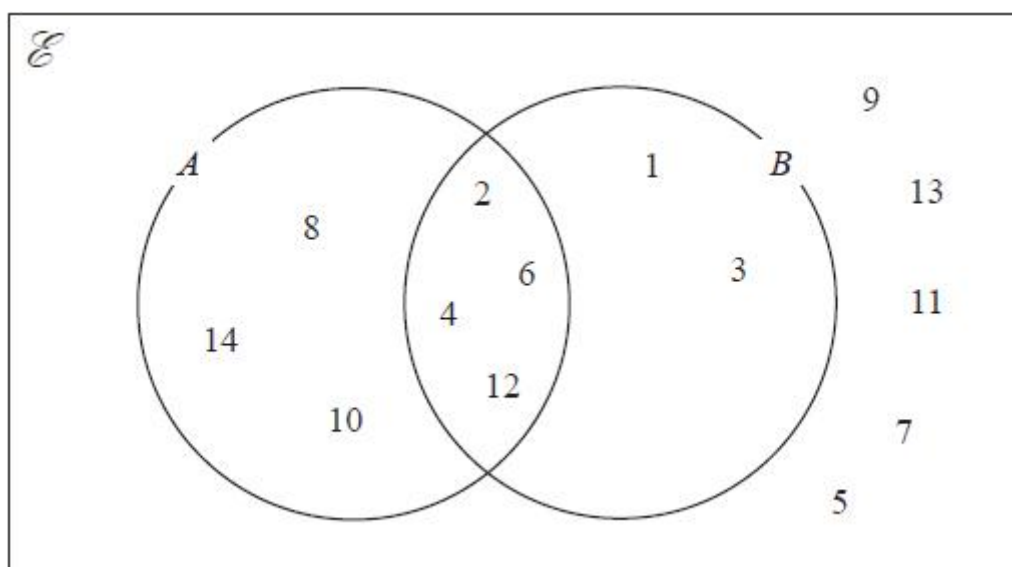
(2)

(Total for question = 5 marks)



Q15.

The numbers from 1 to 14 are shown in the Venn diagram.



(a) List the members of the set $A \cap B$

(1)

(b) List the members of the set B'

(1)

A number is picked at random from the numbers in the Venn diagram.

(c) Find the probability that this number is in set A but is **not** in set B .

(2)

(Total for question = 4 marks)

Q16.

There are 32 students in a class.

In one term these 32 students each took a test in Maths (M), in English (E) and in French (F).

25 students passed the test in Maths.

20 students passed the test in English.

14 students passed the test in French.

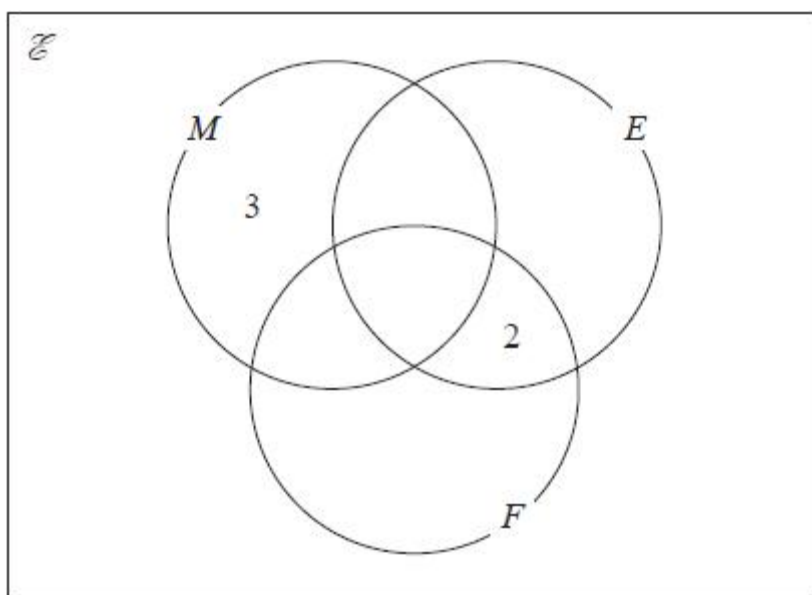
18 students passed the tests in Maths and English.

11 students passed the tests in Maths and French.

4 students failed all three tests.

x students passed all three tests.

