CHAPTER 1: BINOMIAL DISTRIBUTION

* If $X \sim B(n,p)$ then $P(X=x) = {}^{n}C_{x}\, p^{x}(1-p)^{n-x}$
  where n is the number of trials and p is the probability of success.

* Conditions : ① Fixed number of trials
  ② Constant probability of success
  ③ Only two outcomes: success or failures
  ④ Trials are independent

* $E(X) = np$
* $Var(X) = np(1-p)$
* For $P(X \leq x)$ you can use the tables provided p is at most 0.5, and both n and p have values that appear in the table

* Special cases: ① $X \sim B(10, 0.12)$ Find $P(X \leq 1)$

$P(X \leq 1) = P(X=0) + P(X=1)$ (since 0.11 does not appear in the tables)

$$= {}^{10}C_0\, 0.12^0\, 0.88^{10} + {}^{10}C_1\, 0.12^1\, 0.88^9$$

$$= 0.658$$

② $X \sim B(15, 0.70)$ Find $P(X \leq 3)$

Since probability of success is more than 0.5, consider instead the number of failures

i.e. $Y \sim B(15, 0.30)$

$X + Y = 15$ (since successes and failures add up to number of trials)

$$\Rightarrow P(X \leq 3) = P(15 - Y \leq 3)$$
$$= P(12 \leq Y)$$
$$= P(Y \geq 12)$$
$$= 1 - P(Y \leq 11) = 1 - 0.9999 = 0.0001$$