| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(i) | $\Sigma(t-120) = -25+6-3+15+0+5-6-1+16 = 7$ | **M1** | Attempt to sum both $(t-120)$ and $(t-120)^2$ Correct ans using $\Sigma t - 9\times 120$ and $\Sigma (t-120)^2$ M1A1 |
| | $\Sigma(t-120)^2 = 25^2+6^2+3^2+15^2+0^2+5^2+6^2+1^2+16^2$ $= 1213$ | **A1** | Both correct, www, **SC** correct ans no working **B1B1** |
| | | **2** | |
| 1(ii) | $\text{Var} = \dfrac{\Sigma(t-120)^2}{9} - \left(\dfrac{\Sigma(t-120)}{9}\right)^2 = \dfrac{their\,1213}{9} - \left(\dfrac{their\,7}{9}\right)^2$ | **M1** | Using two coded values in correct formula including finding $\Sigma t$ from 7 etc |
| | $= 134(.2)$ | **A1** | Correct answer<br>**SC** if correct variance obtained by another method from raw data give **SCB1** |
| | | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2 | Jameel: P(plum) $= \dfrac{5}{8}$ , Rosa: P(plum) $= \dfrac{x}{x+6}$<br>$\dfrac{5}{8}\times\dfrac{x}{x+6} = \dfrac{1}{4}$ | **M1** | *Their* 2 probabilities for P(plum) multiplied and equated to 1/4 |
| | | **A1** | Correct equation oe |
| | $(x =)\ 4$ | **A1** | **SC** correct answer with no appropriate equations i.e. common sense **B1** |
| | | **3** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3 | P(X) = $\frac{3}{36}$ $\left(\frac{1}{12} oe\right)$ | **B1** | |
| | P(Y) = $\frac{12}{36}$ $\left(\frac{1}{3} oe\right)$ | **B1** | |
| | P(X∩Y) = $\frac{1}{36}$ | **M1** | Independent method to find P($X \cap Y$) without multiplication, either stated or by listing or circling numbers on a probability space diagram. OR condititional prob with a single fraction numerator |
| | P(X) × P(Y) = P(X∩Y), independent | **A1** | Numerical comparison and conclusion, www |
| | | **4** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4 | Median Maths = 40 | **M1** | Indication of finding medians, such as mark on graph or reference marks to 700 pupils, condone poor terminology such as 'mean' |
| | Median English = 55 | **A1** | Both values correct, condone 54<English<56 but 54, 56 get A0 |
| | Median of English is larger than median of Maths | **B1** | Correct statement, median must be referenced within answer.<br>No credit if statement references 'means' |
| | Range Maths is 100 or IQ range Maths = 80 – 12 = 68 | **M1** | Evidence of finding either both ranges or both IQ ranges i.e. see a minus |
| | Range English is 60 or IQ range English = 62 – 42 = 20 | **A1** | Both ranges or IQR correct |
| | Maths marks have more spread then English marks | **B1** | Correct conclusion. Accept standard deviation but must see some figures |
| | | **6** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5(i) | (P > 12) = P(13, 14, 15) | **M1** | Binomial term of form ${}^{15}C_x p^x(1-p)^{15-x}$ $0 < p < 1$ any $p$, $x \neq 15,0$ |
| | $= {}^{15}C_{13}(0.65)^{13}(0.35)^2 + {}^{15}C_{14}(0.65)^{14}(0.35)^1 + (0.65)^{15}$ | **A1** | Correct unsimplified answer |
| | = 0.0617 | **A1** | SC if use np and npq with justification give (12.5 – 9.75)/√3.41 M1 1–F(1.489) A1 0.0681 A0 |
| | | **3** | |
| 5(ii) | mean = 250 × 0.65 = 162.5<br>variance = 250 × 0.65 × 0.35 = 56.875 | **B1** | Correct unsimplified *np* and *npq* |
| | $P(< 179) = P(z < \frac{178.5-162.5}{\sqrt{56.875}}) = P(z < 2.122)$ | **M1** | Substituting *their* $\mu$ and $\sigma$ (condone $\sigma^2$) into the Standardisation Formula with a numerical value for *'178.5'*. Continuity correct not required for this M1. Condone ± standardisation formula |
| | Using continuity correction 178.5 or 179.5 | **M1** | |
| | = 0.983 | **A1** | Correct final answer |
| | | **4** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(i) | P(loses \$1) = P( F and F) = 0.8 × 0.8 | **M1** | 0.8 x 0.8 or (1 – 0.2)(1-0.2) or P(F) × P(F) or P(F)+P(F) seen or implied |