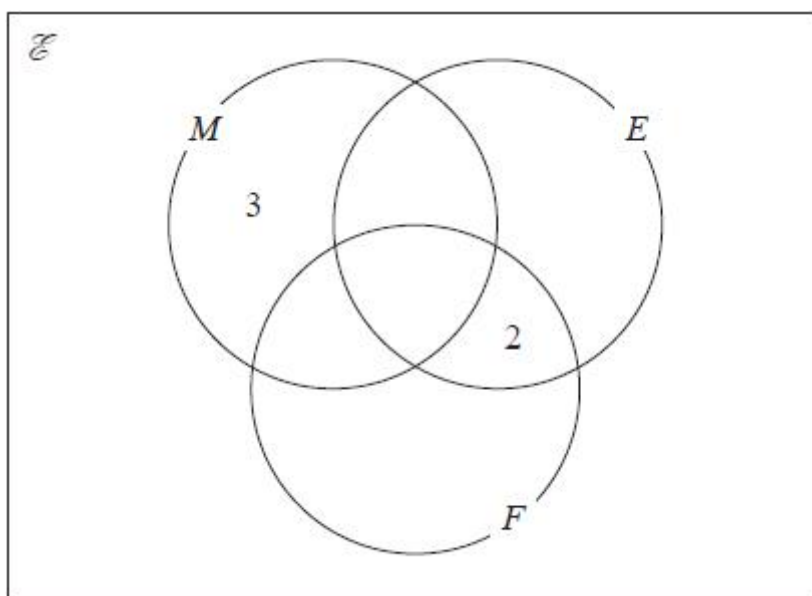
The incomplete Venn diagram gives some more information about the results of the 32 students.



(a) Use all the given information about the results of students who passed the test in Maths to find the value of x .

(2)

(b) Use your value of x to complete the Venn diagram to show the number of students in each subset.



(2)

A student who passed the test in Maths is chosen at random.

(c) Find the probability that this student failed the test in French.

(1)

(Total for question = 5 marks)



Q17.

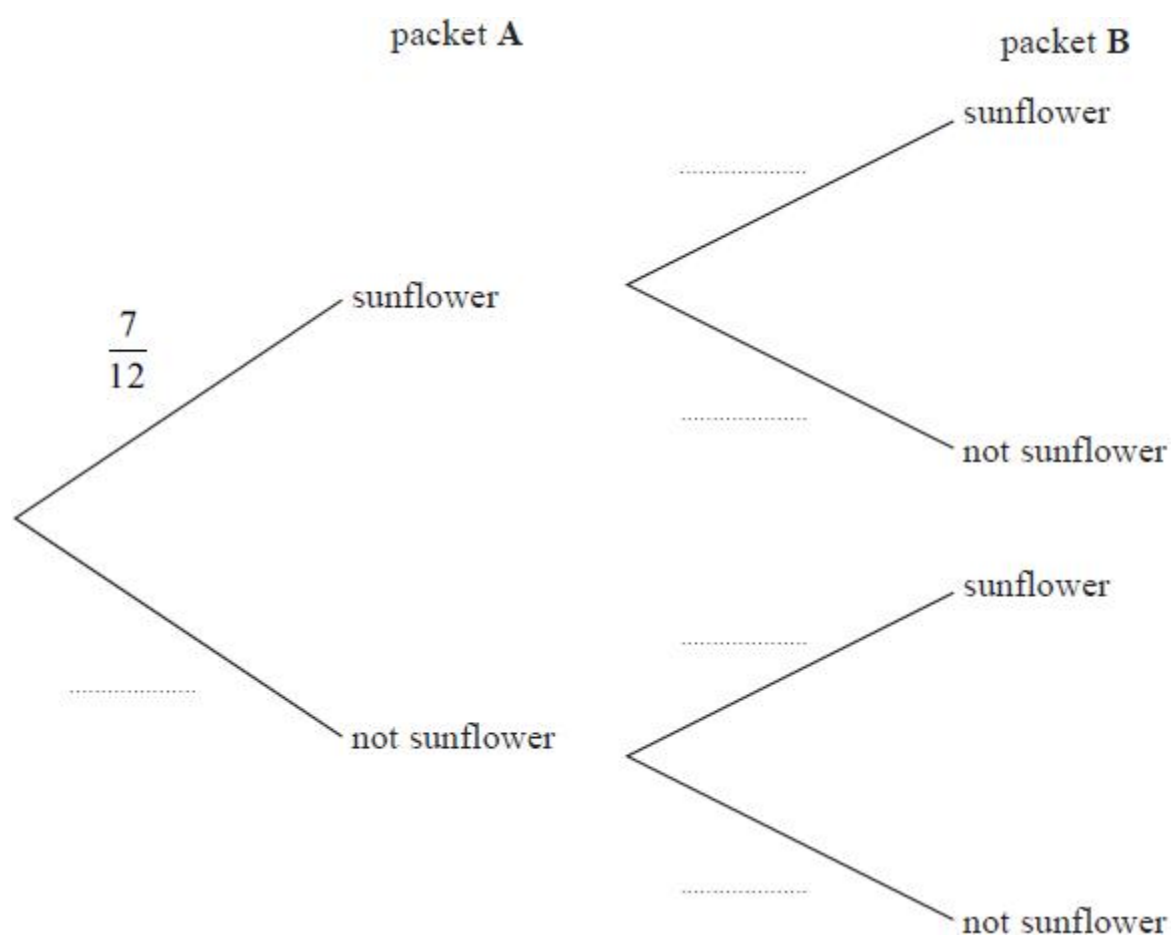
Aika has 2 packets of seeds, packet **A** and packet **B**

