EXPERT TUITION

Maths Questions By Topic:

Probability
Mark Scheme

Edexcel GCSE (Foundation)

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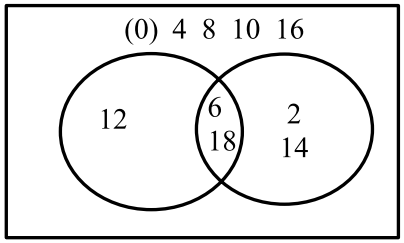
Question	Answer	Mark	Mark scheme	Additional guidance
1	Venn Diagram	C1 C1 C1	for one correct region for two correct regions for all regions correct	 Ignore all entries except the region you are marking for each mark
2 (a)	cross at ½	B1	Cross (or mark) at ½	Accept any mark near to ½ if the intention is clear; do not accept if any additional marks are shown
(b)	cross at 0	B1	Cross (or mark) at 0	Accept any mark near to 0 if the intention is clear; do not accept if any additional marks are shown
3 (a)	16 45 29 75 14 61	C1 C1 C1	starts to interpret information eg 75 or 29 in the correct place for 120 – 75 (= 45) and "45" – 29 (= 16) Complete and correct frequency tree	May be seen as numerators of fractions for the first 2 marks. Could be seen in working or on the diagram
(b)	$\frac{29}{120}$	B1	for $\frac{29}{120}$ or ft "29" from part (a)	Accept any equivalent fraction, decimal form 0.24(166…) or percentage form 24(.166..) Ignore subsequent incorrect attempts to write the correct answer in a different form.

Question	Answer	Mark	Mark scheme	Additional guidance
4 (i)	Maxine with bigger number of trials	C1	for Maxine with reason **Acceptable examples** She throws the coin more times than Stuart **Not acceptable examples** Maxine throws it 50 times She gets more Tails Stuart (he) ……	
(ii)	$\frac{37}{60}$	B1	for $\frac{37}{60}$ oe	
5 (a)	0.4, 0.4	P1	for process to find sum of unknown probabilities, eg 1 – 0.2 (= 0.8)	Award mark for any two probabilities given that sum to 0.8, eg given in the table
		A1	oe	Accept any equivalent fraction or 40%
(b)	60	P1	for complete process to find total number of cubes, eg 12 ÷ 0.2 **or** 12 × 5 **or** ("0.4" ÷ 0.2) ×12 + ("0.4" ÷ 0.2) ×12 + 12 **OR** states 0.1 = 6 **or** 0.4 = 24	
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
6 (a)	32, 48, 24, 8, 37, 11	C1	starts to interpret information, eg 48 or 8 in correct place	
		C1	for 80 – 48 (= 32) and "32" – 8 (= 24)	
		C1	completes frequency tree correctly SC: award C2 if all correct frequencies are shown as fractions of 80.	
(b)	$\frac{37}{61}$	M1	ft for $\frac{a}{"61"}$ with $a <$ "61" or $\frac{"37"}{b}$ with $b >$ "37"	Incorrect notation with "37" and "61"can earn the method mark but not the accuracy mark.
		A1	ft from diagram in (a)	Accept any equivalent fraction, decimal form 0.60(65...) or 0.61 or percentage form 60(.65...)% or 60% or 61%
7 (a)	$\frac{7}{10}, \frac{4}{9}, \frac{5}{9}, \frac{4}{9}$	B2	for all probabilities correct (oe)	
		(B1	for 2 or 3 correct)	
(b)	$\frac{15}{90}$	M1	for $\frac{3}{10} \times \frac{5}{9}$ oe	
		A1	$\frac{15}{90}$ oe	Accept any equivalent fraction, decimal form 0.16(6...) or 0.17 or percentage form 16(.6...)% or 17%

Question	Answer	Mark	Mark scheme	Additional guidance
8 (a)	D	B1	cao	
(b)	B	B1	cao	
(c)	Shown	M1	for number of green counters, eg $12 - (3+1+2) = 6$ **OR** for $\frac{3}{12}$ oe **or** $\frac{1}{12}$ oe **or** $\frac{2}{12}$ oe linked to the appropriate colour	This is awarded for a correct first step
		M1	for $1 - ("\frac{3}{12}" + "\frac{1}{12}")$ $(= \frac{8}{12})$ or "$\frac{2}{12}$"+ $\frac{"6"}{12}$ $(= \frac{8}{12})$ **OR** for method to find $\frac{2}{3}$ of 12, eg. $12 \div 3 \times 2$ (= 8)	This is awarded for a fully correct method from which the correct answer of $\frac{2}{3}$ can be found Sight of $\frac{8}{12}$ gets M2
		C1	for correct conclusion supported by accurate figures, eg $\frac{8}{12} = \frac{2}{3}$ **or** $\frac{2}{3}$ of 12 = 8 **and** number of yellow + green = 2 + 6 = 8	
9 (a)	15, 17, 19, 20, 21, 23, 25	M1	for listing either set eg 15,20,25 **or** 15,17,19,21,23,25 with no incorrect numbers	The 'lists' may be seen in a Venn Diagram or in the working space in part (b) provided they are not contradicted by incorrect lists in part (a)
		A1	15,17,19,20,21,23 and 25 with no repeats	If repeats (but no incorrect numbers) award M1 only.
(b)	Statement or 15 and 25	C1	eg odd multiples of 5 (between 14 and 26) oe NB Could be a general description, eg numbers that are in both (A and B), **or** 15 and 25 (ft from their sets A and B in part (a)) **or** numbers ending in 5 (between 14 and 26)	