| | = 0.64 AG | **A1** | Must see probabilities multiplied together with final answer and a clear probability statement or implied by labelled tree diagram |
| | | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(ii) | <table><tr><td>Amount gained ($)</td><td>–1</td><td>0.50</td><td>2</td></tr><tr><td>Prob</td><td></td><td>0.16</td><td>0.2</td></tr></table> | **B1** | –1 linked with 0.64 in table |
| | | **B1** | 0.5 seen in table |
| | | **B1** | 0.16 seen in table linked to their 0.5 |
| | | **B1** | **FT** P(2.00 gained) = 0.36 – P(0.50 gained) or correct, and all amount gained linked correctly in table |
| | | **4** | |
| 6(iii) | E(winnings) = $–1 \times 0.64 + 0.5 \times 0.16 + 2 \times 0.2$<br>= –($)0.16, –16 cents | **B1** | **FT** Accept ($)0.16 or 16 cents **loss.** FT unsimplified E(winnings) from their table provided $\Sigma p = 1$ |
| | | **1** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 7(i) | $P(< 700) = P\left(z < \frac{700 - 830}{120}\right) = P(z < -1.083)$ | **M1** | Using ± standardisation formula, no continuity correction, not $\sigma^2$ or $\sqrt{\sigma}$ |
| | = 1 – 0.8606 | **M1** | Appropriate area Φ from standardisation formula P(z<….) in final probability solution, (<0.5 if $z$ is –ve, >0.5 if $z$ is +ve) |
| | = 0.1394 | **A1** | Correct final probability rounding to 0.139 |
| | Expected number of female adults = 430 × *their* 0.1394<br>= 59.9 So 59 or 60 | **B1** | **FT** *their* 3 or 4 SF probability, rounded or truncated to integer |
| | | **4** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 7(ii) | P(giraffe < 830+$w$) = 95% so $z$ = 1.645 | **B1** | ±1.645 seen (critical value) |
| | $\frac{(830+w)-830}{120} = \frac{w}{120} = 1.645$ | **M1** | An equation using the standardisation formula with a $z$-value (not 1 – $z$), condone $\sigma^2$ or $\sqrt{\sigma}$ not 0.8519, 0.8289 |
| | $w$ = 197 | **A1** | Correct answer |
| | | **3** | |
| 7(iii) | P(male > 950) = 0.834, so $z$ = –0.97 | **B1** | ± 0.97 seen |
| | $\frac{950-1190}{\sigma} = -0.97$ | **M1** | Using ± standardisation formula, condone continuity correction, $\sigma^2$ or $\sqrt{\sigma}$, condone equating with non $z$-value not 0.834, 0.166 |
| | $\sigma$ = 247 | **A1** | Condone $-\sigma = -247$. www. |
| | | **3** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 8(i) | $({}^9C_4 =)$ 126 | **B1** | |
| | | **1** | |
| 8(ii) | ${}^7C_2$ | **B1** | ${}^7C_x$ or ${}^yC_2$ (implied by correct answer) or ${}^7P_x$ or ${}^7P_y$, seen alone |
| | = 21 | **B1** | correct answer |
| | | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 8(iii) | _ $C_1$ ($B_1$ $B_2$ $B_3$ ) $C_2$ _ $C_3$ _ $C_4$ _ $C_5$ _ $C_6$ | **B1** | 3! or 6! seen alone or multiplied by k > 1 need not be an integer |
| | 3! × 6! × 7 | **B1** | 3! and 6! seen multiplied by k > 1, integer, no division |
| | = 30240 | **B1** | Exact value |
| | **Alternative method for question 8(iii)** | | |
| | $C_1$ ($B_1$ $B_2$ $B_3$ ) $C_2$ $C_3$ $C_4$ $C_5$ $C_6$ | **B1** | 3! or 7! seen alone or multiplied by k > 1 need not be an integer |
| | 3! × 7! | **B1** | 3! and 7! seen multiplied by k > or = 1, no division |
| | = 30240 | **B1** | Exact value |
| | | **3** | |
| 8(iv) | $C_1$ _ $C_2$ _ $C_3$ _ $C_4$ _ $C_5$ _$C_6$ | **B1** | 6! or 4! X 6P2 seen alone or multiplied by k > 1, no division (arrangements of cars) |
| | 6! × 5P3 *or* 6! × 5 × 4 × 3 or 6! x 3! x10 | **B1** | Multiply by 5P3 oe i.e. putting Bs in between 4 of the Cs<br>OR multiply by 3! x n where n = 7, 8, 9, 10 (number of options) |
| | = 43200 | **B1** | Correct answer |
| | | **3** | |