**1.** 4024/11/M/J/16 Q26

| | | | |
|---|---|---|---|
| **26 (a) (i)** | 0 | 1 | |
| **(ii)** | $\frac{3}{7}$ | 1 | |
| **(b)** | $\frac{2}{7}$ oe | 1 | |
| **(c)** | $\frac{11}{14}$ oe | 2* | **M1** for $\frac{1}{2}\times 1 + \frac{1}{2}\times\frac{4}{7}$ |

**2.** 4024/12/M/J/16 Q20

| | | | |
|---|---|---|---|
| **20 (a)** | $\frac{2}{10}, \frac{2}{9}, \frac{8}{9}, \frac{1}{9}$ correctly positioned | 1 | |
| **(b) (i)** | $\frac{56}{90}$ oe | 1* | |
| **(ii)** | $\frac{32}{90}$ oe | 2ft* | **M1** for $\frac{8}{10}\times\frac{2}{9}+\frac{2}{10}\times\frac{8}{9}$<br>ft *their* tree diagram with fractions < 1 |

**3.** 4024/21/O/N/16 Q10 (b)

| | | | |
|---|---|---|---|
| **(b) (i)** | $\frac{33}{95}$ oe | **1** | |
| **(ii)** | $\frac{48}{95}$ oe | **2** | **M1** for $\frac{3}{5}\times\frac{8}{19}+\frac{2}{5}\times\frac{12}{19}$<br>Or **SC1** for answer $\frac{24}{95}$ |
| **(iii)** | 12 cao | **1** | |
| **(iv)** | $\frac{91}{190}$ oe | **2** | **M1** for $\frac{k}{n}\times\frac{k-1}{n-1}$ where $n > k > 1$ |

**4.** 4024/12/M/J/17 Q24

| | | | |
|---|---|---|---|
| 24(a) | Correctly completed tree diagram<br>$\frac{n-3}{n-1}$ oe<br>$\frac{n-3}{n}$ oe<br>$\frac{n-4}{n-1}$ oe | **2** | **C1** for one correct probability correctly positioned |
| 24(b) | $\frac{3}{n}\times\frac{2}{n-1}=\frac{1}{15}$ | **M1** | |
| | Correct rearrangement with at least one further step to reach<br>$n^2-n-90=0$ | **A1** | |
| 24(c) | 10 | **2** | **B1** for solutions 10, –9 seen<br>or **M1** for $(n-10)(n+9)$ [ = 0]<br>or for $\frac{1\pm\sqrt{(-1)^2-4\times1\times-90}}{2\times1}$ or better |

**5.** 4024/12/O/N/17 Q19

| | | | |
|---|---|---|---|
| 19(a) | Probabilities 0.7 and 0.3 on the correct branches | **1** | |
| 19(b)(i) | 0.49 oe | **1** | |
| 19(b)(ii) | 0.42 oe | **1** | FT from their diagram, provided their diagram probabilities are less than 1, and 0 < ans. < 1. |

**6.** 4024/21/O/N/17 Q4

| | | | |
|---|---|---|---|
| 4(a) | $\frac{5}{9}$ oe | **1** | |
| 4(b)(i) | $\frac{25}{81}$ oe | **1** | |
| 4(b)(ii) | $\frac{40}{81}$ oe | **2** | **M1** for $\frac{their\,5}{9}\times\frac{(9-their5)}{9}$ soi or<br>$\frac{their\,5}{9}\times\frac{4}{9}$ |
| 4(c) | $\frac{4}{9}$ oe **nfww** | **3** | **M2** for $\frac{5}{9}\times\frac{4}{8}+\frac{4}{9}\times\frac{3}{8}$<br>or **M1** for $\frac{4}{9}\times\frac{3}{8}$ or $\frac{5}{9}\times\frac{4}{8}$ |

