

Sets & Probability – Paper 4 – Mark Scheme

Question 1

| | | | | |
|---------|--|-------|--|--|
| 4 | | | | <p>In (b) and (c) isw any cancelling or changing to other forms, after correct answer seen. Penalty of – 1 for 2 sf decimals or percentages. Do not accept ratio or worded forms.</p> |
| (a) | B and $\frac{2}{5}, \frac{1}{4}$ oe | | | <p>1 Allow any reasonable explanation, e.g. 2 out of 5 greater than 1 out of 4.</p> |
| (b) (i) | $\frac{1}{3}, \frac{3}{4}, \frac{2}{5}, \frac{3}{5}$ | | | <p>4 B1 B1 B1 B1</p> |
| (ii) | $\frac{6}{12}$ oe cao | www 2 | | <p>2 $\frac{1}{2}, 0.5$ etc M1 for $\frac{2}{3} \times$ their $\frac{3}{4}$ i.e. product of correct branches on their tree</p> |
| (iii) | $\frac{42}{60}$ oe cao | www2 | | <p>2 $\frac{7}{10}, 0.7$ etc</p> <p>M1 for their (ii) + their $\frac{1}{3} \times$ their $\frac{3}{5}$ from their tree</p> |
| (c) | $\frac{2}{60}$ oe cao | www2 | | <p>2 $\frac{1}{30}, 0.0333(3\dots\dots)$ etc</p> <p>M1 for $\left(\frac{2}{3} \times \frac{1}{4} \times 0\right) + \frac{1}{3} \times \frac{2}{5} \times \frac{1}{4}$</p> |

Question 2

| | | | |
|----------------|--------------------------------------|---|--|
| 3 | | | Throughout this question isw any cancelling or changing to other forms, after correct answer seen. Penalty of –1 for 2 sf decimals or percentages. Do not accept ratio or worded forms. |
| (a) (i) | $\frac{4}{6}$ oe (0.667) | 1 | Allow 0.6666 – 0.6667 |
| (ii) | $\frac{3}{6}$ oe | 1 | |
| (iii) | $\frac{2}{6}$ oe (0.333) | 1 | Allow 0.3333... |
| (iv) | $\frac{5}{6}$ oe (0.833) | 1 | Allow 0.8333... |
| (b) (i) | $\frac{1}{36}$ oe (0.0278) | 2 | Allow 0.02777 – 0.02778, M1 for $\frac{1}{6} \times \frac{1}{6}$ |
| (ii) | $\frac{6}{36}$ oe (0.167) www 2 | 2 | Allow 0.1666 – 0.1667, M1 for $\frac{3}{6} \times \frac{1}{6} \times 2$ oe |
| (c) (i) | $\frac{1}{4}$ oe | 1 | |
| (ii) | $\frac{1}{2}$ oe | 1 | |
| (d) | 5 (but not from rounding) | 2 | M1 for repeating $\times \frac{4}{6}$ oe e.g. $\left(\frac{2}{3}\right)^n$ |

Question 3

| | | | |
|----------------|-----------------------|------------|---|
| 3 | | | Throughout this question isw any cancelling or changing to other forms, after correct answer seen. Do not accept ratio or worded forms. |
| (a) | 0.4, 0.1 oe | 1 | |
| (b) (i) | 1 | 1 | |
| (ii) | 0.7 oe ft | 1ft | ft their first three probabilities |
| (c) (i) | 0.04 oe | 1 | |
| (ii) | 0.03 oe ft | 2ft | M1 for their 0.1×0.3 |
| (iii) | 0.12 oe ft | 3ft | ft their 0.1, their 0.4 and their (c)(i) M2 for their $0.4 \times$ their 0.1 + their 0.1 \times their $0.4 + 0.2 \times 0.2$ (or their (c)(i)) or M1 for any two of these products added or two of each |
| (d) | 0.147 oe ft | 2ft | ft their (b)(ii) . M1 for their $0.7 \times$ their $0.7 \times (1 -$ their 0.7) |

Question 4

| | | | |
|---|--|------|---|
| 9 | (a) $\frac{4}{11}$ and $\frac{4}{10}$, $\frac{7}{10}$ $\frac{3}{10}$ | 1 | Accept fraction, %, dec equivalents (3sf or better) throughout but not ratio or words i.s.w. incorrect cancelling/conversion to other forms Pen -1 once for 2 sf answers |
| | | 1, 1 | |
| | (b) (i) $\frac{7}{11} \times \frac{6}{10}$ $\frac{42}{110}$ oe $\left(\frac{21}{55}\right)$ | M1 | |
| | | A1 | www2 0.382 (0.3818...) |
| | (ii) $\frac{7}{11} \times \frac{4}{10} + \frac{4}{11} \times \frac{7}{10}$ $\frac{56}{110}$ oe $\left(\frac{28}{55}\right)$ | M2 | ft their tree M1 for either pair seen |
| | | A1 | www3 0.509(0..) |
| | (c) (i) $\frac{7}{11} \times \frac{6}{10} \times \frac{5}{9}$ or their (b)(i) $\times \frac{5}{9}$ $\frac{210}{990}$ oe $\left(\frac{7}{33}\right)$ | M1 | |
| | | A1 | www2 0.212(1..) |
| | (ii) $1 - \left(\frac{4}{11} \times \frac{3}{10} \times \frac{2}{9}\right)$ oe $\frac{966}{990}$ oe $\left(\frac{161}{165}\right)$ | M2 | Longer methods must be complete M1 for 4/11, 3/10 and 2/9 seen |
| | | A1 | www3 0.976 (0.9757...) |

Question 5

| | | | | |
|---|--|--|---|---|
| 6 | | | Accept fraction, %, dec equivalents (3sf or better) throughout but not ratio or words i.s.w. incorrect cancelling/conversion to other forms Pen -1 once for 2 sf answers | |
| | | (a) (i) 33 | 1 | |
| | | (ii) $\frac{243}{3125}$ (0.07776) | 2 | Accept 0.0778. M1 for $\left(\frac{3}{5}\right)^5$ oe |
| | | (b) (i) $\frac{2}{5}, \frac{3}{4}, \frac{1}{8}, \frac{7}{8}$ | 3 | B1 for $\frac{2}{5}$ and $\frac{3}{4}$ B1 for $\frac{1}{8}$ B1 for $\frac{7}{8}$ |
| | | (ii) $\frac{1}{20}$ (0.05) cao | 2 | M1 for their $\frac{2}{5} \times$ their $\frac{1}{8}$ |
| | | (iii) $\frac{1}{5}$ (0.2) ft | 2ft | ft $\frac{3}{20} +$ their (b)(ii) or M1 for $\frac{3}{5} \times \frac{1}{4}$ |

