Discrete Random Variabes – 2022 GCE AS Statistics Further Mathematics A

1. June/2022/Paper_Y532/01/No.3

A discrete random variable X has the following probability distribution.

x	1	2	3	4
$P(X = x)$	p	0.31	0.3	p^2

(a) Determine the value of p. **[3]**

(b) It is given that $E(aX + b) = Var(aX + b) = 23.19$, where a and b are positive constants. Determine the value of a and the value of b. **[6]**

2. June/2022/Paper_Y532/01/No.5

The manager of an emergency response hotline believes that calls are made to the hotline independently and at constant average rate throughout the day. From a small random sample of the population, the manager finds that the mean number of calls made in a 1-hour period is 14.4.

Let R denote the number of calls made in a randomly chosen 1-hour period.

(a) Using evidence from the small sample, state a suitable distribution with which to model R. You should give the value(s) of any parameter(s). **[1]**

(b) In this part of the question, use the distribution and value(s) of the parameter(s) from your answer to part **(a)**.

(i) Find $\mathrm{P}(R > 20)$. **[2]**

(ii) Given that $\mathrm{P}(R = r) > \mathrm{P}(R = r+1)$, show algebraically that $r > 13.4$. **[2]**

(iii) Hence write down the mode of the distribution. **[1]**

The manager also finds, from records over many years, that the modal value of R is 10.

(c) Use this result to comment on the validity of the distribution used in part **(b)**. **[1]**

(d) Assume now that the type of distribution used in part **(b)** is valid. Find the range(s) of values of the parameter(s) of this distribution that would correspond to the modal value of R being 10. **[2]**