1) Suppose that a machine is supposed to produce bearings with an average diameter of 0.50 inches. A random sample of 25 bearings is taken off the production line to determine if the manufacturing process is in control. The machine is said to be in control if the average diameter of the 25 bearings is between 0.495 inches and 0.505 inches. If the actual diameter, X of a single bearing is a normal random variable with mean $\mu = 0.502$ inches and standard deviation $\sigma = 0.003$ inches, what is the probability that the procedure will signal that the process OUT OF control?

2) A physical fitness association is including a mile run in its secondary school fitness test for boys. The time for this for this event, X, is a normally distributed random variable with mean $\mu = 450$ seconds and a standard deviation of 40 seconds. The slowest 10% of the boys are designated as "poor". What is the minimum time that a boy will have to take to be classified as "poor".

3) A major car manufacturer wants to test a new engine to determine if it meets the required pollution standards. The mean emission of all the engines must be less than 20 ppm of carbon. A random sample of 35 new engines shows an average emission of 19.25 ppm of carbon. We assume that the standard deviation of the emissions from the new engines the same as that of the old engines and is equal to 4.5 ppm. Do the data provide sufficient evidence to prove that the new engines meet the pollution standards. Also Calculate a 90% confidence interval for the true mean emission from all the new engines. INTERPRET THE INTERVAL.

4) With the gasoline prices going up, drivers are using their automobiles less frequently. It is claimed that automobiles in the US are driven less than the old average of 15,000 miles per year. To test the claim, a random sample of 100 drivers from across the US is taken and asked to record the number of miles they drive per year. The sample gave an average of $\bar{X}=14,687$ miles and sample standard deviation, $s = 3,458$ miles.

Calculate a 95% confidence interval for $\mu$, the true average distance per year being driven by drivers in the US. Interpret the interval in words. Based on the interval, what can you conclude about the statement that drivers are using their automobiles less frequently?