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 ($X \sim Bernoulli(p)$) 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,

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

$$p = \frac{2}{3} \tag{2}$$

$$\Pr(X = 0) = 1 - p \tag{3}$$

$$= 1 - \frac{2}{3}$$

$$= \frac{1}{3} \tag{4}$$

We know that

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

$$\frac{b}{a+b} = \frac{1}{3} \tag{6}$$

$$\frac{b}{24} = \frac{1}{3}$$

$$\implies b = 8 \tag{7}$$

Therefore, There are 8 Blue marbles in the jar.