KEY

AP Statistics Ch. 9 More One-Sample z Tests

1. A company has developed a new AAA battery. Based on years of experience, the company knows that its regular AAA batteries last for 30 hours of continuous use on average with a standard deviation of 2 hours. The company selects an SRS of 50 new batteries and uses them continuously until they are completely drained. The batteries in this sample last an average of 30.48 hours. Is there evidence that the length of time the new batteries last is different than that of the regular batteries?

P: *State what the **parameter** of interest is representing in this problem.*

μ = mean duration of the new batteries

H: *State **hypotheses** in words and symbols.*

H_0: $\mu = 30$ The mean duration of the new batteries is the same as the regular batteries

H_a: $\mu \neq 30$ The mean duration of the new batteries is different than the regular batteries

A: *Verify the **assumptions**/conditions.*

- Random. "The company selects an SRS of 50 new batteries..."
- Normal. Approx. Normal by CLT since $n \geq 30$ $(n = 50)$
- Independent. $n \leq \frac{1}{10} N$ It's safe to assume the company makes at least 500 of these new batteries.
  $50 \leq \frac{1}{10} N$
  $500 \leq N$

N: *Name the appropriate inference procedure.*

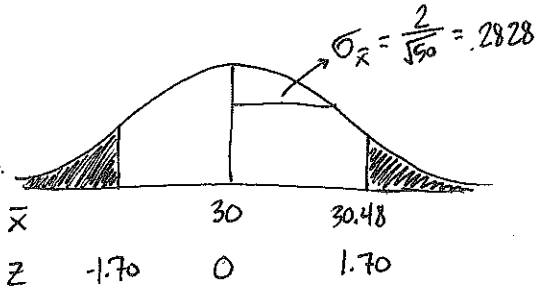
Since σ is known, we will use a one-sample z test

T: *Carry out the selected procedure. Find the **test statistic**.*

$$z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}} = \frac{30.48 - 30}{2/\sqrt{50}} = 1.70$$

O: ***Obtain** the corresponding P-value based on the test statistic and H_a.*

P-value $= 2 \cdot P(z > 1.70) = 2(.0446) = .0892$



M: ***Make** a decision to reject or fail to reject H_0.*

Because the P-value is not significant at the 5% level, we fail to reject H_0.

S: ***State** your conclusion in the context of the problem.*

There is not strong evidence that the mean duration of the new batteries is different than the regular batteries.

2. A company has developed a new AAA battery that is supposed to last longer than its regular AAA battery. Based on years of experience, the company knows that its regular AAA batteries last for 30 hours of continuous use on average with a standard deviation of 2 hours. The company selects an SRS of 50 new batteries and uses them continuously until they are completely drained. The batteries in this sample last an average of 30.48 hours. Is there evidence that the new batteries last longer than the regular batteries?

P: ----------> H_0: $\mu = 30$ The duration of the new batteries is the same

H_a: $\mu > 30$ The duration of the new batteries is greater than the regular batteries

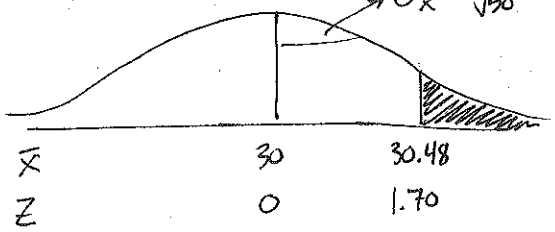
H: } Same as front

A: }

N: }

T: }

$\sigma_{\bar{x}} = \frac{2}{\sqrt{50}} = .2828$



O: P-value = $P(z > 1.70) = .0446$

M: Because the P-value is significant at the 5% level, we reject H_0.

S: There is strong evidence that the new batteries last longer than the regular batteries.