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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **1a** | A complete collection of relevant individual people or items. | **B1** | 1.2 | 2nd  Understand the vocabulary of sampling. |
|  | **(1)** |  |  |
| **1b** | Opportunity (convenience). | **B1** | 1.2 | 3rd  Understand quota and opportunity sampling. |
|  | **(1)** |  |  |
| **1c** | Systematic. | **B1** | 1.2 | 3rd  Understand and carry out systematic sampling. |
|  | **(1)** |  |  |
| **1d** | Two from:   * not random * electoral register may have errors * there may not be enough (500) households on the register. | **B1**  **B1** | 2.4  2.4 | 5th  Select and critique a sampling technique in a given context. |
|  | **(2)** |  |  |
| **1e** | **Either**: random sampling – it avoids bias.  **Or**: quota sampling – no sampling frame required, continue until all quotas filled. | **B1** | 2.4 | 5th  Select and critique a sampling technique in a given context. |
| **Either:** Random sampling from people buying kitchen cleaners in a large store, as this would reduce potential bias.  **Or:** Quota sampling from people based on a chosen set of ages and genders who use kitchen cleaners, continuing until all quotas are filled, as this would avoid the need for a sampling frame and allow for a more clearly representative sample. | **B1** | 2.4 |
|  | **(2)** |  |  |
| **(7 marks)** | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **2a** | Tree (both sections) and labels  0.85, 0.15  0.03, 0.97, 0.06, 0.94 | **B1**  **B1**  **B1** | 3.1a  1.1b  1.1b | 2nd  Draw and use simple tree diagrams with two branches and two levels. |
|  | **(3)** |  |  |
| **2b** | P(Not faulty) = (0.85 × 0.97) + (0.15 × 0.94)  = 0.9655 | **M1**  **M1dep**  **A1** | 3.4  1.1b  1.1b | 2nd  Draw and use simple tree diagrams with two branches and two levels. |
|  |  | **(3)** |  |  |
| **(6 marks)** | | | | |
| **Notes**  **2b**  M1 for either 0.85 × 0.97 or 0.15 × 0.94 (ft from their tree diagram) and M1 (dep) for adding two such probabilities (allow one error). | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **3** | Three comparisons in context:  For example:  **Very** much warmer in Beijing than Perth.  Both consistent in the temperatures.  Less rainfall in Beijing.  Less likely to have high rainfall in Beijing.  Rainfall in Beijing is consistently less than in Perth.  Evidence of use of a statistic from the boxplots:  For example:  Medians  Measure of a difference in medians  Mention of a particular outlier | **B3**  **B1** | 2.4  2.4 | 4th  Compare data sets using a range of familiar calculations and diagrams. |
| For accurately reading data from boxplots. | **B1** | 2.4 |
|  | **(5)** |  |  |
| **(5 marks)** | | | | |
| **Notes** | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **4a** | *X* ~ B(15, 0.5)  B1 for binomial  B1 for 15 and 0.5 | **B1**  **B1** | 3.1b  3.1b | 5th  Understand the binomial distribution (and its notation) and its use as a model. |
|  | **(2)** |  |  |
| **4bi** | from calculator P(*X* = 8) = 0.19638… | **M1**  **A1** | 3.4  1.1b | 5th  Calculate binomial probabilities. |
|  | **(2)** |  |  |
| **4bii** | P(*X* 4) = 1 – P(*X* 3)  = 1 – 0.0176 | **M1** | 3.4 | 6th  Use statistical tables and calculators to find cumulative binomial probabilities. |
| = awrt 0.982 or | **A1** | 1.1b |
|  | **(2)** |  |  |
| **(6 marks)** | | | | |
| **Notes**  **4bi**  P(*X* = 8) = P(*X*  8) – P(*X*  7) = 0.6964 – 0.5  or  or  or  = awrt 0.196 or | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **5a** | P(*X* ⩽ 1) = 0.0076 and P (*X* ⩽ 2) = 0.0355 | **M1** | 1.1b | 5th  Find critical values and critical regions for a binomial distribution. |
| P(*X* ⩾ 10) = 1 – 0.9520 = 0.0480 and  P(*X* ⩾ 11) = 1 – 0.9829 = 0.0171 | **A1** | 1.1b |
| Critical region is *X* ⩽ 1 ∪ 11 ⩽ *X* (⩽ 20) | **A1** | 1.1b |
|  | **(3)** |  |  |
| **5b** | Significance level = 0.0076 + 0.0171  = 0.0247 or 2.47% | **B1** | 1.1b | 6th  Calculate actual significance levels for a binomial distribution test. |
|  | **(1)** |  |  |
| **5c** | Not in critical region therefore insufficient evidence to reject H0. | **B1** | 2.2b | 6th  Interpret the results of a binomial distribution test in context. |
| There is insufficient evidence at the 5% level to suggest that the value of *p* is not 0.3. | **B1** | 3.2a |
