Probability (Foundation) Mark Scheme

Q1.

Question	Answer	Additional guidance	Mark
(a)	B1 eg the number of films that were produced in the UK **and** made more than £40 million	B1 for a correct description which includes both events	(1)
(b)	B1 $\dfrac{5}{20}$	B1 allow equivalent fraction, decimal or percentage	(1)
(c)	M1 $\dfrac{\frac{3}{20}}{\frac{8}{20}}$ or for $\dfrac{k}{8}$ with $0 < k < 8$ A1 $\dfrac{3}{8}$	M1 for use of conditional probability $P(B\mid A) = \dfrac{P(A \text{ and } B)}{P(A)}$ or for use of Venn diagram A1 allow equivalent fraction, decimal or percentage	(2)
(d)	M1 $\dfrac{5}{20} \neq \dfrac{3}{8}$ A1ft so they are not independent	M1 for a comparison of their part (b) and their part (c) A1ft for correct conclusion based on their values (M1 must have been scored)	(2)

Q2.

Question number	Answer	Additional guidance	Mark
(i)	B1 $\dfrac{1}{8}$ (0.125)	B1 for correct equivalent fraction decimal or percentage (Allow 0.13)	(1)
(ii)	B1 $\dfrac{1}{12}$ (0.08 or better)	B1 for correct equivalent fraction decimal or percentage	(1)
(iii)	B1ft Nabir has a greater probability of being selected	B1ft for Nabir with a correct comparison (accept $\dfrac{1}{8} > \dfrac{1}{12}$ or $8 < 12$) Accept: Nabir as he is in a smaller team. Allow ft for Jenny if the reason based on their probabilities.	(1)

Q3.

Question	Answer	Additional guidance	Mark
(a)	B1 unlikely		(1)
(b)	B2 One tally added to each of Blue & Yellow AND frequencies 3, 9, 8 in table	B2 for a fully complete table with tallies and frequencies Otherwise… B1 for tallies correct OR frequencies correct OR one row correct	(2)
(c)	B1 $\frac{3}{20}$	B1 for $\frac{3}{20}$ or 0.15 or 15%	(1)
(d)	M1 20×0.1 or 20×0.6 or 20×0.3 A1 Expected frequencies Red $= 2$, Blue $= 12$, Yellow $= 6$	M1 for any one correct product (or one correct answer) A1 all correct	(2)
(e)(i)	B2 ft eg Spinner appears equally likely to land on each side + supporting reason: eg Blue most for both; red fewest for both; blue > yellow > red for both; results are similar; etc OR eg Spinner is not equally likely to land on each side + supporting reason: eg too few blue; too many yellow; etc	B2 ft for a conclusion (allow for or against equally likely) with a corresponding supporting argument. (Accept not biased / biased or fair / not fair) Otherwise B1 for an incomplete answer. eg correct reasoning but no conclusion NB: allow conclusions which follow through from their two tables	(2)
(ii)	B1 eg carry out more spins / get more results	B1 for explaining how to improve reliability in the method, recognising that relative frequency tends towards probability with a greater number of results	(1)

Q4.

Question	Answer	Additional guidance	Mark
(a)	B1 C		(1)
(b)	B1 A and E		(1)
(c)	B1 $\frac{1}{2}$ oe	Allow equivalent decimal or percentage	(1)
(d)	B1 0		(1)
(e)	B1 ft 1	B1 ft 1 – their (d), provided that their (d) is a probability	(1)

Q5.