Question	Working	Answer	Mark	Notes
10 (a)	**12** 7 19 18 **8** 26 **30** 15 **45**	Correct table	B3 (B2 (B1	Fully correct table for 5, 6, 7 or 8 figures correct) for given values entered correctly in the table **or** for a correct row **or** column)
(b)		$\frac{8}{45}$	B1	for $\frac{8}{45}$ **or** ft from values in table eg $\frac{"8"}{"45"}$
11		$\frac{4}{9}$	M1 A1	for listed outcomes (allow 1 error eg omission or repeat) **or** fractions $\frac{1}{3}\times\frac{2}{3}+\frac{2}{3}\times\frac{1}{3}$ for $\frac{4}{9}$ oe

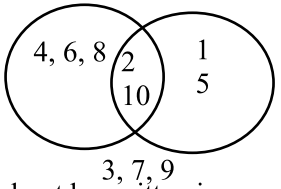
Question	Working	Answer	Mark	Notes
12 (i)		× at ½	B1	
(ii)		× at 0	B1	
13		$\frac{7}{17}$	M1	for $\frac{a}{17}$ where a ≠7 but < 17 or $\frac{7}{b}$ where b≠17 but > 7
			A1	oe

Question	Working	Answer	Notes
14 (i)		× at $\frac{1}{2}$	B1
(ii)		× at $\frac{4}{6}$	B1
15		$\frac{1}{4}$	B1 $\frac{1}{4}$ oe
16 (a)		42, 58 39, 3, 53, 5	C1 starts to interpret information eg. one correct frequency C1 continue to interpret information C1 communicates all information correctly
(b)		$\frac{5}{58}$	M1 ft for $\frac{a}{58}$ with $a < 58$ **or** $\frac{5}{b}$ with $b > 5$ A1 ft from (a)
17		0.22	P1 begins process of subtraction of probabilities from 1 A1 oe

Question	Working	Answer	Notes	
18 (a)		Sharif	B1	Sharif with mention of greatest total throws
(b)		Decision (supported)	P1 A1 P1	starts working with proportions Conclusion: correct for Paul, but not for the rest; or ref to just Paul's results selects Sharif or overall and multiplies P(heads)×P(heads) eg ¾ × ¾
(c)	Tot: H 300 T 100	$\frac{9}{16}$	A1	oe

Question	Working	Answer	Notes
19 a		$\frac{1}{4}$	M1 For $\frac{x}{24}$ with $x < 24$ or $\frac{6}{y}$ with $y > 6$ A1 for $\frac{6}{24}$ oe
b		PP PM PW MM MW WW	M1 At least 3 correct combinations A1 Fully correct list with no extras or permutations
20 a	$\frac{1}{6} \times \frac{1}{5} \times 30 \times 5 = 5$ $(\frac{5}{6} \times \frac{1}{5} + \frac{1}{6} \times \frac{4}{5} + \frac{1}{6} \times \frac{1}{5}) \times 30 = 10$ $30 \times 1 - 5 - 10 \times 2$	5	P1 for identifying correct process to find probabilities for winnng scores. May include use of tree diagram or sample space P1 for correct process to find prize money P1 for completing correct process to find profit A1 cao
b		Explanation	C1 for appropriate comment to interpret result eg probability so only likelihood not certainty, other than 30 may play, £5 is small difference.

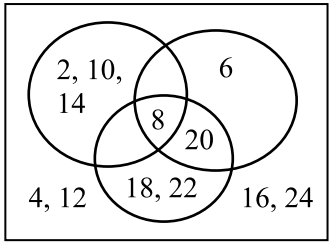
Question	Answer	Mark	Mark scheme	Additional guidance
21 (a)	120	M1	for sensible use of proportion eg $\frac{135}{90}$ (= 1.5) **or** $\frac{90}{135}$ (= $\frac{2}{3}$) **or** 135 × 4 (= 540) **or** 135 ÷ 9 (=15) **or** 80 ÷ 90 (= 0.888...)	ie 135 ÷ 9 but not 135 ÷ 10 without 80 ÷ 9
		M1	for a complete method eg 80 × "1.5" **or** 80 ÷ "$\frac{2}{3}$" **or** "540" × $\frac{80}{360}$ **or** "15" × 8 **or** "0.888..." × 135	
		A1	cao	
(b)	$\frac{50}{540}$	M1	for method to find total number of cars, eg 135 × $\frac{360}{90}$ (= 540) **or** for $\frac{50}{135}\times\frac{1}{4}$ oe **or** begins to work with probability by using a numerator of 50 eg $\frac{50}{a}$ where a >50 and an integer	
		A1	for $\frac{50}{540}$ oe ft "540" from part (a)	Accept any equivalent fraction, decimal form 0.09(25..) or percentage form 9(.25..)%
22	7 22 15 38 29 9	C1	for correctly placing one of the given values in the diagram eg 38 women or 15 men email	
		M1	for 60 – 38 (=22) **or** 22 (men) correctly placed in the diagram **or** 60 – 38 – 15 (=7) **or** 7 (men texting) correctly placed in the diagram	
		M1	for a method to find 60% of 60, eg. 60 × 0.6 (= 36)	May be implied by the total number of texts in the frequency diagram being 36
		M1	for calculating with 60% of 60 eg "36" – ("22" – 15) (= 29) **or** "36" – "7" (=29) **or** (60 – "36") – 15 (= 9)	9 or 29 on the diagram (women branch) gets the two M marks for finding and calculating with 60% of 60
		A1	for a fully correct frequency diagram	If probabilities used instead of frequencies then maximum of C1M1M1M1A0 can be awarded

