1. A machine in an assembly line will need adjusting if the tolerance of a part it produces is above or below a certain tolerance value = 56.00 that the machinist considers reasonable. You will adjust the machine only if you consider the machine is "out of control". The mean tolerance for 13 measurements was 51.22 with a standard error of 3.18.

a. Identify the null and alternative hypothesis

Null hypothesis: $\mu = 56$ **(mean tolerance value doesn't differ from the reasonable one, which is 56)**

Alternative hypothesis: $\mu \neq 56$ **(mean tolerance value differs from 56).**

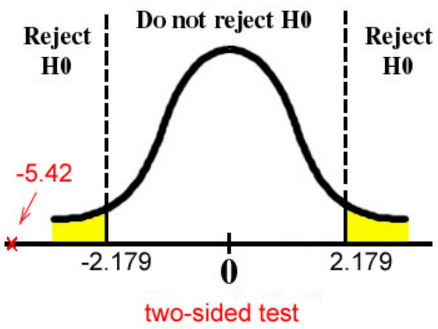
b. Perform a two-sided test at the 5% significance level

The value of the test statistic is

$$t = \frac{51.22 - 56}{3.18/\sqrt{13}} = -5.4197$$

The critical values for the two-sided test are

$\pm t_{0.025}$ **with 12 degrees of freedom. According to the Student t-distribution table** $t_{0.025} = 2.179$.



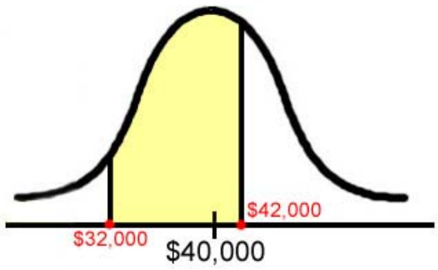
c. State whether you accept or reject the null hypothesis

As far as the value of the test statistic falls in the rejection region, we reject the null hypothesis. Thus we conclude that at the 5% significance level the data provide sufficient evidence to conclude that the mean tolerance value differs from the reasonable value of 56.

2. The yearly commissions per salesperson employed by a manufacturer of light machinery average \$40,000 with a standard deviation of \$5,000. What percent of the salespersons earn between \$32,000 and \$42,000?

60.06%
39.94%
34.13%
65.87%
81.66%
none of the above

The task is to find the shaded below area:



So we first make a transition to a standard normal curve.
z-score computations:

x=42,000 → $z = \dfrac{42,000 - 40,000}{5,000} = 0.4$

x=32,000 → $z = \dfrac{32,000 - 40,000}{5,000} = -1.6$

The area which lies between two z-scores (-1.6 and 0.4) under the standard normal curve is

0.6554-0.0548 = 0.6006, which is 60.06%.

So the correct answer is given in the first option, 60.06%.

3) The manufacturer of the X-15 steel-belted radial truck tire claims that the mean mileage the tire can be driven before the tread wears out is 60,000 miles. The standard deviation of the mileage is 5,000 miles. The Crosset Truck Company bought 48 tires and found that the mean mileage for their trucks is 59,500 miles. Is Crosset's experience different from that claimed by the manufacturer at the 0.05 significance level?

(a) State the null hypothesis and the alternative hypothesis. (b) State the decision rule.
(b) Compute the value of the test statistic. (d) What is your decision regarding H_0?
(e) What is the p-value? Interpret it.

(a) Null hypothesis: $\mu = 60,000 \text{ miles}$ **(mean mileage the tire can be driven before the thread wears out doesn't differ from the claimed mileage of 60,000 miles)**
Alternative hypothesis: $\mu \neq 60,000 \text{ miles}$ **(mean mileage the tire can be driven before the thread wears out differs from the claimed mileage of 60,000 miles).**
(b) We will perform the two-sided test, the critical values are $\pm z_{0.025} = \pm 1.96$**. So, if the test statistic comes to be less than -1.96 or greater than 1.96 we reject the null hypothesis, if it comes to lie between -1.96 and 1.96 then we do not reject the null hypothesis.**
(c) The test statistic is

$$z_0 = \frac{59,500 - 60,000}{5,000/\sqrt{48}} = -0.6928$$

(d) As far as -0.6928 lies between -1.96 and 1.96 then we DO NOT reject the null hypothesis and thus we accept it. This means that at the 5% significance level the data do not provide sufficient evidence to conclude that the mean mileage the tire can be driven before the thread wears out differs from 60,000 miles.
(e) The p-value for z_0 **given above includes the area which lies to the left from -0.6928 and to the right from 0.6928. It's 0.4902 (approximately). Small p-values provide evidence against the null hypothesis, larger p-values do not. In our case the p-value we obtained is greater than the significance level of 0.05. So we accept the null hypothesis.**