

Review for Final Exam
STAT 308

1. A firm's marketing manager believes that total sales for the firm next year can be modeled by using a normal distribution, with a mean of \$2.5 million and a standard deviation of \$300,000.

(a) What is the probability that the firm's sales will exceed \$3 million?

Probability :

(b) What is the probability that the firm's sales will fall within \$150,000 of the expected level of sales?

Probability :

(c) In order to cover fixed costs, the firm's sales must exceed the break-even level of \$1.8 million. What is the probability that sales will exceed the break-even level?

Probability :

(d) Determine the sales level that has only a 9% chance of being exceeded next year.

Sales Level :

2. In recent years, the Japanese have made noticeable inroads into American markets. At the same time Americans have watched their own productivity reach an all-time low. In order to gather some empirical evidence of the difference between Japanese and American management orientation a study of Japanese and American managers was conducted. The Japanese sample included 100 managers and the American sample consisted of 211 managers. The two groups of managers were administered the Sarnoff Survey of Attitudes Towards Life which is designed to measure motivation for upward mobility in three major areas - advancement, money and forward striving. The overall results of the study are given in the following table:

	AMERICAN		JAPANESE		Z value	p-value
	$n_1 = 211$ \bar{x}_1	s_1	$n_2 = 100$ \bar{x}_2	s_2		
Advancement	16.75	4.75	23.92	3.20	-15.66	0.0000
Money	17.30	3.60	18.12	2.90	- 2.15	0.0316
Forward Striving	34.24	5.55	37.79	3.50		

Do the data provide sufficient evidence of a difference in **Forward Striving** between Japanese managers and their American counterparts? Use $\alpha = .01$. Show your work.

- (a) State the null and alternative hypothesis.

H_0 : H_a :

- (b) Calculate the value of the test statistic. Show your workings.

Value of Test Statistic :

- (c) Sketch the rejection region. Mark in the critical value(s).

- (d) Decision is:

(Circle One) :

Interpretation: _____

- (e) In looking at the p-value for the measures of motivation in the area of **Money**, what can you conclude about the difference between American and Japanese managers? Use $\alpha=.05$.

Decision is:

(Circle One) :

Reject H_0 / Not Reject H_0

Reason for decision : _____

- (f) Build a 95% confidence interval for the difference in **Advancement** between Japanese and American managers. Interpret your interval.

95% Confidence Interval :

Interpretation : _____

3. An organization is considering setting up a wildlife park in Dunedin, and decides to carry out a survey to assess the likely level of public support. One of the questions will be : **If it costs \$15.00 for a family to visit the park, would you come at least once a year?**

- (a) This question will only be addressed to the father or mother in families with at least one child. How many families need to be randomly sampled in order to have a margin of error of 5% or less with a confidence level of 90%?

Sample Size :

- (b) Suppose that as a result of the survey 180 fathers ($x_1=180$) out of 300 fathers ($n_1=300$) say "yes" to the question and 350 mothers ($x_2=350$) out of 500 mothers ($n_2=500$) say "yes" to the question. Does this show that the mothers support the idea of the wildlife park more than the fathers? Use $\alpha=0.10$. Show your work.

- i. State the null and alternative hypothesis.

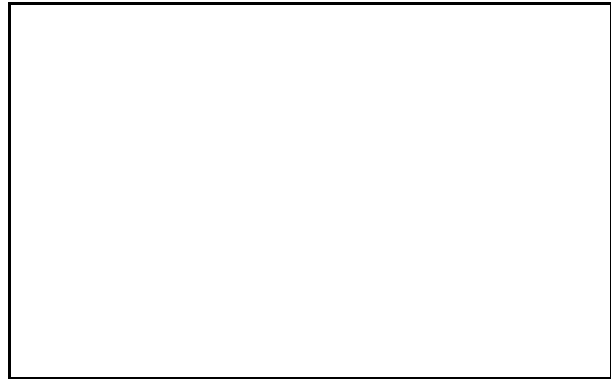
H_0 :

H_a :

ii. Calculate the value of the test statistic. Show your workings.

Value of Test Statistic :

iii. Sketch the rejection region. Mark in the critical value(s).



iv. Decision is:

(Circle One) :

Reject H_0 / Not Reject H_0

Interpretation : _____

(c) Find a 90% confidence interval for the proportion of mothers supporting the wildlife park and interpret it.

90% Confidence Interval :

Interpretation : _____

(d) If the number of mothers sampled is 400 instead of 500, what effect would it have in the width of the interval found in part (c)? Explain (do not do any calculations).

The interval would be : Wider / Narrower / Same / Can't Say (Circle One)

Explain : _____

4. According to a study conducted for the New Zealand Society of Quality Control, overall, 52% of the women surveyed rated New Zealand products "high" in quality. Assuming that the sample survey included 1,000 women, conduct a test to determine whether the true percentage of women who rate New Zealand products "high" in quality is more than 50%. Use $\alpha=0.01$.

(a) State the null and alternative hypothesis.

H_0 : H_a :

(b) Show that the conditions for the assumption of normality hold.

(c) Calculate the value of the test statistic. Show your workings.

Value of Test Statistic :

(d) Find the p-value associated with this test.

p-value :

(e) Based on the answer obtained in part (d), the decision is:

(Circle One) :

Reason for decision : _____

(f) What type of error are you likely to commit in this test?

(Circle One) : Error

FORMULAE

The following formulae may be useful:

$$Z = \frac{\bar{X} - \mu}{\sigma}$$

$$Z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}}$$

$$Z = \frac{\bar{X} - \mu_0}{\sigma / \sqrt{n}}$$

$$\mu_{\bar{x}} = \mu$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$$\hat{p} = \frac{x}{n}$$

$$t = \frac{\bar{X} - \mu_0}{s / \sqrt{n}}$$

$$Z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

$$\bar{x} \pm t_{\alpha/2, n-1} \frac{s}{\sqrt{n}}$$

$$\bar{x} \pm z_{\alpha/2} \frac{s}{\sqrt{n}}$$

$$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$\hat{p} \pm z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$n = \left[\frac{z_{\alpha/2} \sigma}{E} \right]^2$$

$$n = pq \left[\frac{z_{\alpha/2}}{E} \right]^2$$

$$\hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

$$Z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}\hat{q} \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

$$\bar{x}_1 - \bar{x}_2 \pm z_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

$$\bar{x}_1 - \bar{x}_2 \pm t_{\alpha/2, df} s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}, \text{ df} = n_1 + n_2 - 2$$

$$\hat{p}_1 - \hat{p}_2 \pm z_{\alpha/2} \sqrt{\frac{\hat{p}_1 \hat{q}_1}{n_1} + \frac{\hat{p}_2 \hat{q}_2}{n_2}}$$

$$s_p = \sqrt{\frac{(n_1 - 1) s_1^2 + (n_2 - 1) s_2^2}{n_1 + n_2 - 2}}$$

$$\bar{d} = \frac{\sum d_i}{n_d} \quad s_d = \sqrt{\frac{\sum d_i^2 - \frac{(\sum d_i)^2}{n_d}}{n_d - 1}}$$

$$\bar{d} \pm t_{\alpha/2, n-1} \frac{s_d}{\sqrt{n_d}}$$