Question	Answer	Mark	Mark scheme	Additional guidance
23 (a)	Venn diagram	M1	for correct numbers in at least one region	Ignore all entries except the region you are marking for each method mark
		M1	for correct numbers in at least two regions	
		A1	for all regions correct	
(b)	$\frac{2}{10}$	M1	for $\frac{a}{10}$ where $0 < a < 10$ and a is an integer **or** $\frac{2}{b}$ where $b > 2$ and b is an integer **or** ft diagram	Need not be written in correct form at this stage eg could be a ratio 2 : 10 Repeated digits in the diagram should be counted as 2 elements
		A1	$\frac{2}{10}$ oe or ft diagram	Accept any equivalent fraction, decimal form 0.2 or percentage form 20%

Question	Answer	Mark	Mark scheme	Additional guidance
24 (a)	5	M1	for listing numbers in order, eg 3 4 4 6 8 9 **or** answer of 4, 6 **or** answer of 8.5	Condone one error or additional number
		A1	cao	
(b)	$\frac{2}{6}$	M1	for $\frac{2}{x}$ with $x > 2$ **or** for $\frac{y}{6}$ with $y < 6$	Incorrect notation can imply a correct method. Award M1 for eg 2 out of 6 **or** 2 in 6 **or** 2 : 6
		A1	for $\frac{2}{6}$ oe	Accept any equivalent fraction, decimal form 0.33(33..) or percentage form 33(.33..)%
(c)	3, 6	P1	for at least one 3 **or** 5×5 (= 25)	Numbers may be seen on the cards (but the answer line takes precedence)
		A1	for 3, 6 or 6, 3	

Question	Answer	Mark	Mark scheme	Additional guidance
25 (a)(i)	B	B1	for B, accept 0.033 on the answer line	
(ii)	C	B1	for C, accept $\frac{1}{3}$ on the answer line	
(b)	Statement	C1	eg No with $\left(\frac{1}{3}\right)$ and $\frac{2}{3}$ or No, probabilities would need to be $\frac{1}{2}$ or No since $\frac{1}{3} + \frac{1}{3}$ does not equal 1 or No since tails is 67% (or 0.67)	Accept rounded conversions **seen** to decimals or percentages if the reasoning is correct
(c)	132	M1	for 4000×0.033 **OR** $\frac{132}{4000}$	
		A1	cao	132 out of 4000 is an acceptable answer
26	$\frac{29}{49}$	P1	for $\frac{29}{a}$ where $a > 29$ **or** $\frac{b}{49}$ where $b < 49$ **or** $1 - \frac{20}{49}$ **or** $\frac{49-20}{c}$ where $c > 49 - 20$ **OR** for 29 and 49 with incorrect notation eg 29 : 49	
		A1	oe	Acceptable equivalents are any equivalent fraction to $\frac{29}{49}$, decimal 0.59 (…) or 59 (…)%

Question	Answer	Mark	Mark scheme	Additional guidance
27 (a)	No (supported)	C1	No and explanation eg "it is $\frac{1}{6}$" or "each number is the same probability" **Acceptable examples** No, they are both 1/6 (accept 1 in 6 or 1 : 6 etc) No, they are both the same No, an equal chance No, it's a fair dice No, there's only one of each number **Not acceptable examples** No, it's an even chance No, it's 50 – 50 No, 1 : 6	
(b)	No (supported)	C1	No and explanation eg "it is out of 36" or "it is $\frac{1}{6}$ times $\frac{1}{6}$" **Acceptable examples** No, the probability is 1/36 No, it's out of 36 No, he should times not add **Not acceptable examples** No, it's 1/6 × 1/6, the probability is 1/12 No, he's more likely to get it once only No, there's only one 6 on a dice No, you will have a 2/12 chance	
(c)	1H, 2H, 3H, 4H, 5H, 6H, 1T, 2T, 3T, 4T, 5T, 6T	B2 (B1	for all 12 outcomes with no extras or repeats for at least 6 correct outcomes, ignoring extras and repeats)	Pairs must be unambiguous Accept words and abbreviations

Question	Answer	Mark	Mark scheme	Additional guidance
28 (a)	Venn diagram	C4	fully correct Venn diagram	
		(C3	7 of the 8 regions correct **or** for a diagram with only one number incorrectly placed)	
		(C2	5 or 6 of the 8 regions correct)	
		(C1	3 or 4 of the 8 regions correct)	
(b)	$\frac{1}{12}$	M1	ft for identification of 1 or 12 eg from the diagram	Need not be written as a fraction or probability at this stage. eg could be a ratio 1:12
		A1	ft oe	Acceptable equivalents are (eg, could ft) any fraction equivalent to $\frac{1}{12}$, 0.08(33..) or 8(.33..)%

