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

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

By binomial mass disribution function :

$$n = 4 \text{.....(1)}$$

$$p = \frac{1}{10} \text{.....(2)}$$

$$\Pr(X = 0) = {}^{n}C_0 \times (p)^0 \times (1-p)^4 \text{.....(3)}$$

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

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

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