1	0.4×280 oe		2	M1	
		112		A1	cao SC B1 for 168
					Total 2 marks

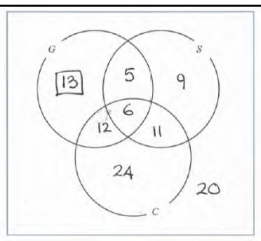
2 (a)		$\frac{3}{10}, \frac{7}{12}, \frac{5}{12}, \frac{7}{12}, \frac{5}{12}$	2	B2	B1 for $\frac{3}{10}$ oe B1 for all other correct probabilities 2d.p truncated or rounded (e.g 0.58 or 0.41 or 0.42)
(b)	$\frac{7}{10} \times "\frac{5}{12}"$ or $"\frac{3}{10}" \times "\frac{7}{12}"$ oe		3	M1ft	
	$\frac{7}{10} \times "\frac{5}{12}" + "\frac{3}{10}" \times "\frac{7}{12}"$ oe			M1ft	
		$\frac{56}{120}$ oe		A1	eg $\frac{7}{15}$ or 0.46....(2 dp truncated or rounded)
(c)	$"\frac{3}{10}" \times "\frac{5}{12}" \times x = \frac{3}{100}$ oe		3	M1ft	A correct equation involving the unknown probability
	$x = \frac{3}{100} \div "\frac{15}{120}"$ $(= \frac{6}{25})$ oe			M1ft	Isolating or calculating the value of x
		25		A1	Dep on M1
					Total 8 marks

3	$1 - (0.24 + 0.31)$ $(= 0.45)$ Or $(0.24 + 0.31) \times 180$ $(= 99)$		4	M1	or for a correct equation for missing values eg $x + 0.24 + 2x + 0.31 = 1$ oe (can be implied by 2 probabilities that total 0.45 in table if not contradicted in working space)
	'0.45' ÷ 3 (= 0.15) Or '0.45' × 180 (= 81) Or 180 − 99 (= 81)			M1	(or 0.15 correctly placed in table as long as not contradicted)
	'0.15' × 180 Or '81' ÷ 3			M1	or for an answer of $\frac{27}{180}$
		27		A1	
					Total 4 marks

4	(a)	eg $1 - (0.2 + 0.12 + 0.08)$ $(= 0.6)$ $1 - \left(\frac{20}{100} + \frac{12}{100} + \frac{8}{100}\right) \left(= \frac{60}{100}\right)$oe **or** $100(\%) - (20(\%) + 12(\%) + 8(\%))$ $(= 60(\%))$ **or** $0.2 + 0.12 + 0.08 + 3x + x = 1$ oe		3	M1	For a correct calculation for the remaining probability **or** a correct equation for the remaining probability
		"0.6" ÷ 4 (= 0.15) oe **or** "0.6" ÷ 4 × 3 **or** "0.6" × 0.75 oe (Sight of 0.15 in the table for Orange or Pink or 0.45 for Pink gains M2)			M1	For dividing the remaining probability by 4 or finding ¾ of the remaining probability NB "0.6" means 0.6 must come from correct working
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	0.45		A1	**or** $\frac{9}{20}$ oe **or** 45% (if working in % final answer must have % sign). Allow $\frac{0.45}{1}$ If no answer on answer line, check in the correct space in table above. Value on the answer line takes precedence over the table.
	(b)	0.12×150 oe eg $12 \div 6$		2	M1	For a correct calculation to find the number of times the spinner lands on blue
		Working not required, so correct answer scores full marks (unless from obvious incorrect working)	18		A1	(an answer of $\frac{18}{150}$ scores M1A0 as this is a probability not a number of times)
						Total 5 marks

