

IMM - DTU

02405 Probability
2006-11-1
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Question a)

$$P(X = 1, Y = 2)$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2)$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2}$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X + Y}{2} \geq 1\right)$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X + Y}{2} \geq 1\right) = P(X + Y \geq 2)$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X + Y}{2} \geq 1\right) = P(X + Y \geq 2) = 1 -$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X + Y}{2} \geq 1\right) = P(X + Y \geq 2) = 1 - P(X + Y \leq 1)$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$\begin{aligned} P\left(\frac{X+Y}{2} \geq 1\right) &= P(X+Y \geq 2) = 1 - P(X+Y \leq 1) \\ &= 1 - (P(X+Y = 0) + \end{aligned}$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$\begin{aligned} P\left(\frac{X+Y}{2} \geq 1\right) &= P(X+Y \geq 2) = 1 - P(X+Y \leq 1) \\ &= 1 - (P(X+Y = 0) + P(X+Y = 1)) \end{aligned}$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$\begin{aligned} P\left(\frac{X+Y}{2} \geq 1\right) &= P(X+Y \geq 2) = 1 - P(X+Y \leq 1) \\ &= 1 - (P(X+Y = 0) + P(X+Y = 1)) = 1 - (1 + 3)e^{-3} \end{aligned}$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$\begin{aligned} P\left(\frac{X+Y}{2} \geq 1\right) &= P(X+Y \geq 2) = 1 - P(X+Y \leq 1) \\ &= 1 - (P(X+Y = 0) + P(X+Y = 1)) = 1 - (1 + 3)e^{-3} = 0.80, \end{aligned}$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X+Y}{2} \geq 1\right) = P(X+Y \geq 2) = 1 - P(X+Y \leq 1)$$

$$= 1 - (P(X+Y = 0) + P(X+Y = 1)) = 1 - (1 + 3)e^{-3} = 0.80,$$

where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X+Y}{2} \geq 1\right) = P(X+Y \geq 2) = 1 - P(X+Y \leq 1)$$

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where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

$$P\left(X = 1 \mid \frac{X+Y}{2}\right)$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X+Y}{2} \geq 1\right) = P(X+Y \geq 2) = 1 - P(X+Y \leq 1)$$

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where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

$$P\left(X = 1 \mid \frac{X+Y}{2} = 2\right)$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X+Y}{2} \geq 1\right) = P(X+Y \geq 2) = 1 - P(X+Y \leq 1)$$

$$= 1 - (P(X+Y = 0) + P(X+Y = 1)) = 1 - (1 + 3)e^{-3} = 0.80,$$

where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

$$P\left(X = 1 \mid \frac{X+Y}{2} = 2\right) = P(X = 1 \mid X+Y = 4)$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X+Y}{2} \geq 1\right) = P(X+Y \geq 2) = 1 - P(X+Y \leq 1)$$

$$= 1 - (P(X+Y = 0) + P(X+Y = 1)) = 1 - (1 + 3)e^{-3} = 0.80,$$

where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

$$P\left(X = 1 \mid \frac{X+Y}{2} = 2\right) = P(X = 1 \mid X+Y = 4) = \frac{P(X = 1, X+Y = 4)}{P(X+Y = 4)}$$

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Question a)

$$P(X = 1, Y = 2) = P(X = 1)P(Y = 2) = \frac{1^1}{1!}e^{-1}\frac{2^2}{2!}e^{-2} = 2e^{-3}$$

Question b)

$$P\left(\frac{X+Y}{2} \geq 1\right) = P(X+Y \geq 2) = 1 - P(X+Y \leq 1)$$

$$= 1 - (P(X+Y = 0) + P(X+Y = 1)) = 1 - (1 + 3)e^{-3} = 0.80,$$

where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

$$P\left(X = 1 \mid \frac{X+Y}{2} = 2\right) = P(X = 1 \mid X+Y = 4) = \frac{P(X = 1, X+Y = 4)}{P(X+Y = 4)}$$
$$= \frac{e^{-1}\frac{2^3}{3!}e^{-2}}{\frac{3^4}{4!}e^{-3}}$$

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where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

$$\begin{aligned} P\left(X = 1 \mid \frac{X+Y}{2} = 2\right) &= P(X = 1 \mid X+Y = 4) = \frac{P(X = 1, X+Y = 4)}{P(X+Y = 4)} \\ &= \frac{e^{-1}\frac{2^3}{3!}e^{-2}}{\frac{3^4}{4!}e^{-3}} = \binom{4}{1} \left(\frac{1}{3}\right) \left(\frac{2}{3}\right)^3 \end{aligned}$$

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Question b)

$$P\left(\frac{X+Y}{2} \geq 1\right) = P(X+Y \geq 2) = 1 - P(X+Y \leq 1)$$

$$= 1 - (P(X+Y = 0) + P(X+Y = 1)) = 1 - (1 + 3)e^{-3} = 0.80,$$

where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

$$\begin{aligned} P\left(X = 1 \mid \frac{X+Y}{2} = 2\right) &= P(X = 1 \mid X+Y = 4) = \frac{P(X = 1, X+Y = 4)}{P(X+Y = 4)} \\ &= \frac{e^{-1}\frac{2^3}{3!}e^{-2}}{\frac{3^4}{4!}e^{-3}} = \binom{4}{1} \left(\frac{1}{3}\right) \left(\frac{2}{3}\right)^3 = 0.395 \end{aligned}$$

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where we use a) to find $P(X+Y = 0)$ and $P(X+Y = 1)$.

Question c)

$$P\left(X = 1 \mid \frac{X+Y}{2} = 2\right) = P(X = 1 \mid X+Y = 4) = \frac{P(X = 1, X+Y = 4)}{P(X+Y = 4)}$$
$$= \frac{e^{-1}\frac{2^3}{3!}e^{-2}}{\frac{3^4}{4!}e^{-3}} = \binom{4}{1} \left(\frac{1}{3}\right) \left(\frac{2}{3}\right)^3 = 0.395$$

the conditional probability is given by the Binomial distribution. This is a general result.