Quick Questions 13  Large Sample Hypothesis Testing

I. Complete the following chart and questions.
A. Type I error is called ___ alpha ___ error.
B. Type II error is called ___ beta ___ error.
C. When z calculated from sample data is beyond the critical value (less than for left tail problems and greater than for right tail problems), the null hypothesis is ____ rejected ____.
D. True

II. Make these tests using the 5-step approach to hypothesis testing.
A. A light bulb warranty states average bulb life is at least 20,000 hours. A sample of 49 bulbs had an average life of 19,000 hours. The population standard deviation is 1,400 hours. Test the warranty claim to the .01 level of significance.
   1. $H_0 : \mu \geq 20,000$ hours  $H_1 : \mu < 20,000$ hours
   2. $\alpha = .01$ (Note: $H_1$ points to the area of rejection)
   3. $\bar{x}$ is the test statistic.
   4. The critical value of $z$ for .01 is -2.33.
      If the test $Z$ is beyond -2.33, reject $H_0$.
   5. Apply the decision rule.

   $$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{19,000 - 20,000}{1,400/\sqrt{49}} = \frac{-1,000}{200} = -5.0$$

   Reject $H_0$ because -5.0 is beyond -2.33.

   The claim is not substantiated.

B. Average weekly manufacturing earnings were $480 and the standard deviation was $72. A recent sample of 36 resulted in a mean of $450. The standard deviation has not changed. Test to the .05 level whether average weekly earnings changed.

   1. $H_0 : \mu = 480$ and $H_1 : \mu \neq 480$
   2. $\alpha = .05$
   3. $\bar{x}$ is the test statistic.
   4. The critical value of $z$ for $\alpha + z = .05/2 = .025$ is $\pm 1.96$.
      If the test $Z$ is beyond $\pm 1.96$, reject $H_0$.
   5. Apply the decision rule.

   $$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{450 - 480}{72/\sqrt{36}} = \frac{-30}{12} = -2.50$$

   Reject $H_0$ because -2.50 is beyond -1.96.

   Weekly earnings changed.