Question

A null hypothesis claims a population has a mean $\mu = 33$. You decide to run two-tail test on a sample of size $n = 10$ using a significance level $\alpha = 0.05$.

You then collect the sample:

46.6	23.9	43.2	38.2	48.9
32.5	44.5	32	34.5	45.9

Answerlist

- Determine the p-value.
- Do you reject the null hypothesis?

Solution

State the hypotheses.

$$H_0 \quad \text{claims} \quad \mu = 33$$

$$H_A \quad \text{claims} \quad \mu \neq 33$$

Find the mean and standard deviation of the sample.
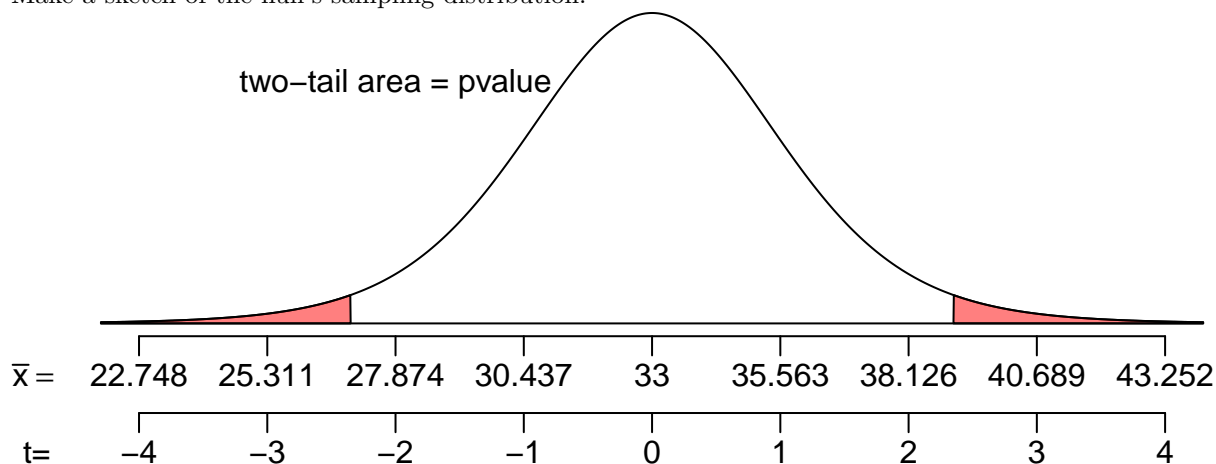
$$\bar{x} = 39.02$$

$$s = 8.106$$

Determine the degrees of freedom.

$$df = 10 - 1 = 9$$

Find the standard error.

$$\sigma_{\bar{x}} = \frac{s}{\sqrt{n}} = \frac{8.106}{\sqrt{10}} = 2.563$$

Make a sketch of the null's sampling distribution.

two–tail area = pvalue

$\overline{x} =$	22.748	25.311	27.874	30.437	33	35.563	38.126	40.689	43.252
t=	−4	−3	−2	−1	0	1	2	3	4

Find the t score.

$$t = \frac{\bar{x} - \mu_0}{\sigma_{\bar{x}}} = \frac{39.02 - 33}{2.563} = 2.35$$

Find the p-value.

$$p\text{-value} = P(|T| > 2.35)$$

We can't get an exact value with our table, but we can determine an interval that contains the p-value. (Look at row with $df = 9$.)

$$P(|T| > 2.4) = 0.04$$

$$P(|T| > 2.26) = 0.05$$

Basically, because t is between 2.4 and 2.26, we know the p-value is between 0.04 and 0.05.

$$0.04 < p\text{-value} < 0.05$$

Compare the p-value and the significance level ($\alpha = 0.05$).

$$p\text{-value} < \alpha$$

Yes, we reject the null hypothesis.

Answerlist

- $0.04 < p\text{-value} < 0.05$
- Yes, we reject the null hypothesis.

Meta-information

extype: num exsolution: 0.0434 exname: binomial exact extol: 0.01