

Task Statistics 2

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Q1:

1:

Null Hypothesis: statement about a population parameter that we assume true unless data doesn't agree with it.

2:

The statement we consider if the null hypothesis were proven false

3:

Rejecting the null hypothesis when it's actually true

4:

Accepting the null hypothesis when it's actually false

5:

It's the value before which we can't accept the null hypothesis, and after which we can accept it

Q2,Q3:

$$Q20 \quad \bar{x} = 4.3 \quad s = 0.6 \quad n = 36, \alpha = 0.05$$

$$H_0: \mu = 4 \quad H_a: \mu > 4$$

$$SE = \frac{s}{\sqrt{n}} = \frac{0.6}{6} = 0.1$$

$$z = \frac{\bar{x} - \mu}{SE} = \frac{4.3 - 4}{0.1} = 3$$

$$\text{for } \alpha = 0.05 \quad z_{0.05} = 1.645$$

$$z = 3 > 1.645 \rightarrow \text{reject } H_0$$

We proved at the 5% level that the drink
increased alertness for 4+ hours

Q38

$$\bar{x} = 4.85 \quad s = 0.3, \quad n = 25 \quad \alpha = 0.01$$

$$H_0: \mu = 5 \quad H_a: \mu \neq 5$$

$$SE = \frac{s}{\sqrt{n}} = \frac{0.3}{5} = 0.06$$

$$t = \frac{\bar{x} - \mu_0}{SE} = \frac{4.85 - 5}{0.06} = -2.5$$

Rejection region (two tailed $\alpha = 0.01$) is $t = \pm 2.797$

$|t| < 2.797 \rightarrow \text{reject } H_0 \rightarrow \text{fails}$

Conclusion: no enough evidence to conclude the true mean
differs from 5cm

Q4:

$$Q4b \quad \bar{x} = 6.7 \quad s = 0.8 \quad n = 40 \quad \alpha = 0.05$$

$$H_0: \mu = 7$$

$$H_a: \mu < 7$$

$$SE = \frac{0.8}{\sqrt{40}} = 0.1264$$

$$t = \frac{6.7 - 7}{0.1264} = -2.372$$

$$df = 39 \quad P\text{-value is } P(Z_{39} \leq -2.372)$$

$$= 0.077$$

$$P = 0.077 < 0.05 \rightarrow \text{reject } H_0$$

then there's evidence that high school students sleep less than 7 hours

Q5:

One-tailed checks for effect in one direction, ex: a drug increases headache.

Two-tailed test: checks for effect in two directions, ex: coffee changes blood pressure(it may increase or decrease)