

Solution

We have $n = 12$, which is the sample size. We have $p = 0.95$ (from 95%), and we have $q = 0.05$ (from $q = 1 - p$). Using $n = 12$, $p = 0.95$, and $q = 0.05$, Formulas 5-6 and 5-8 can be applied as follows:

$$\mu = np = (12)(0.95) = 11.4$$

$$\sigma = \sqrt{npq} = \sqrt{(12)(0.95)(0.05)} = 0.754983 = 0.8 \text{ (rounded)}$$

For random groups of 12 adults, the mean number of people who recognize the brand name of McDonald's is 11.4 people, and the standard deviation is 0.8 people.

Example 2 Unusual Outcomes

From Example 1 we see that for groups of 12 randomly selected people, the mean number of people who recognize the brand name of McDonald's is $\mu = 11.4$ people, and the standard deviation is $\sigma = 0.8$ people.

- For groups of 12 randomly selected people, use the range rule of thumb to find the minimum usual number and the maximum usual number of people who recognize the brand name of McDonald's.
- In one particular randomly selected group of 12 people, is 12 an unusually high number of people who recognize the brand name of McDonald's?

Solution

- With $\mu = 11.4$ people and $\sigma = 0.8$ people, we use the range rule of thumb as follows:

$$\begin{aligned}\text{maximum usual value: } \mu + 2\sigma &= 11.4 + 2(0.8) = 13 \text{ people} \\ \text{minimum usual value: } \mu - 2\sigma &= 11.4 - 2(0.8) = 9.8 \text{ people}\end{aligned}$$

For groups of 12 randomly selected people, the number who recognize the brand name of McDonald's should usually fall between 9.8 and 13. (Actually, with 12 people selected, the maximum usual value cannot exceed 12, so the range of usual values is between 9.8 and 12.)

- Because 12 falls within the range of usual values (from 9.8 to 13), we conclude that 12 is *not an unusually high number* of people who recognize the brand name of McDonald's (assuming that the recognition rate is 95%).

Example 3 XSORT Method of Gender Selection

The Chapter Problem includes results from the XSORT method of gender selection. Among 945 births, there were 879 girls born to parents using the XSORT method.

- Assuming that boys and girls are equally likely, use Formulas 5-6 and 5-8 to find the mean and standard deviation for the numbers of girls born in groups of 945 babies (as in the Chapter Problem).
- Use the range rule of thumb to find the minimum usual number and the maximum usual number of girls born in groups of 945 births, assuming that boys and girls are equally likely.
- The Chapter Problem described the XSORT method of gender selection that resulted in 879 girls born in a group of 945 babies. Is 879 girls unusually high?