Homework #02

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Chapter 02

Problem 01

6/36 or 1/6

```
mean(replicate(10000, {x<-sample(1:6, 2, replace=TRUE)
  ((x[1] == (2 * x[2])) || (x[2] == (2* x[1])))
  }))
```

```
## [1] 0.1702
```

Problem 02

a. 6/36 or 1/6

```
mean(replicate(10000, {x<-sample(1:6, 2, replace=TRUE)
  abs(x[1] - x[2]) == 0
}))
```

```
## [1] 0.1666
```

b. 4/36 or 1/9

```
mean(replicate(10000, {x<-sample(1:6, 2, replace=TRUE)
abs(x[1] - x[2]) == 4
}))
```

```
## [1] 0.1168
```

Problem 03

a. P(not green) = 1 - .2 = .8
b. P(r U o U y) = .13 + .2 + .14 = .47
c. Approximately .2

```
mm<- c("y","r","o","br","g","bl")
pb<-c(.14,.13,.2,.12,.2,.21)
mean(replicate(10000, {x<-sample(mm, 4, prob=pb, replace=TRUE);
  sum(x=="bl") > 1
}))
```

```
## [1] 0.1974
```

d. Approximately .01

```
mean(replicate(10000, {x<-sample(mm, 6, prob=pb, replace=TRUE);
  ((sum(x=="y") == 1) & (sum(x=="r") == 1) & (sum(x=="o") == 1) &
    (sum(x=="br") == 1) & (sum(x=="g") == 1) & (sum(x=="bl") == 1))
}) )
```

```
## [1] 0.0143
```

Problem 04

Approximatly .06

```
mean(replicate(10000, {x<-sample(mm, 30, prob=pb, replace=TRUE);
  ( (sum(x=="bl") > 8) & (sum(x=="o") > 5))
}) )
```

```
## [1] 0.0684
```

Problem 05

Approximately 0.37 or 3/8

```
type<- c("o","a","b","ab")
pb<-c(.45,.40,.11,.04)

mean(replicate(10000, {x<-sample(type,2,prob=pb,replace=TRUE);
  x[1] == x[2]
}))
```

```
## [1] 0.3751
```

Problem 08

Approximately 0.56

```
mean(replicate(10000, {x<-sample(1:6, 5, replace=TRUE)
  ((14 < sum(x)) & (sum(x) < 21))
}))
```

```
## [1] 0.5622
```

Problem 09

Approximately 0.29

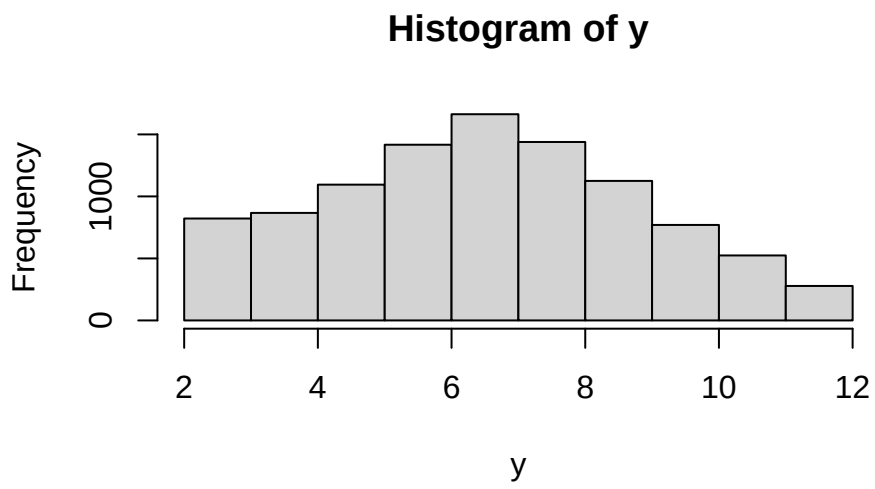
```
mean(replicate(10000, {x<-sample(1:6, 20, replace=TRUE)
  y<-cumsum(x)
  sum(y == 20)
}))
```

```
## [1] 0.2874
```

Problem 10

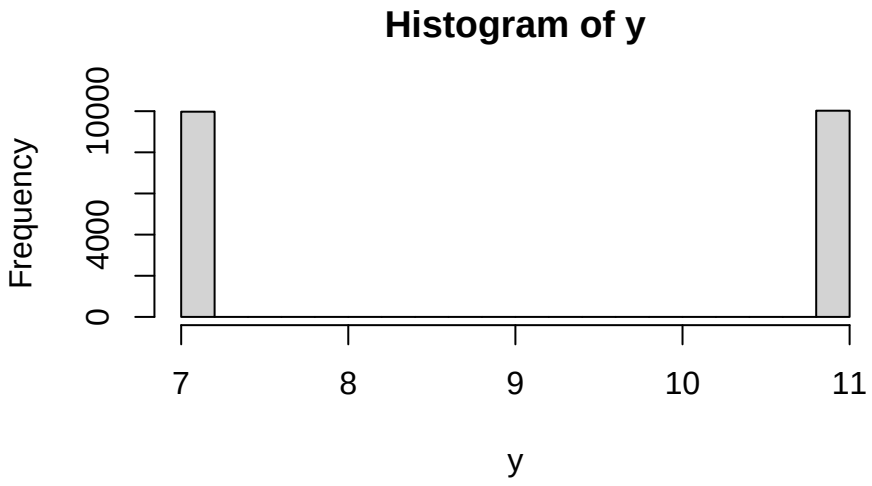
a.

```
y <- replicate(10000, {x<-sample(1:6, 2, replace=TRUE)
sum(x)
})

hist(y, breaks=12)
```



