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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step**  **and Progress descriptor** |
| **1a** | All readers of the online newspaper. | **B1** | 1.2 | 2nd  Understand the vocabulary of sampling. |
|  | **(1)** |  |  |
| **1b** | A list of readers who subscribe to the extra content. | **B1** | 1.2 | 2nd  Understand the vocabulary of sampling. |
|  | **(1)** |  |  |
| **1c** | The subscribers. | **B1** | 1.2 | 2nd  Understand the vocabulary of sampling. |
|  | **(1)** |  |  |
| **1d** | Advantage: accuracy of the data, unbiased. | **B1** | 1.2 | 3rd  Comment on the advantages and disadvantages of samples and censuses. |
| Disadvantage: difficult to get a 100% response to a survey. | **B1** | 1.2 |
|  | **(2)** |  |  |
| **1e** | Natural variation in a small sample. | **B1** | 1.2 | 3rd  Comment on the advantages and disadvantages of samples and censuses. |
| Bias. | **B1** | 1.2 |
|  | **(2)** |  |  |
| **(7 marks)** | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **2ai** | 37 (minutes). | **B1** | 1.1b | 2nd  Draw and interpret box plots. |
|  | **(1)** |  |  |
| **2aii** | Upper quartile or Q3 or third quartile or 75th percentile or P75 | **B1** | 1.2 | 2nd  Understand quartiles and percentiles. |
|  | **(1)** |  |  |
| **2b** | Outliers.  Sensible interpretation:  For example:  Observation that are very different from the other observations (and need to be treated with caution).  Possible errors.  These two children probably walked/took a lot longer. | **B1**  **B1** | 1.2  2.4 | 3rd  Recognise possible outliers in data sets. |
|  | **(2)** |  |  |
| 2**c** | 50 + 1.5 × 20 = 80 or 30 − 1.5 × 20 =0  Maximum value =55 < 80 minimum value = 25 > 0  No outliers. | **M1**  **A1**  **B1** | 1.1b  1.1b  1.1b | 4th  Calculate outliers in data sets and clean data. |
|  | **(3)** |  |  |
| **2d** | The scale **must** be the same as for school *A*.  **Figure 1** | **B1** | 1.1b | 2nd  Draw and interpret box plots. |
| Box & whiskers 30, 37, 50 | **B1** | 1.1b |
| 25, 55 | **B1** | 1.1b |
|  | **(3)** |  |  |
| **2e** | Three comparisons in context.  Comment on comparing averages.  For example, children from school *A* took less time **on average**. | **B3** | 2.2b | 4th  Compare data sets using a range of familiar calculations and diagrams. |
| Comment comparing consistency of times.  For example, there is less variation in the times for school *A* than school *B.* |  |  |
| Comment on comparing symmetry:  For example,both positive skew (or neither symmetrical or median closer to LQ (o.e.) for both). (Most children took a short time with a few taking longer.) |  |  |
| Comment on comparing outliers.  For example, school *A* has two children whose times are outliers (or errors) where as school *B* has no outliers. |  |  |
|  | **(3)** |  |  |
| **(13 marks)** | | | | |
| **Notes**  **2c**  Allow horizontal line through box. | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **3a** | = (5 × 2) + (4 × 4) + (4 × 6) + (7 × 5) + (15 × 1) = 100  P(Takes longer than 18 mins)  or equivalent. | **M1**  **A1**  **M1**  **A1** | 3.1a  1.1b  3.1a  1.1b | 2nd  Calculate probabilities from relative frequency tables and real data. |
|  | **(4)** |  |  |
| **3b** | P(Takes less than 30 mins)  or equivalent. | **M1**  **M1**  **A1** | 2.2b  1.1b  1.1b | 2nd  Calculate probabilities from relative frequency tables and real data. |
|  | **(3)** |  |  |
| **(7 marks)** | | | | |
| **Notes**  **3a**  M1 for attempt to find total frequency by adding at least three “width × frequency density” terms (which may contain errors).Alternative: M1 for  M1 for 1 − A1 for  o.e. | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **4** | H0: *p* = 0.25, H1: *p*> 0.25 | **B1** | 2.5 | 5th  Carry out 1-tail tests for the binomial distribution. |
| Let *X* represent the number of seeds that germinate.  (Under H0) *X*~B(25, 0.25) | **M1** | 3.4 |
| P(*X* ⩾ 10) = 1 – P(*X* ⩽ 9) = 0.0713 | **M1** | 1.1b |
| > 0.05 | **A1** | 1.1b |
| 10 is not in critical region therefore insufficient evidence to reject H0. | **B1** | 2.2b |
