

Assignment 1

AI1110: Probability and Random Variables
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10.15.2.5: Question. A jar contains 24 marbles, some are green and others are blue. If a marble is drawn at random from the jar, the probability that it is green is $\frac{2}{3}$. Find the number of blue balls in the jar.

Answer: 8.

Solution:

Let X be a Bernoulli Random Variable ($X \sim \text{Bernoulli}(p)$) corresponding to the colour of the marble

Given Information		
Definition	Variable	Given values
No of Green marbles	a	
No of Blue marbles	b	
Total no of marbles	a+b	24
Probability that marble is Green	p	$\frac{2}{3}$
Random Variable Declaration		
Random Variable	Value of Random Variable	Event
X	0	Blue marble is drawn
	1	Green marble is drawn

From the above table,

$$\Pr(X = 1) = \frac{2}{3} \quad (1)$$

$$p = \frac{2}{3} \quad (2)$$

$$\Pr(X = 0) = 1 - p \quad (3)$$

$$= 1 - \frac{2}{3} \\ = \frac{1}{3} \quad (4)$$

We know that

$$\Pr(X = 0) = \frac{b}{a + b} \quad (5)$$

$$\frac{b}{a + b} = \frac{1}{3} \quad (6)$$

$$\frac{b}{24} = \frac{1}{3} \\ \implies b = 8 \quad (7)$$

Therefore, There are 8 Blue marbles in the jar.