Question		Answer	Mark	Mark scheme	Additional guidance
29		$\frac{338}{350}$	M1	for $350 - 12$ (=338) **or** $\frac{y}{350}$ oe where $y < 350$ **and** $y \neq 12$ **or** $1 - \frac{12}{350}$ oe	For the method mark probability fractions can be expressed as equivalent expressions, even if not correct probability notation eg. 338 : 350 scores M1 A0
			A1	oe	Using correct probability notation Allow 0.96 to 0.97 or 96% to 97%
30		22 **4** 45 **18** **23** **7** 16	C1	for correctly placing at least one piece of data (22 or 16) **OR** for finding at least one unknown piece of data (4, 18, 7 or 23)	Unknown figures may be seen in working and need not be on the diagram
			C1	for correctly placing at least one piece of data (22 or 16) **and** for finding at least one unknown piece of data (4, 18, 7 or 23)	Award of this mark implies the first C1
			C1	for a complete correct tree. **SC C2** if all 6 figures are shown as the numerator of fractions in the correct places	

Question	Working	Answer	Mark	Notes
31 (a)		23, 177	C3	Completes all information correctly.
		10, 13, 85, 92	(C2	3 or 4 correct frequencies or all correct probabilities)
			(C1	2 correct frequencies)
(b)		$\frac{13}{23}$	M1	ft oe for $\frac{a}{23}$, $a < 23$ or $\frac{13}{b}$, $b > 13$
			A1	ft oe from (a)

Question	Working	Answer	Mark	Notes
32		0.985	B1	oe
33		98	P1	for process to find P(1), e.g. 1 – 0.17 – 0.18 – 0.09 – 0.15 – 0.1 (= 0.31) or for a process to find P(1 or 3), e.g. 1 – 0.17 – 0.09 – 0.15 – 0.1 (= 0.49)
			P1	for process to find the number of 3s, e.g. 0.18 × 200 (=36) or process to find the number of 1s, e.g. P(1) × 200 (= 62), or process to find the number of (1 or 3)s, eg [P(1) + 0.18] × 200 or process to find any expected frequency, using any probability × 200, eg 0.17 × 200
			A1	cao
				OR
		98	P1	for process to find P(2 or 4 or 5 or 6), eg 0.17 + 0.09 + 0.15 + 0.1 (= 0.51)
			P1	for process to find the number of (2 or 4 or 5 or 6)'s, eg "0.51" × 200 (= 102)
			A1	cao

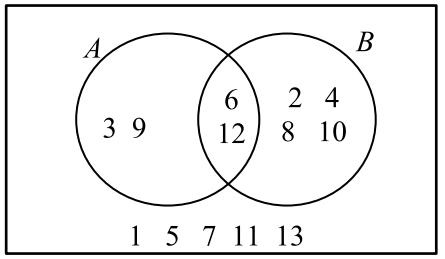
Question	Working	Answer	Notes
34		$\frac{2}{3}$	B1 oe
35		0.06	M1 for 0.2 and 0.3 A1 cao

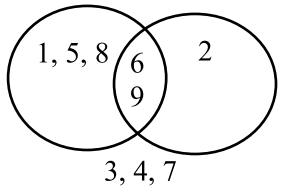
Question	Working	Answer	Notes
36 (a)		12| 3 5 9 13| 0 3 3 5 7 8 14| 7 7 8 9 15| 0 1 Key: 12|3 represents 123	C1 for an unordered diagram with just one error or for an ordered diagram with no more than two errors C1 for a fully correct diagram C1 for a correct key (units may be omitted but must be correct if included)
(b)		$\frac{6}{15}$	M1 for correct interpretation from their diagram (or from original information) of the number over 140 or for $\frac{n}{15}$, $n < 15$ A1 for $\frac{6}{15}$ oe or ft their diagram

Question	Working	Answer	Notes
37 (a)		Table complete	B1 cao
(bi)		$\frac{1}{10}$	B1 for $\frac{1}{10}$ oe or ft from table
(bii)		$\frac{7}{10}$	B1 for $\frac{7}{10}$ oe or ft from table
38 (a)(i)		10, 12, 14, 15, 16, 18	B1 cao
(ii)		12, 18	B1 cao
(b)		$\frac{7}{10}$	M1 for 7 or indicating correct region or for 10, 14, 16, 11, 13, 17, 19 listed A1 for $\frac{7}{10}$ oe
39	6 : 5 = 12 : 10 2 : 1 = 10 : 5 C : S : P = 12 : 10 : 5 $\frac{10}{27} \times 189$	70	P1 for strategy to start to solve the problem eg 12 : 10 and 10: 5 P1 for process to solve the problem eg $\frac{10}{27} \times 189$ A1 cao

Question	Answer	Mark	Mark scheme	Additional guidance
40 (a)	0.5, 0.3	P1	for $1 - 0.05 - 0.15$ (=0.8)	Award this mark for any two probabilities that sum to 0.8
		A1	oe	
(b)	120	M1	$18 \div 0.15$ oe **or** $6 + 18 + a + b$ where $a + b = 96$	
		A1	cao	

