

Class Practice on Hypothesis Testing #4 – Homework Problems

1. The college bookstore tells prospective students that the average cost of its textbooks is \$52 with a standard deviation of \$4.50. A group of smart statistics students thinks that the average cost is higher. In order to test the bookstore's claim against their alternative, the students will select a random sample of size 100. Assume that the mean from their random sample is \$52.80. Perform a hypothesis test (6 step procedure outlined in class) at the 5% level of significance and state your decision.

2. A certain chemical pollutant in the Genesee River has been constant for several years with mean $\mu = 34$ ppm (parts per million) and standard deviation $\sigma = 8$ ppm. A group of factory representatives whose companies discharge liquids into the river is now claiming that they have lowered the average with improved filtration devices. A group of environmentalists will test to see if this is true at the 4% level of significance. Assume that their sample of size 50 gives a mean of 32.5 ppm. Perform a hypothesis test (6 step procedure outlined in class) at the 4% level of significance and state your decision.

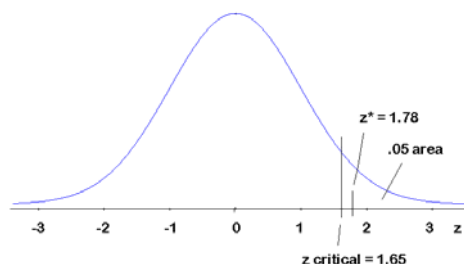
3. A manufacturing process produces ball bearings with diameters that have a normal distribution with known standard deviation of .04 centimeters. Ball bearings with diameters that are too small or too large are undesirable. In order to test the claim that $\mu = 0.50$ centimeters, perform a two-tailed hypothesis test at the 5% level of significance. Assume that a random sample of 25 gave a mean diameter of 0.51 centimeters. Perform a hypothesis test (6 step procedure outlined in class) and state your decision.

Brief Solutions

1. $H_0: \mu = 52$

$H_a: \mu > 52$

$\alpha = .05, z_{critical} = 1.65$



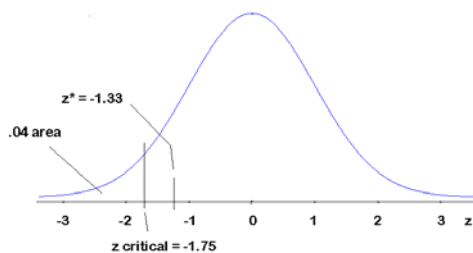
$z^* = 1.78$ (This test statistic lies in the Rejection Region for H_0 .)

Reject H_0 . Based on this one sample of size 100 with a one-tailed test on the right and $\alpha = .05$, it seems as though we can not believe the bookstore's claim that the mean cost of textbooks is \$52. The higher value of \$52.80 is probably not due to random chance.

2. $H_0: \mu = 34$

$H_a: \mu < 34$

$\alpha = .04, z_{critical} = -1.75$



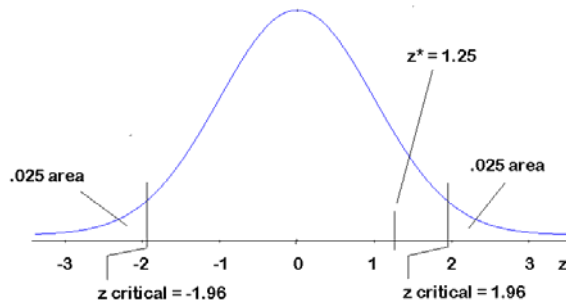
$z^* = -1.33$ (This test statistic lies in the Acceptance Region for H_0 .)

Do not Reject H_0 . Based on this one sample of size 50 with a one-tailed test on the left and $\alpha = .04$, it seems as though we can not believe the factories claim that the mean amount of pollutant is less than 34 ppm. The lower value of 32.5 ppm is probably due to random chance.

3. $H_0: \mu=0.5$

$H_a: \mu \neq 0.5$

$\alpha = .05$, $z_{critical} = \pm 1.96$, because there is 2.5% of the area in *each* tail.



$z^* = 1.25$ (This test statistic lies in the Acceptance Region for H_0 .)

Do not Reject H_0 . Based on this one sample of size 25 with a two-tailed test and $\alpha = .05$, it seems as though we can believe the claim that the mean diameter still is 0.5 centimeters. The larger value of 0.51 centimeters is probably due to random chance.