| There is insufficient evidence at the 5% level to suggest that the book has underestimated the probability. (o.e.) | **B1** | 3.2a |
| **(6 marks)** | | | | |
| **Notes** | | | | |

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| **Q** | | **Scheme** | | **Marks** | | **AOs** | | **Pearson Progression Step and Progress descriptor** | |
| **5a** | | States or implies that *s* = −80 | | **B1** | | 3.1b | | 5th Use equations of motion to solve problems involving vertical motion. | |
| States or implies that *a* = −9.8 | | **B1** | | 3.1b | |
| Writes  or makes a substitution | | **M1** | | 3.1b | |
| Finds *v* = 43 (m s−1). Accept 42.7 (m s−1). | | **A1** | | 1.1b | |
|  | | **(4)** | |  | |  | |
| **5b** | | States or implies that *s* = 5 m. | | **B1** | | 3.1b | | 5th Use equations of motion to solve problems involving vertical motion. | |
| Simplifies  to obtain | | **M1** | | 1.1b | |
| Makes an attempt to use the quadratic formula: | | **M1** | | 1.1b | |
| Solves to find  *t* = 0.35… (s). Accept awrt 0.35 (s). | | **A1** | | 1.1b | |
| Solves to find *t* = 2.91… (s). Accept awrt 2.92 (s). | | **A1** | | 1.1b | |
| States that the ball is above 85 m for 2.56… (s). Accept awrt 2.6 (s). | | **B1** | | 3.2a | |
|  | | **(6)** | |  | |  | |
| **5c** | | States or implies that at the greatest height *v* = 0 | | **B1** | | 3.1b | | 5th Use equations of motion to solve problems involving vertical motion. | |
| Finds the value of *u*:  (m s−1). Accept awrt 8.5 (m s−1). | | **M1** | | 3.1b | |
| Writes  or makes a substitution | | **M1** | | 3.1b | |
| Finds *s* = 3.72...(m). Accept awrt 3.7 (m). | | **A1 ft** | | 1.1b | |
|  | | **(4)** | |  | |  | |
| **(14 marks)** | | | | | | | | | |
| **Notes**  **5c**  Award ft marks for a correct answer using their answer from part **a**. | | | | | | | | | |
| **Q** | | **Scheme** | | **Marks** | | **AOs** | | **Pearson Progression Step and Progress descriptor** | |
| **6a** | | States that *a* = −4. 6 – 2 + *a* = 0 may be seen. | | **B1** | | 1.1b | | 4th  Understand Newton’s first law and the concept of equilibrium. | |
| States that *b* = −5. −4 + 9 + *b* = 0 may be seen. | | **B1** | | 1.1b | |
|  | | **(2)** | |  | |  | |
| **6b** | | States that **R** = 2**i** – 9**j** (N). | | **M1** | | 1.1b | | 4th  Calculate resultant forces using vectors. | |
| States that the magnitude of | | **M1** | | 1.1b | |
| States(N) or *R* = 9.21… (N). Accept awrt 9.2 (N). | | **A1** | | 1.1b | |
|  | | **(3)** | |  | |  | |
| **6c** | | States | | **M1** | | 1.1b | | 4th  Calculate resultant forces using vectors. | |
| Finds the value of *θ*: *θ* = 77.47…(°). Accept awrt *θ* = 77.5 (°). | | **A1 ft** | | 1.1b | |
|  | | **(2)** | |  | |  | |
| **(7 marks)** | | | | | | | | | |
| **Notes**  **6b**  Award second method mark and accuracy mark for a correct answer using their *R*.  **6c**  Award ft marks for correct answer using their **R** vector from part **a**. | | | | | | | | | |

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| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **7a** | seen or implied. | **M1** | 3.1b | 5th  Use equations of motion to solve problems in familiar contexts. |
| Finds the value of *a*: m s−2 | **A1** | 1.1b |
|  | **(2)** |  |  |
| **7b** | Use the fact that  to write 3*t*1 = 4*t*2 or 3*t*1 − 4*t*2 = 0 or equivalent. | **M1** | 1.1b | 5th  Use equations of motion to solve problems in familiar contexts. |
| States or implies that *t*1 + *t*2 = 35 | **M1** | 3.1b |
| Solves to find *t*1 = 20 or *t*2 = 15. Could use substitution or simultaneous equations. Does not need to find both values for mark to be awarded as either value can be used going forward. | **A1** | 1.1b |
| Use *v* = *u* + *at* to write either *x* = 6 + 0.4(20) or 20 = *x* + 0.4(15) | **M1** | 2.2a |
| Finds *x* = 14 (m s−1). | **A1ft** | 1.1b |
|  | **(5)** |  |  |
| **7c** | States or implies that | **M1** | 2.2a | 5th  Use equations of motion to solve problems in familiar contexts. |
| Finds the value of *s*: (m). | **A1** | 1.1b |
|  | **(2)** |  |  |
| **(9 marks)** | | | | |
| **Notes**  **7b**  Award ft marks for a correct answer using their value from part **a**. | | | | |