# Statistics Assignment

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## Q1.

① Mean = $\frac{5+7+9+12+14+15+18}{7} = \frac{80}{7}$

② 4th Value = Median = 12

③ Mode = no mode (no repeated value)

④ Range = 18 − 5 = 13

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## Q2.

① $S^2 = \frac{\Sigma (X-\bar{X})^2}{n-1} = 21.61$

② $S = \sqrt{S^2} = 4.64$

③ $CV = \frac{S}{\bar{X}} = 0.4068$

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## Q3.

① Mean: arithmetic average, best when the data is symetric.
ex. average salary in a department. (no outliers)

② Median: Middle value; robust to outliers.
ex. reporting house hold income (skewed data)

③ Mode: Most frequent value, useful for Categorical data.
ex. Most common Product sold.

Q4. $X = \{2, 4, 6, 8\}$ $N = 17$

$f = \{3, 5, 7, 2\}$

① Weighted mean $= \frac{3\times2 + 5\times4 + 7\times6 + 8\times2}{17} = 4.94$

② Weighted Variance $= 3.349$

③ Weighted Std $= \sqrt{3.349} = 1.83$

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Q5.

① $M = 100$

② $SE = \frac{\sigma}{\sqrt{n}} = \frac{20}{\sqrt{36}} = 3.33$

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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, $Z = \pm 1.5$

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

Q7.

CLT: for large n, the sampling distribution of the sample mean $\bar{X}$ is approximately normal with mean $\mu$ and SD $\sigma/\sqrt{n}$

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

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Q8.

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

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Q9.

① Point: Single best estimate
Interval: Range of plausible values with Conf. level.
ex. Point → reported mean; interval → 95% CI for the mean

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

SD → varation of students scores.
SE → uncertainity in estimated class mean.

Q10.

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