There are 12 seeds in packet **A** and 7 of these are sunflower seeds.

There are 15 seeds in packet **B** and 8 of these are sunflower seeds.

Aika is going to take at random a seed from packet **A** and a seed from packet **B**

(a) Complete the probability tree diagram.



(2)

(b) Calculate the probability that Aika will take two sunflower seeds.

(2)

(Total for question = 4 marks)



Mark Scheme

Q1.

Question	Working	Answer	Mark	Notes
ai		unlikely	1	B1
aii		impossible	1	B1
b		$\frac{3}{8}$	2	M1 for $\frac{a}{8}$ with $a < 8$ or $\frac{3}{b}$ with $b > 3$ A1
c		E,W E,X F,W F,X G,W G,X	2	M1 for at least 3 correct pairs (ignore repeats) A1 for all 6 pairs with no repeats
				Total 6 marks

Q2.

Q	Working	Answer	Mark	Notes
	$0.3 \times 0.9 (=0.27)$ $0.7 + '0.27'$	0.97	3	M1 The correct product for fail, pass M1 A fully correct method to find the probability that Sophie passes 1 st or 2 nd time A1 oe
				Total 3 marks



Q3.

Question	Working	Answer	Mark	Notes
	$\frac{n-4}{n}$ or $\frac{n-5}{n-1}$ $\frac{n-4}{n} \times \frac{n-5}{n-1} = \frac{1}{3}$ Eg $3(n^2 - 9n + 20) = n(n-1)$ or $3n^2 - 27n + 60 = n^2 - n$ Eg $2n^2 - 26n + 60 = 0$ or $n^2 - 13n + 30 = 0$ Eg $(n-10)(n-3) = 0$ or $\frac{- -13 \pm \sqrt{(-13)^2 - 4 \times 1 \times 30}}{2 \times 1}$	10	6	M1 $\frac{n-4}{n}$ or $\frac{n-5}{n-1}$ M1 for the correct equation M1 for a correct quadratic equation with fractions removed M1 for a correct quadratic equation equal to 0 M1 dep on M2 ft for method to solve 3 term quadratic A1 for correct answer from correct working NB. Award M5A1 for an answer of 10 with justification e.g. $\frac{6}{10} \times \frac{5}{9} = \frac{1}{3}$ Award M0A0 for an answer of 10 with no working and no justification



Q4.

Question	Working	Answer	Mark	Notes
	<div>RG and GR method</div> <div>RR and GG method</div>			
	$\frac{3}{t} \times \frac{t-3}{t-1} \text{ or } \frac{t-3}{t} \times \frac{3}{t-1}$	$\frac{3}{t} \times \frac{2}{t-1} \text{ or } \frac{t-3}{t} \times \frac{t-4}{t-1}$		M1 for one correct product
	$\frac{3}{t} \times \frac{t-3}{t-1} + \frac{t-3}{t} \times \frac{3}{t-1} = \frac{12}{35} \text{ or } 2 \times \frac{3}{t} \times \frac{t-3}{t-1} = \frac{12}{35} \text{ oe}$	$\frac{3}{t} \times \frac{2}{t-1} + \frac{t-3}{t} \times \frac{t-4}{t-1} = \frac{23}{35}$		M1 dep on M1 for a correct equation
	e.g. $2t^2 - 37t + 105 (= 0)$ or allow $2t^2 - 37t = -105$			A1 (dep on M2) writing the correct quadratic expression in form $ax^2 + bx + c (= 0)$ allow $ax^2 + bx = c$
	e.g. $(2t - 7)(t - 15) = 0$ e.g. $t = \frac{-(-37) \pm \sqrt{(-37)^2 - 4 \times 2 \times 105}}{2 \times 2}$ e.g. $2 \left(\left(t - \frac{37}{4} \right)^2 - \left(\frac{37}{4} \right)^2 \right) = -105$			M1 (dep on A1) for a complete method to solve the 3-term quadratic equation (allow one sign error and some simplification - allow as far as $\frac{37 \pm \sqrt{1369 - 840}}{4}$) or Can be implied by answers of 15 (and $\frac{7}{2}$)
		12	5	A1 (dep on A1) cao
				Total 5 marks



