Assignment 8 Solution

1.

$H_0 : \mu = 26$ vs. $H_1 : \mu < 26$

Test statistic: z = -2.25

Rejection region: z < $-z_{.01} = -2.33$

Conclusion: Don't reject H_0, No, we cannot conclude at $\alpha = .01$ that the social scientist is right

2.

$H_0 : \mu = 45$, $H_1 : \mu > 45$

Test statistic: z = 2.41

p-value = 0.008

Reject H_0. Yes, there is enough statistical evidence at the 10% significance level to conclude that the population mean is greater than 45.

3.

H_0 : The drug is not safe and effective

H_1 : The drug is safe and effective

Type I error： The new drug is not safe and effective, but the government judges it is safe and effective.

Type II error：The new drug is safe and effective, but the government judges it is not safe and effective.

When type I error happens, the government will approve the drug which will result in some serious problem for the people who take the drug.

When type II error happens, the government will disapprove the drug. The pharmaceutical factory need to develop another new drug.

4.

a.

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{52 - 50}{5 / \sqrt{9}} = 1.20$$

p-value = P(Z > 1.20) = 1 – .8849 = .1151

b. The value of the test statistic increases and the p-value decreases.

5.

$H_0: \mu = 50$

$H_1: \mu > 50$

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{59.17 - 50}{10 / \sqrt{18}} = 3.89$$

p-value = P(Z > 3.89) = 0

There is enough evidence to infer that the mean is greater than 50 minutes.

6.

a.

$H_0: \mu = 17.85$

$H_1: \mu > 17.85$

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{19.13 - 17.85}{3.87 / \sqrt{25}} = 1.65$$

p-value = P(Z > 1.65) = 1 – .9505 = .0495

There is enough evidence to infer that the campaign was successful.

b We must assume that the population standard deviation is unchanged.

7.

$\bar{x} \pm z_{\alpha/2}\sigma / \sqrt{n} = 252.38 \pm 1.96(30/\sqrt{400}\,) = 252.38 \pm 2.94$; LCL = 249.44, UCL = 255.32

z-Estimate: Mean

	Times
Mean	252.375
Standard Deviation	32.3435
Observations	400
SIGMA	30
LCL	249.4351
UCL	255.3149

8.

$H_0: \mu = 30000$

$H_1: \mu < 30000$

Z-Test: Mean

	Incomes
Mean	29119.52
Standard Deviation	8460.491
Observations	350
Hypothesized Mean	30000
SIGMA	8000
z Stat	-2.059
P(Z<=z) one-tail	0.0197
z Critical one-tail	1.6449
P(Z<=z) two-tail	0.0394
z Critical two-tail	1.96

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{29{,}120 - 30{,}000}{8{,}000 / \sqrt{350}} = -2.06$$

p-value = (P(Z < –2.06) = .0197

There is enough evidence to infer that the president is correct