Answer on Question #46950 – Math – Statistics and Probability

Question:

In a litter of seven kittens, three are female. You pick two kittens at random.

a. Create a probability model for the number of male kittens you get.

b. Find the expected number of males.

c. Find the standard deviation for your distribution.

Solution:

a. There are total $\binom{7}{2} = 21$ ways to pick 2 kitties from 7.

We can pick 0, 1, or 2 male kittens. Denote the random variable of male kitties picked as X.

P(X = 0) = P(pick 2 female kittens)=$\frac{\binom{3}{2}}{21} = \frac{3}{21} = \frac{1}{7}$.

P(X = 1) = P(pick 1 male and 1 female kitten) = $\frac{\binom{3}{1}\binom{4}{1}}{21} = \frac{3*4}{21} = \frac{4}{7}$.

P(X = 2) = P(pick 2 male kittens) = $\frac{\binom{4}{2}}{21} = \frac{6}{21} = \frac{2}{7}$.

So, for X:

x_i	0	1	2
$p_i = P(X = x_i)$	1/7	4/7	2/7

b. The expected number of males is $E(X) = 0 * \frac{1}{7} + 1 * \frac{4}{7} + 2 * \frac{2}{7} = \mathbf{\frac{8}{7}}$.

c. $E(X^2) = 0 * \frac{1}{7} + 1 * \frac{4}{7} + 4 * \frac{2}{7} = \frac{12}{7}$. Then

The standard deviation is $\sigma(X) = (E(X^2) - E(X)^2)^{1/2} = \left(\frac{12}{7} - \frac{64}{49}\right)^{1/2} = \left(\frac{20}{49}\right)^{1/2} = \mathbf{\frac{2\sqrt{5}}{7}}$.