

STT810 ICA4

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Question 1

a

$\text{cdf}(x = 1) = 0.3$ (probability $x \leq 1$) $\text{cdf}(x = 2) = 0.5$ (probability $x \leq 2$) $\text{cdf}(x = 3) = 0.65$ (probability $x \leq 3$) $\text{cdf}(x = 4) = 1$ (probability $x \leq 4$)

b

$4 \times 4 = 16$ total outcome

the possible outcome 4 has combination 1+3, 2+2, 2+2 and 3+1

So it's " $0.3 \times 0.152 + 0.2 \times 0.2$ " = 0.13

We can also test with R function.

```
lis <- (sample(c(1:4),10000,prob = c(0.3,0.2,0.15,0.35),replace = T) +  
sample(c(1:4),10000,prob = c(0.3,0.2,0.15,0.35),replace = T))
```

```
sum(lis == 4)/10000
## [1] 0.1325
```

We can see it's similar.

Question 2

```
a
dbinom(6,12,0.5)
## [1] 0.2255859
```

We can see it's 0.22556.

```
pbinom(3,12,0.5)
## [1] 0.07299805
```

We can see the probability for the coin is heads 3 times or less is 0.073.

```
c
sample(c(0,1),12,replace = T)
## [1] 1 0 0 1 1 1 0 0 1 0 0 1
```

Question 3

```
a
1-pbinom(1,6,0.2)
## [1] 0.34464
```

The probability is 0.345.

```
b
dbinom(0, 6, 0.2)
## [1] 0.262144
```

The probability of winning 0 times out of 6 is 0.262.

```
c
xx = replicate(10000,sample(c(1:5),6,replace = T))

tes <- 0
for (i in 1:10000){
  if ((sum(xx[,i]==1) == 0)){
    tes <- tes + 1
  }
}
```

```
}  
tes/10000  
## [1] 0.2613
```

We can see that the results are similar.