Question 6

| | | | |
|-------|---|----------------|---|
| 2 (a) | Monday $\frac{3}{5}, \frac{2}{5}$ Tuesday $\frac{4}{7}, \frac{3}{7}$ $\frac{5}{7}, \frac{2}{7}$ | 1 1 1 | |
| (b) | (i) $\frac{12}{35}$ oe cao (ii) $\frac{9}{35}$ oe cao (iii) $\frac{19}{35}$ oe | 2 2 2 ft | M1 $\frac{3}{5} \times \frac{4}{7}$ ft their tree M1 $\frac{3}{5} \times \frac{3}{7}$ ft their tree ft their (b)(ii) + $\frac{10}{35}$ ft their tree throughout (iii) M1 for $\frac{2}{5} \times \frac{5}{7}$ + their (b)(ii) or $1 - \frac{3}{5} \times \frac{4}{7} - \frac{2}{5} \times \frac{2}{7}$ |
| (c) | $\frac{34}{35}$ oe cao | 3 | ft their tree throughout (iv) M2 for $1 - \frac{2}{5} \times \frac{2}{7} \times \frac{1}{4} (= 1 - \frac{1}{35})$ (M1 for $\frac{2}{5} \times \frac{2}{7} \times \frac{1}{4} (= \frac{1}{35})$) or M2 for $\frac{3}{5} + \frac{2}{5} \times \frac{5}{7} + \frac{2}{5} \times \frac{2}{7} \times \frac{3}{4}$ (M1 for any two of these) |

Question 7

| | | | |
|-------|----------------------------------|---|---|
| 7 (a) | Correct tree diagram. | 5 | B1 for labels flower and not flower First pair B1 for $\frac{7}{10}$ and $\frac{3}{10}$ B1 for next three branches after flowers B1 for clear labels for colours B1 for $\frac{2}{3}, \frac{1}{4}$ and $\frac{1}{12}$ in correct places If three branches at ends of both branches of first pair, lose final B, unless probabilities of 0 indicated. |
| (b) | $\frac{33}{40}$ o.e. (0.825) cao | 3 | M2 for $1 - \frac{7}{10} \times \frac{1}{4}$ (M1 for $\frac{7}{10} \times \frac{1}{4}$ or $\frac{7}{10} \times (1 - \frac{1}{4})$) oe or M2 for $\frac{3}{10} + \frac{7}{10} \times \frac{2}{3} + \frac{7}{10} \times \frac{1}{12}$ or $\frac{3}{10} + \frac{7}{10} \times \frac{3}{4}$ oe |
| (c) | 7 cao | 2 | M1 for $120 \times \frac{7}{10} \times \frac{1}{12}$ |

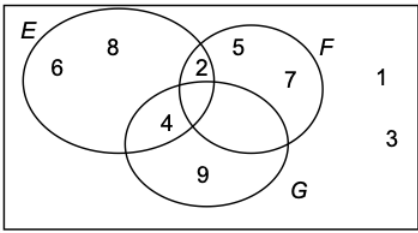
Question 8

| | | | |
|----------|---|---|---|
| <p>9</p> | <p>(a) (i) $\frac{120}{336}$ oe $\frac{5}{14}$ 0.357(1...)</p> <p>(ii) $\frac{180}{336}$ oe $\frac{15}{28}$ 0.536 or 0.5357...</p> <p>(b) (i) $\frac{x}{25} \times \frac{x-1}{24} = \frac{7}{100}$ $\frac{x^2 - x}{600} = \frac{7}{100}$ or $x(x-1) = \frac{7}{100} \times 25 \times 24$ $x^2 - x - 42 = 0$</p> <p>(ii) $(x+6)(x-7)$</p> <p>(iii) $-6, 7$</p> <p>(iv) 18</p> | <p>3</p> <p>3</p> <p>M2</p> <p>M1</p> <p>E1</p> <p>B2</p> <p>B1ft</p> <p>B1ft</p> | <p>Accept fraction, %, dec equivalents (3sf or better) throughout but not ratio or words isw incorrect cancelling/conversion to other forms Pen -1 once for 2sf answers</p> <p>M2 for $\frac{6}{8} \times \frac{5}{7} \times \frac{4}{6}$ or M1 for $\frac{5}{7}$ seen</p> <p>M2 for $\frac{2}{8} \times \frac{6}{7} \times \frac{5}{6} + \frac{6}{8} \times \frac{2}{7} \times \frac{5}{6} + \frac{6}{8} \times \frac{5}{7} \times \frac{2}{6}$ Accept $3 \times \frac{2 \times 5 \times 6}{6 \times 7 \times 8}$ or M1 for $\frac{2 \times 5 \times 6}{6 \times 7 \times 8}$ oe seen ($\frac{60}{336}$ oe $\frac{5}{28}$)</p> <p>M1 for $\frac{x}{25}$ or $\frac{x-1}{24}$ seen</p> <p>Or better, min requirement is $x^2 - x = 7 \times 6$</p> <p>With no errors or omissions</p> <p>SC1 any other $(x+a)(x+b)$ where $a \times b = -42$ or $a + b = -1$</p> <p>Correct or follow through dep on at least SC1 in (b)(ii)</p> <p>Correct or ft 25 – their positive integer solution Dep on pos and neg answer to (b)(iii) Answer must be positive integer</p> |
|----------|---|---|---|

Question 9

| | | | |
|----------|---------------------------|------------|--|
| 9 | | | Accept fraction, %, dec equivalents (3sf or better when not exact) throughout but not ratio or words isw incorrect cancelling/conversion to other forms |
| | (a) (i) $\frac{1}{4}$ oe | 1 | |
| | (ii) 25 cao | 1ft | ft their $\frac{1}{4} \times 100$ to 3sf or better or rounding or truncating to integer Not 25/100 |
| | (b) $\frac{2}{12}$ oe cao | 2 | M1 for $\frac{2}{4} \times \frac{1}{3}$ 0.167, 16.7% |
| | (c) $\frac{7}{20}$ oe cao | 3 | M2 for $\frac{1}{4} \times \frac{4}{5} + \frac{3}{4} \times \frac{1}{5}$ or M1 for $\frac{1}{4} \times \frac{4}{5}$ or $\frac{3}{4} \times \frac{1}{5}$ After 0, SC1 for 7 correct in list (condone UU in addition) |
| | (d) $\frac{6}{60}$ oe cao | 2 | M1 for $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} \times \left(\frac{2}{2}\right)$ |

Question 10

| | | | |
|----------|---|--------------|---|
| 8 | (a) 2 4 6 8 | 1 | |
| | (b) 3 | 1 | |
| | (c) (i) $(x-4)(x-9)$ | 2 | SC1 any other $(x+a)(x+b)$ where $a \times b = 36$ or $a + b = -13$ |
| | (ii) 4 9 | B1 ft | ft or can recover |
| | (d)  | 2 | Must have all 9 numbers on diagram and no extras SC1 for 5 or more correct elements |
| | (e) (i) \emptyset or $\{ \}$ cao | 1 | |
| | (ii) \notin cao | 1 | |
| | (iii) \cup cao | 1 | |

