

Recall the example from the previous quiz: an aid agency is packaging bags of seeds for distribution in a community where farmers have been unable to save enough seeds to plant crops this year. Rather than just giving them food, the agency wants to give each farmer a 10 pound bag of seed. The bags are filled automatically by a machine. Suppose that the actual weight of a randomly chosen bag varies according to a normal distribution with a mean of 10.2 lbs and a standard deviation of .5 lbs. For this quiz, consider a collective of 10 farmers, each of whom receive a randomly chosen bag of grain from the aid agency.

1. What is the probability that the average of the ten bags received will be less than 10 lbs?

$$P(\bar{X} < 10) = .5 - .3962 = .1038$$

$$\frac{10 - 10.2}{\frac{0.5}{\sqrt{10}}} = -1.26 \rightarrow 0.3962$$

2. What is the probability that the average of the ten bags received will be more than 10.2 lbs?

$$P(\bar{X} < 10) = .5 - .0000 = .5000$$

$$\frac{10.2 - 10.2}{\frac{0.5}{\sqrt{10}}} = 0.00 \rightarrow 0.0000$$

3. What is the probability that the average of the ten bags received will be between 10 and 10.5 lbs?

$$P(10 < \bar{X} < 10.5) = .3962 + .4713 = .8675$$

$$\frac{10 - 10.2}{\frac{0.5}{\sqrt{10}}} = -1.26 \rightarrow 0.3962$$

$$\frac{10.5 - 10.2}{\frac{0.5}{\sqrt{10}}} = 1.90 \rightarrow 0.4713$$

4. If the values found by the aid agency are correct, how heavy would the average need to be for the group to have an average that is in the top 10% of all averages for ten randomly chosen bags?

$$\text{Top 10\%: } .5 - .10 = .4000 \rightarrow Z = 1.28 = \frac{\bar{X} - 10.2}{\frac{0.5}{\sqrt{10}}} \rightarrow \bar{X} = 10.4024 \text{ lbs.}$$