

| Question | Answer                                  | Marks     | Guidance   |
|----------|---|-----------|--|
| 1        | ${}^9C_4 \times {}^5C_3 \times {}^2C_2$ | <b>B1</b> | ${}^9C_4$ or ${}^9C_3$ or ${}^9C_2$ seen ( <i>1st group</i> )  |
|          | $=126 \times 10 \times 1$               | <b>B1</b> | ${}^5 \text{ or } {}^7C_3$ or ${}^6 \text{ or } {}^7C_4$ or ${}^6 \text{ or } {}^5C_2$ times an integer ( <i>2nd group</i> ) |
|          | $=1260$                                 | <b>B1</b> | Correct answer   |
|          |   | <b>3</b>  |  |

| Question | Answer  | Marks     | Guidance   |
|----------|---|-----------|--|
| 2(i)     | $6p + 0.1 = 1$<br>$p = 0.15$  | <b>B1</b> | Correct answer   |
|          |   | <b>1</b>  |  |
| 2(ii)    | $\text{Var}(X) = 1 \times p + 1 \times 2p + 4 \times 2p + 16 \times 0.1 - 1.15^2$ | <b>M1</b> | Correct unsimplified formula, <i>their p</i> substituted (allow 1 error) |
|          | $0.15 + 0 + 0.3 + 1.2 + 1.6 - 1.15^2$<br>$= 1.9275 = 1.93$ (3sf)                  | <b>A1</b> | Correct answer   |
|          |   | <b>2</b>  |  |

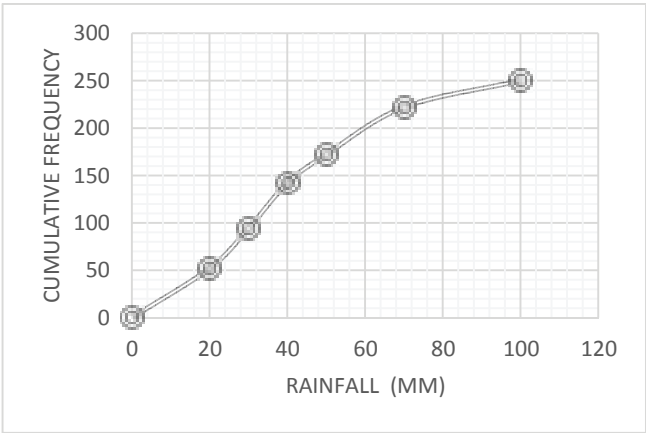
| Question | Answer  | Marks     | Guidance   |
|----------|---|-----------|--|
| 3(i)     | Scenarios are:<br>4V + 1C + 1DB: ${}^{11}C_4 \times {}^5C_1 \times {}^4C_1$     | <b>M1</b> | ${}^{11}C_a \times {}^5C_b \times {}^4C_c, a+b+c=6,$ |
|          | 4V + 2C:<br>5V + 1C: ${}^{11}C_4 \times {}^5C_2$<br>${}^{11}C_5 \times {}^5C_1$ | <b>B1</b> | 2 correct unsimplified options                       |
|          | 6600 + 3300 + 2310  | <b>M1</b> | Add 2 or 3 correct scenarios only                    |
|          | = 12210   | <b>A1</b> | Correct answer                                       |
|          |   | <b>4</b>  |  |
| 3(ii)    | $4! \times 3!$  | <b>M1</b> | $k$ multiplied by 3! or 4!, $k$ an integer $\geq 1$  |
|          |   | <b>A1</b> | Correct unsimplified expression                      |
|          | = 144   | <b>A1</b> | Correct answer                                       |
|          |   | <b>3</b>  |  |

| Question | Answer   | Marks     | Guidance                             |
|----------|--|-----------|--------------------------------------|
| 4(a)     | $P(X < 29.4) = P\left(Z < \frac{29.4 - 31.4}{\sqrt{3.6}}\right)$<br>$= P(Z < -1.0541)$ | <b>M1</b> | Standardise, no cc, must have sq rt. |
|          | = 1 - 0.8540   | <b>M1</b> | Obtain 1 - prob                      |
|          | = 0.146  | <b>A1</b> | Correct final answer                 |
|          |  | <b>3</b>  |                                      |

| Question | Answer   | Marks     | Guidance   |
|----------|--|-----------|--|
| 4(b)     | $P(X < 12) = \frac{42}{400} = 0.105$ and $P(X > 19) = \frac{58}{400} = 0.145$                                | <b>M1</b> | Eqn with $\mu, \sigma$ and a $z$ -value. Allow cc, wrong sign, but not $\sqrt{\sigma}$ or $\sigma^2$ |
|          | $\frac{12 - \mu}{\sigma} = -1.253$   | <b>B1</b> | Any form with $z$ value rounding to $\pm 1.25$   |
|          | $\frac{19 - \mu}{\sigma} = 1.058$  | <b>B1</b> | Any form with $z$ value rounding to $\pm 1.06$   |
|          | $12 - \mu = -1.253\sigma$<br>$19 - \mu = 1.058\sigma$<br><br>$7 = 2.307\sigma$ or $36.455 + 2.307\mu = 0$ oe | <b>M1</b> | Solve 2 equations in $\mu, \sigma$ eliminating to 1 unknown  |
|          | $\mu = 15.8, \sigma = 3.03$  | <b>A1</b> | Correct answers  |
|          |  | <b>5</b>  |  |

