

### Answer on Question #51153 – Math – Statistics and Probability

4. For the previous problem 51152, The sample of 100 screws turns out to have mean = 15.005mm. (Still testing against = 15 mm and assuming population standard deviation is known to be 0.04 mm.) Does this give evidence that the lengths of the screws are longer than 15 mm? Explain using the important values you use to make your decision.

#### Solution:

In given task we need to state the hypotheses and identify the claim. We apply the following algorithm of solution.

The usual process of hypothesis testing consists of four steps.

1. Formulate the null hypothesis  $H_0$  (commonly, that the observations are the result of pure chance) and the alternative hypothesis  $H_a$  (commonly, that the observations show a real effect combined with a component of chance variation).

2. Identify a test statistic that can be used to assess the truth of the null hypothesis.

3. Compute the P-value, which is the probability that a test statistic at least as significant as the one observed would be obtained assuming that the null hypothesis were true. The smaller the P-value, the stronger the evidence against the null hypothesis.

4. Compare the p-value to an acceptable significance value  $\alpha$  alpha (sometimes called an alpha value). If  $p \leq \alpha$  alpha, that the observed effect is statistically significant, the null hypothesis is ruled out, and the alternative hypothesis is valid.

We start with the state the test hypothesis.

$$H_0: \mu = 15 \text{ mm}$$

$$H_a: \mu > 15 \text{ mm}$$

$$\alpha = 0.05$$

Now we apply the z statistic.

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

We substitute the find values into the formula.

$$z = \frac{15 - 15.005}{\frac{0.04}{\sqrt{100}}} = \frac{-0.005}{0.004} = -1.25$$

We obtained the following result.

$$z = -1.25$$

From the table for z values we can determine the value of probability. Thus, we can note the following: since the P-value, equal to 0.1056, is greater than the significance level 0.05, we cannot reject the null hypothesis, which states that the average length of the screws is 15 mm.

Thus we can conclude that we have not enough evidence, that the length of the screws is longer than 15 mm.