

Assignment 1

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- 1) A box contains 10 red marbles, 20 blue marbles and 30 green marbles. 5 marbles are drawn from the box, what is the probability that

- a) all will be blue?
b) atleast one will be green?

Solution: Consider the random variables X_1, X_2, X_3, X_4, X_5 as described in the table 1.

RV	Values	Description
X_1	$\{0, 1, 2\}$	1st draw - 0: red, 1: blue, 2: green
X_2	$\{0, 1, 2\}$	2nd draw - 0: red, 1: blue, 2: green
X_3	$\{0, 1, 2\}$	3rd draw - 0: red, 1: blue, 2: green
X_4	$\{0, 1, 2\}$	4th draw - 0: red, 1: blue, 2: green
X_5	$\{0, 1, 2\}$	5th draw - 0: red, 1: blue, 2: green

TABLE 1: Random variables X_1, X_2, X_3, X_4, X_5

Total marbles in the box are 60.

- a) The probability that all drawn marbles are blue is given by the expression,

$$\Pr(X_1 = 1, X_2 = 1, X_3 = 1, X_4 = 1, X_5 = 1) \quad (0.0.1)$$

$$= \frac{{}^{20}C_5}{{}^{60}C_5} \quad (0.0.2)$$

- b) The probability that the drawn marble contains atleast 1 green. This even is complement to the event where no marble drawn is green, Its probability is given by,

$$\Pr(X_1 \in \{0, 1\}, X_2 \in \{0, 1\}, X_3 \in \{0, 1\}, X_4 \in \{0, 1\}, X_5 \in \{0, 1\}) \quad (0.0.3)$$

$$= \frac{{}^{30}C_5}{{}^{60}C_5} \quad (0.0.4)$$

Hence the required probability is given by,

$$1 - \frac{{}^{30}C_5}{{}^{60}C_5} \quad (0.0.5)$$