Uniform (Discrete) Q1[8 marks] (13/6/21)

Exam Boards

OCR : Statistics (Year 1)

MEI: Statistics a

AQA: Statistics (Year 1)

Edx: A Level (Year 1)

The probability distribution of a discrete random variable is shown below.

x	a	$a+d$	$a+2d$
$P(X=x)$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

where a and d are positive integers.

Given that $E(X)=6$ and $Var(X)=6$, find a and d. [8 marks]

Solution

Let Y have the uniform distribution with values 1, 2 & 3.

[1 mark]

Then $E(Y) = \frac{3+1}{2} = 2$ [1 mark]

and $Var(Y) = \frac{1}{12}(3^2 - 1) = \frac{2}{3}$ [1 mark]

And $X = dY + a - d,$ [1 mark]

so that $E(X) = dE(Y) + a - d$ [1 mark]

and $Var(X) = d^2 Var(Y)$ [1 mark]

Hence $6 = d(2) + a - d; a + d = 6$

and $6 = d^2\left(\frac{2}{3}\right); d = 3$ [1 mark], so that $a = 3$ [1 mark]