Question		Answer	Mark	Mark scheme	Additional guidance
41	(a)	$\frac{5}{11}$	M1	for $\frac{5}{n}$ where $n > 5$ or $\frac{m}{"11"}$ where $m < 11$	where "11" comes from 5+2+4
			A1	for $\frac{5}{11}$ oe	Accept any equivalent fraction, decimal form 0.45(45...) or percentage form 45(.45...)%
	(b)	0.7	B1	for 0.7 oe	Accept any equivalent fraction eg $\frac{7}{10}$ or percentage form eg 70%
42	(a)	25	B1	cao	
	(b)	Simon with reason	C1	for Simon with reason **Acceptable examples** Simon; he uses more trials Simon; he does 10 times more Simon, since 100 > 10 Simon because he threw it more frequently / often Simon since he has a larger range of results **Not acceptable examples** Paula …. Simon (unsupported) Simon because he threw it 100 times He gets more tails	If figures are given as part of the answer they must be correct
43	(a)	$\frac{1}{3}, \frac{2}{3}$ $\frac{1}{3}, \frac{2}{3}, \frac{1}{3}, \frac{2}{3}$	B2	six fully correct probabilities	Accept any equivalent fraction, decimal form 0.33(3...) and 0.66(6...) or 0.67 or percentage form 33(.3...)% and 66(.6...)% or 67%
			(B1	at least 2 correct probabilities)	
	(b)	$\frac{2}{9}$	M1	for $\frac{1}{3} \times \frac{2}{3}$ oe or ft probabilities from diagram	
			A1	for $\frac{2}{9}$ oe	Accept any equivalent fraction, decimal form 0.22(2...) or percentage form 22(.2...)%

Question	Answer	Mark	Mark scheme	Additional guidance
44	blue 0.15 green 0.2	P1	for $1 - 0.4 - 0.25$ (=0.35) oe	May work in percentages, condone missing % sign If the two numbers in the table sum to 0.35 that implies P1
		P1	for using the ratio, eg "0.35" ÷ (3 + 4) (=0.05) **or** "0.35" × $\frac{3}{7}$ (=0.15) **or** "0.35" × $\frac{4}{7}$ (=0.2)	One correct value in the table implies P2 7 can come from 3+4
		P1	for a complete process 3 × "0.05" (=0.15) **and** 4 × "0.05" (=0.2) **or** "0.35" – "0.15" (=0.2) **or** "0.35" – "0.2" (=0.15) **or** green 0.15, blue 0.2	
		A1	oe	Accept answers given in decimals, fractions or percentages.
45	Venn Diagram	B1	for labelling diagram, accept "multiples of 3" and "even numbers" for labels	Ignore all entries except the region you are marking for each method mark
		M1	for correct numbers in at least one region	
		M1	for correct numbers in at least two regions	
		A1	for all regions correct	

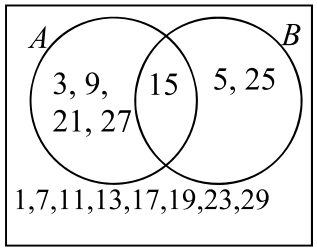
Question	Answer	Mark	Mark scheme	Additional guidance
46 (a)	6,9	M1	for 6, 9 in the intersection only	Ignore all entries except the region you are marking for each method mark
	1,5,8 2 3, 4,7	M1	for 1, 5, 8 in set A only or 2 in set B only or 3, 4, 7 in set $(A \cup B)'$ only	
		C1	for all numbers correctly placed in the Venn Diagram	
(b)	$\frac{2}{9}$	M1	ft for identification of 2 or 9 or ft diagram	Need not be written in correct form at this stage eg could be a ratio 2 : 9 Repeated digits in the diagram should be counted as 2 elements
		A1	$\frac{2}{9}$ oe or ft diagram	Accept any equivalent fraction, decimal form 0.22(22..) or percentage form 22(.22…)%

Question	Answer	Mark	Mark scheme	Additional guidance
47 (a)	Cross at $\frac{1}{2}$	B1	cross at $\frac{1}{2}$	Accept any other marks near to ½ if the intention is clear; do not accept if any other marks are shown.
(b)	$\frac{2}{6}$	B1	$\frac{2}{6}$ oe	Acceptable equivalents are equivalent fractions to $\frac{2}{6}$ eg $\frac{1}{3}$ decimal 0.33(…) or 33(..)%
48 (a)	0.3	B1	for 0.3 oe	Acceptable equivalents are 3/10 or 30% Answer on answer line takes precedence
(b)	4	B1	4 or ft their (a)	Do not accept a statement of probability (eg 0.1)
(c)	12	M1	for 0.2 × 60 oe	Do not accept the use of any other probability
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
49 (a)	6 | 4799 7 | 0015667 8 | 0011247 9 | 14	B2 (B1 B1	for correct ordered stem and leaf for fully correct unordered or ordered with one error or omission) (indep) for key (units not required but must be correct if stated) eg 6 | 4 = 64 (marks)	
(b)	Explanation	C1 C1	for identifying "6" students failed (ft their diagram) **OR** for 20 ÷ 4 (= 5) for comparing $\frac{1}{4}$ with $\frac{6}{20}$ or $\frac{3}{10}$ (ft their diagram) **OR** for comparing "6" with 5	Explanation does not need to state that Omar is wrong, but just needs to provide two comparable values (that are not the same) unless ft values show that Omar is not wrong in which case a statement is needed.
50	Probabilities should sum to 1 0.35 and 0.65 reversed	C1 C1	for stating that the probabilities should total 1 eg 0.25 should be 0.35 for recognising that the 0.35 and 0.65 in the first branches for the 2nd throw should be reversed eg, "for the second throw, the probability it lands on 4 should be 0.65"	 Can be shown on the diagram

