

**Answer on Question #55447 – Math – Statistics and Probability**

a company that manufactures rivets believes the shear strength of the rivets they manufacture follows a normal model with a mean breaking strength of 950 pounds and a standard deviation of 40 pounds

**a)** what percentage of rivets selected at random will break when tested under a 900 pound load?

**b)** you're trying to improve the rivets and want to examine some that fail. use a simulation to estimate how many rivets you might need to test in order to find three that fail at 900 pounds or below.

**Solution**

**a)** Let  $X$  follow a normal model with a mean of 950 pounds and a standard deviation of 40 pounds. Let  $Z$  follow a normal model with a mean of 0 pound and a standard deviation of 1 pound.

$$\text{Then } Z = \frac{X-950}{40}.$$

Calculate

$$P(X < 900) = P\left(\frac{X - 950}{40} < \frac{900 - 950}{40}\right) = P\left(Z < \frac{900 - 950}{40}\right) = P(Z < -1.25)$$

From z-table obtain that

$$P(Z < -1.25) = 0.1056,$$

hence

$$P(X < 900) = 0.1056$$

10.56% of rivets selected at random will break when tested under a 900 pound load.

**b)** Proportion of rivets that fail at 900 pounds or below is  $0.1056 = \frac{3}{n}$ .

So sample size is determined by

$$n = \frac{3}{0.1056} = 28.4 \text{ round up to } 29.$$

**Answer: a)** 10.56%; **b)** 29.