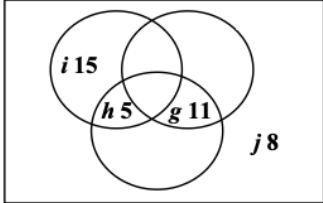
Question 11

| | | |
|--|--|--|
| <p>8</p> <p>(a) (i) $\frac{2}{3}$</p> <p>(ii) $\frac{1}{3}, \frac{2}{3}, \frac{2}{5}, \frac{3}{5}, \frac{1}{6}, \frac{5}{6}$ correctly placed</p> <p>(b) $\frac{4}{9}$ cao www 3</p> <p>(c) $\frac{14}{45}$ cao www 3</p> | | <p>Throughout question, penalise non-reduced fraction only once; isw any conversion and allow decimals in working and on branches but not final answers if fractions not seen.</p> <p>1</p> <p>2 B1 for $\frac{1}{3}$ and $\frac{2}{3}$ and $\frac{3}{5}$ or $\frac{5}{6}$ correctly placed</p> <p>For method marks in (b) and (c), ft tree with each probability $0 < p < 1$</p> <p>3 M2 for $1 - \frac{2}{3} \times \frac{5}{6}$ or $\frac{1}{3} + \frac{2}{3} \times \frac{1}{6}$ or $\frac{1}{3} \times \frac{2}{5} + \frac{1}{3} \times \frac{3}{5} + \frac{2}{3} \times \frac{1}{6}$ M1 for $\frac{1}{3} + \frac{2}{3} \times \frac{5}{6}$ or two of $\frac{1}{3} \times \frac{2}{5}, \frac{1}{3} \times \frac{3}{5}, \frac{2}{3} \times \frac{1}{6}$ added</p> <p>3 M2 for $\frac{1}{3} \times \frac{3}{5} + \frac{2}{3} \times \frac{1}{6}$ or their $\frac{4}{9} - \frac{1}{3} \times \frac{2}{5}$ M1 for one of $\frac{1}{3} \times \frac{3}{5}$ or $\frac{2}{3} \times \frac{1}{6}$ from a maximum of two products added.</p> |
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Question 12

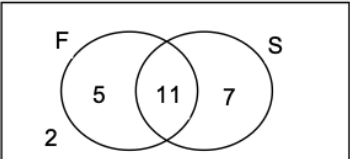
| | | | | |
|---|---------|--------------------------|---|--|
| 6 | (a) (i) | 180 | 1 | |
| | (ii) | 20 | 1 | |
| | (b) | 220 | 1 | |
| | (c) (i) | $\frac{170}{240}$ oe isw | 1 | Allow 0.708, 0.7083... or % equivalents |
| | (ii) | $\frac{150}{240}$ oe isw | 1 | Allow 0.625 or % equivalents |
| | (d) | | | Penalise once for first correct none 4 dp dec answer to at least 3sf or correct fraction answer in parts (d) and (e) |
| | (i) | 0.5617 | 2 | Accept 56.1715% , do not accept 0.562 ww M1 for $\frac{180}{240} \times \frac{179}{239}$ [0.56171 to 0.56172], $\frac{537}{956}$ oe |
| | (ii) | 0.3766 | 3 | Accept 37.6569% M2 for $2 \times \frac{180}{240} \times \frac{60}{239}$ oe [0.37656 to 0.37657] $\frac{90}{239}$ oe Or M1 for one correct product seen, implied by 0.18828... or 0.1883 |
| | (e) | 0.6937 | 3 | Accept 69.3669%, do not accept 0.694 ww M2 for $\frac{150}{180} \times \frac{149}{179}$ [0.69366 to 0.69367] $\frac{745}{1074}$ oe or M1 for $\frac{150}{180}$ oe soi |

Question 13

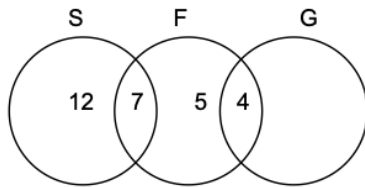
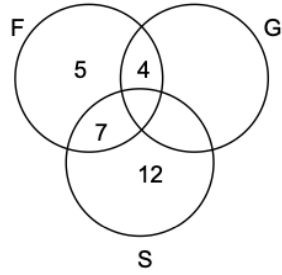
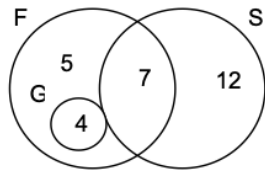
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|---|---------|---|------|---|
| 3 | (a) |  | | |
| | | <p>(g =)11 (h =) 5 (i =)15 (j =) 8</p> | 1 | |
| | (b) (i) | 5 | 1 | ft 16 – their 11 |
| | (ii) | 51 | 1 ft | ft 20 – their 5 |
| | (c) (i) | 15 | 1 ft | ft 39 – (their 11 + their 5 + their 15) |
| | (ii) | 10 | 1 | ft for positive integers only |
| | (d) (i) | $\frac{13}{90}$ oe [0.144] | 1 | |
| | (ii) | $\frac{15}{90}$ oe [0.167] | 1 | In (d) and (e) accept fraction, %, dec equivalents (3sf or better) throughout but not ratio or words isw incorrect cancelling/conversion |

| | | | |
|--|--|-------------------|--|
| | <p>(e) (i) $\frac{20}{8010}$ oe [0.0025[0]]</p> <p>(ii) $\frac{598}{8010}$ oe [0.0747]</p> | <p>2</p> <p>3</p> | <p>M1 for $\frac{5}{90} \times \frac{4}{89}$ oe</p> <p>After M0, SC1 for $\frac{5}{90} \times \frac{5}{90}$ oe</p> <p>M2 for $\left(\frac{23}{90} \times \frac{13}{89}\right) + \left(\frac{13}{90} \times \frac{23}{89}\right)$ oe</p> <p>or M1 for one product soi [0.0373..]</p> <p>After M0, SC1 for $2 \left(\frac{23}{90} \times \frac{13}{90}\right)$ oe</p> |
|--|--|-------------------|--|

Question 14

| | | | |
|----------|--|--|--|
| <p>9</p> | <p>(a) (i) </p> <p>(ii) 9</p> <p>(iii) 14</p> <p>(iv) $\frac{11}{25}$</p> <p>(v) $\frac{42}{600}$ oe = $\frac{7}{100}$</p> | <p>2</p> <p>1ft</p> <p>1</p> <p>1ft</p> <p>2ft</p> | <p>B1 for 2 outside of circles in diagram or all three of 5, 11, 7 correctly placed</p> <p>ft <i>their 2 + their 7</i></p> <p>ft <i>their 11 from diagram / 25</i></p> <p>isw incorrect cancelling</p> <p>ft <i>their 7 from diagram for numerator</i></p> <p>M1 for $\frac{\text{their}7}{25} \times \frac{\text{their}(7-1)}{24}$</p> <p>After 0 scored, SC1 for $\frac{\text{their}7}{25} \times \frac{\text{their}(7)}{25}$</p> |
|----------|--|--|--|

