

STAT244 BU Homework 1 Answer Key

3. a. $H_0: \mu = 32$ Specified filling weight
 $H_a: \mu \neq 32$ Overfilling or underfilling exists
- b. There is no evidence that the production line is not operating properly. Allow the production process to continue.
- c. Conclude $\mu \neq 32$ and that overfilling or underfilling exists. Shut down and adjust the production line
5. a. The Type I error is rejecting H_0 when it is true. This error occurs if the researcher concludes that young men in Germany spend more than 56.2 minutes per day watching prime-time TV when the national average for Germans is not greater than 56.2 minutes.
- b. The Type II error is accepting H_0 when it is false. This error occurs if the researcher concludes that the national average for German young men is ≤ 56.2 minutes when in fact it is greater than 56.2 minutes.
15. a. $H_0: \mu \geq 1056$
 $H_a: \mu < 1056$
- b. $z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}} = \frac{910 - 1056}{1600 / \sqrt{400}} = -1.83$
- Lower tail p -value is the area to the left of the test statistic
- Using normal table with $z = -1.83$: p -value = .0336
- c. p -value $\leq .05$, reject H_0 . Conclude the mean refund of “last minute” filers is less than \$1056.
- d. Reject H_0 if $z \leq -1.645$
 $-1.83 \leq -1.645$, reject H_0
33. a. $H_0: \mu \leq 21.6$
 $H_a: \mu > 21.6$
- b. $24.1 - 21.6 = 2.5$ gallons

$$c. \quad t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{24.1 - 21.6}{4.8/\sqrt{16}} = 2.08$$

Degrees of freedom = $n - 1 = 15$

Upper tail p -value is the area to the right of the test statistic

Using t table: p -value is between .025 and .05

Exact p -value corresponding to $t = 2.08$ is .0275

- d. p -value $\leq .05$; reject H_0 . The population mean consumption of milk in Webster City is greater than the National mean.

43. a. $H_0: p \leq .10$

$H_a: p > .10$

- b. There are 13 “Yes” responses in the Eagle data set.

$$\bar{p} = \frac{13}{100} = .13$$

c.
$$z = \frac{\bar{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}} = \frac{.13 - .10}{\sqrt{\frac{.10(1-.10)}{100}}} = 1.00$$

Upper tail p -value is the area to the right of the test statistic

Using normal table with $z = 1.00$: p -value = $1 - .8413 = .1587$

p -value $> .05$; do not reject H_0 .

Eagle should not go national with the promotion.

51. a. Accepting H_0 and letting the process continue to run when actually over - filling or under - filling exists.

- b. Decision Rule: Reject H_0 if $z \leq -1.96$ or if $z \geq 1.96$

and $Z = \frac{(\bar{x} - 16)}{0.8/\sqrt{30}}$ indicates

Accept H_0 if $15.71 < \bar{x} < 16.29$

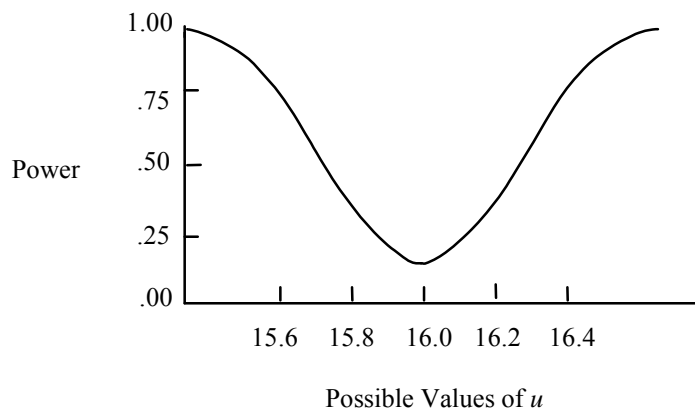
Reject H_0 if $\bar{x} \leq 15.71$ or if $\bar{x} \geq 16.29$

For $\mu = 16.5$

$$P(15.71 < \bar{x} < 16.29 / \mu = 16.5) = P(-5.1 < z < -1.44) = 0.0749$$

c. Power = $1 - .0749 = .9251$

d. The power curve shows the probability of rejecting H_0 for various possible values of μ . In particular, it shows the probability of stopping and adjusting the machine under a variety of underfilling and overfilling situations. The general shape of the power curve for this case is



55.

$$Z_{\alpha} = Z_{0.025} = 1.96 \quad Z_{\beta} = Z_{0.05} = 1.645 \quad \mu_a = 22 \quad \mu_o = 20 \quad \sigma = 10$$

$$n = \frac{(z_{\alpha} + z_{\beta})^2 \sigma^2}{(\mu_o - \mu_a)^2} = \frac{(1.96 + 1.645)^2 (10)^2}{(20 - 22)^2} = 325$$