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| **Q** | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **1a** |  | **M1****A1** | 1.1a2.1 | 1stUnderstand how to find unknowns from a probability mass function |
|  | **(2)** |  |  |
| **1b** |    | **M1****A1** | 1.1a2.1 | 2ndCalculate the mean of a discrete random variable |
|  | **M1****A1** | 1.1a1.1b |
|  | **(4)** |  |  |
| **1c** |   | **B1** | 1.1b | 3rdCalculate the variance of a discrete random variable |
|  | **(1)** |  |  |
| **1d** |   | **B1** | 1.1b | 4thFind the expectation of a function of a random variable |
|   | **B1** | 1.1b |
|  | **(2)** |  |  |
| **(9 marks)**  |
| **Notes** |

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| **Q** | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **2** | Expectation, in points | **M1** | 3.3 | 2ndCalculate the mean of a discrete random variable |
|  | **A1** | 1.1a |
|  | **M1** | 1.1b |
|  | **A1** | 2.1 |
| **(4 marks)**  |
| **Notes**Award 1st **M1** for attempt to form expression for expectation in terms of *k*. Does not need to be equal to 3.Award 1st **A1** for correct equation in *k*, unsimplified or simplified.Award 2nd **M1** for attempt to solve *their* equation in *k*.Alternative method20 – 0.2(20 + 2*k*) – 0.2(20 + 4*k*) = 3 for 1st M1, A1(or any scalar multiple of this equation)Leading to:12 – 1.2*k* = 3 as above |

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| **Q** | **Scheme** | **Marks** | **AOs** | Pearson Progression Step and Progress Descriptor |
| **3a** | 0.15 | **B1** | 1.2 | 1stUnderstand how to find unknowns from a probability mass function |
|  | **(1)** |  |  |
| **3b** | E(*X*) = | **M1** | 1.1a | 2ndCalculate the mean of a discrete random variable3rdCalculate the variance of a discrete random variable |
|  | **A1** | 1.1b |
|  | **M1** | 1.1a |
|   | **A1** | 2.1 |
|  | **(4)** |  |  |
| **3c** |  | **M1****A1** | 3.1a1.1b | 5thSolve problems involving functions of discrete random variables |
|  | **(2)** |  |  |
| **(7 marks)**  |
| **Notes****3b** Allow follow through from incorrect part **a** for all **M** marks.  |

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| **Q** | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **4a** |   | **M1****A1** | 1.1a2.1 | 1stUnderstand how to find unknowns from a probability mass function |
|  | **(2)** |  |  |
| **4b** |     | **M1****A1****M1****A1** | 1.1a1.1b1.1a1.1b | 2ndCalculate the mean of a discrete random variable3rdCalculate the variance of a discrete random variable |
|  | **(4)** |  |  |
| **4c** |   | **M1****A1** | 1.22.1 | 4thFind the expectation of a function of a random variable |
|  | **(2)** |  |  |
| **(8 marks)**  |
| **Notes****4b** Allow follow through from *their* *k* for **M** marks.**4c** Allow follow through from their Var(*X*) for **M** mark. |

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| **Q** | **Scheme** | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **5a** | *a* + *b* = 0.4  *a* = 0.1, *b* = 0.3 | **B1****M1****M1****A1****A1** | 1.1b3.1a1.1b1.1b1.1b | 4thFind the expectation of a function of a random variable |
|  | **(5)** |  |  |
| **5b** |  E(*X*) = 2.7Var(*X*) = 12.9 – 2.72 = 5.61  | **M1****M1****A1** | 1.1a1.1b2.1 | 2ndCalculate the mean of a discrete random variable3rdCalculate the variance of a discrete random variable |
|  | **(3)** |  |  |
| **5c** | 22.44 | **B1**ft | 1.1b | 4thFind the expectation of a function of a random variable |
|  | **(1)** |  |  |
| **5d** | P(*X* – 3 > 2*Y*) = P(*X* < 1) = 0.3 | **M1****A1** | 3.1a1.1b | 5thSolve problems involving functions of discrete random variables |
|  | **(2)** |  |  |
| **(11 marks)** |

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| **Notes****5a** 1st **M1** for attempt to find *Y*s. 2nd **M1** for attempt to form equation for E(*Y*).**5c** Allow follow through from **b**. |

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| **Q** | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **6a** |  [1] (or scalar multiple of this equation, e.g. 9*a* + 6*b* + 12*c* = 5.7)P(*Y* < 0) gives P(*X* > 2) hence  [2] [3] Solve system using matrices or elimination:*a* = 0.1, *b* = 0.2, *c* = 0.3 | **M1****M1****M1****M1****M1****A1****A1** | 3.1a1.1b2.11.1b1.1b1.1b1.1b | 5thSolve problems involving functions of discrete random variables |
|  | **(7)** |  |  |
| **6b** | 27.81 ÷ 9 = 3.09  | **M1****A1** | 1.1a1.2 | 4thFind the expectation of a function of a random variable |
|  | **(2)** |  |  |
| **6c** | P(*X* < *Y*) means P(*X* < 1)P(*X* < 1) = 0.1 + 0.2 = 0.3 | **M1****A1**ft | 3.1a1.1b | 5thSolve problems involving functions of discrete random variables |
|  | **(2)** |  |  |
| **(11 marks)** |
| **Notes****6a** 1st **A1** for any two of *a*, *b* and *c* correct.**6c** Allow follow through from *their a* and *b*. |