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Objective:

Demonstrating a Bernoulli process. Specifically, WAP to find the probability that in case of a Bernoulli process,

1. Out of n trials k are successes
2. kth success occurs at the nth trial

Theory:

If X is a Binomial random variable, we denote this X ~ Bin(n, p), where p is the probability of success in a given trial. A binomial random variable has the following properties:

$$P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$$

Suppose the probability of hitting a target with a rock is 0.4 and missing a target is 0.6 and assume that each throw is independent. A person throws the rock 20 times we have to find probability -

1. He hits the target exactly 13 times
2. He hits the target 7th time at the 14th throw

Code:

```
import math

n = 20
k = 13
p = 0.4

ans = math.factorial(n)
```

```
ans = ans/math.factorial(n-k)
ans = ans/math.factorial(k)
ans = ans*pow(p,k)*pow(1-p,n-k)
print("Probability of hitting the target exactly",k,"times is:",ans)

n = 14
k = 7

temp = math.factorial(n-1)/(math.factorial(n-k) * math.factorial(k-1))
temp = temp * pow(p,k-1) * pow(1-p,n-k) * p
print("Probability of hitting target 7th time at 14th throw is:",temp)
```

```
Probability of hitting the target exactly 13 times is: 0.014563052125736147
Probability of hitting target 7th time at 14th throw is: 0.07870384963584003
```

Result:

The probability calculated are as follows:

```
print("Probability of hitting the target exactly",k,"times is:",ans)
print("Probability of hitting target 7th time at 14th throw is:",temp)
```

```
Probability of hitting the target exactly 7 times is: 0.014563052125736147
Probability of hitting target 7th time at 14th throw is: 0.07870384963584003
```

Discussion:

Computed the probability in case a Bernoulli process, (a) out of n trials k are successes, (b) kth success occurs at the nth trial.