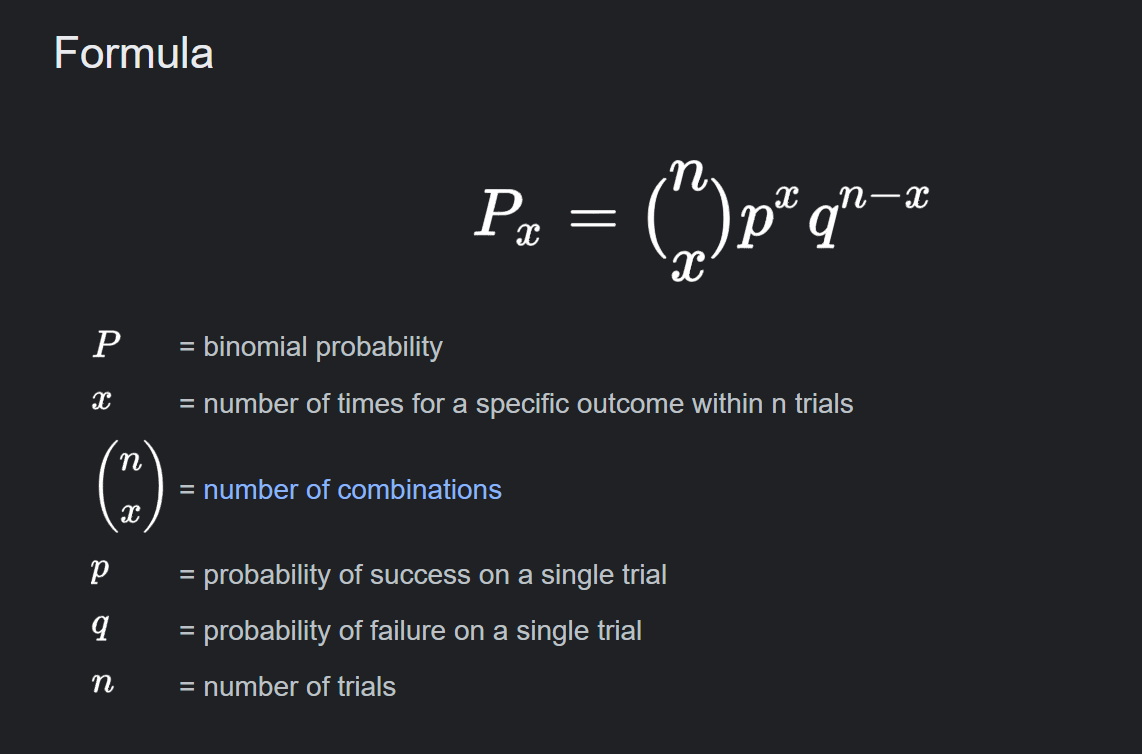
1. Suppose you play the game of shooting. You shoot 6 times, each time to a different enemy, and each shot has a 10% chance of success.

1) What's the probability of killing two enemies out of six?

2) What's the probability of killing at most three enemies out of six?

3) What's the maximum number of enemies we can kill with 90% probability?

2. Suppose there is only one enemy and two success shots can kill the enemy. Each shot has a 10% chance of success. How many times do you need to shoot to kill the enemy with 80% probability?



Q1

1. P(X = k) = (n choose k) \* p^k \* (1 - p)^(n - k)  
   C(6, 2) = 6! / (2! \* (6 - 2)!) = 15  
   P(X = 2) = 15 \* (0.1^2) \* (0.9^(6 - 2))  
   P(X = 2) = 15 \* 0.01 \* 0.6561  
   P(X = 2) = 9.8415%
2. P(X = 0):

P(X = 0) = (6 choose 0) \* (0.1^0) \* (0.9^6) = 1 \* 1 \* 0.531441 = 0.531441

P(X = 1):

P(X = 1) = (6 choose 1) \* (0.1^1) \* (0.9^5) = 6 \* 0.1 \* 0.59049 = 0.354294

P(X = 2):

P(X = 2) = (6 choose 2) \* (0.1^2) \* (0.9^4) = 15 \* 0.01 \* 0.6561 = 0.98415

P(X = 3):

P(X = 3) = (6 choose 3) \* (0.1^3) \* (0.9^3) = 20 \* 0.001 \* 0.729 = 0.01458

P(X ≤ 3) = 0.531441 + 0.354294 + 0.98415 + 0.01458 ≈ 1.884465

P(X ≤ k) = ∑[i=0 to k] [(n choose i) \* p^i \* (1 - p)^(n - i)]  
For k = 0:

P(X ≤ 0) = (6 choose 0) \* (0.1^0) \* (0.9^6) ≈ 0.531441

For k = 1:

P(X ≤ 1) = (6 choose 0) \* (0.1^0) \* (0.9^6) + (6 choose 1) \* (0.1^1) \* (0.9^5) ≈ 0.531441 + 0.354294 ≈ 0.885735

For k = 2:

P(X ≤ 2) = (6 choose 0) \* (0.1^0) \* (0.9^6) + (6 choose 1) \* (0.1^1) \* (0.9^5) + (6 choose 2) \* (0.1^2) \* (0.9^4) ≈ 0.885735 + 0.098415 ≈ 0.98415

At this point, P(X ≤ 2) is approximately 0.98415, which is less than 90%. To exceed 90%, you need to go to k = 3:

For k = 3:

P(X ≤ 3) = (6 choose 0) \* (0.1^0) \* (0.9^6) + (6 choose 1) \* (0.1^1) \* (0.9^5) + (6 choose 2) \* (0.1^2) \* (0.9^4) + (6 choose 3) \* (0.1^3) \* (0.9^3) ≈ 0.98415 + 0.01458 ≈ 0.99873

Q2

1. For k = 1:

P(X < 1) = 1 - P(X = 1) = 1 - (0.90^0 \* 0.10) = 0.10

For k = 2:

P(X < 2) = 1 - P(X = 1) - P(X = 2) = 1 - (0.90^0 \* 0.10) - (0.90^1 \* 0.10) = 0.19

For k = 3:

P(X < 3) = 1 - P(X = 1) - P(X = 2) - P(X = 3) = 1 - (0.90^0 \* 0.10) - (0.90^1 \* 0.10) -(0.90^2 \* 0.10) = 0.271

Now, for k = 4:

P(X < 4) = 1 - P(X = 1) - P(X = 2) - P(X = 3) - P(X = 4) = 1 - (0.90^0 \* 0.10) - (0.90^1 \* 0.10) - (0.90^2 \* 0.10) - (0.90^3 \* 0.10) = 0.3439