5	(a)		0.45	1	B1	oe eg $\frac{9}{20}, \frac{45}{100}, 45\%$
	(b)	eg $1-(0.25+0.2+0.2)\ (=0.35)$ **or** $1-(\text{“}0.45\text{”}+0.2)\ (=0.35)$ **or** $300\times(0.25+0.2+0.2)(=195)$		3	M1	allow use of their “0.45” from part (a), check the table
		eg $300\times\text{“}0.35\text{”}$ **or** $300-\text{"195"}$			M1	for a complete method
			105		A1	cao (award $\frac{105}{300}$ M2 only)
						Total 4 marks

6	eg $\left(\frac{1}{2}\right)^4\left(=\frac{1}{16}\text{ or }0.0625\right)$ or $4\left(\frac{1}{2}\right)^4\left(=\frac{4}{16}\text{ or }\frac{1}{4}\text{ or }0.25\right)$ or $6\left(\frac{1}{2}\right)^4\left(=\frac{6}{16}\text{ or }\frac{3}{8}\text{ or }0.375\right)$ oe		3	M1 for finding the probability of one correct combination eg calculation for *oooo* or *eeee* or $4\times$ *eooo* or $4\times$ *eeeo* or $6\times$ *eeoo*
	eg $1-\left(\frac{1}{2}\right)^4$ **or** $4\left(\frac{1}{2}\right)^4+6\left(\frac{1}{2}\right)^4+4\left(\frac{1}{2}\right)^4+\left(\frac{1}{2}\right)^4$ or $(e\ +\ oe\ +\ ooe\ +\ oooe\ )$ $\frac{1}{2}+\frac{1}{2}\times\frac{1}{2}+\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}+\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}$ $\left(=\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\frac{1}{16}\right)$ oe			M1 for a complete method
		$\frac{15}{16}$		A1 oe eg 0.9375 (allow 0.937 or 0.938)
				Total 3 marks

7	(a)		Fully correct Venn diagram	3	B1 B2	For 13 correct in *G* only 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 $\frac{\text{"18"}}{m}$ where $m>\text{"18"}$ or $\frac{n}{\text{"53"}}$ where $n<\text{"53"}$)
						Total 8 marks

8	0.65×300 oe			M1
		195		A1 (SCB1 for 105)
				Total 2 marks

9	(a)	$1-(0.24+0.16+0.38)$ oe		2	M1
			0.22		A1 oe
	(b)	$0.24+0.16\ (=0.4)$ oe		2	M1
			0.4		A1 oe
					Total 4 marks

10 (a)		$\frac{5}{12}\ \frac{8}{15}\ \frac{7}{15}\ \frac{8}{15}\ \frac{7}{15}$	2	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 $\frac{8}{15},\frac{7}{15},\frac{8}{15},\frac{7}{15}$)
					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
	(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

11	28 ÷ 0.35 (= 80) oe eg (28 ÷ 7) × 20 (= 80)		5	M1	indep for calculating total number of sweets
	1 – (0.2 + 0.35) (= 0.45) oe **or** (0.2 + 0.35) × "80" (= 44) or 28 + "16" (= 44)			M1	or for a correct equation for missing values eg $x + 2x + 0.2 + 0.35 = 1$ oe (can be implied by 2 probabilities that total 0.45 in table if not contradicted in working space)
	"0.45" ÷ 3 (= 0.15) oe **or** "0.45" × "80" (= 36) **or** "80" – "44" (= 36)			M1	(or 0.15 or 0.3 seen in table – either order)
	"80" × "0.15" **or** "80" × "0.3" (= 24) **or** "36" ÷ 3 or "36" ÷ $\frac{3}{2}$ (= 24)			M1	A correct calculation for the number of white sweets or the number of pink sweets
		12		A1	
11 alt	1 – (0.2 + 0.35) (= 0.45) or 100(%) – 20(%) – 35(%) = 45(%)		5	M1	or for a correct equation for missing values eg $x + 2x + 0.2 + 0.35 = 1$ oe
	"0.45" ÷ 3 (= 0.15) 45(%) ÷ 3 (= 15(%))			M1	(or 0.15 or 0.3 seen in table – either order)
	$\frac{n}{28}=\frac{0.15}{0.35}$ **or** $\left(\frac{n}{0.15}=\right)\frac{28}{0.35}$ oe or $\frac{\cdot\cdot}{28}=\frac{\cdot\cdot}{0.35}$ **or** $\left(\frac{\cdot\cdot}{0.3}=\right)\frac{\cdot\cdot}{0.35}$ **or** 35% = 28 so 5% = 4			M1	for using proportion with an expression for n white sweets or finding 5% oe to enable calculation to 15%
	$(n=)\ 28\times\frac{0.15}{0.35}$ **or** $(n=)\ 0.15\times\frac{28}{0.35}$ or 15% = 3 × 4 or $28\times\frac{0.3}{0.35}$ **or** $0.3\times\frac{28}{0.35}$ **or** 30% = 6 × 4 (= 24)			M1	a calculation using proportion that would lead to finding their n or $2n$
		12		A1	
					Total 5 marks

