

أسئلة من الاختبار النهائي لعام 2024 مساق نظرية احتمالات وإحصاء

Random variable X has PDF

$$f_X(x) = \begin{cases} 1/4 & -1 \leq x \leq 3, \\ 0 & \text{otherwise.} \end{cases}$$

Define the random variable Y by $Y = h(X) = X^2$.

Find $E[h(X)]$.

- ☐ 4/3
- ☐ 6.756
- ☐ 1
- ☐ 7/3
- ☐ 2/3

To communicate one bit of information reliably, cellular phones transmit the same binary symbol five times. Thus the information "zero" is transmitted as 00000 and "one" is 11111. The receiver detects the correct information if three or more binary symbols are received correctly. What is the information error probability $P[E]$, if the binary symbol error probability is $q = 0.1$?

- ☐ 0.0856
- ☐ 0.23
- ☐ 0.056
- ☐ 0.00856
- ☐ 0.00658

Monitor three consecutive packets going through an Internet router. Classify each one as either video (v) or data (d). Your observation is a sequence of three letters (each one is either v or d). For example, three video packets corresponds to vvv. The outcomes vvv and ddd each have probability 0.2 whereas each of the other outcomes vvd, vdv, vdd, dvv, dvd, and ddv has probability 0.1. Count the number of video packets N_V in the three packets you have observed. Describe in words and also calculate the following probabilities:

$$P[N_V = 2 | N_V \geq 1]$$

- ☐ 0.3
- ☐ 3/8
- ☐ 1/3
- ☐ 0.8
- ☐ 0

The random variable X has probability density function

$$f_X(x) = \begin{cases} cx & 0 \leq x \leq 2, \\ 0 & \text{otherwise.} \end{cases}$$

Use the PDF to find

$P[0 \leq X \leq 2]$,

- ☐ 1/8
- ☐ 0.5
- ☐ 1/16
- ☐ 1
- ☐ 1/24

Monitor three consecutive packets going through an Internet router. Classify each one as either video (v) or data (d). Your observation is a sequence of three letters (each one is either v or d). For example, three video packets corresponds to vvv. The outcomes vvv and ddd each have probability 0.2 whereas each of the other outcomes vvd, vdv, vdd, dvv, dvd, and ddv has probability 0.1. Count the number of video packets N_V in the three packets you have observed. Describe in words and also calculate the following probabilities:

$$P[\{vvd\} | N_V = 2]$$

- ☒ 1/3

Random variable X has PDF

$$f_X(x) = \begin{cases} 1/4 & -1 \leq x \leq 3, \\ 0 & \text{otherwise.} \end{cases}$$

Define the random variable Y by $Y = h(X) = X^2$.

Find $E[X]$

- ☐ 4/3
- ☐ 2/3
- ☒ 1
- ☐ 7/3
- ☐ 6.756

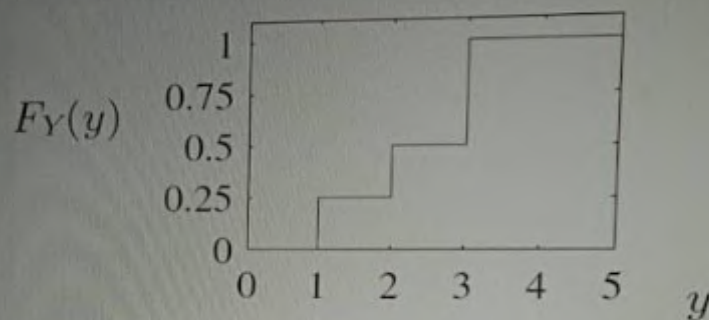
The random variable Y has a PMF

$$P_Y(y) = \begin{cases} 1/11 & y = 5, 6, 7, \dots, 15 \\ 0 & \text{otherwise} \end{cases}$$

Find $P[Y < 10]$?

- ☐ 3/11
- ☐ 4/11
- ☐ 5/11
- ☐ 2/9
- ☐ 5/9

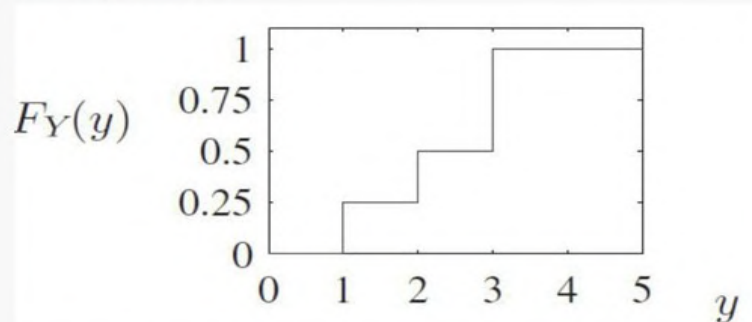
Discrete random variable Y has the CDF $F_Y(y)$ as shown:



Use the CDF to find $P[Y \leq 1]$

- ☐ 0
- ☐ 0.75
- ☐ 0
- ☐ 0.5
- ☒ 0.25

Discrete random variable Y has the CDF $F_Y(y)$ as shown:



Use the CDF to find $P[Y = 3]$

- ☐ 0
- ☒ 0.5
- ☐ 0
- ☐ 0.25
- ☐ 0.75

Random variable X has PDF

$$f_X(x) = \begin{cases} 1/4 & -1 \leq x \leq 3, \\ 0 & \text{otherwise.} \end{cases}$$

Define the random variable Y by $Y = h(X) = X^2$.

Find $\text{Var}[X]$.

- ☐ 4/3
- ☐ 1
- ☐ 2/3
- ☐ 6.756
- ☐ 7/3

Mobile telephones perform handoffs as they move from cell to cell. During a call, a telephone either performs zero handoffs (H0), one handoff (H1), or more than one handoff (H2). In addition, each call is either long (L), if it lasts more than three minutes, or brief (B). The following table describes the probabilities of the possible types of calls.

	H0	H1	H2
L	0.1	0.1	0.2
B	0.4	0.1	0.1

What is the probability that a long call will have one or more handoffs?

- ☐ 0.25
- ☐ 0.8
- ☐ 0.2
- ☐ 0.5
- ☐ 0.75