

# 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:**

Parameters used and their values :

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	$\left(\frac{1}{10}\right)$
$n$	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 :

$$n = 4 \quad (1)$$

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

$$\Pr(X = 0) = {}^nC_0 \times (p)^0 \times (1 - p)^4 \quad (3)$$

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

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

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