|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step**  **and Progress descriptor** |
| **1a** | Quota. | **B1** | 1.2 | 3rd  Understand quota and opportunity sampling. |
|  | **(1)** |  |  |
| **1b** | Advantages – two from:   * easy to get sample size * inexpensive * fast * can be stratified if required. | **B1**  **B1** | 2.4  2.4 | 5th  Select and critique a sampling technique in a given context. |
| Disadvantages – one from:   * not random * could be biased. | **B1** | 2.4 |
|  | **(3)** |  |  |
| **1c** | Allocate each of the males a number from 1 to 300 | **B1** | 3.1b | 3rd  Understand and carry out simple random sampling. |
| Use calculator or number generator to generate 50 different random numbers from 1 to 300 inclusive. | **B1** | 1.1b |
| Select males corresponding to those numbers. | **B1** | 1.1b |
|  | **(3)** |  |  |
| **1d** | 300 ÷ 50 = 6 | **B1** | 3.1b | 3rd  Understand and carry out simple random sampling. |
| Use a random number generator to select the first name (or one of the first 6 names on the list) as a starting point and then select every 6th name thereafter to get 50 names. | **B1** | 1.1b |
|  | **(2)** |  |  |
| **(9 marks)** | | | | |
| **Notes** | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **2a** | All points correctly plotted. | **B2** | 1.1b | 2nd  Draw and interpret scatter diagrams for bivariate data. |
|  | **(2)** |  |  |
| **2b** | The **points** lie reasonably close to a **straight line** (o.e.). | **B1** | 2.4 | 2nd  Draw and interpret scatter diagrams for bivariate data. |
|  | **(1)** |  |  |
| **2c** | *f* | **B1** | 1.2 | 2nd  Know and understand the language of correlation and regression. |
|  | **(1)** |  |  |
| **2d** | Line of best fit plotted for at least 2.2 ⩽ *x* ⩽ 8 with *D* and *F* above and *B* and *C* below. | **M1** | 1.1a | 4th  Make predictions using the regression line within the range of the data. |
| 26 to 31 inclusive (must be correctly read from *x* = 7 from the line of best fit). | **A1** | 1.1b |
|  | **(2)** |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **2e** | It is reliable because it is interpolation (700 km is within the range of values collected). | **B1** | 2.4 | 4th  Understand the concepts of interpolation and extrapolation. |
|  | **(1)** |  |  |
| **2f** | No, it is not sensible since this would be extrapolation (as 180 km is outside the range of distances collected). | **B1** | 2.4 | 4th  Understand the concepts of interpolation and extrapolation. |
|  |  | **(1)** |  |  |
| **(8 marks)** | | | | |
| **Notes**  **2a**  First B1 for at least 4 points correct, second B1 for all points correct.  **2b**  Do not accept‘The points lie reasonably close to a line’. Linear or straight need to be noted.  **2e**  Also allow ‘It is reliable because the points lie reasonably close to a straight line’.  **2f**  Allow the answer ‘It is sensible since even though it is extrapolation it is not by much’ provided that the answer contains both ideas (i.e. it IS extrapolation but by a small amount compared to the given range of data). | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | | | **Pearson Progression Step and Progress descriptor** | |
| **3a** | \\192.168.0.251\Pearson\A Level Maths\WIP files\Unit tests\Stats 1\Artwork\2. Files from YPS\alevel_ut_sm1_u3_test_aw5.png  Correct tree structure.  All labels correct.  All probabilities correct. | **B1**  **B1**  **B1** | 3.1a  1.1b  1.1b | | | 3rd  Draw and use tree diagrams with three branches and/or three levels. | |
|  | **(3)** |  | | |  | |
| **3bi** | or equivalent. | **M1**  **A1** | 3.4  1.1b | | | 3rd  Draw and use tree diagrams with three branches and/or three levels. | |
|  | **(2)** |  | | |  | |
| **3bii** | Car NL + Bike NL + Foot NL | **M1** | 3.4 | | | 3rd  Draw and use tree diagrams with three branches and/or three levels. | |
| or equivalent. | **A1** | 1.1b | | |
|  | **(2)** |  | | |  | |
| **(7 marks)** | | | | | | | |
| **Notes**  **3bii**  ft from their tree diagram. Allow one error for M1.  Can also be found from | | | | | | | |
| **Q** | **Scheme** | **Marks** | | **AOs** | **Pearson Progression Step and Progress descriptor** | |