(b) (i)



(ii) 28

4

B1 for any correct diagram with blanks or zeros where needed and labelled unambiguously

B1 for 4 in correct place

B1 for 12 in correct place

B1 for 5 and 7 in correct place

1ft

Correct or ft from *their* diagram

Question 15

| | | | | |
|---|---------|-------------------------------------|-----|--|
| 7 | (a) (i) | $\frac{2}{20}$ oe | 2 | M1 for $\frac{2}{5} \times \frac{1}{4}$ oe |
| | (ii) | $\frac{6}{20}$ oe | 3 | M2 for $2 \times \frac{1}{5} \times \frac{1}{4} + 2 \times \frac{2}{5} \times \frac{1}{4}$ oe M1 for pairs 1, 4 and 2, 3 clearly identified and no other incorrect pairings or for one appropriate product isw |
| | (iii) | $\frac{14}{20}$ oe | 1ft | ft 1 – their (a)(ii) or recovery to correct ans |
| | (b) (i) | 7 | 1 | |
| | (ii) | 42 | 1 | |
| | (iii) | $\frac{7}{50}$ | 1ft | ft their 7/50 from Venn diagram or correct recovery |
| | (iv) | $\frac{7}{9}$ [0.777[7].. or 0.778] | 1ft | ft their 7/their 9 from Venn diagram or correct recovery |

Question 16

| | | | | |
|---|---------|--|-----|---|
| 8 | (a) | hat $\frac{5}{8}, \frac{3}{8}$ scarf $\frac{2}{3}, \frac{1}{3}$ $\frac{1}{6}, \frac{5}{6}$ | 1 | 1 mark per pair in correct place |
| | (b) (i) | $\frac{15}{48}$ oe $\left[\frac{5}{16} \right]$ | 2FT | FT their $\frac{3}{8} \times \frac{5}{6}$ correctly evaluated M1 $\frac{3}{8} \times \frac{5}{6}$ FT from their tree |
| | (ii) | $\frac{5}{24}$ | 2FT | FT their $\frac{5}{8} \times \frac{1}{3}$ correctly evaluated M1 $\frac{5}{8} \times \frac{1}{3}$ FT from their tree |

| | | | |
|-------|---|---|---|
| (iii) | $\frac{13}{48}$ cao | 2 | M1 for <i>their</i> $\frac{3}{8} \times \frac{1}{6} + \text{their (b)(ii) soi}$ |
| (c) | $\frac{170}{240}$ or $\frac{85}{120}$ or $\frac{34}{48}$ or $\frac{17}{24}$ cao | 3 | M2 for $1 - \frac{5}{8} \times \frac{2}{3} \times \frac{7}{10}$ FT <i>their tree</i> or $\frac{3}{8} + \frac{5}{8} \times \frac{1}{3} + \frac{5}{8} \times \frac{2}{3} \times \frac{3}{10}$ oe or M1 for ["wears all" =] $\frac{5}{8} \times \frac{2}{3} \times \frac{7}{10}$ FT <i>their tree seen</i> |

Question 17

| | | | |
|-------|---|---|--|
| 6 (a) | $\frac{3}{10}$ correctly placed | 1 | Accept 0.3 |
| | $\frac{6}{9}$ and $\frac{3}{9}$ correctly placed | 1 | Accept 0.667 or better and 0.333 or better |
| | $\frac{7}{9}$ and $\frac{2}{9}$ correctly placed | 1 | Accept 0.778 or better and 0.222 or better |
| (b) | $\frac{42}{90}$ or $\frac{21}{45}$ or $\frac{14}{30}$ or $\frac{7}{15}$ | 3 | M2 for $\frac{7}{10} \times \frac{3}{9} + \frac{3}{10} \times \frac{7}{9}$ soi by 0.467 or better or M1 for $\frac{7}{10} \times \frac{3}{9}$ or $\frac{3}{10} \times \frac{7}{9}$ soi by 0.233 or better |

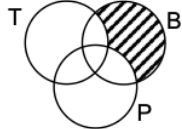
Question 18

| | | | | | | |
|----------|------------|-----------------------------------|---------------------------------|------------|---|--|
| 6 | (a) | (i) $\frac{1}{110}$ oe | | 2 | M1 for $\frac{1}{11} \times \frac{1}{10}$ | |
| | | (ii) $\frac{6}{110}$ oe | $\left[\frac{3}{55} \right]$ | 2 | M1 for $\frac{3}{11} \times \frac{2}{10}$ | |
| | | (iii) $\frac{8}{110}$ oe | $\left[\frac{4}{55} \right]$ | 2FT | FT <i>their (a)(ii)</i> + $\frac{2}{11} \times \frac{1}{10}$ correctly evaluated or M1 <i>their (a)(ii)</i> + $\frac{2}{11} \times \frac{1}{10}$ | |
| | (b) | (i) $\frac{6}{990}$ oe | $\left[\frac{1}{165} \right]$ | | 2 | M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{1}{9}$ |
| | | (ii) $\frac{336}{990}$ oe | $\left[\frac{56}{165} \right]$ | | 2 | M1 for $\frac{8}{11} \times \frac{7}{10} \times \frac{6}{9}$ |
| | | (iii) $\frac{198}{990}$ oe | $\left[\frac{1}{5} \right]$ | | 5 | M4 for $3\left(\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}\right) + 3\left(\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9}\right]\right)$ oe or M3 for $3\left(\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}\right)$ <i>or</i> $3\left(\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9}\right]\right)$ oe Or M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}$ oe seen and M1 for $\frac{2}{11} \times \frac{1}{10} \left[\times \frac{9}{9}\right]$ oe seen |