12 (b)	eg $\frac{15}{20}\times 32(=24)$ **or** $\frac{5}{20}\times 32(=8)$ **or** $\frac{15}{20}\times 32+18(=42)$ **or** $32+18-\frac{5}{20}\times 32(=42)$		2	M1 ft	for a method to find an estimate for the number of students who took between 30 and 45 minutes **or** between 45 and 50 minutes **or** between 25 and 45 minutes ft incorrect histogram
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{42}{50}$		A1	oe eg $\frac{21}{25}$, 0.84, 84%

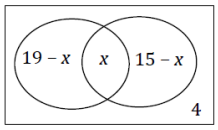
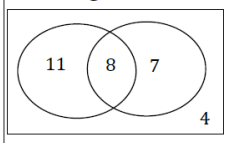
13	$1 - (0.24 + 0.4)$ (= 0.36) oe or $3x + x = 1 - (0.24 + 0.4)$ oe		4	M1
	48 ÷ 0.24 (= 200) or "0.36" ÷ 4 (= 0.09) or "0.36" ÷ 4 × 3 (= 0.27)			M1
	"0.27" × "200" or "200" × "0.36" ÷ 4 × 3 ("200" – 48 – "80") ÷ 4 × 3			M1 for a complete method
		54		A1
				Total 4 marks
13 ALT	$1 - (0.24 + 0.4)$ (= 0.36) oe or $3x + x = 1 - (0.24 + 0.4)$ oe		4	M1
	48 ÷ 24 (= 2) oe or $\left(\frac{"0.36"}{4} \times 3\right) \div 0.24 \left(= \frac{9}{8} = 1.125\right)$ oe or $\left(\frac{"36"}{4} \times 3\right) \div 24 \left(= \frac{9}{8} = 1.125\right)$ oe			M1
	$"2" \times \left(\frac{"36"}{4} \times 3\right)$ oe or $"\frac{9}{8}" \times 48$ oe or ("27" ÷ 24) × 48 oe			M1 for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	54		A1
				Total 4 marks

