Important Questions on Data Analysis

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1. 3 groups of students perform a weight measuring experiment to give a result. Group 1, Group 2, and Group 3 report 10, 10.1 and 10.5 g of sample respectively. The actual weight of the sample is 10.6 g. Which group's result is more accurate?
A. Group 1
B. Group 1
C. Group 1
D. All are equally accurate

2. Closeness of measurement to the true value is defined as:
A. Accuracy
B. Precision
C. Approx
D. Estimate

3. When a measurement is repeatable and consistent, it is said to have...
A. High precision
B. Low precision
C. High accuracy
D. Low accuracy

4. During the gravimetric analysis Nickel was measured as 0.03g and the actual amount of Nickel present in the complex is 0.04 g, Calculate the relative error.
A. 0.25
B. −0.205
C. −0.25
D. −0.025

5. What will be the error in the result if titrant has uncertainty of ±5% and titrant has an uncertainty of ±1%?
A. 5.09%
B. 5.9%
C. 6.09%
D. 7.09%

6. Calculate the mode form the following data
2, 1, 12, 41, 2, 1, 2, 2, 5
A. 2
B. 1
C. 5
D. 41

7. During the acid base titration a student has the following end points.
10.1, 10.2, 10.1, 10.4, 10.6
Calculate the mean of the experiment.
A. 10.28
B. 10.45
C. 10.39
D. 10.30

8. What is the average deviation from the following data?
10, 15, 20, 25, 30
A. 3
B. 4
C. 5
D. 6

9. Calculate the standard deviation.
1.2, 2.4, 3.6
A. 1.2
B. 2.4
C. 2.2
D. 3.0

10. From the Gaussian distribution curve represented as $e^{-|3x-15|}$. Calculate the avg. value.
A. 5
B. 6
C. 7
D. 4

Answer Key:

1. C
2. A
3. A
4. C
5. A
6. A
7. A
8. D
9. A
10. A

Solutions:

Solution 1. Accuracy is the degree to which the result of a measurement, calculation, or specification conforms to the correct value.
Therefore, the Group 3 group result is more accurate because 10.5 g is closer to 10.6 g.

Solution 2. Accuracy is the degree to which the result of a measurement, calculation, or specification conforms to the correct value. Closeness to true value is defined by accuracy.

Solution 3. If the experiment is repeated to produce the same value, then it is defined by the term precision because repeating of the same value doesn't mean it is accurate. It can be repeated via having a random error which cannot be overcome.

Solution 4. Relative error = $\left[\dfrac{(X_m - X_t)}{X_t}\right]$

$X_m \longrightarrow$ Measured value

$X_t \longrightarrow$ True value
$X_m - X_t = 0.03 - 0.04$
Relative error = $[(X_m - X_t)/ X_t]$
$= \dfrac{(0.03 - 0.04)}{0.04}$
$= -0.25$

Solution 5. % error = $\sqrt{x^2 + y^2}$
$= \sqrt{5^2 + 1^2} = \sqrt{26}$
$= 5.09\%$

Solution 6. Mode is defined as a value that occurs most frequently in a dataset. Here 2 repeated 3 times maximum among the other data. Hence, 2 is the correct answer.

Solution 7. Mean = $\dfrac{\Sigma x_i}{\text{total number of term's}}$

$= \dfrac{[10.1 + 10.2 + 10.1 + 10.4 + 10.6]}{5}$

$= 10.28$

Solution 8. First calculate the mean = $\dfrac{\Sigma x_i}{x}$

$= \dfrac{[10 + 15 + 20 + 25 + 30]}{5} = 20$

Deviation = Mean – observed value

Average of deviation = $\dfrac{1}{n} \Sigma |\text{mean} - x_i|$

$$= \frac{1}{5}[|23 - 10| + |20 - 15| + |20 - 20| + |20 - 25| + |20 - 30|]$$

$$= \frac{1}{5}[10 + 5 + 0 + 5 + 10]$$

$$= 6$$

Solution 9. S → Standard deviation

$$S = \sqrt{\frac{\Sigma(x_i - \overline{x})^2}{N-1}}; \quad \begin{array}{l} x_i \rightarrow \text{Terms} \\ \overline{x} \rightarrow \text{Means value} \end{array}$$

$$\overline{x} = \frac{1.2 + 2.4 + 3.6}{3} = \frac{7.2}{3}$$

$$\overline{x} = 2.4$$

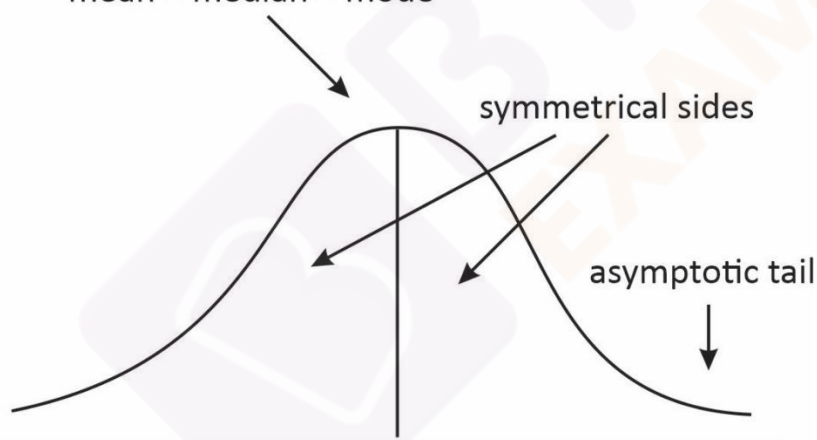$$S = \sqrt{\frac{(1.2 - 2.4)^2 + (2.4 - 2.4)^2 + (2.4 - 3.6)^2}{3 - 1}}$$

$$= \sqrt{\frac{1.44 + 0 + 1.44}{2}}$$

$$S = \sqrt{1.44}$$

S = 1.2

Solution 10.

From the Gaussian distribution curve, we know avg. value is the maximum value of e^{-y}

To get maximum value, put y = 0

∴ 3x − 15 = 0

3x = 15

x = 5

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