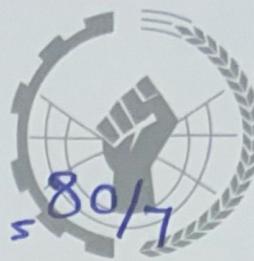


# Statistics Assignment

Fares Ahmed



شركات صلاح أبو دنقلى  
SALAH ABO DONKOL COMPANIES

Q1.

$$\textcircled{1} \text{ Mean} = \frac{5+7+9+12+14+15+18}{7} = 12$$

$$\textcircled{2} \text{ 4th Value} = \text{Median} = 12$$

\textcircled{3} Mode = no mode (no repeated value)

$$\textcircled{4} \text{ Range} = 18 - 5 = 13$$

Q2.

$$\textcircled{1} \sigma^2 = \frac{\sum (X - \bar{X})^2}{n-1} = 21.61$$

$$\textcircled{2} \sigma = \sqrt{\sigma^2} = 4.64$$

$$\textcircled{3} CV = \frac{\sigma}{\bar{X}} = 0.4068$$

Q3.

\textcircled{1} Mean: arithmetic average, best when the data is symmetric.

ex. average salary in a department. (no outliers)

\textcircled{2} Median: Middle value; robust to outliers.

ex. reporting household income (skewed data)

\textcircled{3} Mode: Most frequent value, useful for categorical data.

ex. Most common product sold.

Q4.  $X = \{2, 4, 6, 8\}$        $N = 17$   
 $f = \{3, 5, 7, 2\}$



سالاح ابو دوك  
SALAH ABO DOEK COMPANIES

- ① Weighted mean =  $\frac{3 \times 2 + 5 \times 4 + 7 \times 6 + 8 \times 2}{17} = 4.94$
- ② Weighted Variance = 3.349
- ③ Weighted Std =  $\sqrt{3.349} = 1.83$

Q5.

①  $M = 100$   
 2.  $SE = \frac{\sigma}{\sqrt{n}} = \frac{20}{\sqrt{36}} = 3.33$

Q6.  $Z = \frac{\bar{X} - M}{SE}$

$P(\bar{X} < 95) \rightarrow Z = \frac{95 - 100}{3.33} = -1.5$

•  $P(95 < \bar{X} < 105) \rightarrow$  symmetric about mean,  $Z = \pm 1.5$

$$P = \Phi(1.5) - \Phi(-1.5) = 0.9332 - 0.0668 = 0.866$$

HOT LINE  
16628



Q7.

CLT: for large  $n$ , the Sampling distribution of the Sample Mean  $\bar{X}$  is approximately normal with mean  $M$  and  $SD \sigma / \sqrt{n}$

شرکات صلاح أبو دنقلا SALAH ABO DONKOL COMPANIES

Importance in AI and ML: Allows the use of normal-based inference (hypothesis tests) and justifies approximation for average metrics.

Q8.

- t-distribution with  $df = 24 \times t_{0.975, 24} \approx 2.06$
- Margin =  $t \times \frac{s}{\sqrt{n}} = 2.06 \times \frac{8}{\sqrt{5}} = 3.3$
- 95% CI:  $60 \pm 3.3 = [56.7, 63.3]$

Q9.

- ① Point: Single best estimate  
Interval: Range of plausible values with Conf. level.

ex. Point  $\rightarrow$  reported mean; interval  $\rightarrow$  95% CI for the mean

- ② SD: measures spread of individual obsrvs.  
SE: measures variability of a statistic.

SD  $\rightarrow$  Variation of students scores.

SE  $\rightarrow$  Uncertainty in estimated class mean.

Q10.

- Critical  $t_{0.95, 15} \approx 1.7531$
- Margin =  $1.7531 \times \frac{5}{4} = 2.191$
- 90% CI:  $45 \pm 2.191 = [42.81, 47.19]$



شركات صالح أبو دنقول  
SALAH ABO DONKOR COMPANIES