| **4a** | Two from:   * Each bolt is either faulty or not faulty. * The probability of a bolt being faulty (or not) may be assumed constant. * Whether one bolt is faulty (or not) may be assumed to be independent (or does not affect the probability of) whether another bolt is faulty (or not). * There is a fixed number (50) of bolts. * A random sample. | **B2** | | 1.2  1.2 | 5th  Understand the binomial distribution (and its notation) and its use as a model. | |
|  | **(2)** | |  |  | |
| **4b** | Let *X* represent the number of faulty bolts.  *X*~B(50, 0.25)  P(*X* ⩽ 6) = 0.0194  P(*X* ⩽ 7) = 0.0453  P(*X* ⩾ 19) = 0.0287  P(*X* ⩾ 20) = 0.0139 | **M1**  **M1dep** | | 3.4  1.1b | 5th  Find critical values and critical regions for a binomial distribution. | |
| Critical Region is *X* ⩽ 6 ∪ *X* ⩾ 20 | **A2** | | 1.1b  1.1b |
|  | **(4)** | |  |  | |
| **(6 marks)** | | | | | | |
| **Notes**  **4a**  Each comment must be in context for its mark. | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **5a** | Makes an attempt to find the absolute value. For example,  is seen. | **M1** | 3.1b | 4th  Find the magnitude and direction of a vector quantity. |
| Simplifies to | **M1** | 1.1b |
| Finds speed = 26.07… (ms−1)  Accept awrt 26.1 (ms−1) | **A1** | 1.1b |
|  | **(3)** |  |  |
| **5b** | States that | **M1** | 1.1b | 4th  Find the magnitude and direction of a vector quantity. |
| Finds the value of *θ*, *θ* = 57.52… | **A1** | 1.1b |
| Demonstrates that the angle with the unit **j** vector is  90 – 57.52… | **M1** | 1.1b |
| Finds 32.47… (°)  Accept awrt 32.5(°) | **A1** | 1.1b |
|  | **(4)** |  |  |
| **5c** | Ignore the value of friction between the hockey puck and the ice. | **B1** | 3.4 | 3rd  Understand assumptions common in mathematical modelling. |
|  | **(1)** |  |  |
| **5d** | Award 1 method mark for division by 1000 and 1 method mark for multiplication by 100 only once and the final method mark for multiplication by 100 three times. | **M3** | 1.1b | 4th  Know derived quantities and SI units. |
| 1400 kg m−3 | **A1** | 1.1b |
|  | **(4)** |  |  |
| **(12 marks)** | | | | |
| **Notes**  **5b**  Award all 4 marks for a correct final answer. Award 2 marks for a student stating , and then either making a mistake with the inverse or subtracting that answer from 90. | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **6** | Makes an attempt to integrate  Raising power by one would constitute an attempt. | **M1** | 3.1b | 6th  Uses differentiation to solve problems in kinematics. |
| Correctly finds  Note that *C* = 0. | **A1** | 1.1b |
| Makes an attempt to integrate. Raising power by one would constitute an attempt. | **M1** | 3.1b |
| Correctly finds . Note that *C* = 0. | **A1** | 1.1b |
| Substitutes *t* = 10 into  to obtain (m). Accept awrt 23.3 (m). | **A1 ft** | 1.1b |
|  | **(5)** |  |  |
| **(5 marks)** | | | | |
| **Notes**  **6**  Award the final accuracy mark for a correct substitution using their equation for displacement. | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q** | **Scheme** | **Marks** | **AOs** | **Pearson Progression Step and Progress descriptor** |
| **7a** | Makes an attempt to substitute *t* = 25 into.  For example is seen. | **M1** | 1.1b | 5th  Use equations of motion to solve problems in unfamiliar contexts. |
| Correctly states that *AB* = 500 (m). Accept *s* = 500 (m). | **A1** | 1.1b |
|  | **(2)** |  |  |
| **7b** | Differentiates to obtain | **M1** | 3.1b | 6th  Solve problems using calculus and the equations of motion. |
| Differentiates to obtain | **M1** | 3.1b |
| States that(m s−2) is a constant as it does not depend on *t*. | **A1** | 3.5a |
|  | **(3)** |  |  |
| **7c** | States distance of the car from point *A* is | **M1** | 3.3 | 6th  Solve problems using calculus and the equations of motion. |
| *u* = 2 and *a* = 0.1 and an attempt to use  is seen. | **M1** | 3.3 |
| States distance of the runner from point *B* is | **M1** | 1.1b |
| States that the runner and the car will pass each other when their distances total 500 (m), or writes (m)or writes | **M1** | 3.3 |
| States that or equivalent. | **A1** | 1.1b |
| Solves to find *t* = 20 (s). Answer does not need to state that *t*= or 71.4… (s) is not in the given range. | **A1** | 1.1b |
| Makes an attempt to substitute *t* = 20 into  or | **M1** | 1.1b |
| Correctly states they will pass each other 440 (m) from *A* or60 (m) from *B.* | **A1 ft** | 3.5a |
|  | **(8)** |  |  |
| **(13 marks)** | | | | |
| **Notes** | | | | |