Question	Answer	Mark	Mark scheme	Additional guidance
51 (a)	8	P1	for process to find sum of unknown probabilities, eg $1 - 0.45 - 0.25$ (= 0.3) **OR** to find the total number of counters in the bag, eg $\frac{18}{0.45}$ (= 40) **OR** to find the number of yellow counters, eg $\frac{0.25}{0.45} \times 18$ (= 10)	Award mark for any two probabilities given that sum to 0.3 eg given in the table.
		P1	for process to find P(red) = 0.2 oe **or** P(white) = 0.1 oe **OR** for process to find the total number of red and white counters, eg "40" – 18 – "10" (=12) **OR** for process to derive an equation in x, eg $2x + x = 1 - 0.45 - 0.25$ or $2x + x =$ "0.3" or $x = 0.1$	Award P2 for P(red) or P(white) (could be shown in table) Equations could be given as written statements or working but must be fully equivalent.
		P1	for a complete process to find the number of red counters, eg $\frac{2 \times 0.1}{0.45} \times 18$ or $\frac{2}{3} \times$ "12" or $0.2 \times$ "40" or $\frac{0.2}{0.025}$	
		A1	cao	
(b)	Explanation	C1	for explanation eg 0.5 multiplied by an odd number will never be a whole number, for half of a number to be an integer that number must be even, you can't have half a marble	

Question	Working	Answer	Mark	Notes
52 (a)		Mel (supported)	B1	Mel with reference to greatest number of throws
(b)		$\frac{2}{9}$	M1	selects overall total and multiplies P(point up)×P(point down) eg $\frac{50}{150}\times\frac{100}{150}$ oe (accept $\frac{14}{45}\times\frac{31}{45}$ or $\frac{27}{80}\times\frac{53}{80}$ or $\frac{9}{25}\times\frac{16}{25}$)
			A1	for $\frac{2}{9}$ oe

Question	Working	Answer	Mark	Notes
53 (a)		Venn Diagram	B1 M1 M1 C1	for labels on diagram for just 15 in the intersection for just 5 and 25 in only set B or just 3, 9, 21 and 27 in only set A or just 1, 7, 11, 13, 17, 19, 23, 29 in $(A \cup B)'$ for all numbers correctly placed in the Venn Diagram Ignore all entries except the region you are marking for each method mark
(b)		$\frac{7}{15}$	P1 A1	ft for $\frac{"7"}{a}$ where $a \geq$ "7" or $\frac{b}{"15"}$ where $b \leq$ "15" ft $\frac{7}{15}$ oe
54 (a)		12	B1	cao
(b)		Explanation	C1	No with statement about not being mutually exclusive events eg a person could be in both categories

Question	Working	Answer	Notes
55	$25 \div 5 \times 2 = 10$ $32 \div 2 = 16$ $\frac{10}{10+16}$	$\frac{10}{26}$	P1 Process to find number of boys walking and number of girls walking P1 Complete process to find probability A1 $\frac{10}{26}$ oe

Question	Working	Answer	Notes
56		Venn diagram	M1 for two overlapping ovals M1 for only 2 and 6 in the intersection M1 for only 5 and 7 in the universal set only C1 for a fully correct Venn Diagram

Question	Working	Answer	Notes
57 (a)		56	B1 cao
(b)		32	B1 cao
(c)		Reason	C1 starts argument eg 8 cars or 8/27 C1 completes argument eg with 1/3 = 9/27
58 (a)		0.05	B1 cao
(b)		24	M1 for 120 × 0.2 oe A1 cao

Question	Working	Answer	Mark	Notes
59		$\frac{4}{15}$	3	M1 for a method to find the total number of people e.g 3×5 (= 15) or writing $\frac{5}{15}$ as an equivalent fraction to $\frac{1}{3}$ M1 (dep) for "15" $-5-6$ (= 4) A1 oe **or** M1 for a method to find prob (boy) e.g. $\frac{6}{5}\times\frac{1}{3}(=\frac{6}{15})$ M1 (dep) for $1-"\frac{6}{15}"-\frac{1}{3}$ A1 oe **or** M1 for an expression for the probability of the number of girls in the room e.g. $\frac{5}{5+6+x}$ M1 (dep) for "$\frac{5}{5+6+x}$" = $\frac{1}{3}$ or $x = 4$ A1 oe **SC B2 for** $\frac{4}{n}$ where $n > 4$ and $\neq 15$

Question	Working	Answer	Mark	Notes
60 (a)		13347	1	B1cao
(b)		73314	2	B2 cao (B1 for 74331 **or** any number made from the given 5 digits ending with 4)
(c)		$\frac{1}{5}$	1	B1 for $\frac{1}{5}$ oe
(d)		$\frac{4}{5}$	1	B1 ft for $\frac{4}{5}$ oe
61	(A, 1), (A, 2), (A, 3) (B, 1), (B, 2), (B, 3) (C, 1), (C, 2), (C, 3)	$\frac{1}{9}$	3	M1 for any 3 combinations with no incorrect combinations or for 3 × 3 A1 for all 9 combinations with no duplicates or extras **or** for 9 B1 (dep on M1) for $\frac{1}{'9'}$ **Alternative scheme** B1 for $\frac{1}{3}$ seen M1 for $\frac{1}{3} \times \frac{1}{3}$ A1 for $\frac{1}{9}$ oe