14 (a)		$\frac{2}{9}, \frac{7}{9}$	2		B1 for correct probabilities for the first card Allow equivalent probabilities e.g 0.2
		$\frac{1}{8}, \frac{7}{8}, \frac{2}{8}, \frac{6}{8}$			B1 for correct probabilities for the second card Allow equivalent probabilities
(b)	$"\frac{2}{9}" \times "\frac{1}{8}"$ or $1 - "\frac{2}{9}" \times "\frac{7}{8}" - "\frac{7}{9}" \times "\frac{2}{8}" - "\frac{7}{9}" \times "\frac{6}{8}"$		2		M1ft (All probabilities must be less than 1)
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{1}{36}$			A1ft oe probability must be less than 1 Allow equivalent decimal to at least 2 sf (truncated or rounded) for $\frac{1}{36}$ (= 0.027(77..))
(c)	$"\frac{2}{9}" \times "\frac{7}{8}"$ or $"\frac{7}{9}" \times "\frac{2}{8}"$ oe or $"\frac{2}{9}" \times "\frac{1}{8}"$ **and** $"\frac{7}{9}" \times "\frac{6}{8}"$ oe or $"\frac{1}{36}"$ **and** $"\frac{7}{9}" \times "\frac{6}{8}"$ oe		3		M1ft (All probabilities must be less than 1)
	$"\frac{2}{9}" \times "\frac{7}{8}" + "\frac{7}{9}" \times "\frac{2}{8}"$ or $2 \times \frac{14}{72}$ oe or $1 - "\frac{2}{9}" \times "\frac{1}{8}" - "\frac{7}{9}" \times "\frac{6}{8}"$ oe or $1 - "\frac{1}{36}" - "\frac{7}{9}" \times "\frac{6}{8}"$ oe				M1ft

	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{7}{18}$		A1ft oe probability must be less than 1 Allow equivalent decimal to at least 2 sf (truncated or rounded) for $\frac{7}{18}$ (= 0.38(88..))
				Total 7 marks

15 (b)	$(9 + \frac{2}{3} \times 12)$ (= 17) oe eg 9 + 8 (= 17) or $55 - (12 + 7 + 15 + \frac{1}{3} \times 12)$		2	M1	may be seen as numerator of fraction (ft their graph dep on M1 in (a))
	Correct answer scores full marks (unless from obvious incorrect working)	$\frac{17}{55}$		A1cao	Or 0.30909…or 30.909…% (to at least 2 sf) SCB1 for $\frac{38}{55}$ (0.6909…)

16	eg 0.74×300 (= 222) **or** $1 - 0.74$ (= 0.26) seen **or** $\frac{78}{300}$		2	M1	for a method to work out an estimate for the number of games Evie will win **or** the probability that Evie will lose **or** an answer of $\frac{78}{300}$
	Correct answer scores full marks (unless from obvious incorrect working)	78		A1	cao
					Total 2 marks

17	$(19 + 15 + 4) - 30$ or $38 - 30$ or $19 + 15 - 26$ or  or $19 - x + x + 15 - x + 4 = 30$ oe		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	
	$\frac{8}{30} \times \frac{7}{29}$ or $\frac{8}{30} \times \frac{8}{30} = \frac{64}{900}$ or $\frac{16}{225}$ oe			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

18	$1 - (0.32 + 0.13 + 0.28)$ oe eg $1 - 0.73$ (= 0.27) or 0.32×200 (= 64) or 0.13×200 (= 26) or 0.28×200 (= 56) or 0.73×200 (= 146)		3	M1	(0.27 may be seen in table) [could work with percentages eg $100 - 32 - 13 - 28$ (=27)]
	[1 – "0.73"] × 200 oe eg "0.27" × 200 or 200 – "64" – "26" – "56" or 200 – "146"			M1	for a complete method or for an answer of $\frac{54}{200}$
	Correct answer scores full marks (unless from obvious incorrect working)	54		A1	
					Total 3 marks

19	(a)		$\frac{4}{6}$ $\frac{1}{6}, \frac{5}{6}, \frac{1}{6}, \frac{5}{6}$	2	B2oe	B1 for $\frac{4}{6}$ (or $\frac{2}{3}$) on LH bottom branch B1 for all other branches correct (allow 0.66 or 0.67 or better, 0.16 or 0.17 or better, 0.83 or better)
	(b)	"$\frac{4}{6}$" × "$\frac{5}{6}$"		2	M1ft	ft their tree diagram if probabilities less than 1 (only considering this product or 1 – (RR + RY + YR))
		Correct answer scores full marks (unless from obvious incorrect working)	$\frac{5}{9}$		A1	oe eg $\frac{20}{36}$ or (0.55(55…) or 55% or better or 56%
						Total 4 marks