Stats 10
Homework 7
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1A

8. 2. sample ··· population

14. a. H_0: $p = 33\%$
H_a: $p < 33\%$

b. $z = \frac{\hat{p} - p}{SE}$
$= \frac{\frac{195}{500} - 0.33}{\sqrt{\frac{0.33 \times (1-0.33)}{500}}}$
≈ -1.90

28. (A), because we want to see whether the rate changed, so two ends should be checked (H_a is $p \neq 88\%$)
(H_0 is $p = 88\%$, corresponds to some $z < 0$)

34. (A) Yes, because it ~~is from one end to a vertical line in the graph plot~~. This is the p-value of a ~~one-tail~~ one-sided alternative hypothesis.
(B) Yes, because it corresponds to some $z > 0$. This is the p-value of a one-sided alternative hypothesis.

36. a. (1) Hypothesize: H_0: $p = 50\%$
H_a: $p > 50\%$
(2) Prepare. Type: one-proportion z-test
Check conditions: The people are randomly polled, so the results are random and independent; $50\% \cdot 2001 = (1-50\%) \cdot 2001 = 1000.5 > 10$, $|1241| > 10$, $2001 - 1241 > 10$; $10 \cdot 2001 = 20010$, and there are more than 20010 people in the population.
(3) Test statistics: $z_{obs} = \frac{\hat{p} - p}{SE} = \frac{\frac{1241}{2001} - 50\%}{\sqrt{\frac{50\%(1-50\%)}{2001}}} = 10.75$
(4) find the p-value: $p\text{-value} = \text{Prob}(z_{obs} > 10.75) \approx 0.00$
(5) Conclusion: $\because p\text{-value} = 0.00 < 0.05$, the null hypothesis is rejected, there are more than half of people favor the death penalty.
b. No, because there are more than half of people favor the death penalty according to (a).
(there is sufficient evidence to suggest that)

38. a. H_0: $p = 0.50$
H_a: $p \neq 0.50$
The accidents are separate, so they are random and independent; $62 > 10$, $100 - 62 = 38 > 10$, $10 \times 100 = 1000$ and there are more than 1000 accidents.
$z_{obs} = \frac{\hat{p} - p}{SE} = \frac{\frac{62}{100} - 0.50}{\sqrt{\frac{0.50 \cdot (1-0.50)}{100}}} = 2.4$
p-value $= P(|z_{obs}| > 2.4) = 0.0082 \times 2 = 0.0164$
$\because 0.0164 < 0.05$
$\therefore$ The H_0 is rejected. There is sufficient evidence to suggest that the percentage of plane crashes due to pilot error is not 50%

b. ii

44. $z_{\frac{16}{30}} = \frac{\frac{16}{30} - 50\%}{\sqrt{\frac{0.50 \cdot (1-0.50)}{30}}} = 0.37$
$z_{\frac{18}{30}} = \frac{\frac{18}{30} - 0.50\%}{\sqrt{\frac{0.50 \cdot (1-0.50)}{30}}} = 1.10$
~~p-value~~ $\therefore$ A is the figure of getting 16 heads and B is the figure of getting 18 heads, because when there are 18 heads, z is larger than when there are 16 heads.

50. The uses the one-proportion z-test, but the conditions are not ~~fo~~ met.

$np = 5 \times 0.50 = 2.50 < 10$,
$n(1-p) = 5 \times (1-0.50) = 2.50 < 10$

56. No, because we still do not know whether H_0 is correct or not. We only know that there is not sufficient evidence to suggest that H_a is plausible.

62. With a larger ~~p-value~~ sample size,
because: p-value $= P(|Z| > |Z_{obs}|)$,

$$Z_{obs} = \frac{\hat{p}_1 - \hat{p}_2 - 0}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n} + \frac{1}{n}\right)}},$$

so with a ~~smaller~~ larger sample size n,
$|Z_{obs}|$ becomes ~~larger~~ smaller, so
p-value $= P(|Z| > |Z_{obs}|)$ becomes larger.

68. $H_0: p_1 = p_2$
$H_a: p_1 < p_2$
Let p_1 be the percentage of people in counseling group being rearrested, and p_2 be the percentage of people in the probation group being rearrested

$p_1 = \frac{55}{230} \approx 23.91\%$, $p_2 = \frac{42}{174} \approx 24.14\%$

$p_1 < p_2$

$$Z_{obs} = \frac{23.91\% - 24.14\% - 0}{\sqrt{\frac{55+42}{230+174}\left(1 - \frac{55+42}{230+174}\right)\left(\frac{1}{230} + \frac{1}{174}\right)}}$$

≈ -0.05

$P(Z < -0.05) = 0.4801$ is the p-value

$\because 0.4801 > 0.05$ $\therefore$ There is not enough evidence to reject H_0

$\therefore$ There is not sufficient evidance to support that counseling lowers the arrest rate.

72. a. two proportion z-test
2 populations: all men and all women leaving the Milwaukee supermarket.

b. one proportion z-test
population: graduates from Oregon University School of Law.

86. No, because the unemployment rates given are already the data of the populations instead of samples.