

## Answer on Question #59241 – Math – Statistics and Probability

### Question

1. Rumor has it, going to class and reading the textbook will improve your chances of doing well (i.e., better than average) in stat's class. You notice that there are 4 students that always go to class and review the textbook every day. To determine if the rumors are true, you ask those 4 students their marks on the quiz and find that their scores are:

60

60

61

67

Based on these scores and the knowledge that the exam scores are normally distributed ( $\mu=50$ ,  $\sigma=10$ ), what can you conclude about going to every class and reviewing the textbook everyday on marks on the quiz? Do you reject or fail to reject the null hypothesis? What is the effect size? Assuming  $\alpha=0.05$ , state your hypotheses for a one-tailed test, the critical test statistic, your conclusion, and show all your work.

### Solution

The null hypothesis  $H_0$ : the students who always go to class and review the textbook every day have the same mean exam marks as the population mean.

The alternative hypothesis  $H_A$ : the students who always go to class and review the textbook every day have mean exam marks higher than the population mean.

$H_0: \mu = 50$ ;

$H_A: \mu > 50$  (right-tailed test).

Since the population exam scores are normally distributed and the population standard deviation is known, one should use z-test. Further we shall apply critical value approach.

Critical value can be obtained either from the standard normal table or by using the technology. For the right-tailed test at the significance level of 0.05, the critical value is  $z_c = 1.645$ .

The sample mean:

$$\bar{x} = \frac{\sum x}{n};$$

$$\bar{x} = \frac{60+60+61+67}{4} = 62$$

Cohen's  $d$  is a measure of effect size. It is equal to

$$d = \left| \frac{\bar{x} - \mu}{\sigma} \right| = \left| \frac{62 - 50}{10} \right| = \frac{12}{10} = 1.2.$$

Because Cohen's  $d > 0.8$ , the effect size is large.

Test statistic:

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}};$$
$$z = \frac{62 - 50}{10 / \sqrt{4}} = 2.40.$$

Conclusion: since the test statistic is more extreme than the critical value, we reject the null hypothesis.

Interpretation: at the 0.05 level of significance, there is enough evidence to support the claim that the students who always go to class and review the textbook every day have mean exam marks higher than the population mean.