assignment_3_solution

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```r
# Q1.Roll 12 dice simultaneously, and let X denotes the number of 6's that appear.
# Calculate the probability of getting 7, 8 or 9, 6's using R. (Try using the function pbinom;
# If we set S = {get a 6 on one roll}, P(S) = 1/6 and the rolls constitute Bernoulli
# trials; thus X = binom(size=12, prob=1/6) and we are looking for P(7 <= X <= 9).
size<-12
prob<-1/6
p_to9<-pbinom(9,size,prob)
p_to7<-pbinom(6,size,prob)
p1<-p_to9-p_to7
p1
```

```
## [1] 0.001291758
```

```r
p_9<-dbinom(9,12,1/6)
p_8<-dbinom(8,12,1/6)
p_7<-dbinom(7,12,1/6)
p2<-p_9+p_8+p_7
p2
```

```
## [1] 0.001291758
```

```r
p3<-diff(pbinom(c(6,9),size,prob))
p3
```

```
## [1] 0.001291758
```

```r
# Q2.Assume that the test scores of a college entrance exam fits a normal distribution.
# Furthermore, the mean test score is 72, and the standard deviation is 15.2. What is
# the percentage of students scoring 84 or more in the exam?
mean<-72
sd<-15.2
res<-pnorm(84,mean,sd,lower.tail=FALSE)
res
```

```
## [1] 0.2149176
```

```r
# Q3.On the average, five cars arrive at a particular car wash every hour. Let X count the
# number of cars that arrive from 10AM to 11AM, then X = Poisson(lamda = 5). What is
# probability that no car arrives during this time. Next, suppose the car wash above
# is in operation from 8AM to 6PM, and we let Y be the number of customers that
# ppear in this period. Since this period covers a total of 10 hours, we get that Y =
# Poisson(lamda = 5×10 = 50). What is the probability that there are between 48 and 50
# customers, inclusive?
p0<-dpois(0,5)
p0
```

```
## [1] 0.006737947
```

```r
lambda<-50
p1<-ppois(50,lambda)-ppois(47,lambda)
p1
```

```
## [1] 0.1678485
```

```r
a<-diff(ppois(c(47,50),lambda))
a
```

```
## [1] 0.1678485
```

```r
# Q4.Suppose in a certain shipment of 250 Pentium processors there are 17 defective processors. A
# quality control consultant randomly collects 5 processors for inspection to determine whether
# or not they are defective. Let X denote the number of defectives in the sample. Find the probability
# of exactly 3 defectives in the sample, that is, find P(X = 3).
n=250
m=233
k=5
n=17
h_1<-dhyper(3,17,233,5)
h_1
```

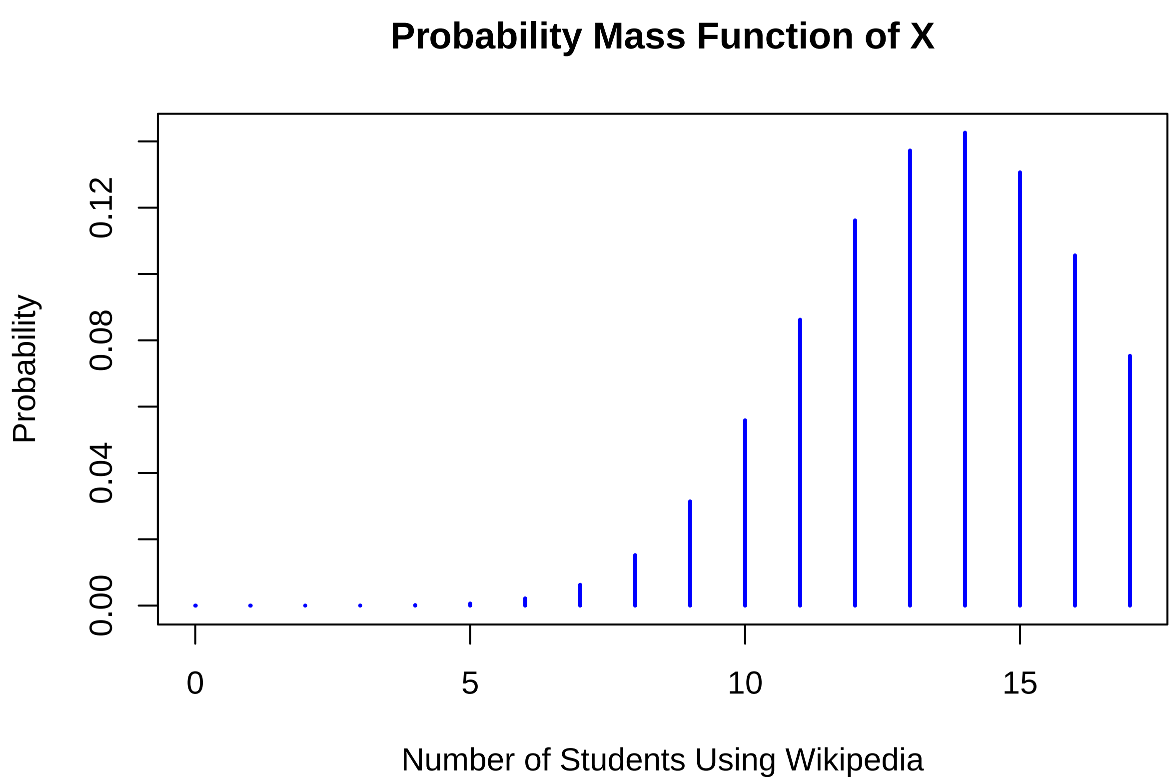
```
## [1] 0.002351153
```