Question 19

| | | | | | |
|---|---------|---|---|---|---|
| 5 | (a) (i) | 3.81 or 3.812 to 3.813 or 3h 49min nfw | 4 | M1 for midpoints soi (condone 1 error or omission and M1 for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) and M1 (dep on 2 nd M1) for $\sum fx \div 80$ (305 \div 80) | |
| | (ii) | Correct histogram | | 4 | B1 for each correct block and B1 for correct widths |
| | (b) (i) | $\frac{2}{5}, \frac{1}{4}, \frac{3}{4}, \frac{1}{4}$ oe | | 2 | B1 for $\frac{2}{5}$ or both $\frac{1}{4}$ s in correct place |
| | (ii) | $\frac{18}{20}$ nfw $\left[\frac{9}{10} \right]$ | 3 | M2 FT for $1 - \text{their } \frac{2}{5} \times \text{their } \frac{1}{4}$ or $\frac{3}{5} \times \frac{3}{4} + \frac{3}{5} \times \text{their } \frac{1}{4} + \text{their } \frac{2}{5} \times \frac{3}{4}$ oe or M1 FT for $\text{their } \frac{2}{5} \times \text{their } \frac{1}{4}$ or $\frac{3}{5} \times \text{their } \frac{1}{4} + \text{their } \frac{2}{5} \times \frac{3}{4}$ oe | |
| | (iii) | $\frac{27}{125}$ [0.216] | 2 | M1 for $\frac{3}{5} \times \frac{3}{5} \times \frac{3}{5}$ | |

Question 20

| | | | | |
|---|---------|---|-----|--|
| 4 | (a) | 4 - x correctly placed 5 - x correctly placed 7 correctly placed | 1 | SC3 for 1, 2 and 7 all correctly placed instead of expressions in x |
| | (b) | $4 + 11 + (6 - x) + x + 9 + (4 - x) + (5 - x) + 7 = 40$ oe $46 - 2x = 40$ nfw $x = 3$ | M1 | FT from their Venn diagram, condone omission of one subset |
| | (c) (i) | $\frac{9}{40}$ or 0.225 or 22.5% | A1 | Must be in the form $a + bx = c$, ie each side simplified, or better |
| | (ii) | 2 | B1 | |
| | (iii) | 15 | 1 | ISW cancelling or conversion after correct answer seen |
| | (iv) | 25 | 1FT | FT from their Venn diagram and their x provided $n(B \cap P \cap T') \neq 5$ |
| | (v) | 4 | 1FT | FT from their Venn diagram |
| | (d) | Correct region shaded.  | 1FT | FT from their Venn diagram |
| | | | 1 | |
| | | | 1 | |

Question 21

| | | | | |
|---|---------|--|---|--|
| 6 | (a) (i) | 0.6 oe | 2 | M1 for $0.2 + 0.4$ |
| | (ii) | 1500 | | |
| | (iii) | 0.03 oe | 1 | |
| | (b) | $\frac{112}{132}$ oe $\frac{28}{33} = 0.848[4\dots]$ | 2 | M1 for 0.1×0.3 |
| | | | 3 | M2 for $1 - \frac{5}{12} \times \frac{4}{11}$ or $\frac{7}{12} \times \frac{5}{11} + \frac{5}{12} \times \frac{7}{11} + \frac{7}{12} \times \frac{6}{11}$ or $\frac{7}{12} + \frac{5}{12} \times \frac{7}{11}$ or M1 for addition of any two of $\frac{7}{12} \times \frac{5}{11}$, $\frac{5}{12} \times \frac{7}{11}$, $\frac{7}{12} \times \frac{6}{11}$ or sum of 3 products with an error in the numerator of one product or for $\frac{5}{12} \times \frac{4}{11}$ identified |

Question 22

| | | | | |
|---|-----|---|---|--|
| 9 | (a) | $\frac{1}{4}, \frac{9}{10}, \frac{1}{3}, \frac{2}{3}$ | 3 | B1 for $\frac{1}{4}$ B1 for $\frac{9}{10}$ B1 for $\frac{1}{3}$ and $\frac{2}{3}$ |
| | (b) | 45 | | |
| | (c) | $\frac{3}{40}$ oe | | |
| | (d) | $\frac{101}{120}$ oe | | |
| | (e) | $\frac{781}{1024}$ oe | | |
| | | | 1 | |
| | | | 2 | M1 for $\frac{3}{4} \times \frac{1}{10}$ oe |
| | | | 3 | M2 for $\frac{3}{4} \times \frac{9}{10} + \frac{1}{4} \times \frac{2}{3}$ only or $1 - \text{their (c)} - \frac{1}{4} \times \frac{1}{3}$ only or M1 for $\frac{3}{4} \times \frac{9}{10}$ or $\frac{1}{4} \times \frac{2}{3}$ or $\text{their (c)} + \frac{1}{4} \times \frac{1}{3}$ |
| | | | 2 | M1 for $1 - \left(\frac{3}{4}\right)^5$ oe |

Question 23

| | | | | |
|-----|---------------------|--------------------|---|---|
| 6 | (a) (i) | $\frac{1}{6}$ | 1 | |
| | (ii) | $\frac{4}{6}$ oe | 1 | |
| | (iii) | $\frac{2}{6}$ oe | 1 | |
| | (b) | $\frac{16}{36}$ oe | 3 | <p>M2 $\frac{2}{6} \times \frac{4}{6} + \frac{4}{6} \times \frac{2}{6}$ only oe</p> <p>or M1 for one of $\frac{2}{6} \times \frac{4}{6}$ or $\frac{4}{6} \times \frac{2}{6}$ soi by $\frac{2}{9}$</p> |
| (c) | $\frac{48}{360}$ oe | 3 | <p>M2 for $\frac{4}{6} \times \frac{3}{5} \times \frac{2}{4} \times \frac{2}{3}$ only oe</p> <p>or M1 for denominators 6, 5, 4, 3 soi in product of four fractions</p> | |

Question 24

| | | | | |
|----|---------|---|---|--|
| 10 | (a) (i) | $\frac{1}{36}$ final answer | 2 | M1 for $\frac{1}{6} \times \frac{1}{6}$ |
| | (ii) | $\frac{1}{12}$ final answer | 3 | <p>M2 for $3\left(\frac{1}{6} \times \frac{1}{6}\right)$ oe</p> <p>or M1 for identifying 3 correct pairs (4, 6), (6, 4) and (5, 5)</p> |
| | (b) | 7 | 1 | |
| | (c) | $\frac{141}{1296}$ oe $\left[\frac{47}{432}\right]$ | 5 | <p>Dependent on previous mark</p> <p>M4 for $\frac{2}{36} + \left[\left(1 - \frac{3}{36}\right) \times \frac{2}{36}\right] + \left(\frac{1}{36} \times \frac{3}{36}\right)$ oe</p> <p>or M3 for 2 correct probabilities shown <u>added</u> from those above</p> <p>or M1 for $\left(1 - \frac{3}{36}\right) \times \frac{2}{36}$ seen oe</p> <p>And M1 for $\frac{1}{36} \times \frac{3}{36}$ seen oe</p> <p>or $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$ oe alone or added to a probability not of the form $\frac{n}{36}$</p> |