**7.** 4024/21/M/J/18 Q4

| | | | |
|---|---|---|---|
| 4(a) | $\frac{1}{6}$ cao | **1** | |
| 4(b) | $\frac{1}{660}$ oe | **2** | **M1** for $\frac{1}{12}\times\frac{1}{11}\times\frac{2}{10}$ oe<br>or **SC1** for $\frac{1}{12}\times\frac{1}{12}\times\frac{2}{12}$ or answer $\frac{1}{864}$ or $\frac{1}{12},\frac{1}{11},\frac{2}{10}$ |
| 4(c)(i) | $\frac{8}{12},\frac{8}{11},\frac{4}{11},\frac{7}{11}$ oe correctly placed | **2** | **B1** for two correct |
| 4(c)(ii) | $\frac{1}{11}$ oe | **1** | |
| 4(c)(iii) | $\frac{16}{33}$ oe | **2** | **M1** for $\frac{4}{12}\times\frac{8}{11}$ or $\frac{8}{12}\times\frac{4}{11}$ oe |

**8.** 4024/12/O/N/18 Q17

| | | | |
|---|---|---|---|
| 17(a) | $\frac{4}{7}$ | **1** | |
| | $\frac{2}{7}$ (black) **and** $\frac{5}{7}$ (white) with two branches and both labels | **1** | |
| 17(b) | $\frac{13}{35}$ oe | **2** | **FT** $\frac{3}{5}\times\frac{3}{7}+\frac{2}{5}\times(their\ \frac{2}{7})$<br>or **M1** for $\frac{3}{5}\times\frac{3}{7}$ ; or for $\frac{2}{5}\times(their\ \frac{2}{7})$ |

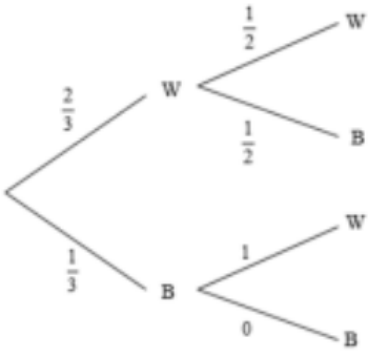
**9.** 4024/11/M/J/19 Q18

| | | | |
|---|---|---|---|
| 18(a) | [0].7, [0].3, [0].2, [0].4 correctly placed | **2** | **M1** for two or three correct |
| 18(b) | [0].74 oe | **2** | **M1** for $0.7 \times 0.8$ or $0.3 \times 0.6$ oe |

**10.** 4024/12/M/J/19 Q17

| | | | |
|---|---|---|---|
| 17(a) | $\frac{2}{6}$ on first branch<br>$\frac{2}{5},\frac{4}{5},\frac{1}{5}$ on second set | **2** | **B1** for two or three completed correctly |
| 17(b) | $\frac{14}{30}$ oe | **2** | **M1** for $\frac{4}{6}\times\frac{3}{5}$ oe **or** $their\ \frac{2}{6}\times their\ \frac{1}{5}$ oe |

**11.** 4024/12/O/N/19 Q17

| | | | |
|---|---|---|---|
| 17(a) | Correct tree diagram with four branches added and the five correct probabilities $\frac{2}{3}, \frac{1}{2}, \frac{1}{2}, 1, [0]$   | **2** | **B1** for at least two second branches drawn and 2 or 3 probabilities completed correctly |
| 17(b) | 0 | **1** | |