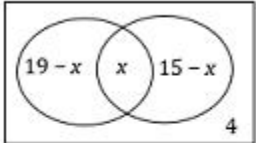
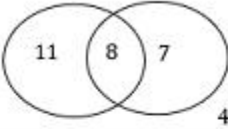
Alt	RG and GR method	RR and GG method			
	$\frac{3}{x+3} \times \frac{x}{x+2}$ or $\frac{x}{x+3} \times \frac{3}{x+2}$	$\frac{3}{x+3} \times \frac{2}{x+2}$ or $\frac{x}{x+3} \times \frac{x-1}{x+2}$			M1 for one correct product
	$\frac{3}{x+3} \times \frac{x}{x+2} +$ $\frac{x}{x+3} \times \frac{3}{x+2} = \frac{12}{35}$ or $2 \times \frac{3}{x+3} \times \frac{x}{x+2} = \frac{12}{35}$ oe	$\frac{3}{x+3} \times \frac{2}{x+2} +$ $\frac{x}{x+3} \times \frac{x-1}{x+2} = \frac{23}{35}$			M1 dep on M1 for a correct equation
	e.g. $2x^2 - 25x + 12 (= 0)$ or allow $2x^2 - 25x = -12$				A1 (dep on M2) writing the correct quadratic expression in form $ax^2 + bx + c (= 0)$ allow $ax^2 + bx = c$
	e.g. $(2x - 1)(x - 12) = 0$ e.g. $x = \frac{-(-25) \pm \sqrt{(-25)^2 - 4 \times 2 \times 12}}{2 \times 2}$ e.g. $2 \left(\left(x - \frac{25}{4} \right)^2 - \left(\frac{25}{4} \right)^2 \right) = -12$				M1 (dep on A1) for a complete method to solve the 3-term quadratic equation (allow one sign error and some simplification - allow as far as $\frac{25 \pm \sqrt{625 - 96}}{4}$) or can be implied by answers of 12 (and $\frac{1}{2}$)
			12	5	A1 (dep on A1) cao
					Total 5 marks



Q5.

Question	Working	Answer	Mark	Notes	
(a)		0.65 0.35, 0.65 0.35, 0.65	2	B2oe	for all correct If not B2 then award B1 for 0.65 in any of the 3 possible positions NB all values may be given as fractions
(b)	0.35×0.35 or 0.35×0.65 or 0.65×0.35 or 0.65×0.65 $0.35 \times 0.35 + 0.35 \times 0.65 + 0.65$ $\times 0.35$ or $1 - 0.65 \times 0.65$	0.5775	3	M1 M1 A1	ft from (a) ft from (a) oe e.g. $\frac{231}{400}$, 0.58 or 58% or better

Q6.

	$(19 + 15 + 4) - 30$ or $38 - 30$ or $19 + 15 - 26$ or  or $19 - x + x + 15 - x + 4 = 30$ oe 8		4	M1 for a correct method to find the number of people booking breakfast and dinner	M1A1 for a fully correct Venn diagram  or for $\frac{8}{30}$
	8			A1 can be shown in a Venn diagram or a valid calculation	
	$\frac{8}{30} \times \frac{1}{29}$ or $\frac{8}{30} \times \frac{8}{30} = \frac{64}{900} \approx \frac{16}{225}$			M1 for the use of $\frac{k}{30} \times \frac{k-1}{29}$ where $k < 30$ or $\frac{"8"}{n} \times \frac{"8"-1}{n-1}$ where $n > 8$	
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{28}{435}$		A1 oe awrt 0.064 or awrt to 6.4%	
Total 4 marks					



Q7.