Question 25

| | | | |
|--|---|--|---|
| <p>4 (a) (i)</p> <p>(ii)</p> <p>(iii)</p> <p>(b) (i)</p> <p>(ii)</p> | <p>Ariven with comparable form for both shown or difference between the two fractions shown</p> <p>$\frac{6}{15}$ oe</p> <p>$\frac{7}{15}$ oe</p> <p>Completes tree diagram correctly</p> <p>$\frac{126}{350}$ oe $\left[\frac{9}{25} \right]$</p> | <p>1</p> <p>2</p> <p>3</p> <p>3</p> <p>2</p> | <p>Accept probabilities changed to decimals or percentages (to 2sf or better)</p> <p>M1 for $\frac{3}{5} \times \frac{2}{3}$</p> <p>M2 for $\frac{3}{5} \times \frac{1}{3} + \frac{2}{5} \times \frac{2}{3}$ oe $1 - \text{their (a)(ii)} - \frac{2}{5} \times \frac{1}{3}$ or M1 for $\frac{3}{5} \times \frac{1}{3}$ or $\frac{2}{5} \times \frac{2}{3}$ seen</p> <p>B2 for 5 values correct or B1 for 1 value correct</p> <p>M1 for $\frac{3}{5} \times \frac{6}{7} \times \frac{7}{10}$</p> |
| <p>(iii)</p> | <p>$\frac{344}{350}$ oe</p> | <p>3</p> | <p>M2 for $1 - \text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}$ oe or $\frac{3}{5} + \frac{2}{5} \times \frac{6}{7} + \frac{2}{5} \times \frac{1}{7} \times \frac{7}{10}$ M1 for $\text{their } \frac{2}{5} \times \text{their } \frac{1}{7} \times \text{their } \frac{3}{10}$ oe or identifies the 7 routes or attempt to add 7 probabilities with at least 5 correct $\frac{9}{25} + \frac{27}{175} + \frac{3}{50} + \frac{9}{350} + \frac{6}{25} + \frac{18}{175} + \frac{1}{25}$ oe</p> |

Question 26

| | | | |
|--|--|---|---|
| <p>4 (a)</p> <p>(b)</p> <p>(c)</p> <p>(d) (i)</p> <p>(ii)</p> <p>(e)</p> | <p>5</p> <p>$C \cap M$ oe</p> <p>3</p> <p>$\frac{8}{30}$ oe</p> <p>$\frac{14}{30}$ oe</p> <p>$\frac{30}{272}$ oe</p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>3</p> | <p>Allow e.g. $(B \cap C \cap M) \cup (C \cap M)$</p> <p>0.267 or better</p> <p>0.467 or better</p> <p>M2 for $\frac{6}{17} \times \frac{5}{16}$ or M1 for $\frac{6}{17}$ seen 0.110[2...] or better</p> |
|--|--|---|---|

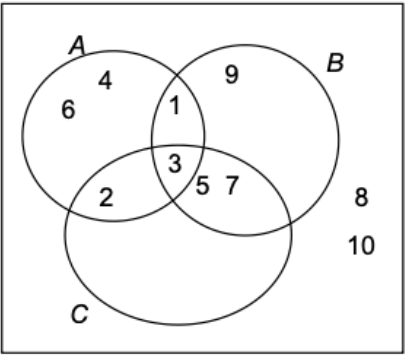
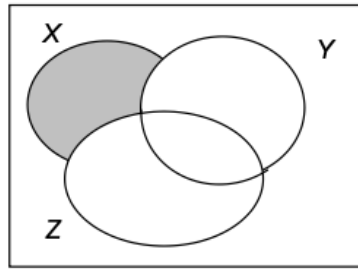
Question 27

| | | | |
|----------------------|---------------------------------------|-----------------|--|
| <p>11 (a)</p> | $\frac{38}{56}$ or $\frac{19}{28}$ oe | <p>4</p> | <p>[0.679 or 0.6785 to 0.6786]</p> <p>M3 for $\frac{4}{8} \times \frac{4}{7} + \frac{3}{8} \times \frac{5}{7} + \frac{1}{8} [\times \frac{7}{7}]$ oe</p> <p>or</p> <p>M2 for sum of two of the products isw</p> $\frac{4}{8} \times \frac{4}{7}, \frac{3}{8} \times \frac{5}{7}, \frac{1}{8} [\times \frac{7}{7}]$ oe <p>or</p> <p>M1 for $\frac{4}{8} \times \frac{4}{7}$ or $\frac{3}{8} \times \frac{5}{7}$ oe isw</p> <p>or $\frac{1}{8} \times \frac{7}{7}$ isw</p> <p>After 0 scored, SC1 for answer of $\frac{38}{64}$ oe</p> |
| <p>(b)</p> | $\frac{60}{336}$ or $\frac{5}{28}$ oe | <p>2</p> | <p>M1 for $\frac{5}{8} \times \frac{4}{7} \times \frac{3}{6}$</p> <p>or $\left(\frac{4}{8} \times \frac{3}{7} \times \frac{2}{6}\right) + 3\left(\frac{4}{8} \times \frac{1}{7} \times \frac{3}{6}\right)$ oe</p> |

Question 28

| | | | |
|-------------------------|--------------------------|-----------------|---|
| <p>5 (a) (i)</p> | $\frac{4}{7}$ oe | <p>1</p> | |
| <p>(ii)</p> | $\frac{6}{7}$ oe | <p>1</p> | |
| <p>(iii)</p> | $\frac{5}{7}$ oe | <p>1</p> | |
| <p>(b) (i)</p> | $\frac{12}{42}$ oe nfw | <p>2</p> | <p>M1 for $\frac{4}{7} \times \frac{3}{6}$</p> |
| <p>(ii)</p> | $\frac{28}{42}$ oe nfw | <p>3</p> | <p>M2 for $\frac{4}{7} \times \frac{3}{6} + \frac{2}{7} \times \frac{5}{6} + \frac{1}{7}$ or</p> $1 - \frac{4}{7} \times \frac{3}{6} - \frac{2}{7} \times \frac{1}{6}$ oe <p>or M1 for the sum of two terms of</p> $\frac{4}{7} \times \frac{3}{6}, \frac{2}{7} \times \frac{5}{6}, \frac{1}{7}$ |
| <p>(c)</p> | $\frac{120}{210}$ oe nfw | <p>2</p> | <p>M1 for $\frac{6}{7} \times \frac{5}{6} \times \frac{4}{5}$</p> <p>or $\left(\frac{4}{7} \times \frac{3}{6} \times \frac{2}{5}\right) + 3\left(\frac{4}{7} \times \frac{3}{6} \times \frac{2}{5}\right) + 3\left(\frac{4}{7} \times \frac{2}{6} \times \frac{1}{5}\right)$ oe</p> |

