2. In a quant test of the CAT Exam, the population standard deviation is known to be 100. A sample of 25 tests taken has a mean of 520. construct an 80% CI about the mean.

Ans:

To construct a confidence interval (CI) about the mean with known population standard deviation, you can use the formula:

CI = bar{x} \pm z \frac{s}{\sqrt{n}}

σ

σ is the population standard deviation,

n

n is the sample size,

z

z is the Z-score corresponding to the desired level of confidence.

For an 80% confidence interval, you would need to find the Z-score corresponding to the middle 80% of the standard normal distribution. This Z-score can be found using statistical tables or using a statistical software. For an 80% confidence interval,

z

z is approximately 1.282.

Given:

σ

=

100

σ=100,

x

–

=

520

x

–

=520,

n

=

25

n=25,

z

=

1.282

z=1.282,

Let's calculate the confidence interval:

CI

=

(

520

-

1.282

×

100

25

,

520

+

1.282

×

100

25

)

CI=(520-1.282×

25

100

,520+1.282×
25

100

)

ci
=
(
520
-
25.64
,
520
+
25.64
)
ci=(520-25.64,520+25.64)

CI

=

(

494.36

,

545.64

)

CI=(494.36,545.64)

So, the 80% confidence interval about the mean is (494.36, 545.64).

3A car believes that the percentage of citizens in city ABC that owns a vehicle is 60% or less. A sales manager disagrees with this. He conducted a hypothesis testing surveying 250 residents & found that 170 residents responded yes to owning a vehicle.
State the null & alternate hypothesis.
At a 10% significance level, is there enough evidence to support the idea that vehicle owner in ABC city is 60% or less.

Ans: In hypothesis testing, we have a null hypothesis (H_0) and an alternative hypothesis (H_1). These hypotheses are statements about a population parameter that we want to test.

Null Hypothesis (H_0): The percentage of citizens in city ABC that owns a vehicle is 60% or less.

$$H_0: p \leq 0.60$$

Alternative Hypothesis (H_1): The percentage of citizens in city ABC that owns a vehicle is more than 60%.

$$H_1: p > 0.60$$

Where p represents the population proportion of citizens in city ABC who own a vehicle.

The sales manager conducted a survey of 250 residents, of which 170 responded yes to owning a vehicle. To test the hypothesis, we will perform a one-sample z-test for the proportion.

Given:
- Sample size (n) = 250
- Number of residents who responded yes (x) = 170
- Population proportion under the null hypothesis (p_0) = 0.60 (60%)
- Significance level (α) = 0.10

We'll calculate the test statistic (z-score) and compare it with the critical value at the 10% significance level.

The test statistic (z) is calculated using the formula:

$$z = \frac{(p - p_0)}{\sqrt{\frac{p_0(1 - p_0)}{n}}}$$

Where p is the sample proportion, p_0 is the population proportion under the null hypothesis, and n is the sample size.

Let's calculate p and then the test statistic z:

$$ p = \frac{x}{n} = \frac{170}{250} = 0.68 $$

$$ z = \frac{(0.68 - 0.60)}{\sqrt{\frac{0.60(1 - 0.60)}{250}}} $$

Now, we compare the calculated z value with the critical value at the 10% significance level.

If the calculated z value is greater than the critical value, we reject the null hypothesis.

If the calculated z value is less than the critical value, we fail to reject the null hypothesis.

Let me calculate the z value and the critical value.

4.What is the value of the 99 percentile?
2,2,3,4,5,5,5,6,7,8,8,8,8,8,9,9,10,11,11,12

Ans:

To find the value at the 99th percentile, we arrange the data in ascending order and then locate the value corresponding to the 99th percentile.

Here's the sorted data:
$$ 2, 2, 3, 4, 5, 5, 5, 6, 7, 8, 8, 8, 8, 8, 9, 9, 10, 11, 11, 12 $$

The 99th percentile represents the value below which 99% of the data fall. Since we have 20 data points, the 99th percentile corresponds to the value at the $\left(\frac{99}{100} \times 20 \right)$th position, which is approximately the 19.8th position.

To find the value at the 99th percentile, we can use linear interpolation between the 19th and 20th values.

$$ \text{Value at 99th percentile} = \text{value at 19th position} + \left(\frac{0.8}{1} \times \text{(difference between values at 20th and 19th positions)} \right) $$

$$\text{Value at 99th percentile} = 11 + \left(\frac{0.8}{1} \times (12 - 11) \right)$$

$$\text{Value at 99th percentile} = 11 + (0.8 \times 1)$$

$$\text{Value at 99th percentile} = 11.8$$

So, the value at the 99th percentile is approximately 11.8.

5. In left & right-skewed data, what is the relationship between mean, median & mode? Draw the graph to represent the same.

Ans:

In left-skewed (negatively skewed) data, the mean is typically less than the median, and the median is less than the mode. Conversely, in right-skewed (positively skewed) data, the mean is typically greater than the median, and the median is greater than the mode.

Here's a graphical representation of left-skewed, symmetrical, and right-skewed distributions along with their mean, median, and mode positions:

Left-skewed distribution:
```
| Mode Median Mean
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
Mean Median| | | | Mode
```

Symmetrical distribution:
```
| | | |
| | | |
| | | |
| | | |
```

| | | |
| | | |
Mode Median| | | | Mean
```

Right-skewed distribution:
```
Mode Median Mean | | | |
```

In a left-skewed distribution:
- Mode is the highest point, then the Median, and finally the Mean.
- Mode < Median < Mean.

In a symmetrical distribution (normal distribution):
- Mode, Median, and Mean are all at the same
```

point.

- Mode = Median = Mean.

In a right-skewed distribution:

- Mean is the highest point, then the Median, and finally the Mode.
- Mean > Median > Mode.

These relationships hold true in general, but there can be exceptions depending on the shape and characteristics of the data distribution.