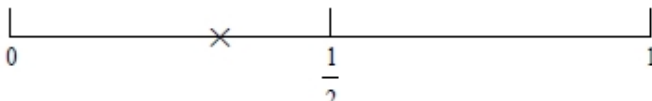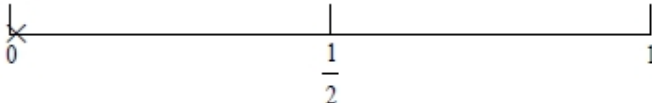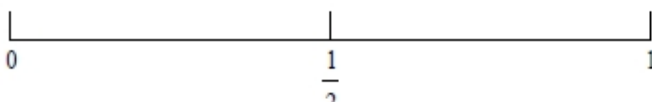| Question	Answer	Additional guidance	Mark
(a)	B1 B1 <table><tr><th>Number of lollies in packet</th><th>Tally</th><th>Frequency</th></tr><tr><td>11</td><td>I</td><td>1</td></tr><tr><td>12</td><td>IIII II</td><td>7</td></tr><tr><td>13</td><td>IIII</td><td>4</td></tr><tr><td>14</td><td>III</td><td>3</td></tr><tr><td>15</td><td>III</td><td>3</td></tr></table>	B1 any one row or one column correct B1 all correct	(2)
(b)	B1 ft the mode is 12 B1 ft Katy is correct because $4 + 3 + 3 = 10$	B1 for correct interpretation of data to find mode B1 for correct conclusion and explanation ft allow not correct if their $(4 + 3 + 3) \neq 10$	(2)
(c)	B1 ft $\dfrac{17}{18}$	B1 for $\dfrac{17}{18}$ oe	(1)

Q6.

Question	Answer	Additional guidance	Mark
(a)	M1 $\dfrac{1}{20}$ or $\dfrac{2}{50}$ M1 $\dfrac{1}{20} \div \dfrac{2}{50}$ A1 1.25	M1 for $\dfrac{1}{20}$ oe or $\dfrac{2}{50}$ oe A1 for 1.25 oe	(3)
(b)	B1 ft for relative risk > 1 **and** Carla is correct	B1 for correct conclusion ft For *their* relative risk ≤ 1 **and** Carla is incorrect	(1)

Q7.

Question number	Answer	Additional guidance	Mark
(d)	B1 The events can both happen at the same time (1268 are female and from an independent school).		(1)
(e)	M1 $\dfrac{2778+6573}{9963}$ A1 $\dfrac{9351}{9963}$ or $\dfrac{1039}{1107}$ or awrt 0.94 or awrt 94% oe	M1 for fully correct method A1 awrt 0.94	(2)

Q8.

Question number	Answer	Additional guidance	Mark
(a)	B1	B1 for × indicated between 0 and ½ (but closer to ½).	(1)
(b)	B1	B1 for × indicated at 0	(1)
(c)	B1	B1 for × indicated between ½ and 1 (but closer to 1).	(1)

Q9.

Question number	Answer	Additional guidance	Mark
(a)(i)	B1 (0.3+0.4=) 0.7	For probability answers accept equivalent fractions, decimals or percentages	(1)
(a)(ii)	B1 0.3		(1)
(a)(iii)	M1 $\dfrac{0.3}{0.5}$ A1 0.6		(2)
(b)	M1 0.8 × 0.5 A1 0.4		(2)

Q10.

Question number	Answer	Additional guidance	Mark
(a)	B1 unlikely		(1)
(b)	B1 green AND yellow	Accept in either order.	(1)
(c)	B1 cross marked at $\frac{1}{2}$		(1)
(d)	B1 cross marked at 0		(1)

Q11.

Question number	Answer	Additional guidance	Mark
(a)	M1 $\dfrac{75+111}{300}$ or $0.25+0.37$ or $1-\dfrac{96+18}{300}$ or $1-(0.32+0.06)$ A1 $\dfrac{186}{300}$ o.e. $\left(=\dfrac{31}{50},\ 0.62\right)$	M1 for attempting probability with a correct numerator (Condone '186 out of 300' for M1 only.) A1 for correct equivalent fraction decimal or percentage	(2)
(b)	B1 e.g. • Repeat the survey / collect more data • Use a longer period • Use more than one shop	B1 for recognising that a larger sample is likely to give a better estimate But do not accept e.g. 'use more money/notes' alone scores B0	(1)
(c)	B1 (UK has a) **lower** proportion (of £5 notes than prediction/supermarket) B1 e.g. • people tend to use lower value notes when shopping • the sample is not representative of bank notes in use in the UK. • Data not from same year	1st B1 for a correct statistical **comparison**. Condone 'decreased' for lower. (Do not accept listing without comparison, and do not accept 'differ by 15%.') Accept converse statements about the prediction if made clear. 2nd B1 for a sensible reason supporting a higher proportion of low value notes used in the supermarket. Condone suggesting problems with the data collection/recording e.g. a small sample / only one Saturday, or an error in recording data (but do not condone errors in calculation)	(2)

Q12.