Question 29

| | | | |
|------------------|--|-------------------|--|
| <p>2 (a) (i)</p> |  | <p>3</p> | <p>B2 for 8 or 9 numbers correct B1 for 6 or 7 numbers correct</p> |
| <p>(ii)</p> | <p>\in cao {3} \emptyset or {}</p> | <p>1</p> | <p>1FT FT <i>their</i> intersection of all 3 sets – <i>their</i> diagram</p> |
| <p>(iii)</p> | <p>5</p> | <p>1FT</p> | <p>FT <i>their</i> set B on diagram</p> |
| <p>(b) (i)</p> | <p>\subset</p> | <p>1</p> | |
| <p>(ii)</p> |  | <p>1</p> | |

Question 30

| | | | |
|---------|----------------------|-----|--|
| 6 (a) | $\frac{4}{15}$ | 1 | |
| (b) | 80 | 1FT | FT $300 \times \text{their (a)}$ |
| (c) (i) | $\frac{40}{225}$ oe | 3 | M2 for $\frac{5}{15} \times \frac{4}{15} \times 2$ oe or M1 for $\frac{5}{15} \times \frac{4}{15}$ |
| (ii) | $\frac{121}{225}$ | 3 | M2 for $\frac{11}{15} \times \frac{11}{15}$ oe or M1 for $\frac{11}{15}$ or $1 - \frac{4}{15}$ seen |
| (d) (i) | $\frac{108}{210}$ oe | 3 | M2 for $\frac{6}{15} \times \frac{9}{14} + \frac{9}{15} \times \frac{6}{14}$ oe or M1 for $\frac{6}{15} \times \frac{9}{14}$ oe or $\frac{9}{15} \times \frac{6}{14}$ oe or $\frac{6}{15} \times \frac{5}{14}$ oe or $\frac{6}{15} \times \frac{4}{14}$ oe |
| (ii) | $\frac{148}{210}$ oe | 4 | M3 for $\frac{5}{15} \times \frac{10}{14} + \frac{6}{15} \times \frac{9}{14} + \frac{4}{15} \times \frac{11}{14}$ oe or $1 - \frac{5}{15} \times \frac{4}{14} - \frac{6}{15} \times \frac{5}{14} - \frac{4}{15} \times \frac{3}{14}$ or M2 for equivalent of 2 of above products added together oe or M1 for one correct relevant product oe |

Question 31

| | | | |
|--|--|--|---|
| <p>3 (a) (i)</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> </div> <p>(ii) 46 (iii) 11 (iv) $\frac{7}{19}$ oe</p> <p>(b) (i) $\frac{9}{200}$ or 0.045 (ii) 10800 (iii) 7.2</p> | | <p>3</p> <p>1FT</p> <p>1</p> <p>2</p> <p>1</p> <p>3</p> <p>1FT</p> | <p>B1 for each</p> <p>FT 29 + <i>their</i> 3 values from (a)</p> <p>M1 for $\frac{n}{16 + \text{their } 3}$ ($0 < n < (16 + \text{their } 3)$) or $\frac{4 + \text{their } 3}{k}$ ($k > (4 + \text{their } 3)$)</p> <p>M2 for $\frac{1}{2}(900 + 1500) \times 9$ oe or M1 for method of finding a relevant area</p> <p>FT (<i>their</i> 10800) \div 1500</p> |
|--|--|--|---|

Question 32

| | | | |
|---|--|---|--|
| <p>5 (a) 0.05 oe</p> <p>(b) 15</p> <p>(c) (i) 0.75 oe (ii) 0.135 oe (iii) 0.12 oe</p> <p>(d) 0.243 oe</p> | | <p>2</p> <p>1</p> <p>2</p> <p>2</p> <p>3</p> <p>5</p> | <p>M1 for $1 - (0.2 + 0.3 + 0.45)$ oe</p> <p>M1 for $0.45 + 0.3$ oe</p> <p>M1 for 0.45×0.3 oe</p> <p>M2 for $2(0.3 \times 0.2)$ oe or M1 for 0.3×0.2 or 0.06 oe nfw</p> <p>M4 for $3(0.45 \times 0.45 \times 0.2) + 3(0.3 \times 0.3 \times 0.45)$ oe or M3 for $3(0.45 \times 0.45 \times 0.2)$ or $3(0.3 \times 0.3 \times 0.45)$ oe or M2 for $0.45 \times 0.45 \times 0.2$ and $0.3 \times 0.3 \times 0.45$ or M1 for $0.45 \times 0.45 \times 0.2$ or $0.3 \times 0.3 \times 0.45$ oe or for identifying the correct 6 outcomes e.g. 10 0 0, 0 0 10, 0 10 0, 5 5 0, 5 0 5, 0 5 5</p> |
|---|--|---|--|

Question 33

| | | | |
|----------|----------------------|---|--|
| 9(a)(i) | 52 | 2 | M1 for $(1 - 0.35) \times 80$ oe |
| 9(a)(ii) | 84 | 1 | |
| 9(b)(i) | $\frac{27}{729}$ oe | 2 | M1 for $\frac{3}{9} \times \frac{3}{9} \times \frac{3}{9}$ |
| 9(b)(ii) | $\frac{144}{729}$ oe | 3 | M2 for $\frac{2}{9} \times \frac{3}{9} \times \frac{4}{9} \times 6$ oe or M1 for $\frac{2}{9} \times \frac{3}{9} \times \frac{4}{9}$ oe isw |
| 9(c) | $\frac{42}{60}$ oe | 4 | M3 for $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} + \frac{3}{5} \times \frac{2}{4} \times \frac{2}{3} \times 3$ oe or M2 for $\frac{3}{5} \times \frac{2}{4} \times \frac{2}{3} \times 3$ oe or for $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} + \left(\frac{3}{5} \times \frac{2}{4} \times \frac{2}{3}\right) [\times 2]$ or M1 for $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3}$ or $\frac{3}{5} \times \frac{2}{4} \times \frac{2}{3}$ oe isw or for PPG, PGP, GPP and PPP selected soi |

Question 34

| | | | |
|------|---|---|---|
| 9(a) | $\frac{5}{8} \quad \frac{3}{8}$ $\frac{1}{6} \quad \frac{5}{6}$ $\frac{7}{10} \quad \frac{3}{10}$ | 3 | B1 for each pair |
| 9(b) | $\frac{5}{48}$ oe | 2 | M1FT for <i>their</i> $\frac{5}{8} \times$ <i>their</i> $\frac{1}{6}$ |
| 9(c) | $\frac{304}{480}$ oe | 3 | M2 for <i>their</i> $\frac{5}{8} \times$ <i>their</i> $\frac{5}{6} +$ <i>their</i> $\frac{3}{8} \times$ <i>their</i> $\frac{3}{10}$ oe or M1 for <i>their</i> $\frac{5}{8} \times$ <i>their</i> $\frac{5}{6}$ or <i>their</i> $\frac{3}{8} \times$ <i>their</i> $\frac{3}{10}$ |

| | | | |
|------------|-------------------|---|---|
| 10(a) | 75 | 3 | M2 for $79.5 \div 1.06$ oe or M1 for 79.5 associated with 106 [%] |
| 10(b) | 962.5 cao | 2 | B1 for 35 or 27.5 seen |
| 10(c)(i) | 16 | 1 | |
| 10(c)(ii) | 50 | 1 | |
| 10(c)(iii) | $\frac{4}{50}$ oe | 2 | FT <i>their (c)(ii)</i> for 1 or 2 marks B1 for $\frac{4}{k}$, $k > 4$ or $\frac{k}{\text{their}50}$, $k < 50$ |
| 10(c)(iv) | 19 | 1 | |