|  | **(2)** |  |  |
| (**6 marks**) | | | | |
| **Notes**  **5c**  Conclusion must contain context and non-assertive for first B1. | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **6a** | Makes an attempt to find the distance from *A* to *B*. For example, is seen. | **M1** | 3.1b | 4th  Find the magnitude and direction of a vector quantity. |
| Makes an attempt to find the distance from *B* to *C*. For example, is seen. | **M1** | 3.1b |
| Demonstrates an understanding that these two values need to be added. For example, 84.75… + 130.86… is seen. | **M1** | 1.1b |
| 215.62… (m)  Accept anything which rounds to 216 (m) | **A1** | 1.1b |
|  | **(4)** |  |  |
| **6b** | States that (m)  Award one point for each value. | **B2** | 3.1b | 4th  Find the magnitude and direction of a vector quantity. |
| States or implies that | **M1** | 1.1b |
| Finds  Accept awrt 43.0° | **A1** | 1.1b |
|  | **(4)** |  |  |
| **(8 marks)** | | | | |
| **Notes** | | | | |

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| **Q** | **Scheme** | | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **7a** | Velocity = acceleration × time seen or implied. | | **M1** | 3.1b | 4th  Use and interpret graphs of velocity against time. |
| Velocity = 11 × 8 = 88 m s−1 | | **A1** | 1.1b |
| **Figure 2** | General shape of the graph is correct. i.e. positive gradient, followed by horizontal line, followed by negative gradient not returning to zero. | **M1** | 3.3 |
| Vertical axis labelled correctly. | **A1** | 1.1b |
| Horizontal axis labelled correctly. | **A1** | 1.1b |
|  | | **(5)** |  |  |
| **7b** | Makes an attempt to find the area of the trapezoidal section. For example,is seen. | | **M1** | 1.1b | 4th  Calculate and interpret areas under velocity–time graphs. |
| Demonstrates an understanding that the three areas must total 1404. For example,  or  is seen. | | **M1** | 2.1 |
| Correctly solves to find *T* = 10.5 (s). | | **A1** | 1.1b |
|  | | **(3)** |  |  |
| **(8 marks)** | | | | | |
| **Notes**  **7a**  Accept the horizontal axis labelled with the correct intervals.  **7b**  Award full marks for correct final answer, even if some work is missing. | | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **8a** | Either states that or | **M1** | 1.1b | 5th  Use Newton’s second law to model motion in two directions. |
| Correctly find | **M1** | 1.1b |
| Interprets *a* in the context of the question, stating | **A1** | 3.2 |
|  | **(3)** |  |  |
| **8b** | States that the magnitude of | **M1** | 1.1b | 5th  Use Newton’s second law to model motion in two directions. |
| States *R* = 20 (N). | **A1 ft** | 1.1b |
|  | **(2)** |  |  |
| **8c** | States *F* = *ma* or implies use of *F* = *ma*. For example 20 = 6 × *a* is seen. | **M1** | 3.3 | 5th  Use Newton’s second law to model motion in two directions. |
| Correctly findsm s−2. | **A1 ft** | 1.1b |
|  | **(2)** |  |  |
| **8d** | States thator implies it use by writing | **M1** | 3.1b | 5th  Use Newton’s second law to model motion in two directions. |
| Solves to find(s). Accept awrt 19.6 (s). | **A1 ft** | 1.1b |
|  | **(2)** |  |  |
| **(9 marks)** | | | | |
| **Notes**  **8b**  Award ft marks for a correct answer using their value from part **a** for the **i** component of the force.  **8c**  Award ft marks for a correct answer using their value from part **b** for the resultant force.  **8d**  Award ft marks for a correct answer using their value from part **c** for the acceleration. | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **9** | *t* = 5, *v* = 0 | **B1** | 1.1b | 6th  Uses differentiation to solve problems in kinematics. |
| Expands brackets and attempts differentiation. Reducing any power by one is sufficient evidence of differentiation. | **M1** | 3.1b |
| Solves  to find *t* = The expression can be factorised, or the quadratic formula can be used. *t* = 5 does not have to be seen to award the mark. | **A1** | 1.1b |
| Makes an attempt to substitute *t* =into  For example, is seen. | **M1** | 2.2a |
| Correctly finds or 0.92… (m s−1). Accept awrt 0.9 (m s−1). | **A1 ft** | 1.1b |
|  | **(5)** |  |  |
| **(7 marks)** | | | | |
| **Notes**  **9**  Award the final method mark and the final accuracy mark for a correct substitution using their value for *t*. | | | | |