

Princess Sumaya University of Technology
Statistical Methods for IT / Midterm Exam
Spring 2022

Excellent
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Student's Name:

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(12 marks)

Q#1: Write down the correct answers only in the table below:

Question Number	1	2	3	4	5	6	7	8
Answer	C	C	A	C	B	C	A	C

1) The variable "The area of an apartment" is:

- A) Numerical, Continuous, Interval B) Numerical, Discrete, Ratio
 C) Numerical, Continuous, Ratio D) Numerical, Discrete, Interval

2) A bell-shaped population data has a mean of 23 and a standard deviation of 9. Approximately 95% of the data lie inside the interval:

- A) [-4,50] B) [-14,32] C) [5,41] D) [6,30]

3) Two events A and B are independent if

- A) $P(A/B) = P(A)$ B) $P(A/B) = P(B)$
 C) $P(A \cup B) = P(A) + P(B)$ D) Can't tell

Answer the questions 4-8 regarding the data below:

2, 2, 6, 9, 12, 12, 14, 15, 15, 23, 28, 30

$n=12$

4) The value of Q_1 is:

- A) 6 B) 9 C) 7.5 D) 10

5) The value of Q_2 is:

- A) 12 B) 13 C) 14 D) 15

6) The value of Q_3 is:

- A) 23 B) 15 C) 19 D) 25.5

7) The distribution is:

- A) Right-skewed B) Left-Skewed C) Symmetric

8) The value 28 represents the percentile:

- A) 83.33 B) 70 C) 87.5 D) 73

$$Q_1 = \frac{12 \cdot 25}{100} = \frac{x_3 + x_4}{2} = 7.5$$

$$Q_2 = \frac{12 \cdot 50}{100} = \frac{x_6 + x_7}{2} = 13$$

$$Q_3 = \frac{75 \cdot 12}{100} = \frac{x_9 + x_{10}}{2} = 19$$

$$Q_3 - Q_2 = 6$$

$$Q_2 - Q_1 = 5.5$$

$$\frac{Q_2 - Q_1}{5.5} = \frac{Q_3 - Q_2}{6}$$

$$P = \frac{10.5 \cdot 100}{12}$$

Q#2: Suppose A and B are events such that $P(A) = 0.6$, $P(B) = 0.5$ and $P(A/B) = 0.3$. Find the value of the following: (4 marks)

1) $P(A \cup B)$

~~$P(A \cup B) = P(A \cup \bar{B})$~~

$$\frac{P(A) - P(A \cap B)}{P(B)} = \frac{0.6 - P(A \cap B)}{0.5} = 0.3 \rightarrow 0.6 - P(A \cap B) = 0.15 \rightarrow P(A \cap B) = 0.45$$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.6 + 0.5 - 0.45 = 0.65$$

$$P(\bar{A} \cup \bar{B}) = 1 - P(A \cap B) = 1 - 0.45 = 0.55$$

Sol.
 $P(\bar{A} \cup \bar{B}) = 0.55$

2) $P(\bar{A}/\bar{B})$

$$= \frac{P(\bar{A} \cap \bar{B})}{P(\bar{B})} = \frac{P(\bar{A} \cup \bar{B})}{P(\bar{B})} = \frac{0.55}{0.5} = 1.1$$

Sol.
 $P(\bar{A}/\bar{B}) = 0.7$

Q#3: In a research project on the relation between the gender of 150 science students at college and their degree subject the following data set is collected: (6 marks)

Subject \ Gender	Biology	Physics	Chemistry	
Male	40	16	35	91
Female	15	24	20	59
	55	40	55	150

One student is selected at random. Find the probability that the student is

1) Male or studies biology.

$$P(\text{Male} \cup \text{studies biology}) = P(\text{Male}) + P(\text{study biology}) - P(\text{Male} \cap \text{study biology})$$

$$= \frac{91}{150} + \frac{55}{150} - \frac{40}{150} = \frac{106}{150}$$

2) Female given that she studies physics.

$$P(\text{Female} / \text{physics}) = \frac{P(\text{Female} \cap \text{physics})}{P(\text{physics})} = \frac{\frac{24}{150}}{\frac{40}{150}} = \frac{24}{40}$$

3) Male and doesn't study chemistry.

$$P(\text{Male} \cap \bar{\text{chemistry}}) = P(\text{Male} - \text{chemistry}) = P(\text{Male}) - P(\text{Male} \cap \text{chemistry})$$

$$= \frac{91}{150} - \frac{35}{150} = \frac{56}{150}$$

Q#4: The frequency distribution represents the cost (in cents) for the utilities of states that supply much of their own power is shown below:

Class limits	Frequency	x_m	$f \cdot x_m$	$f \cdot x_m^2$
6-8	12	7	84	588
9-11	16	10	160	1600
12-14	3	13	39	507
15-17	1	16	16	256
18-20	0	19	0	0
21-23	0	22	0	0
24-26	1	25	25	625
	33		324	3576

Find the following:

1) The mean.

(2 marks)

2) The variance.

(3 marks)

3) P_{30} .

(3 marks)

$$1) \text{ Mean } (\bar{x}) = \frac{\sum (f \cdot x_m)}{n} = \frac{324}{33} = 9.82$$

6.5

$$2) \text{ Variance } (s^2) = \frac{n(\sum f \cdot x_m^2) - (\sum f \cdot x_m)^2}{n(n-1)} = \frac{33(3576) - (324)^2}{33 \cdot 32}$$

$$s^2 = \frac{33(3576) - (104976)}{33 \cdot 32} = 12.34$$

$$3) P_{30} = \frac{30 \cdot 33}{100} = 9.9$$

$$\frac{8.5 - y}{11.5 - 8.5} = \frac{12 - 9.9}{28 - 12}$$

$$\frac{8.5 - y}{3} = \frac{2.1}{16}$$

$$\rightarrow \frac{16(8.5 - y)}{16} = \frac{6.3}{16} \Rightarrow$$

Best Wishes

$$8.5y = 39.375$$

$$8.5 - 39.375 = y$$

$$y = 8.11$$

$$P_{30} = 8.11$$

y	upper boundary	cumulative f
	8.5	12
	11.5	28
	14.5	31
	17.5	32
	20.5	32
	23.5	32
	26.5	33

9.9