Name - Tanmay Nemade
BITS id - 2025aa05004@wilp.bits-pilani.ac.in
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Ans- Q1) (i) $X = \{8.2, 10.0, 9.5, 12.1, 11.3, 8.8, 9.0, 7.7, 12.8, 10.6, 9.4, 8.1, 13.5, 11.8\}$

a) Mean $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{142.8}{14} = 10.2$

b) Median $= \frac{x_7 + x_8}{2} = \frac{9.5 + 10.0}{2} = 9.75$

c) Range :- Max value $= 13.5$

Min value $= 7.7$

Range = Max value − Min value

$= 13.5 - 7.7$

$= 5.8$

4) Sample variance $= \frac{\sum (x_i - \bar{x})^2}{n-1}$

$= \frac{6.28 + 4.41 + 4.00 + 1.96 + 1.44 + 0.64 + 0.49 + 0.04 + 0.16 + 1.21 + 2.56 + 3.61 + 6.76 + 10.89}{13}$

$= \frac{44.42}{13}$

$= 3.4169$

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5) SD (Standard Deviation) $= \sqrt{s^2}$

$= \sqrt{3.4169}$

$= 1.848$

6) Interquartile Range (IQR) $= Q_3 - Q_1$

$Q_1 = \frac{1 \times (N+1)}{4}$, $Q_3 = \frac{3 \times (N+1)}{4}$

$= 4^{th}$ $= 11^{th}$

$= 8.8$ $= 11.8$

$IQR = 11.8 - 8.8$

$= 3.0$

(ii) Skewness of data

Mean - 10.2 , Median = 9.95

Mean > Median

So, distribution is positively or Right skewed.

(iii) For outliers -

Lower Fence $= Q_1 - 1.5 \times IQR$

$= 8.8 - (1.5 \times 3.0) = 4.3$

Upper Fence $= Q_3 + 1.5 \times IQR$

$= 11.8 + (1.5 \times 3.0) = 16.3$

From, dataset, no value lies below lower fence or above upper fence. So, there are no outliers.

Name - Tanmay Nemade
Id - 2025aa05004@wilp.bits-pilani.ac.in
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Q.2 Ans → N = 120

To find P(EUS) = ?

E = 35 - Total students in Electrical

S → Total students receiving scolarship

S = 20 + 15 + 10 - 2

= 43 → 2 deducted for students reciving double majors counted twice.

∴ E = 35

S = 45

E∩S = 15 - From problem statement

Using addition rule of probability

EUS = E + S - E∩S

= 35 + 43 - 15

= 63

Calculating $P(EUS) = \frac{EUS}{N} = \frac{63}{120} = \frac{21}{40}$

$P(EUS) = 0.525$

Name - Tanmay Nemade
Id - 2025aa05004@wilp.bits-pilani.ac.in
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Q3 Ans:- N = 4

Patient, Fatigue - No - F
Loss of smell - Yes - L
Sore eyes - No - S

To find, $P(Y = yes \mid F, L, S)$

Patient	Fatigue	Loss of smell	Sore Eyes	Has Flu
P1	Yes	Yes	No	Yes
P2	No	No	Yes	No
P3	Yes	No	No	Yes
P4	No	Yes	Yes	No

$$P(Flu = Yes) = \frac{2}{4} = 0.5$$

$$P(Flu = No) = \frac{2}{4} = 0.5$$

$$P(Feature \mid class) = \frac{N_{ic} + 1}{N_c + K}$$

From, the table, K = 2 i.e. Yes or No

Calculating conditional probabilities for all symptoms given ~~flu~~ flu is yes or no

$$P(F = No \mid Yes) = \frac{0 + 1}{2 + 2} = \frac{1}{4} = 0.25$$

(substituting values from table).

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$P(\text{Loss of smell} = \text{Yes} \mid \text{Yes})$

$$= \frac{1+1}{2+2} = \frac{2}{4} = 0.5$$

$P(S = \text{NO} \mid \text{Yes})$

$$= \frac{2+1}{2+1} = \frac{3}{4} = 0.75$$

$P(F = \text{No} \mid \text{No})$

$$= \frac{2+1}{2+2} = \frac{3}{4} = 0.75$$

$P(L = \text{Yes} \mid \text{No})$

$$= \frac{1+1}{2+2} = \frac{2}{4} = 0.5$$

$P(S = \text{No} \mid \text{No})$

$$= \frac{0+1}{2+2} = \frac{1}{4} = 0.25$$

Using formula to calculate Posterior Possibilities.

$$P(c|d) = P(c) \cdot P(d|c) = P(c) \cdot \prod_{\text{tied}} P(t_i|c)$$

$\therefore P(\text{Flu} = \text{Yes} \mid F = \text{No}, L = \text{Yes}, S = \text{No})$

$$= P(\text{Flu} = \text{Yes}) \cdot P(L = \text{Yes} \mid \text{Yes}) \cdot P(S = \text{No} \mid \text{Yes}) \cdot P(F = \text{No} \mid \text{Yes})$$

$$= 0.5 \times 0.25 \times 0.5 \times 0.75$$

$$= \frac{1}{2} \times \frac{1}{4} \times \frac{1}{2} \times \frac{3}{4} = \frac{3}{64}$$

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Also, $P(Flu = No \mid F = No, L = Yes, S = No)$

$= P(Flu = No) \cdot P(F = No \mid No) \cdot P(L = Yes \mid No) \cdot P(S = No \mid No)$

$= 0.5 \times 0.75 \times 0.5 \times 0.25$

$= \frac{1}{2} \times \frac{3}{4} \times \frac{1}{2} \times \frac{1}{4}$

$= \frac{3}{64}$

Both probabilities are equal, and we cannot reach a conclusion.

Q.4 Ans ⇒

Let stocks be S, Mutual funds be M,
Personal buisness be PB.

$P(M) = 40\% = 0.4$
$P(S) = 20\% = 0.2$
$P(PB) = 1 - (0.4 + 0.2) = 0.4$

Let chances of profit be Pr

$P(Pr \mid M) = 20\% = 0.2$
$P(Pr \mid S) = 10\% = 0.1$
$P(Pr \mid PB) = 15\% = 0.15$

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a) Probability of investor getting profit

$P(P_n) = P(M) \cdot P(P_n|M) + P(S) \cdot P(P_n|S) + P(PB) \cdot P(PB|P_n)$ - using law of total probability

$P(P_n) = (0.4 \times 0.2) + (0.2 \times 0.1) \times (0.4 \times 0.15)$

$= 0.08 + 0.02 + 0.06$

$= 0.16$

b) To find, $P(M|P_n)$, $P(S|P_n)$, $P(PB|P_n)$

- Using Bayes Theorem in all 3 cases.

$$P(M|P_n) = \frac{P(P_n|M) \cdot P(M)}{P(P_n)}$$

$$= \frac{0.4 \times 0.2}{0.16}$$

$$= 0.5$$

$$P(S|P_n) = \frac{P(P_n|S) \cdot P(S)}{P(P_n)}$$

$$= \frac{0.2 \times 0.1}{0.16}$$

$$= 0.125$$

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$$P(PB|Ps) = P(Ps|PB) \cdot P(PB) \over P(Ps)$$

$$= \frac{0.4 \times 0.15}{0.16}$$

$$= 0.375$$

—— 0x0 ——