Question 35

| | | | |
|-----------|---|-----------|---|
| 3(a) | $1 - r$ | 1 | |
| 3(b)(i) | $(1 - r)(1.3 - r) [= 0.4]$ | 1 | FT <i>their(a)</i> dep on (a) being an expression in r |
| 3(b)(ii) | $1.3 - 1.3r - r + r^2$ or better nfw | M1 | FT <i>their (b)(i)</i> |
| | $0.9 - 2.3r + r^2 [= 0]$ OR $13 - 13r - 10r + 10r^2 = 4$ oe | M1 | Strict FT <i>their</i> expansion to a quadratic then equating to 0.4 and then collecting to 3 terms on 'one side' OR Strict FT <i>their</i> expansion to a quadratic = 0.4 all multiplied by 10 |
| | $10r^2 - 23r + 9 = 0$ | A1 | no errors or omissions seen |
| | | | |
| 3(b)(iii) | $(5r - 9)(2r - 1) [= 0]$ | B2 | or B2 for e.g. $5r(2r - 1) - 9(2r - 1)$ and then $5r - 9 = 0$ and $2r - 1 = 0$ or B1 for $5r(2r - 1) - 9(2r - 1) [= 0]$ or $2r(5r - 9) - 1(5r - 9) [= 0]$ or $(5r + a)(2r + b) [= 0]$ where a, b are integers and $ab = +9$ or $2a + 5b = -23$ If 0 scored, SC1 for $5r - 9$ and $2r - 1$ seen but not in factorised form |
| | $[r =] \frac{9}{5}$ oe $[r =] \frac{1}{2}$ oe | B1 | |
| 3(b)(iv) | 0.8 or $\frac{4}{5}$ oe | 1 | |

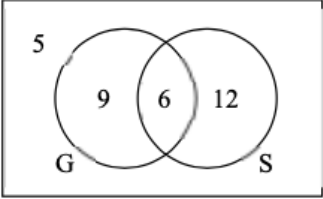
Question 36

| | | | |
|-------------|---|-----------|---|
| 8(a)(i) | $\frac{x-1}{x+2}$ | 2 | B1 for either numerator or denominator correct |
| 8(a)(ii)(a) | $\frac{x}{x+3} \times \frac{x-1}{x+2} = \frac{7}{15}$ | B1 | FT <i>their</i> (a)(i) = $\frac{7}{15}$ |
| | $15x(x-1) = 7(x+3)(x+2)$ | M1 | Removes all algebraic fractions FT <i>their</i> equation if in comparable form |
| | $15x^2 - 15x = 7x^2 + 21x + 14x + 42$ | M1 | Correctly expands all brackets FT <i>their</i> equation if in comparable form |
| | $[8x^2 - 50x - 42 = 0]$ $4x^2 - 25x - 21 = 0$ | A1 | With no errors or omissions seen and one further stage seen after final M1 |
| 8(a)(ii)(b) | $(4x+3)(x-7) [= 0]$ | M2 | M1 for $4x(x-7) + 3(x-7)$ or $x(4x+3) - 7(4x+3)$ or for $(4x+a)(x+b)$ where either $ab = -21$ or $4b+a = -25$ If 0 scored, SC1 for $4x+3$ and $x-7$ seen but not in factorised form |
| | 7 and $-\frac{3}{4}$ | B1 | |
| 8(a)(ii)(c) | 7 | 1 | FT <i>their</i> positive solution |
| 8(b) | $\frac{1}{6}$ oe | 4 | M3 for $\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7} + \frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$ or M2 for $\frac{5}{9} \times \frac{4}{8} \times \frac{3}{7}$ or $\frac{4}{9} \times \frac{3}{8} \times \frac{2}{7}$ or M1 for $\frac{5}{9}, \frac{4}{8}, \frac{3}{7}$ seen or $\frac{4}{9}, \frac{3}{8}, \frac{2}{7}$ seen If 0 scored, SC1 for $\frac{5^3+4^3}{729}$ oe |

Question 37

| | | | |
|-----------|----------------------------|---|--|
| 7(a) | 0.1 | 1 | |
| 7(b)(i) | 0.2 oe 0.6, 0.3, 0.1 oe | 2 | B1 for 0.2 B1 for 0.6, 0.3, 0.1 |
| 7(b)(ii) | 0.48 oe | 2 | FT <i>their</i> 0.6 from tree diagram M1 for $0.8 \times$ <i>their</i> 0.6 |
| 7(b)(iii) | 0.28 oe | 3 | M2 for $0.2 + 0.8 \times 0.1$ oe or M1 for 0.2 or 0.8×0.1 or $0.8 \times (0.6 + 0.3)$ |
| 7(c) | 0.32 oe | 3 | M2 for $0.8 \times 0.2 + 0.2 \times 0.8$ oe M1 for one of these products |

Question 38

| | | | |
|-----------|---|---|--|
| 9(a)(i) |  | 2 | B1 for two correct values Or B1 5 outside and total in G = 15 and total in S = 18 |
| 9(a)(ii) | $\frac{3}{8}$ oe | 1 | FT $\frac{\text{their } 12}{32}$ |
| 9(a)(iii) | $\frac{2}{5}$ oe | 1 | FT $\frac{\text{their } 6}{15}$ |
| 9(b) | 96 | 2 | M1 for $\frac{36}{64} = \frac{54}{x}$ oe or $36 = \frac{54}{(54+b)} \times 100$ oe If 0 scored SC1 for answer 150 |
| 9(c)(i) | $\frac{9}{25}$ oe | 2 | M1 for $\frac{15}{25} \times \frac{15}{25}$ oe |
| 9(c)(ii) | $\frac{16}{25}$ oe | 1 | FT 1 – <i>their (c)(i)</i> |
| 9(d) | $\frac{17}{20}$ oe | 3 | M2 for $1 - \frac{10}{25} \times \frac{9}{24}$ oe or for $\frac{15}{25} \times \frac{14}{24} + \frac{15}{25} \times \frac{8}{24} + \frac{15}{25} \times \frac{2}{24} + \frac{8}{25} \times \frac{15}{24}$ $+ \frac{2}{25} \times \frac{15}{24}$ oe or M1 for one correct relevant product |