| Question | Answer   | Marks     | Guidance  |
|----------|--|-----------|---|
| 5(i)     | $1 - (P(7) + P(8) + P(9))$<br>$= 1 - ({}^9C_7 0.8^7 \times 0.2^2 + {}^9C_8 0.8^8 \times 0.2^1 + {}^9C_9 0.8^9 \times 0.2^0)$ | <b>M1</b> | Any binomial term of form ${}^9C_x p^x (1-p)^{9-x}, x \neq 0$ |
|          |  | <b>M1</b> | Correct unsimplified expression                               |
|          | $= 1 - (0.3019899 + 0.3019899 + 0.1342177)$<br>$= 0.262$   | <b>A1</b> | Correct answer  |
|          |  | <b>3</b>  |   |

| Question | Answer   | Marks     | Guidance  |
|----------|--|-----------|---|
| 5(ii)    | Mean = $200 \times 0.8 = 160$ : var = $200 \times 0.8 \times 0.2 = 32$ | <b>B1</b> | Both unsimplified   |
|          | $P(X > 166) = P\left(Z > \frac{166.5 - 160}{\sqrt{32}}\right)$         | <b>M1</b> | Standardise, $z = \pm \frac{x - \text{their } 160}{\sqrt{\text{their } 32}}$ with square root |
|          |  | <b>M1</b> | 166.5 or 165.5 seen in attempted standardisation expression                                   |
|          | = $P(Z > 1.149) = 1 - 0.8747$  | <b>M1</b> | 1 – a $\Phi$ -value, correct area expression, linked to final answer                          |
|          | = 0.125  | <b>A1</b> | Correct final answer  |
|          |  | <b>5</b>  |   |
| 5(iii)   | $np = 160, nq = 40$ : both $> 5$ (so normal approx. holds)             | <b>B1</b> | Both parts required   |
|          |  | <b>1</b>  |   |

| Question | Answer  | Marks     | Guidance   |
|----------|---|-----------|--|
| 6(i)     |  | <b>B1</b> | Appropriate linear scales starting at (0,0), axes labelled cf and Rainfall, mm |
|          |   | <b>B1</b> | Correct graph, points plotted at ucb, allow straight lines or curve            |
|          |   | <b>2</b>  |  |
| 6(ii)    |   | <b>M1</b> | Read off from increasing graph at cf = 150                                     |
| 42       |   | <b>A1</b> | Correct answer ( $41 \leq r \leq 43$ )   |
|          |   | <b>2</b>  |  |

| Question | Answer  | Marks     | Guidance  |
|----------|---|-----------|---|
| 6(iii)   | Frequencies 52, 42, 48, 30, 50, 28  | <b>B1</b> | Correct frequencies   |
|          | Mean age =<br>$(10 \times 52 + 25 \times 42 + 35 \times 48 + 45 \times 30 + 60 \times 50 + 85 \times 28) / 250$   | <b>B1</b> | Correct midpoints (allow one error)                               |
|          | =9980/250   | <b>M1</b> | Using $\Sigma fx/250$ with mid-points attempt, not cf, cw, lb, ub |
|          | = 39.9(2) oe  | <b>A1</b> | Correct answer  |
|          | Variance =<br>$10^2 \times 52 + 25^2 \times 42 + 35^2 \times 48 + 45^2 \times 30 + 60^2 \times 50 + 85^2 \times 28) / 250 -$<br>mean <sup>2</sup><br>= 539.59 | <b>M1</b> | Attempt at variance using their midpoints and their mean          |
|          | $\sigma = 23.2$   | <b>A1</b> | Correct answer for sd   |
|          |   | <b>6</b>  |   |

| Question | Answer  | Marks     | Guidance   |
|----------|---|-----------|--|
| 7(i)     | $52/160 = 13/40, 0.325$   | <b>B1</b> | oe   |
|          |   | <b>1</b>  |  |
| 7(ii)    | P(boy) = 96/160: P(Music) = 52/160<br>P(boy and Music) = 40/160 | <b>M1</b> | Use of $P(B) \times P(M) = P(B \cap M)$ , appropriate probabilities used |
|          | $96/160 \times 52/160 \neq 40/160$ : Not independent            | <b>A1</b> | Numerical comparison and conclusion stated                               |
|          |   | <b>2</b>  |  |



| Question | Answer  | Marks     | Guidance   |
|----------|---|-----------|--|
| 7(iv)    | <b>Method 2</b>   |           |  |
|          | $\frac{\binom{40}{1} \times \binom{56}{1} \times \binom{52}{1} + \binom{12}{1} \times \binom{56}{2}}{\binom{160}{3}}$ | <b>M1</b> | One scenario identified with 2 or 3 combination multiplied             |
|          |   | <b>A1</b> | One scenario correct   |
|          |   | <b>B1</b> | Denominator correct  |
|          | $\frac{116480 + 18480}{669920}$   | <b>M1</b> | Both scenarios attempted, and added, seen as a numerator of a fraction |
|          | $\frac{1687}{8374}$   | <b>A1</b> | Correct answer, oe   |
|          | <b>5</b>  |           |  |