

Quiz 2-Solution (ECE 313/ECE317, Fall 2023):

Question1: Choose one answer.

In a particular game, a fair die is tossed. If the number of spots showing is either 4 or 5 you win \$2, if the number of spots showing is 6 you win \$5, and if the number of spots showing is 1, 2, or 3 you win nothing. Let X be the amount that you win. Which of the following is the expected value of X ?

- 1) 1
- 2) 1.5
- 3) 2.5

Question2: Choose one answer.

A small store keeps track of the number X of customers that make a purchase during the first hour that the store is open each day. Based on the records, X has the following probability distribution.

X	0	1	2	3	4
$\mathbb{P}_x(X)$	0.1	0.1	0.2	0.3	0.3

The mean number of customers that make a purchase during the first hour that the store is open is:

- 1) 2
- 2) 2.3
- 3) 2.6

Question3: Choose one answer.

A small store keeps track of the number X of customers that make a purchase during the first hour that the store is open each day. Based on the records, X has the following probability distribution.

X	0	1	2	3	4
$\mathbb{P}_x(X)$	0.1	0.1	0.2	0.3	0.3

The standard deviation of the number of customers that make a purchase during the first hour that the store is open is

- 1) 1.2806
- 2) 1.64
- 3) 1.5

Question4: Choose one answer.

In a small town of 100 households, 29 own no dogs, 38 own one dog, 22 own two dogs, and 11 own three dogs.

A household is picked at random. Let " x " = the number of dogs this household own. What is $\mathbb{P}(X \geq 2)$.

- 1) 0.22
- 2) **0.33**
- 3) 0.38
- 4) 0.29

Question5: Choose one answer.

Two fair dice are rolled. Let "x" = the sum of the numbers that appear on the dice. Which value of "x" is most likely?

- 1) 6
- 2) **7**
- 3) 5

Question6: Choose one answer.

If X is binomial distribution with probability of success $p = 0.7$, such that $P(X = k) = C_k^5(1 - p)^{5-k}p^k$. What is $\mathbb{P}(X = 2)$

- 1) 0.1322
- 2) **0.1323**
- 3) 0.1324

Question7: Choose one answer.

Which of the following is NOT a property of a random variable?

- 1) The sum of the probabilities of a random variable is equal to 1.
- 2) **A random variable cannot be negative**
- 3) A random variable represents numerical outcomes for different situations or events.
- 4) A random variable can be discrete or continuous.

Question8: Choose one answer.

You decide to collect a bunch of cans of soda and measure the volume of soda in each can. Let x = the number of mL of soda in each can. What type of variable is x? (Indication: The cans may not contain the same volume)

- 1) x is a discrete random variable.
- 2) **x is a continuous random variable.**
- 3) x is not a random variable.

Question9: Choose one answer.

Which of the following random variables is NOT continuous?

- 1) Amount of gasoline in a car.
- 2) **Number of goals scored by a hockey team.**
- 3) Time it takes to commute to work.

Question10: Choose one answer.

The weight of written reports produced in a certain department has a Normal distribution with mean 60 g and standard deviation 12 g. The probability that the next report will weigh less than 45 g is

- 1) **0.1056**
- 2) 0.1042
- 3) 0.3944
- 4) 0.8944

Question11: Choose one answer.

Let X be the time intervals between successive barges passing a certain point on a busy waterway. The mean of X is 8 minutes. How many barges pass, in average, within one hour

- 1) 7
- 2) **7.5**
- 3) 8

Question12: Choose one answer.

Let X be the time intervals between successive barges passing a certain point on a busy waterway. The mean of X is 8 minutes. What is the probability distribution of X

- 1) Poisson $\rightarrow \mathcal{P}(\frac{1}{8})$
- 2) **Exponential $\rightarrow Exp(\frac{1}{8})$**
- 3) Geometric $\rightarrow \mathcal{G}(\frac{1}{8})$

Question13: Choose one answer.

Let X be the time intervals between successive barges passing a certain point on a busy waterway. The mean of X is 8 minutes. What is the probability $\mathbb{P}(X > 16 \text{ mins})$

- 1) 0.1454
- 2) 0.1656
- 3) **0.1353**

Question14: Choose one answer.

An experiment consists of repeatedly and independently tossing a fair die until a six is obtained. Let X denote the number of throws **until** obtaining a six. Then

- 1) $\mathbb{E}(X) = 5$
- 2) $\mathbb{E}(X) = \frac{1}{6}$
- 3) $\mathbb{E}(X) = 6$
- 4) $\mathbb{E}(X) = 1$

Question15: Choose one answer.

An experiment consists of repeatedly and independently tossing a fair die until a six is obtained. Let X denote the number of throws **before** obtaining a six. Then

- 1) $\mathbb{E}(X) = 5$
- 2) $\mathbb{E}(X) = \frac{1}{6}$
- 3) $\mathbb{E}(X) = 6$
- 4) $\mathbb{E}(X) = 1$

Question16: Choose one answer.

The cumulative distribution function is always non-decreasing.

- 1) **True.**
- 2) False.

Question17: Choose one answer.

The probability that Jalen makes a free throw is 75%. What is the probability he makes his first free throw on his third attempt?

- 1) $\mathbb{P}(X = 3) = (0.25) \cdot (0.75)^2$
- 2) $\mathbb{P}(X = 3) = (0.25)^2 \cdot (0.75)$
- 3) $\mathbb{P}(X = 3) = (0.75)^3$

Question18: Choose one answer.

Zero correlation of two random variables X and Y means that

- 1) X and Y are independent.
- 2) The relation between X and Y is not linear.
- 3) X and Y are dependent.

- 4) **X and Y are independent or the relation between X and Y is not linear.**

Question19: Choose one answer.

If $\mathbb{E}[XY] \neq \mathbb{E}[X] \cdot \mathbb{E}[Y]$, so

- 1) X and Y are independent.
- 2) **X and Y are not independent.**
- 3) We cannot make any conclusion on the independence between X and Y.

Question20: Choose one answer.

If $\mathbb{E}[XY] = \mathbb{E}[X] \cdot \mathbb{E}[Y]$, so

- 1) X and Y are independent.
- 2) X and Y are not independent.
- 3) **We cannot make any conclusion on the independence between X and Y.**