Question	Answer	Additional guidance	Mark
(a)	B1 for impossible		(1)
(b)	B1 for evens		(1)
(c)	B1 for a cross marked at $\dfrac{1}{4}$	B1 for a cross indicated between $\dfrac{1}{6}$ and $\dfrac{2}{6}$ inclusive	(1)
(d)	B1 for a cross marked at $\dfrac{3}{4}$	B1 for a cross indicated between $\dfrac{4}{6}$ and $\dfrac{5}{6}$ inclusive	(1)

Q13.

Question	Answer		Additional guidance	Mark
(a)	B1	for 0.7, 0.4 and 0.8 in correct positions		(1)
(b)	M1 M1 A1 ft	0.3×0.6 or "0.7" × "0.8" 0.3×0.6 + "0.7" × "0.8" 0.74	1st M1 for a correct product of (their) probabilities 2nd M1 for complete method using their probabilities Allow ft provided probabilities are between 0 and 1	(3)
(c)	M1 A1	$\dfrac{0.3 \times 0.6}{0.3 \times 0.6 + \text{"0.7"×"0.8"}}$ 0.243…	M1 for correct method for conditional probability Allow ft provided probabilities are between 0 and 1 A1 for awrt 0.24	(2)

Q14.

Question number	Answer	Additional guidance	Mark
	B1 for finding the total number of diesel cars (10) AND the number of manual petrol cars (20) OR for finding the number of manual petrol cars (20) AND the total number of manual cars (24) B1 for finding the number of manual diesel cars (4) M1 for finding the probability of a manual diesel car '4' OR a manual petrol car '20' '10' 30 A1 $\frac{4}{10}$ and $\frac{20}{30}$ oe depB1ft correct conclusion for their two probabilities	B1B1 may be scored in a table or frequency (tree) diagram. Values may be implied by relevant probabilities, e.g. manual diesel $\frac{4}{10}$ oe implies 4 manual diesel cars and 10 diesel cars; petrol manual $\frac{20}{30}$ oe implies 20 petrol manual cars Numbers alone are not sufficient – there must be an indication of class of car e.g. diesel 10, petrol manual 20 Accept 0.66, 0.67 or better for $\frac{20}{30}$ Dependent on M1 scored.	(5)

Q15.

Question number	Answer	Additional guidance	Mark
(a)	B1 $\frac{27}{200}$ (= 0.135)	B1 for exact equivalent fraction, decimal or percentage	(1)
(b)	B1 $\frac{x \ (\text{or } 18)}{30} = 0.6$ or $0.6 \times 30 \ (=18)$ or $\frac{18}{0.6} = 30$	B1 for correct use of absolute risk in a calculation. (NB Answer 18 is given)	(1)
(c)(i)	M1A1 $\frac{15}{50} \div 0.6 \ (= 0.5)$ or $0.3 \div 0.6 \ (=0.5)$	M1 for a probability $\div 0.6$ (or $\div 50$ $\frac{18}{50}$) A1 for fully correct calculation (may be seen in stages) NB Answer 0.5 is given and need not be stated, or may be embedded. Accept e.g. $0.5 \times 0.6 = 0.3$ for M1A1	(2)
(c)(ii)	B1 e.g. Lateness is half as likely by car (than by bus) or Lateness is twice as likely by bus (than by car)	B1 for a correct contextual interpretation of relative risk	(1)

Q16.

Question	Answer	Additional guidance	Mark
(a)(i)	B1 $\dfrac{13}{40}$	B1 $\dfrac{13}{40}$ or equivalent or also allow 0.33 or 33%	(1)
(ii)	B1 $\dfrac{7}{40}$	B1 $\dfrac{7}{40}$ or equivalent or also allow 0.18 or 18%	(1)
(b)(i)	B1 $\dfrac{18}{40}$	B1 $\dfrac{18}{40}$ or equivalent	(1)
(ii)	B1 $\dfrac{9}{40}$	B1 $\dfrac{9}{40}$ or equivalent also allow 0.23 or 23%	(1)
(iii)	B1 ft $\dfrac{1}{2}$	B1 ft $\dfrac{1}{2}$ or ft their (ii)/their(i) provided they are both probabilities	(1)