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Homework 3

Problems: 6.17, 6.27, 6.28, 6.58, 6.59, 6.71, 6.73, 6.99, 6.120, 7.22, 7.23

6.17 $n=340$, $\mu=5.4$, $\sigma=2.3$

a) Margin of error and 95% confidence interval

z-value = 1.96

$\text{Error} = \frac{z \cdot \sigma}{\sqrt{n}} = \frac{1.96 \cdot 2.3}{\sqrt{340}} = 0.244$

$CI = \bar{x} \pm \text{error} = [5.156, 5.644]$

b) Same for 99% CI

z-value = 2.58

$\text{Error} = \frac{2.58 \cdot 2.3}{\sqrt{340}} = 0.321$

$CI = \bar{x} \pm \text{error} = [5.079, 5.721]$

6.27 $n=1200$, $\mu=11.5$, $\sigma=8.3$, $17\% = 0$

a) Find 95% CI

$z=1.96$

$CI = \bar{x} \pm \frac{z \cdot \sigma}{\sqrt{n}} = 11.5 \pm \frac{1.96 \cdot 8.3}{\sqrt{1200}} = [11.03, 11.97]$

b) Does this CI contain 95% of responses?

No this is a range of potential means

c) With many zeros and skew, why normal dist.?

Sample size is very large

6.28 Continuing from 6.27

a) Find μ and σ in minutes

$\mu = 11.5 \cdot 60 = 690$

$\sigma = 8.3 \cdot 60 = 498$

b) Find 95% CI

$z=1.96$

$CI = \bar{x} \pm \frac{z \cdot \sigma}{\sqrt{n}} = 690 \pm \frac{1.96 \cdot 498}{\sqrt{1200}} = [661.823, 718.177]$

c) How could the previous CI be used?

Multiply both bounds by 60

6.58 $H_0: \mu=\mu_0$, $z=1.77$, find p-values

a) $H_A: \mu > \mu_0$

$P(Z \leq -1.77) = 0.384$

b) $H_A: \mu < \mu_0$

$P(Z \leq 1.77) = 0.9616$

c) $H_A: \mu \neq \mu_0$

$2 \cdot P(Z \leq -1.77) = 0.768$

6.59 $H_0: \mu=\mu_0$, $z=-1.96$, find p-values

a) $H_A: \mu > \mu_0$

$P(Z \leq 1.96) = 0.9750$

b) $H_A: \mu < \mu_0$

$P(Z \leq -1.96) = 0.0250$

c) $H_A: \mu \neq \mu_0$

$2 \cdot P(Z \leq -1.96) = 0.0500$

6.71 $\bar{x}=115$, $\sigma_p=30$, $n=25$, $\bar{x}=127.8$

a) $H_0: \mu=115$; $H_A: \mu>115$, find p-value and state conclusion

$Z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \frac{127.8-115}{30/5} = 2.133$

$P(Z \leq -2.133) = 0.0166$

Reject H_0, small p-value

b) What are the 2 assumptions? Which is more important

SRS and normal distribution, SRS being most important

6.73 $n=20$, $\sigma_p=3.0$, $\bar{x}=2.73$, $\bar{X}=0$?

a) State H_0 and H_A for $\bar{X}=0$

$H_0: \mu=0$, $H_A: \mu \neq 0$

b) Find p-value and interpret

$z = \frac{2.73-0}{3/\sqrt{20}} = 4.07$

$p = 2 \cdot P(Z \leq -4.07) = 4.702 \times 10^{-5}$

Reject H_0 due to small p-value, the calculations are different

6.99 | $H_0: \mu = 2403.7$, $H_A: \mu > 2403.7$, $\sigma = 880$, $\bar{x} = 2453.7$, find p-value

a) $n = 100$

$$Z = \frac{2453.7 - 2403.7}{880/\sqrt{100}} = 0.56$$

$P(Z \leq -0.56) = 0.2877$

b) $n = 500$

$$Z = \frac{50}{880/\sqrt{500}} = 1.27$$

$P(Z \leq -1.27) = 0.1020$

c) $n = 2500$

$$Z = \frac{50}{880/\sqrt{2500}} = 2.84$$

$P(Z \leq 2.84) = 0.0023$

6.120 |

x	0	1	2	3	4	5	6
P_0	.1	.1	.2	.1	.1	.1	.3
P_1	.2	.2	.2	.1	.1	.1	.1

H_0: P_0 is right
H_A: P_1 is right

From 1 observation, determine the distribution by rejecting H_0 if its less than or equal to 2

a) Find probability of Type I error

$0.1 + 0.1 + 0.2 = 0.4$

b) Find probability of Type II error

$0.1 + 0.1 + 0.1 + 0.1 = 0.4$

7.22 | $H_0: \mu = 8$, $H_A: \mu > 8$, $n = 16$, $t = 2.15$

a) What are the degrees of freedom?

$df = 15$

b) Find ~~closest~~ critical values from table

[2.131, 2.249]

d) Is $t = 2.15$ significant at 5%? 1%?

Yes for 5%, no for 1%

c) Find closest p-values from table

[0.025, 0.02]

e) Use software to get exact p-value

$p = 0.02415$

7.23 | $H_0: \mu = 40$, $H_A: \mu \neq 40$, $n = 27$, $t = 2.01$

a) What are the degrees of freedom

39

b) Find closest critical values from table

[1.684, 2.021]

c) Find closest p-values from table

[0.05, 0.025]

d) Is $t = 2.01$ significant at 5%? 1%?

No for both

e) Use software to get exact p-value

$p = 0.0514$