

## Answer on Question #61151 – Math – Statistics and Probability

### Question

According to a survey, 52% of males between the ages of 18 and 24 lived at home in 2005 (unmarried college students living in dorms are counted as living at home). A survey is administered at a community college to 19 randomly selected male students between the ages of 18 and 24 years, and 16 of them respond that they live at home.

**(a)** Based on the sample of 19 students, what proportion of community college males live at home?

**(b)** Find the probability that 16 or more out of 19 community college male students live at home, assuming that the proportion who live at home is 52%.

**(c)** What might you conclude from this result?

### Solution

**(a)** Based on the sample of 19 students, what proportion of community college males live at home?

$$p = 16/19 = 0.8421 \text{ or } 84.21\%.$$

**(b)** Find the probability that 16 or more out of 19 community college male students live at home, assuming that the proportion who live at home is 52%.

Using binomial distribution with parameters  $n = 19$ ,  $p = 0.52$ ,  $q = 1 - p = 0.48$ ,

$$P_n(k) = C_n^k p^k q^{n-k}, \text{ where } C_n^k = \frac{n!}{k!(n-k)!}, n! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot (n-1) \cdot n.$$

The probability that 16 or more out of 19 community college male students live at home is

$$\begin{aligned} P(16 \text{ or more}) &= P_{19}(16) + P_{19}(17) + P_{19}(18) + P_{19}(19) = \\ &= C_{19}^{16} p^{16} q^3 + C_{19}^{17} p^{17} q^2 + C_{19}^{18} p^{18} q^1 + C_{19}^{19} p^{19} q^0 = 0.0037. \end{aligned}$$

**(c)** What might you conclude from this result?

The sample of 19 might be biased or the original survey is no longer valid.