

Question 1

1 points

Save Answer

A term life insurance policy offered to employees at a software engineering firm will pay a beneficiary a certain sum of money should the policyholder die an untimely death. Suppose a recent female graduate who is 22 years old joins this firm. They buy a \$250,000 1-year term life insurance policy for \$350. According to the National Vital Statistics Report, the probability that a female will survive the year at 22 years of age is 0.998937. Compute the expected value of this policy to the insurance company.

Expected Value : $E(X) = \sum X \cdot P(X)$

$$E(X) = 250,000(1 - 0.998937) = \$265.75$$

Question 3

In the discrete probability distribution below, calculate the value of $f'_X(3)$:

X	$P(X \leq x)$	f
0	0.05	0.05
1	0.15	0.10
2	0.35	0.20
3	0.45	0.10
4	0.79	0.34
5	1	0.21

$$f'_X(3) = 0.10$$

In the discrete probability distribution below, calculate the value of $F_X(3)$:

X	$P(X)$
0	0.2
1	0.1
2	0.3
3	0.15
4	0.18
5	0.07

$$F_X(3) = 0.2 + 0.1 + 0.3 + 0.15 = 0.75$$

Question 5

Which random variables below are discrete? Select all that apply.

- ☒ A. The number of students that have the latest iPhone.
- ☒ B. The number of iPhones sold in a week at a local Apple store.
- ☐ C. The weight of various iPhone models.
- ☐ D. The amount of time students spend on their iPhones (instead of studying!).
- ☒ E. The number of defective iPhones in a shipment of 100 phones.

Question 6

Which random variables below are continuous? Select all that apply.

- ☐ A. The number of students that have the latest iPhone.
- ☐ B. The number of iPhones sold in a week at a local Apple store.
- ☒ C. The weight of various iPhone models.
- ☒ D. The amount of time students spend on their iPhones (instead of studying!).
- ☐ E. The number of defective iPhones in a shipment of 100 phones.

Question 8

Compute the standard deviation of the discrete probability distribution. Round to two decimal places.

<u>X</u>	<u>P(X)</u>
1	0.5
2	0.1
3	0
4	0.22
5	0.10
6	0.08

Standard distribution : S.D = $\sqrt{\text{Variance}}$: σ

$$\sigma^2 = E(X - \mu)^2 \cdot P(X)$$

$$\bullet \mu = 1(0.5) + 2(0.1) + 3(0) + 4(0.22) + 5(0.10) + 6(0.08) = 2.56$$

$$\begin{aligned}\Rightarrow \sigma^2 &= (1 - 2.56)^2(0.5) + (2 - 2.56)^2(0.1) + (3 - 2.56)^2(0) + (4 - 2.56)^2(0.22) \\ &\quad + (5 - 2.56)^2(0.10) + (6 - 2.56)^2(0.08) \\ &= 5.44544\end{aligned}$$

$$\therefore \sigma = \sqrt{5.44544} \approx 2.33$$

Question 9

1 points Save Answer

The table below gives all possible values of the random variable X and their respective probabilities, P(X). Calculate the mean of the random variable, X. Do not round your answer.

<u>X</u>	<u>P(X)</u>
0	0.1
2	0.3
7	0.45
12	0.15

$$\mu = 0(0.1) + 2(0.3) + 7(0.45) + 12(0.15) = 5.55$$

Question 7

1 points Save Answer

Use the joint distribution of X and Y to compute E(X). *Do not round decimals at all.*

$P(x, y)$		x			
		1	2	3	4
y	1	0	0.06	0.06	0.10
	2	0.10	0.10	0.04	0.04
	3	0.40	0.10	0	0

0.22

0.28

0.50

0.50

0.26

0.1

0.14

$$E(X) = 1(0.5) + 2(0.26) + 3(0.1) + 4(0.14) = 1.88$$

$$\begin{aligned} \text{Var}(X) &= (1-1.88)^2(0.5) + (2-1.88)^2(0.26) + (3-1.88)^2(0.1) + (4-1.88)^2(0.14) \\ &= 1.1456 \end{aligned}$$

$$E(Y) = 1(0.22) + 2(0.28) + 3(0.5) = 2.28$$

$$\text{Var}(Y) = (1-2.28)^2(0.22) + (2-2.28)^2(0.28) + (3-2.28)^2(0.5) = 0.6416$$

$$P(Y=2 | X=3) = \frac{P(Y=2 \cap X=3)}{X=3} = \frac{0.04}{0.1} = 0.4 = \frac{2}{5}$$

$$P(Y=1 | X=4) = \frac{0.1}{0.14} = \frac{5}{7}$$

$$\text{Var}(X - Y) = \text{Var}(X) + \text{Var}(Y) - 2 \cdot \text{Cov}(X, Y) = 1.1456 + 0.6416 - 2(-0.6264)$$

$$= 3.04$$

$$\text{Cov}(X, Y) = E(XY) - E(X)E(Y) = 3.66 - 4.2864 = -0.6264$$

$$E(XY) = \sum \sum XY \cdot P(XY)$$

$$= (1)(1)(0) + (1)(2)(0.1) + (1)(3)(0.4) + (2)(1)(0.06) + (2)(2)(0.1) + (2)(3)(0.1) \\ + (3)(1)(0.06) + (3)(2)(0.04) + (3)(3)(0) + (4)(1)(0.1) + (4)(2)(0.04) + (4)(3)(0) \\ = 3.66$$

$$E(X)E(Y) = (1.88)(2.28) = 4.2864$$

Question 10

1 points

Save Answer

Given the transformation $Z = XY$, find $P(Z=2)$:

$P(x, y)$		x			
		1	2	3	4
y	1	0	0.06	0.06	0.10
	2	0.10	0.10	0.04	0.04
	3	0.40	0.10	0	0

$$Z = XY$$

Z	$P(Z)$
1	$P(X=1 \cap Y=1) = 0$
2	$P(X=1 \cap Y=2) + P(X=2 \cap Y=1) = 0.1 + 0.06 = 0.16$
3	0.46
4	0.20
5	0
6	0.14
7	0
8	0.04
9	0
10	0
11	0
12	0

Question 10

Compute the standard deviation of the discrete probability distribution. Round to two decimal places.

X	P(X)
0	0.2
1	0
2	0.3
3	0.1
4	0.15
5	0.25

$$\mu = 0(0.2) + 1(0) + 2(0.3) + 3(0.1) + 4(0.15) + 5(0.25) = 2.75$$

$$\begin{aligned}\sigma^2 &= \sum (x - \mu)^2 \cdot P(X) \\ &= (0 - 2.75)^2(0.2) + (1 - 2.75)^2(0) + (2 - 2.75)^2(0.3) + (4 - 2.75)^2(0.15) + (5 - 2.75)^2(0.25) \\ &\quad + (3 - 2.75)^2(0.1) \\ &= 3.1875\end{aligned}$$

$$\sigma = \sqrt{3.1875} = 1.79$$

$$E(X) = \sum X \cdot P(X)$$

$$X = \text{cost} + \text{Profit}$$

$$\text{win } X = \$350 \quad (0.998937)$$

$$\begin{aligned} \text{lose } X &= \$350 - 250,000 \quad (1 - 0.998937) \\ &= -249,650 \end{aligned}$$

$$E(X) = \$350(0.998937) + (-249,650)(1 - 0.998937) = \$84.25$$

=