Hypothesis Testing - Practice Exercises
201-401-DW (Winter 2017)
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1. A random sample of 17 wolf litters in Ontario, Canada gave an average of 4.9 wolf pups per litter wiht sample standard deviation 1.0. Another random sample of 6 wolf litters in Finland gave an average of 2.8 wolf pups per litter with sample standard deviaiton 1.2. Assume normality and test the claim that the average litter size of wolf pups in Ontario is greater than the average litter size of wolf pups in Finland at 0.01.

2. Nationally, about 11% of the total US wheat crop is destroyed each year by hail. An insurance company is studying wheat hail damage claims in Weld County, Colorado. A random sample of 16 claims in Weld County gave the following data (% wheat crop lost to hail).

15 8 9 11 12 20 14 11
7 10 24 20 13 9 12 5

Let x be a random variable that represents the percentage of wheat crop in Weld County lost to hail. Assume that x has a normal distribution and ? = 5%. Do these data indicate that the percentage of wheat crop lost to hail in Weld County is different (either way) from the national mean of 11%? Use level of significance 0.01.

3. Six sets of identical twins were randomly selected from a population of identical twins. One child was taken from each pair to form an experimental group. These children participated in a program designed to promote creative thinking. The other child from each pair was part of the control group that did not participate in the program to promote creative thinking. At the end of the program, a creative problem-solving test was given with the results shown in the following table:

Twin Pair	A	B	C	D	E	F
Experimental group	53	35	12	25	33	47
Control group	39	21	5	18	21	42

Higher scores indicate better performance in creative problem solving. Do the data support the claim that the program of the experimental gruop did promote creative problem solving? Use significance 0.01.

4. Are most student government leaders extroverts? According to Myers-Briggs estimates, about 82% of college student government leaders are extroverts. Suppose that a Myers-Briggs personality preference test was given to a random sample of 73 student government leaders attending a large national leadership conference and that 56 were found to be extroverts. Does this indicate that the population proportion of extrovers is different from 82%. Use significance 0.01.

5. Slab avalanches studied in Canada have an average thickness of 67cm. The ski patrol at Vail, Colorado, is studying slab avalanches in its region. A random sample of avalanches in spring gave the following thicknesses (in cm):

59	51	76	38	65	54	49	62
68	55	64	67	63	74	65	79

Assume the slab thickness has an approximately normal distribution. Use a 1% level of significance to test the claim that the mean slab thickness in the Vail region is different from that in Canada.

6. A study considered the question “Are you a registered voter?” Accuracy of response was confirmed by a check of city voting records. Two methods of survey were used: a face-to-face interview and a telephone interview. A random sample of 93 people was asked the voter registration question face-to-face. Seventy-nine respondents gave accurate answers (as verified by city records). Another random sample of 83 people was asked the same question during a telephone interview. Seventy-four repondents gave accurate answers. Test the claim that there is a difference in proportion of accurate responses from face-to-face interview compared with telephone interviews. Use 5% significance.

7. A random sample of 46 adult coyotes in a region of northern Minnesota showed the average age to be 2.05 years, with sample standard deviation s = 0.82 years. However, it is thought that the overall population mean age of coyotes is 1.75 years. Do the sample data indicate that coyotes in this region of northern Minnesota tend to live longer than the average of 1.75 years. Use significance ? = 0.01.

Answers

1. Two sample t-test for difference of means, df = 7, $H_0 : \mu_{ont} - \mu_{fin} = 0$, $H_a : \mu_{ont} - \mu_{fin} > 0$, reject H_0, there is sufficient evidence to say that average litter size of wolf pups in Ontario is greater than the average litter size in Finland.

2. Use two-tailed z-test, fail to reject H_0, it seems that the average hail damage to wheat crops matches the national average.

3. d = experimental – control, $H_0 : \mu_d = 0$, $H_a : \mu_d > 0$, reject H_0, there is sufficient evidence to indicate that the program of the experimental group promoted creative problem solving.

4. Two-tailed proportion test (use z-table), fail to reject H_0, the evidence is insufficient to indicate that the population proportion of extroverts among college student government leaders is different from 82% .

5. Use two-tailed t-test, df = 15, fail to reject H_0, the sample evidence does not support the claim that the average thickness of slab avalanches in Vail is different from that in Canada.

6. Two sample proportion test, (use z-table), $H_0 : p_{face} - p_{tel} = 0$, $H_a : p_{face} - p_{tel}$? 0, fail to reject H_0, there is insufficient evidence to conclude that the proportion of accurate responses from face-to-face interviews differs from the proportion for telephone interviews.

7. Use right-tailed t-test, df = 45, reject H_0, the sample data indicate that the average age of the Minnesota region coyotes is higher than 1.75 years.