Question		Working	Answer	Mark	Notes
62	(a)		unlikely	1	B1 cao
	(b)		cross at $\frac{1}{2}$	1	B1 for cross at $\frac{1}{2}$
	(c)		cross at O	1	B1 for cross at O
63	(a)		250	2	M1 for $400 \div 8$ or $\frac{5}{8}$ oe A1 cao
	(b)		60	3	M1 for $\frac{16}{80}$ or $\frac{300}{80}$ oe M1 (dep) for "$\frac{16}{80}$" × 300 or "$\frac{300}{80}$" × 16 A1 cao

Question		Working	Answer	Mark	Notes
64	(a)(i)		unlikely	3	B1 cao
	(ii)		impossible		B1 cao
	(iii)		evens		B1 cao
	(b)		J K L L L L M M	2	M1 for number of Js = number of Ks OR number of Ls = twice number of Ms A1 cao
65			BG RG WG BO RO WO	2	B2 for exactly 6 correct combinations in any order (B1 for at least 4 combinations ignoring repeats)

Question		Working	Answer	Mark	Notes
66	(a)(i)		likely	2	B1 cao
	(ii)		Mark at 0		B1 cao
	(b)		Mark at $\frac{1}{2}$	1	B1 cao
	(c)	(1, H), (2, H), (3, H), (4, H), (5, H); (6, H), (1, T), (2, T), (3, T), (4, T), (5, T), (6, T)	combinations shown	2	M1 for at least 4 correct outcomes A1 for all 12 correct outcomes with no incorrect outcomes and no repeats

Question		Working	Answer	Mark	Notes
67	(a)		5	1	B1 cao
	(b)		evens	1	B1 cao
	(c)		$\frac{2}{6}$ oe	2	M1 for $\frac{a}{6}$ where $a < 6$ **or** $\frac{2}{b}$ where $b > 2$ A1 for $\frac{2}{6}$ oe

Question		Working	Answer	Mark	Notes
68	(a)		red	1	B1 cao
	(b)		unlikely	1	B1 cao
	(c)		impossible	1	B1 cao
69	(a)		Cross at $\frac{1}{4}$	1	B1 for cross in correct position
	(b)		Cross at $\frac{1}{2}$	1	B1 for cross in correct position
	(c)		Cross at 0	1	B1 for cross in correct position
70	(a)(i)		$\frac{1}{6}$	2	B1 for $\frac{1}{6}$ or any equivalent fraction, percentage or decimal (rounded or truncated to 2 or more significant figures)
	(a)(ii)		0		B1 accept $\frac{0}{6}$, 0%, zero
	(b)		20	2	M1 for $\frac{1}{6} \times 120$ oe A1 cao (NB: An answer of $\frac{20}{120}$ scores M1 A0)

Question		Working	Answer	Mark	Notes
71	(a)		Cross at $\frac{1}{2}$	1	B1 for cross (×) within overlay
	(b)		Cross at 0	1	B1 for cross (×)within overlay
	(c)(i)		H1 H2 H3 H4 H5 H6 T1 T2 T3 T4 T5 T6		M1 for evidence of attempting combinations eg at least 5 correct A1 for all 12, no extras or repeats (Can repeat H1)
	(ii)		$\frac{3}{12}$	4	M1 ft for evidence of correct numerator or denominator In a fraction less than 1 A1 ft from (i) Note probability must written as a percentage, decimal or fraction
72	(a)		No + reason	1	B1 for no and the (prob.) of red is (bigger than the (prob.) of blue. OR (prob.) of blue is nearer 0 OR (prob.) of red is closer to 1 OR (prob.) of red is 50% and the (prob.) of blue is about 20% oe
	(b)(i)		$\frac{4}{7}$	2	B1 for $\frac{4}{7}$ oe
	(ii)		0		B1 for 0 or $\frac{0}{7}$ or 0% (accept 0 out of 7, but not 0:7 or 0 to 7)
73	(a)		A marked at 0	1	B1 for A marked at 0 (within overlay)
	(b)		B marked at 1/4	1	B1 for B marked at 1/4 (within overlay)

Question		Working	Answer	Mark	Additional Guidance
74	(a)		(2, 6)(4, 4) (6, 2)	2	M1 lists as ordered pairs or in a table with at least 2 entries A1 all 3 correct entries
	(b)		$\frac{6}{16}$	4	M1 lists the sample space (at least 4 pairs) A1 fully correct M1 identifies cases where Ali wins A1 cao
					Total for Question: 6 marks
75		$x + 4x + \frac{1}{2} = 1$ $5x = \frac{1}{2}$, $x = \frac{1}{10}$ **OR** Choose a suitable number of balls (say 10) 5 will be red The other 5 need to be shared out in the ratio 1:4, hence 1 yellow and 4 blue	$\frac{4}{10}$	3	M1 $x + 4x + \frac{1}{2} = 1$ A1 $x = \frac{1}{10}$ A1 $\frac{4}{10}$ oe
					Total for Question: 3 marks

