Assignment 1

AI1110: Probability and Random Variables
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12.13.6.13: Question. A bag consists of 10 balls each marked with one of the digits 0 to 9. If four balls are drawn successively with replacement from the bag, what is the probability that none is marked with the digit 0?

Answer: $\left(\frac{9}{10}\right)^4$.

Solution:

Variable	Definition	Value
X	Number of balls marked with the digit 0 among the 4 balls drawn	0
p	Probability of drawing a ball marked 0 each time	$(\frac{1}{10})$
n	number of trials	4

TABLE 0: Parameters and variables used

Here, we need that none of the balls are marked 0, i.e. $X = 0$

By binomial mass distribution function :

$$n = 4 \tag{1}$$

$$p = \frac{1}{10} \tag{2}$$

$$\mathbf{Pr}\left(X = 0\right) = {}^{n}C_0 \times (p)^0 \times (1-p)^4 \tag{3}$$

$$\mathbf{Pr}\left(X = 0\right) = {}^{4}C_0 \times \left(\frac{1}{10}\right)^0 \times \left(\frac{9}{10}\right)^4$$

$$\mathbf{Pr}\left(X = 0\right) = \times 1 \times \left(\frac{9}{10}\right)^4$$

$$\mathbf{Pr}\left(X = 0\right) = \left(\frac{9}{10}\right)^4$$