Q	Working					Answer	Mark	Notes
(a)		ramen	soba	udon	Total	Correct table	3	B3 All 6 correct entries (B2 4 or 5 correct entries B1 2 or 3 correct entries)
	Boiled	18	<u>5</u>	<u>8</u>	31			
	Fried	<u>10</u>	12	7	<u>29</u>			
	Total	<u>28</u>	<u>17</u>	15	60			
(b)						$\frac{7}{60}$	1	B1 accept 0.11666... (accept 2 d.p. or better truncated or rounded) or 11.666...% (accept 2 s.f. or better truncated or rounded)
								Total 4 marks

Q8.

Question	Working	Answer	Mark	Notes
(a)	$0.15 + 0.26$	0.41 oe	1	B1
(b)	$1 - (0.15 + 0.26 + 0.33)$ or $1 - 0.74 (=0.26)$			M1 can be implied by two values where $P(\text{brown}) + P(\text{yellow}) = 0.26$ (may be seen in table)
	$(P(\text{yellow}) = \frac{0.26 - 0.06}{2})$ or 0.1			M1 for a complete method to find $P(\text{yellow})$
	$150 \times "0.1"$	15	4	M1 independent mark Award for $150 \times p$ where $0 < p < 1$
				A1 NB: An answer of $\frac{15}{150}$ scores M3 A0



Q9.

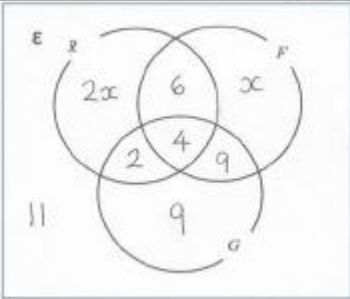
Q	Working	Answer	Mark	Notes	
(a)		Fully correct Venn diagram	3	B1	For 13 correct in <i>G</i> only
				B2	For all 7 others correct (B1 for 4, 5 or 6 others correct (does not need to be complete for this))
(b)(i)		36	1	B1ft	ft from a diagram where values are present in the required regions If these 3 parts are given as probabilities, please mark incorrect the first time but award marks from there on if numerator is correct
(ii)		44	1	B1ft	
(iii)		35	1	B1ft	
(c)		$\frac{18}{53}$	2	B2ft	oe 0.33(96...) or 33(.96...) % ft their Venn diagram or (B1 for $\frac{18}{m}$ where $m > 18$ or $\frac{n}{53}$ where $n < 53$ or for 18 : 53 or other incorrect notation or B1ft their Venn diagram for $\frac{"18"}{m}$ where $m > "18"$ or $\frac{n}{"53"}$ where $n < "53"$)
				Total 8 marks	

Q10.

Question	Working	Answer	Mark	Notes
(a)(i)		{3, 5, 7}	2	B1
(a)(ii)		{1, 2, 3, 5, 7, 9}		B1
(b)		6	1	B1
				Total 3 marks



Q11.

Q	Working	Answer	Mark	Notes
(a)			3	B3 For all sections completed correctly (B2 for 5 or 6 sections correct (excl x), B1 for 3 or 4 sections correct (excl x))
(b)	$2x + 6 + x + 2 + 4 + 9 + 9 + 11 = 80$ $(80 - 6 - 2 - 4 - 9 - 9 - 11) \div 3$		3	M1ft ft their Venn diagram A correct equation to find x or subtracting all numerical values from 80 and dividing by 3 or other fully correct method to find x with all sections completed
	$x = 13$			A1 correct value for x
		38		B1 their $2x + 12$
				Total 6 marks



Q12.

Q	Working	Answer	Mark	Notes
a		8	1	B1
b	$A = \{10, 11, 12, 13, 14, 15, 16, 17\}$ $B = \{13, 14, 15, 16, 17, 18, 19, 20, 21\}$ or $A \cup B = \{10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21\}$			M1 may be seen in a Venn diagram (allow for example 10 – 17 for A and 13 – 21 for B or 10 – 21 for $A \cup B$) or for an answer with one missing element or one extra element
		22, 23, 24, 25	2	A1
c	$A' = \{18, 19, 20, 21, 22, 23, 24, 25\}$ $B = \{13, 14, 15, 16, 17, 18, 19, 20, 21\}$			M1 may be seen in a Venn diagram (allow 18 – 25 for A' and 13 – 21 for B) or for an answer with one missing element or one extra element
		18, 19, 20, 21	2	A1
d		13, 14, 15, 16, 17	1	B1
				Total 6 marks



Q13.

