

Text Exercise Set 25

NAME:

25-1 A 0.05 significance level is chosen for a hypothesis test to see if there is any evidence of a difference in the proportion of farms over 200 acres in size between the northern and southern regions of a state. In a simple random sample of 145 farms from the northern region, 19 are found to be over 200 acres; in a simple random sample of 218 farms from the southern region, 53 are found to be over 200 acres.

(a) Complete the four steps of the hypothesis test by completing the following:

Step 1 H_0 :

H_1 :

$\alpha =$

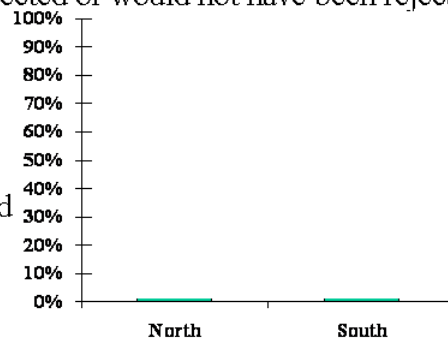
Step 2

Step 3

Step 4

- (b) Verify that the sample sizes are sufficiently large for the z statistic to be appropriate.
- (c) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.
- (d) Decide whether H_0 would have been rejected or would not have been rejected

(e) Complete the construction of the stacked bar chart on the right, and explain why this is an appropriate graphical display.



25-2 A 0.01 significance level is chosen for a hypothesis test to see if there is any evidence that the proportion of teenage male drivers involved in at least one accident is higher than the proportion of teenage female drivers involved in at least one accident in the state. In a simple random sample of 160 teenage male drivers, 36 are found to have been involved in at least one accident; in a simple random sample of 125 teenage female drivers, 21 are found to have been involved in at least one accident.

(a) Complete the four steps of the hypothesis test by completing the following:

Step 1 H_0 :

H_1 :

$\alpha =$

Step 2

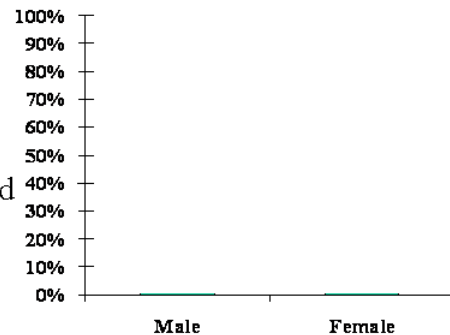
Step 3

Step 4

- (b) Verify that the sample sizes are sufficiently large for the z statistic to be appropriate.
- (c) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(d) with each of the following significance levels: (i) $\alpha = 0.05$, (ii) $\alpha = 0.10$.

(e) Complete the construction of the stacked bar chart on the right, and explain why this is an appropriate graphical display.



25-3 A 0.05 significance level is chosen for a hypothesis test to see if there is any evidence that the proportion of households which use a new toothpaste is higher in Whitown than in Hicksville. In a simple random sample of 230 households from Whitown, 133 are found to use the new toothpaste; in a simple random sample of 285 households from Hicksville, 141 are found to use the new toothpaste.

(a) Complete the four steps of the hypothesis test by completing the following:

Step 1 H_0 :

H_1 :

$\alpha =$

Step 2

Step 3

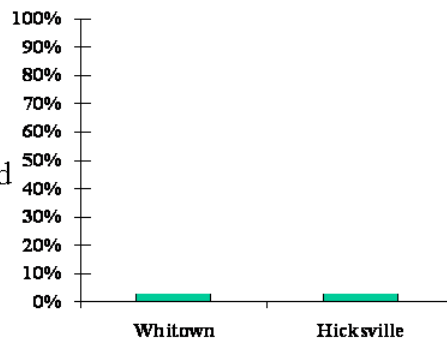
Step 4

(b) Verify that the sample sizes are sufficiently large for the z statistic to be appropriate.

(c) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(d) with each of the following significance levels: (i) $\alpha = 0.01$, (ii) $\alpha = 0.10$.

(e) Complete the construction of the stacked bar chart on the right, and explain why this is an appropriate graphical display.



25-4 A 0.10 significance level is chosen for a hypothesis test to see if there is any evidence of a difference in the proportion of late departures of flights between two airlines, Safeway and Ricketty. In a simple random sample of 600 Safeway flights, 258 departed late; in a simple random sample of 500 Ricketty flights, 283 departed late.

(a) Complete the four steps of the hypothesis test by completing the following:

Step 1 H_0 :

H_1 :

$\alpha =$

Step 2

Step 3

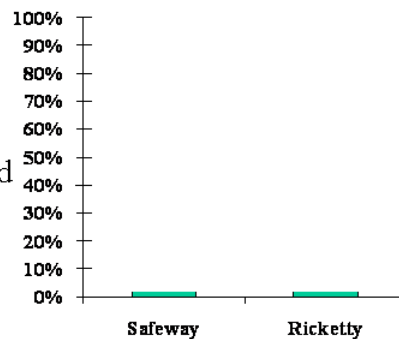
Step 4

(b) Verify that the sample sizes are sufficiently large for the z statistic to be appropriate.

(c) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(d) with each of the following significance levels: (i) $\alpha = 0.01$, (ii) $\alpha = 0.05$.

(e) Complete the construction of the stacked bar chart on the right, and explain why this is an appropriate graphical display.



