**1** The probability generating function of a discrete random variable *X* is given by



**a** Show that  **(2 marks)**

**b** Write down the probability distribution of *X* **(3 marks)**

**2** *Y* ~ Geo(0.6)

Show, from first principles, that the probability generating function for *Y* is

 **(5 marks)**

**3** Paulette writes the following probability generating function for a discrete random variable *X*



**a** Explain why this is not a probability generating function. **(1 mark)**

Given that the bracketed expression is correct, find

**b**  **(2 marks)**

**c** P(*X* = 2) **(2 marks)**

**4** The random variable *X* has the probability distribution shown in the table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *x* | 1 | 2 | 3 | 4 | 5 |
| P(*X* = *x*) | 0.1 | 0.2 | 0.1 | 0.3 | 0.3 |

**a** Show that the probability generating function for *X* can be written as

 **(2 marks)**

**b** Use the probability generating function to show that E(*X*) = 3.5 **(3 marks)**

**5** A discrete random variable *X* has a probability generating function, given by

 where *a* and *b* are positive integers.

Given that the mean of *X* is , find the values of *a* and *b* **(6 marks)**

**6** The probability generating function of a discrete random variable *Y* is given as



**a** Show that  **(2 marks)**

**b** Find P(*Y* = 4) **(2 marks)**

**c** Show that Var(*Y*) = 1 **(8 marks)**

**d** Find the probability generating function of 3*Y* + 1 **(2 marks)**

**7** A discrete random variable *X* has a probability generating function given by



**a** Show that the standard deviation of *X* is  **(5 marks)**

**b** Find the probability generating function of 4*X* + 3 **(2 marks)**

A second discrete random variable *Y* ~ B(2, 0.4)

The discrete random variable *Z* = *X* + *Y*

**c** Show that the probability generating function for *Z* is given by

 **(3 marks)**