Q	Working	Answer	Mark	Notes
	$5x + 3x + 2 = 26$ oe		4	M1 a correct equation for x
	$x = 3$ <i>Correct value of x scores M1A1 (unless from obvious incorrect working)</i>			A1
	$7 \times "3"$ oe eg " 15 " + " 6 " (where " 15 " is $5 \times "3"$ and " 6 " is $2 \times "3"$)			M1ft use of their positive value for x in $7x$ (ie use of correct regions from Venn diagram for the set required) [their value is their value given for x which must be clearly assigned as x]
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	21		A1 cao
				Total 4 marks



Q14.

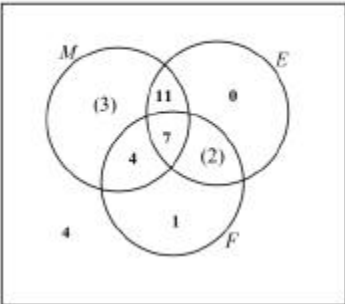
Question	Working	Answer	Mark	Notes
a (i)		1, 2, 3, 4, 6, 12	1	B1 cao
(ii)		1, 3, 5, 7, 9, 10, 11	1	B1 cao
b		Yes with reason	1	B1 e.g. no numbers in both A and C or A and C do not intersect or A and C do not overlap or A and C are mutually exclusive
c		$\frac{10}{12}$ oe	2	M1 for $12 - 2 (=10)$ or $\frac{a}{12}$ with $a < 12$ or 10 and 12 used with incorrect notation E.g. $10 : 12$ A1 for $\frac{10}{12}$ oe or $0.83(3\dots)$ or $83(.3\dots)\%$

Q15.

Q	Working	Answer	Mark	Notes
(a)		2, 4, 6, 12	1	B1
(b)		5, 7, 8, 9, 10, 11, 13, 14	1	B1
(c)			2	M1 for $\frac{a}{14}$ with $a < 14$ or $\frac{3}{b}$ with $b > 3$ or for 3 and 14 used with incorrect notation e.g. $3 : 14$
		$\frac{3}{14}$		A1 for $\frac{3}{14}$ oe or $0.214(\dots)$
				Total 4 marks



Q16.

Q	Working	Answer	Mark	Notes
(a)	$(11 - x) + (x) + (18 - x) + 3 = 25$ oe or $(11 - x) + (x) + (18 - x) + 3 + 7 = 25 + 7$ oe or $x + y + z = 25 - 3$ and $x + z = 11$ and $x + y = 18$ oe where $y = M \cap E \cap F'$ and $z = M \cap F \cap E'$		2	M1 for setting up a correct equation
	Correct answer scores full marks (unless from obvious incorrect working)	7		A1 (allow 7 in the Venn diagram if no answer is given in (a))
(b)			2	B2 ft for $18 - x$, x and $11 - x$ dep on M1 in part (a) and $(x < 12)$ (NB 0, 1 and 4 are fixed) for 6 correct remaining values (B1 ft for 4 or 5 correct remaining values) Allow just E to be blank if other sections are populated with a number
(c)	$\frac{3 + "11"}{25}$ or $\frac{3 + (18 - "7")}{25}$ or 0.56 oe	$\frac{14}{25}$	1	B1ft for $18 - x$, x and $11 - x$ oe
				Total 5 marks



Q17.

Q	Working	Answer	Mark	Notes
(a)		$\frac{5}{12} \frac{8}{15} \frac{7}{15} \frac{8}{15} \frac{7}{15}$	2	<p>B2 for all correct probabilities $\frac{5}{12}, \frac{8}{15}, \frac{7}{15}, \frac{8}{15}, \frac{7}{15}$ (B1 for $\frac{5}{12}$ or $\frac{8}{15}, \frac{7}{15}, \frac{8}{15}, \frac{7}{15}$)</p> <p>oe eg for $\frac{5}{12}$ accept 0.41(666...) or 0.42, for $\frac{8}{15}$ accept 0.53(333...) or 0.53, for $\frac{7}{15}$ accept 0.46(666...) or 0.47</p>
(b)	$\frac{7}{12} \times \frac{8}{15}$		2	M1 ft their tree diagram
		$\frac{14}{45}$		A1 oe eg $\frac{56}{180}$ or 0.31(111...) or 31(.111...)%
				Total 4 marks