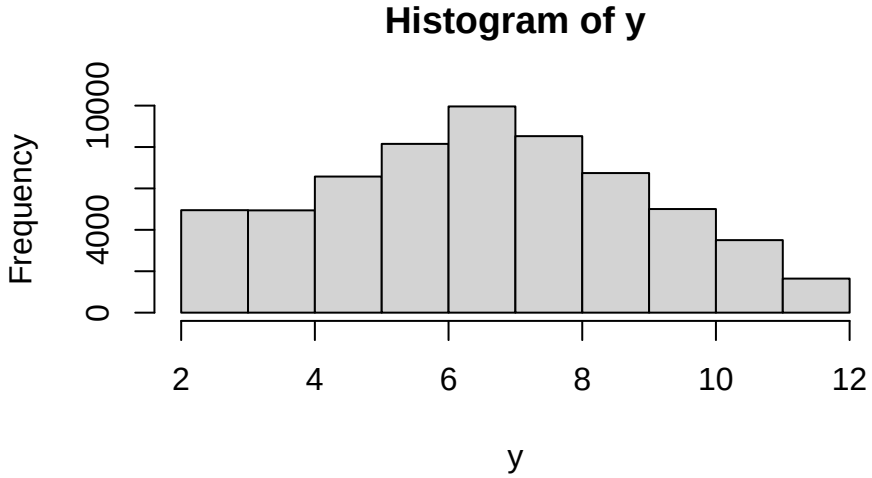
b.

```
y <- replicate(10000, {x<-sample(c(2,6), replace=TRUE)
  x + 5
})

hist(y)
```



c.

```
y <- replicate(10000, {x<-sample(c(1,2,2,3,3,4), replace=TRUE)
  z<-sample(c(1,3,4,5,6,8), replace=TRUE)
  x + z
})

hist(y, breaks=12)
```



Problem 11

Assuming birth year is not accounted for, excluding Feb29 Approximately 0.10

```
mean(replicate(10000, {x<-sample(1:365, 200, replace=TRUE)
  sum(x==1) > 1
}))
```

```
## [1] 0.1045
```

Problem 17

Approximately 0.02

```
s<-fosdata::scrabble

mean(replicate(10000, {x<-sample(s$piece,7,replace=FALSE)
  ((sum(x=='A')==0)&(sum(x=='E')==0)&(sum(x=='I')==0)&(sum(x=='O')==0)&(sum(x=='U')==0))
}))
```

```
## [1] 0.0188
```

Problem 20

a. C and D are disjoint, A and D are disjoint
b. B and D are independent
c. A and B, A and C, B and C

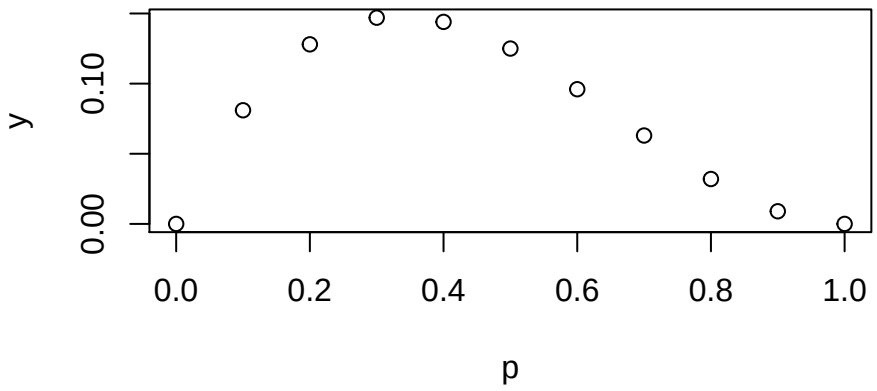
Problem 21

a. A and C
b. B and C
c. 1

Problem 25

a. 1/2
b. p^2 * (1-p)^2 = p^2 * (1 - 2p + p^2) = p^3 - 2p^2 + p
c.

```
p<-seq(0,1,0.1)
y<- p^3 - 2*(p^2) + p
plot(p, y)
```



d. Prob same is approximately .51, different is approximately .49

```
flip<-c("v", "c")
pb<-c(.45,(1-.45))

mean(replicate(10000, {x<-sample(flip,2, prob=pb,replace=TRUE)
  (x[1]==x[2])
}))
```

```
## [1] 0.4938
```

e. Choose same
f. Yes, the two frisbee flip is closer to a .5 probability

Problem 26

Approximate .5

```
people <- sample(0:1, 100000, prob=c(.99,.01), replace=TRUE)
test <- ifelse(people, 1, sample(0:1, 100000, prob=c(.99,.01), replace=TRUE))
1-(sum(test & !people)/sum(test))
```

```
## [1] 0.497
```

Problem 29

a.

```
# P(B|A) = P(A|B) * (P(B)/P(A))
# If there is a second tree, there will always be a first tree
  1 * (.85/.91)
```

```
## [1] 0.9340659
```

b.