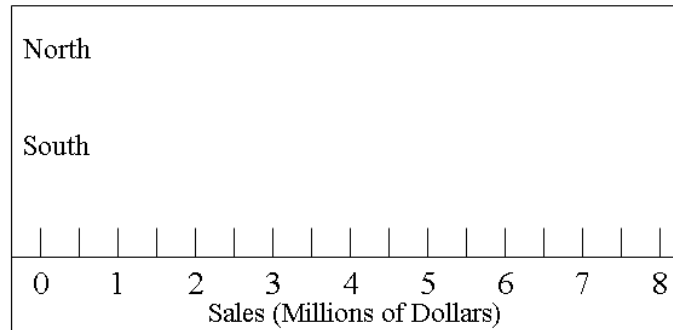
25-5 Sales for the past year at restaurants in a chain known as McDoogles are being studied. A 0.05 significance level is chosen for a hypothesis test to see if there is any evidence of a difference in mean sales between restaurants in the northern and southern parts of the chain. The restaurants selected for the CHAIN DATA, displayed as Data Set 23-1 at the end of Unit 23, are treated as two independent random samples. This data (millions of \$) is as follows:

North 1.8 6.1 3.6 7.5 4.6 8.0 3.3 2.5 8.1 6.7 3.8 5.2 7.8 5.1 7.8 7.7 4.9 8.0 2.5 5.1
 South 0.1 4.0 5.3 4.0 7.4 2.2 2.6 1.7 2.8 2.0

(a) Verify that, when subtracting the mean for the southern part of the chain from the mean for the northern part, the separate two sample t test statistic is $t_{19} = + 2.851$.

(b) Complete the four steps of the hypothesis test by completing the following:

Step 1 H_0 :
 H_1 :
 $\alpha =$



Step 2

Step 3

Step 4

(c) Complete the construction of the box plots above, and comment on whether the two sample t statistic appears to be appropriate.

(d) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(e) Decide whether H_0 would have been rejected or would not have been rejected with each of the following significance levels: (i) $\alpha = 0.01$, (ii) $\alpha = 0.10$.

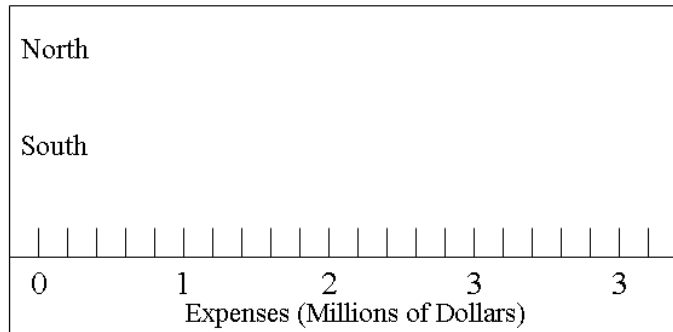
25-6 Expenses for the past year at restaurants in a chain known as McDoogles are being studied. A 0.05 significance level is chosen for a hypothesis test to see if there is any evidence of a difference in mean expenses between restaurants in the northern and southern parts of the chain. The restaurants selected for the CHAIN DATA, displayed as Data Set 23-1 at the end of Unit 23, are treated as two independent random samples. This data (millions of \$) is as follows:

North 1.2 1.9 1.0 0.9 1.6 1.9 0.6 1.0 1.0 1.4 0.7 1.0 1.3 2.4 1.2 1.7 1.0 1.2 2.2 0.8
 South 1.0 2.8 0.3 1.5 3.4 1.6 2.5 1.9 1.4 2.3

(a) Verify that, when subtracting the mean for the southern part of the chain from the mean for the northern part, the separate two sample t test statistic is $t_{12} = -1.848$.

(b) Complete the four steps of the hypothesis test by completing the following:

Step 1 H_0 :
 H_1 :
 $\alpha =$



Step 2

Step 3

Step 4

(c) Complete the construction of the box plots above, and comment on whether the two sample t statistic appears to be appropriate.

(d) Considering the results of the hypothesis test, decide which of the Type I or Type II errors is possible, and describe this error.

(e) Decide whether H_0 would have been rejected or would not have been rejected with each of the following significance levels: (i) $\alpha = 0.01$, (ii) $\alpha = 0.10$.

25-7 Suppose the hypothesis test $H_0: \lambda_Q - \lambda_R = 0$ vs. $H_1: \lambda_Q - \lambda_R > 0$ is performed with $\alpha = 0.05$.

- (a) If you were told that $\bar{p}_Q = 0.47$ and $\bar{p}_R = 0.41$, explain why you do not have enough information to know whether or not H_0 is rejected.

- (b) If you were told that $\bar{p}_Q = 0.41$ and $\bar{p}_R = 0.47$, explain why this is enough information to know that H_0 will not be rejected.

25-8 Suppose the hypothesis test $H_0: \lambda_A - \lambda_B = 0$ vs. $H_1: \lambda_A - \lambda_B < 0$ is performed with $\alpha = 0.05$.

- (a) If you were told that $\bar{p}_A = 0.69$ and $\bar{p}_B = 0.81$, explain why you do not have enough information to know whether or not H_0 is rejected.

- (b) If you were told that $\bar{p}_A = 0.81$ and $\bar{p}_B = 0.69$, explain why this is enough information to know that H_0 will not be rejected.

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