GERMAN INTERNATIONAL UNIVERSITY
الجامعة الألمانية الدولية

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Mathematics

for Computer Science Students (Math 403)

Worksheet No. (6)

Problem 1:

Let $\boldsymbol{X}$ is a random variable represents the number of heads when a coin is tossed 3 times. **Find** the probability that there will appear:

(i) Three heads (ii) Two tails and one head (iii) At least one head

(iv) No more than one tail (v) $E(2\boldsymbol{X}+3)$ (vi) $Var(2\boldsymbol{X}+3)$

Problem 2:

A government agency has 15 building inspectors and 9 home inspectors. 8 inspectors are randomly selected for testing. **What** is the expected number of building inspectors in the sample?

Problem 3:

If the probability that a person suffers a bad reaction from vaccination is 0.001. **Determine** that out of 2000 persons:

(i) Exactly 3 persons will suffer a bad reaction (ii) More than 2 persons will suffer a bad reaction

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Problem 4:

Let $\boldsymbol{X}$ is a random variable has Poisson distribution such that $f(2) = 9f(4) + 90f(6)$. **Find** the standard deviation.

Problem 5:

Let $\boldsymbol{X}$ be a random variable having the binomial distribution with parameters n, p such that $E(\boldsymbol{X}) = 10$ and $Var(\boldsymbol{X}) = 6$. **Find** n and p.

Problem 6:

A certain screw-making machine produces on average 2 defective screws out of 100, and packs them in boxes of 500. **Find** the probability that a box contains 15 defective screws.

Problem 7:

A box of fuses contains 40 fuses, of which 8 are defective. If 5 of the fuses are selected at random and removed from the box in succession without replacement, **what** is the probability that at most two fuses will be defective?

Problem 8:

Given the normally distributed variable $\boldsymbol{X}$ with mean 18 and standard deviation 2.5. **Find**:

(i) $P(\boldsymbol{X} < 15)$

(ii) k such that $P(\boldsymbol{X} < k) = 0.2236$

(iii) k such that $P(\boldsymbol{X} > k) = 0.1814$

(iv) $P(17 < \boldsymbol{X} < 21)$

Problem 9:

Let $\boldsymbol{X}$ be a normal random variable with mean -2 and variance 0.25. **Determine** C such that:

(i) $P(\boldsymbol{X} \geq C) = 0.2$

(ii) $P(-C \leq \boldsymbol{X} \leq -1) = 0.5$

(iii) $P(-2 - C \leq \boldsymbol{X} \leq -2 + C) = 0.9$

(iv) $P(-2 - C \leq \boldsymbol{X} \leq -2 + C) = 0.996$

Problem 10:

Assume the length $\boldsymbol{X}$ in minutes of a telephone conversation is a random variable with the following **PDF**:

$$f(x) = \begin{cases} \frac{1}{5} e^{-x/5} , & x > 0 \\ 0 , & \text{otherwise} \end{cases}$$

Determine:

(i) The mean length $E(\boldsymbol{X})$ of telephone conversation.

(ii) $Var(\boldsymbol{X})$.

(iii) $E(\boldsymbol{X} + 5)^2$.

Problem 11:

In certain experiments, the error made in determining the density of a substance is a random variable having a uniform density with $\alpha = -0.015$ and $\beta = 0.015$. **Find** the probabilities that an error will

(i) Be between -0.002 and 0.003 (ii) Exceed 0.005

Problem 12:

The speeds of motorists passing a point on a motorway are found to be normally distributed with mean 115 km/h and standard deviation 8 km/h. **Find**:

(i) Find the percentage of motorists whose speeds exceed 120 km/h

(ii) Find $\boldsymbol{v}$ such that the speeds of 20% of the motorists do not exceed $\boldsymbol{v}$ km/h

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Problem 13:

The time interval T between thunderstorms in a certain city is exponentially distributed with a mean of 12 days. **Find**:

(i) **CDF** of T (ii) $P(T > 12)$ (iii) $P(5 < T < 8)$

(iv) $P(T > 10 \mid T > 8)$ (v) $P(T > 6 \mid T < 8)$