**12.** 4024/21/M/J/20 Q9

| | | | |
|---|---|---|---|
| 9(a) | $\frac{4}{9}, \frac{x}{9}$ | **2** | **B1** for 1 correct |
| 9(b) | $\frac{12}{90}$ oe | **1** | |
| 9(c)(i) | $\frac{4}{10}\times\frac{3}{9}+\frac{x}{10}\times\frac{x-1}{9}+\frac{6-x}{10}\times\frac{5-x}{9}$ | **M2** | **M1** for $\frac{x}{10}\times\frac{x-1}{9}$ or $\frac{6-x}{10}\times\frac{5-x}{9}$ |
| | $30-5x-6x+x^2$ or better | **B1** | |
| | $\frac{12+x^2-x+30-11x+x^2}{90}$ oe leading to $\frac{x^2-6x+21}{45}$ | **A1** | |
| 9(c)(ii) | $\frac{x^2+6x+21}{45}=\frac{16}{45}$ or better, leading to $x^2-6x+5=0$ with no errors | **1** | |
| 9(c)(iii) | 5 and 1 | **2** | **M1** for $(x-5)(x-1)\,[=0]$ or $[x=]\frac{--6\sqrt{(-6)^2-4\times1\times5}}{2\times1}$ oe |
| 9(c)(iv) | $\frac{5}{10}$ oe | **2** | **B1** for white = 1 or blue = 5 |

**13.** 4024/22/M/J/20 Q6

| | | | |
|---|---|---|---|
| 6(a)(i) | 0.2 or $\frac{1}{5}$ oe | **1** | |
| 6(a)(ii) | 23, 43, 53 | **2** | **B1** for three correct and one incorrect or for two correct and none incorrect |
| 6(a)(iii) | 0.3 or $\frac{6}{20}$ oe | **2** | **B1** for $\frac{6}{k}$ where $k$ is an integer $> 6$ or for 24, 32, 36, 52, 56 and 64 identified |

**14.** 4024/21/O/N/20 Q8

| | | | |
|---|---|---|---|
| 8(a) | $\frac{n}{35}$ and $\frac{35-n}{35}$ oe correctly positioned on tree diagram | **2** | **B1** for each |
| 8(b) | $\frac{n}{36}\times\frac{36-n}{35}$ oe | **1** | |
| 8(c) | $\frac{n}{36}\times\frac{36-n}{35}=\frac{1}{7}$ | **M1** | **FT** *their* **(b)** provided both probabilities in terms of $n$ |
| | Correct rearrangement to $n^2 - 36n + 180 = 0$ **AG** | **A1** | **A0** if any errors or omissions in working |
| 8(d) | $(n-6)(n-30)$ [= 0] | **B1** | Or $\frac{36\pm\sqrt{36^2-4\times180}}{2}$ |
| | 6, 30 | **B1** | |
| 8(e) | $\frac{29}{42}$ final answer | **3** | **B1** for use of $n = 6$<br>**M1** for $\frac{36-\textit{their}\,6}{36}\times\frac{35-\textit{their}\,6}{35}$ oe |

**15.** 4024/21/O/N/22 Q5

| | | | |
|---|---|---|---|
| 5(a)(i) | Correct justification with probabilities 0.44… and 0.45… seen | **2** | **B1** for $\frac{4}{9}$ oe or $\frac{5}{11}$ oe seen |
| 5(a)(ii) | 120 | **2** | **M1** for $\frac{6}{11}\times 220$ |
| 5(b)(i) | Correct tree diagram<br>$\frac{6}{15}, \frac{3}{15}, \frac{5}{15}, \frac{3}{15}, \frac{6}{15}, \frac{2}{15}$ oe | **2** | **M1** for 4 or more probabilities completed correctly |
| 5(b)(ii) | $\frac{5}{8}$ oe nfww | **3** | **M2FT** for $1-\frac{10}{16}\times\frac{9}{15}$ oe<br>or $1-\frac{7}{16}\times\frac{9}{15}-\frac{3}{16}\times\frac{9}{15}$ oe<br>or $\frac{7}{16}\times\frac{6}{15}+\frac{3}{16}\times\frac{6}{15}+\frac{6}{16}$ oe<br><br>or **M1FT** for $\frac{7}{16}\times\frac{6}{15}$ or $\frac{3}{16}\times\frac{6}{15}$<br>or $\frac{6}{16}\times\frac{7}{15}+\frac{6}{16}\times\frac{5}{15}+\frac{6}{16}\times\frac{3}{15}$ oe |