

## Quiz 2 (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  $\mathbb{E}[XY] \neq \mathbb{E}[X].\mathbb{E}[Y]$ , 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  $\mathbb{E}[XY] = \mathbb{E}[X].\mathbb{E}[Y]$ , 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.