```r
# Q5.A recent national study showed that approximately 44.7% of college students have
# used Wikipedia as a source in at least one of their term papers. Let X equal the
# number of students in a random sample of size n = 31 who have used Wikipedia as a source.
# a)How is X distributed? (b) Sketch the probability mass function. (c) Sketch the cumulative
# distribution function. (d) Find mean, variance and standard deviation of X.
x<-0:n
prob<-0.447
n<-31
p0<-dbinom(x,n,prob)
print(data.frame(X=x,P.X=p0))
```

```
##     X          P.X
## 1   0 1.057984e-08
## 2   1 2.651082e-07
```

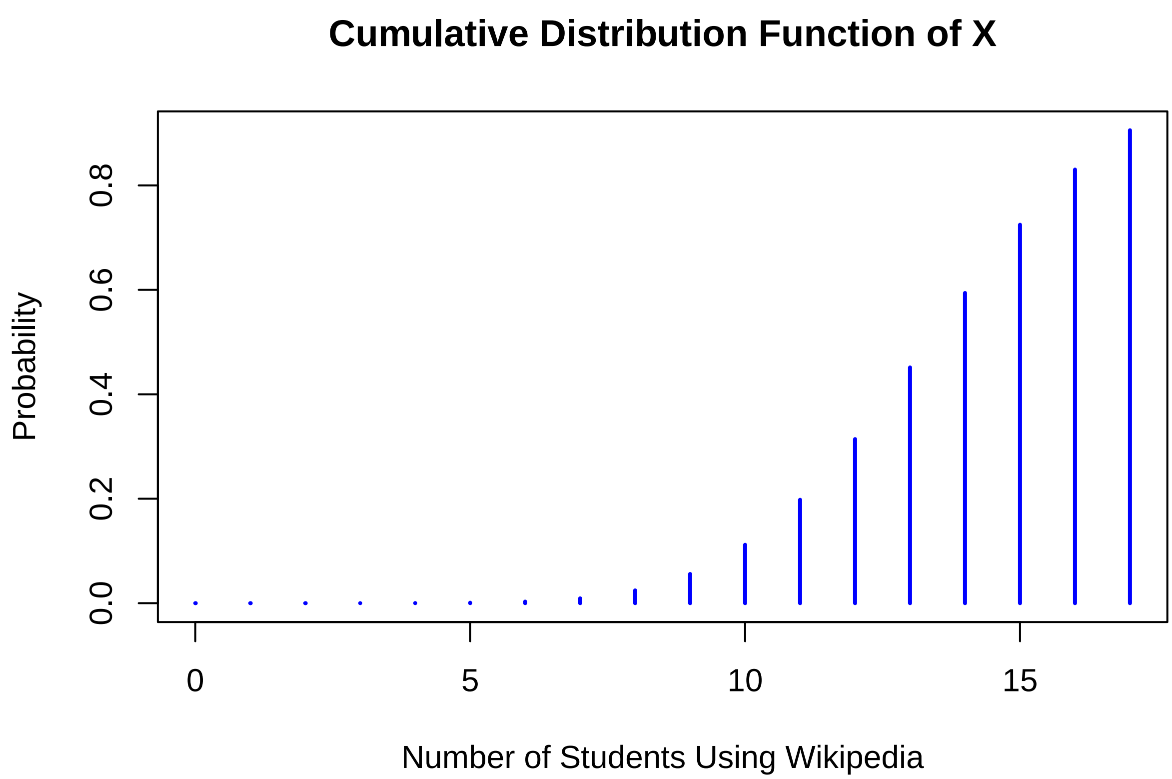
```
## 3   2 3.214377e-06
## 4   3 2.511632e-05
## 5   4 1.421138e-04
## 6   5 6.203153e-04
## 7   6 2.172786e-03
## 8   7 6.272510e-03
## 9   8 1.521055e-02
## 10  9 3.142047e-02
## 11 10 5.587504e-02
## 12 11 8.622373e-02
## 13 12 1.161604e-01
## 14 13 1.372305e-01
## 15 14 1.426190e-01
## 16 15 1.306524e-01
## 17 16 1.056088e-01
## 18 17 7.532248e-02
```

```r
plot(x, p0, type = "h", lwd = 2, col = "blue",
     xlab = "Number of Students Using Wikipedia",
     ylab = "Probability",
     main = "Probability Mass Function of X")
```




```r
cdfP<-pbinom(x,n,prob)
plot(x,cdfP, type = "h", lwd = 2, col = "blue",
     xlab = "Number of Students Using Wikipedia",
```

```r
     ylab = "Probability",
     main = "Cumulative Distribution Function of X")
```




```r
mean_x=n*prob
variance_x=n*prob*(1-prob)
sd_x=sqrt(variance_x)
mean_x
```

```
## [1] 13.857
```

```r
variance_x
```

```
## [1] 7.662921
```

```r
sd_x
```

```
## [1] 2.768198
```