Problem :

A relatively good baseball player has a steady, multi-year batting average of .275.

What is the probability that in the next game, this batter will go 0 – for – 4 ?

How likely is he to go 1 – for – 4 ; 2 – for – 4 ; 3 – for – 4 ; 4 – for - 4 ?

Solution :

The batter will either get a hit, or will not. Therefore, this is a binomial distribution problem. The probability has this form …

$$P(n, x, p) = \frac{n!}{x!\,(n-x)!} * p^x * (1-p)^{n-x}$$

where for our problem,

n = number of at-bats (n = 4)

x = number of hits (x = 0; x = 1; x = 2; x = 3; or, x = 4)

p = probability of a hit (p = .275)

<u>Probability of Going 0 – for – 4</u> :

$$P(n, x, p) = \frac{n!}{x!\,(n-x)!} * p^x * (1-p)^{n-x}$$

$$P(4; 0; 0.275) = \frac{4!}{0!\,(4-0)!} * (.275)^0 * (1-.275)^{4-0}$$

$$P(4; 0; 0.275) = (1) * (1) * (.725)^4$$

$$P(4; 0; 0.275) = 0.28 \quad \longrightarrow \quad \mathbf{28\%}$$

Probability of Going 4 – for – 4 :

$$P(4;4;0.275) = \frac{4!}{4!\,(4-4)!} * (.275)^4 * (1 - .275\,)^{4-4}$$

$$P(4;4;0.275) = (1) * (.275)^4 * (.725)^0$$

$$P(4;0;0.275) = \ 0.006 \quad -\!\!\rightarrow \quad \mathbf{1}\%$$

Probability of Going 1 – for 4 :

You work it out. Show that the probability is **42%**

Probability of Going 2 – for 4 :

You work it out. Show that the probability is **24%**

Probability of Going 3 – for 4 :

You work it out. Show that the probability is **6%**