Question

Suppose that a box contains 7 red balls and 3 blue balls. 5 balls are selected at random, without replacement. Let X denote the number of red balls that will be obtained. Determine the pmf of X and sketch it.

Answer

The possible values of X are 2, 3, 4 and 5. By considering possible combinations of the five balls selected, it can be seen that

$$P\{X = k\} = \frac{\binom{7}{k}\binom{3}{5-k}}{\binom{10}{5}}, \quad k = 2, 3, 4, 5$$

and so

$$P\{X = 2\} = \frac{1}{12}, \ P\{X = 3\} = \frac{5}{12}, \ P\{X = 4\} = \frac{5}{12}, \ P\{X = 5\} = \frac{1}{12}.$$