Problem 4: Convolution calculations

(6/6 points)

1. Let the discrete random variable X be uniform on $\{0, 1, 2\}$ and let the discrete random variable Y be uniform on $\{3, 4\}$. Assume that X and Y are independent. Find the PMF of $X + Y$ using convolution. Determine the values of the constants a, b, c, and d that appear in the following specification of the PMF.

$$p_{X+Y}(z) = \begin{cases} a, & z = 3, \\ b, & z = 4, \\ c, & z = 5, \\ d, & z = 6, \\ 0, & \text{otherwise.} \end{cases}$$

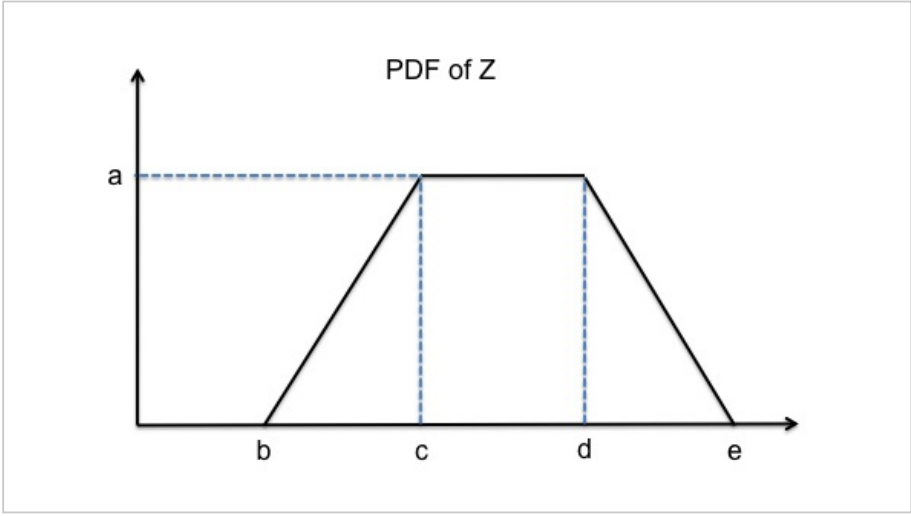
$a =$ 1/6 ✔

$b =$ 1/3 ✔

$c =$ 1/3 ✔

$d =$ 1/6 ✔

2. Let the random variable X be uniform on $[0, 2]$ and the random variable Y be uniform on $[3, 4]$. (Note that in this case, X and Y are continuous random variables.) Assume that X and Y are independent. Let $Z = X + Y$. Find the PDF of Z using convolution. The following figure shows a plot of this PDF. Determine the values of a, b, c, d, and e.



$a =$ 1/2 ✔

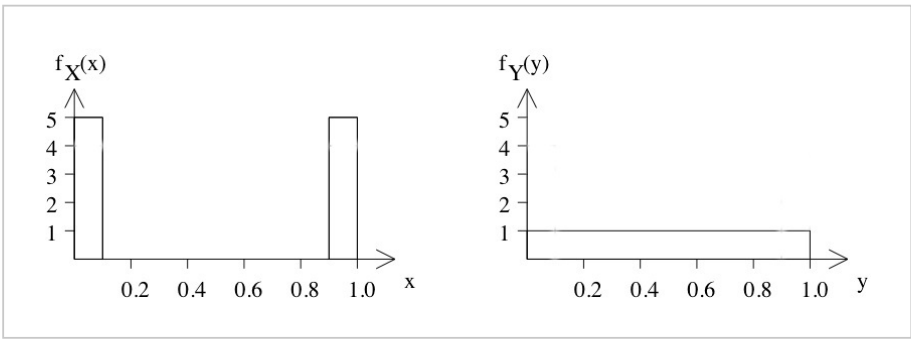
$b =$ 3 ✔

$c =$ 4 ✔

$d =$ 5 ✔

$e =$ 6 ✔

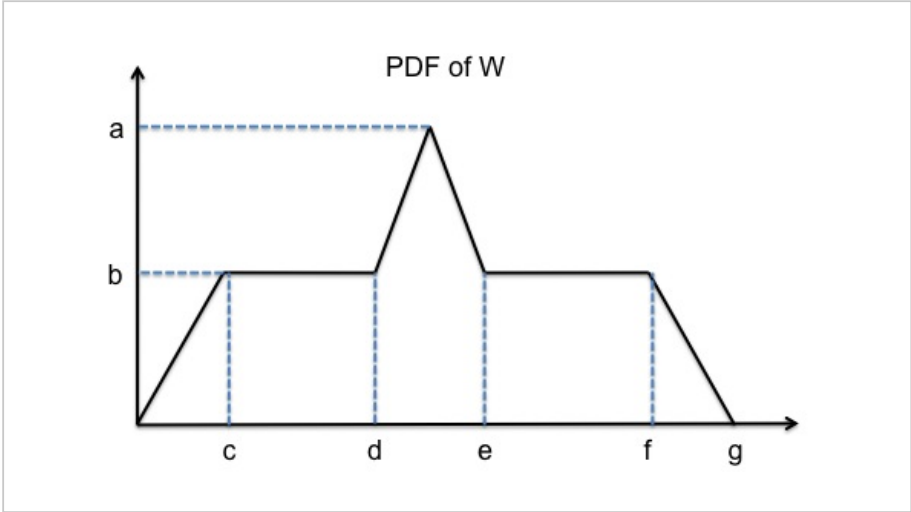
3. Let X and Y be two independent random variables with the PDFs shown below. below.



$$f_X(x) = \begin{cases} 5, & \text{if } 0 \le x \le 0.1 \text{ or } 0.9 \le x \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

$$f_Y(y) = \begin{cases} 1, & \text{if } 0 \le y \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

Let $W = X + Y$. The following figure shows a plot of the PDF of W. Determine the values of a, b, c, d, e, f, and g.



$a =$ 1.0 ✔

$b =$ 0.5 ✔

$c =$ 0.1 ✔

$d =$ 0.9 ✔

$e =$ 1.1 ✔

$f =$ 1.9 ✔

$g =$ 2 ✔

You have used 1 of 2 submissions

DISCUSSION

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