Question		Working	Answer	Mark	Additional Guidance
76		Number of prizes should buy is $\frac{3}{8} \times 1000$ = 375 **OR** Each triangle should win 1000 ÷ 8 times (=125) So 3 × 125 = 375	(376) and justification that matches answer	3	M1 estimate of probability A1 for answer > $\frac{3}{8}$ of 1000 C1 for justification that matches answer Number of prizes between 376 and 500 **OR** M1 1000 ÷ 8 A1 for answer > $\frac{3}{8}$ of 1000 C1 for justification that matches answer Number of prizes between 376 and 500
					Total for Question: 3 marks

Question	Working	Answer	Mark	Notes
77 (a)		Mark at $\frac{1}{2}$	1	B1 for mark at $\frac{1}{2}$
(b)		Mark at 1	1	B1 for mark at 1
(c)		Mark at $\frac{1}{4}$	1	B1 for mark at $\frac{1}{4}$

Question	Working	Answer	Mark	Notes
78 (a)		0.3	2	M1 for 1 − (0.25 + 0.10 + 0.20 + 0.15) oe A1 oe
(b)		6	2	M1 for 60 × 0.10 oe A1 cao

Question	Working	Answer	Mark	Notes
79 (a)		$\frac{1}{6}$	1	B1 for $\frac{1}{6}$ oe
(b)		1	1	B1 cao
*80		Bag A (supported)	3	M1 for $\frac{3}{7}$ or $\frac{5}{12}$ M1 (dep) for method to compare the two probabilities, e.g using a common denominator, eg $\frac{3}{7}=\frac{36}{84}$; $\frac{5}{12}=\frac{35}{84}$ or writing as decimals eg $\frac{3}{7}=0.428571...$ and $\frac{5}{12}=0.416666...$ C1 (dep on M2) for Bag A and correct method of comparison with correct figures using $\frac{3}{7}$ and $\frac{5}{12}$

Question		Working	Answer	Mark	Notes
81	(a)		$\frac{68}{105}$	1	B1 oe
	(b)		22	2	M1 for 105 – 15 – 68 oe A1 cao
	(c)		14.3	2	M1 15 ÷ 105 × 100 oe A1 for answer in range14.2 – 14.3
82	(a)		$\frac{1}{30}$	1	B1 oe
	(b)		$\frac{3}{10}$	2	M1 for method to sum number of white chocolates, eg 4 + 4 + 1 (= 9) A1 $\frac{3}{10}$ or $\frac{9}{30}$ oe
	(c)		0.48	2	M1 for 1 – (0.35 + 0.17) oe A1 0.48 oe

Question		Working	Answer	Mark	Notes
83	(a)		winter	1	B1 cao
	(b)		amaryllis	1	B1 cao
	(c)(i)		Mark at 0	2	B1 for mark at 0
	(ii)		Mark at $\frac{1}{2}$		B1 for mark at $\frac{1}{2}$
84	(a)		**14** 13 **20** 47 **12** **7** 34 **53** 26 20 **54** 100	3	B3 for fully correct table (B2 for 3 or 4 or 5 correct entries) (B1 for 1 or 2 correct entries)
	(b)		$\frac{13}{47}$	2	M1 for $\frac{13}{n}$, $n > 13$ or for $\frac{n}{47}$, $n < 47$ A1 for $\frac{13}{47}$ (or 0.27 - 0.28 or 27% - 28%)

Question	Working	Answer	Mark	Notes
85 (a)		Evens	1	B1 cao
		Certain	1	B1 cao
(b)		4	2	M1 for 14 **or** $\frac{3+7}{n}=\frac{5}{7}$ **or** any fraction equivalent to $\frac{2}{7}$ or $\frac{5}{7}$ A1 cao

Question		Working	Answer	Mark	Notes
86	(a)	$1 - 0.2 - 0.1$ $0.7 \div 2$	0.35	3	M1 for correctly using total probability 1 or 100% if percentages used M1 (dep) for complete correct method to complete the solution A1 for 0.35 or 35% or $\frac{35}{100}$ oe
	(b)	0.1×200	20	2	M1 for 0.1×200 A1 cao [SC: B1 for an answer of $\frac{20}{200}$ if M0 scored]

Question		Working	Answer	Mark	Notes
87	(a)		No + reason	1	B1 for No because she has 1 choice out of 3 which is the same as Mike oe
	(b)	(r,g)(r,b)(g,b)(g,r)(b,g)(b,r) (r,r)(b,b)(g,g)	Complete list	2	M1 for listing pairs (at least 5 correct pairs) A1 for fully correct list (ignore repeats)
	(c)		$\frac{1}{9}$	1	B1 for $\frac{1}{9}$ oe (If M1A0 in (b), then SC B1 in (c) for $\frac{\text{their number of (b,g)}}{\text{their total number of outcomes}}$)
88	(a)	$1 - 0.7$	0.3	2	M1 for $1 - 0.7$ A1 for 0.3 oe
	(b)	200×0.7	140	2	M1 for 200×0.7 A1 for 140

Question		Working	Answer	Mark	Notes
89	(i)		$\frac{7}{18}$	3	B1 for $\frac{7}{18}$ oe
	(ii)		$\frac{12}{18}$		B1 for $\frac{12}{18}$ **or** $\frac{2}{3}$ oe
	(iii)		0		B1 for 0 or $\frac{0}{18}$ or zero oe