# AI1103: Assignment 1

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Download all python codes from

https://github.com/tanmaygar/AI−Course/blob/main/Assignment1/codes/Assignment1.py

and latex-tikz codes from

https://github.com/tanmaygar/AI−Course/blob/main/Assignment1/Assignment1.tex

## Problem Statement:

An urn contains 25 balls of which 10 balls bear a mark 'X' and the remaining 15 bear a mark 'Y'. A ball is drawn at random from the urn, its mark is noted down and it is replaced. If 6 balls are drawn in this way, find the probability that:

1) all will bear 'X' mark.
2) not more than 2 will bear 'Y' mark.
3) at least one ball will bear 'Y' mark.
4) the number of balls with 'X' mark and 'Y' mark will be equal.

## Solution:

Let X be the number of balls which have 'X' mark on them
Using the expression of binomial distribution

$$P(X = r) = \binom{n}{r} p^r q^{n-r} \tag{0.0.1}$$

$$P(X \geq k) = \sum_{r=k}^{n} \binom{n}{r} p^r q^{n-r} \tag{0.0.2}$$

$$P(X \leq k) = \sum_{r=0}^{k} \binom{n}{r} p^r q^{n-r} \tag{0.0.3}$$

$$n = 6, \quad p = 0.4, \quad q = 0.6 \tag{0.0.4}$$

| n | 6 | 6 | 6 | 6 |
|---|---|---|---|---|
| Condition | $P(X = 6)$ | $P(X \geq 4)$ | $P(X \leq 5)$ | $P(X = 3)$ |
| Value | 0.004096 | 0.1792 | 0.995904 | 0.27648 |
| Case | $(i)$ | $(ii)$ | $(iii)$ | $(iv)$ |

TABLE: Probabilities of each case