Assignment 3 - More on Random Variables

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4.24

Find the variance of a fair die roll.

To find variance first you need to find the expected value:

Expected Value: (1 * 1/6) + (2 * 1/6) + (3 * 1/6) + (4 * 1/6) + (5 * 1/6) + (6 * 1/6) = 21/6 = 3.5

then take the variance of the expected value:

(1 - 3.5)^2 * 1/6 + (2 - 3.5)^2 * 1/6 + (3 - 3.5)^2 * 1/6 + (4 - 3.5)^2 * 1/6 + (5 - 3.5)^2 * 1/6 + (6 - 3.5)^2 * 1/6 = 70/24 = 2.91

Using equation 2.10

4.36

Cor(X,Y) = -0.5 Find V[X+Y]

V[X+Y] = V[X] + V[Y] + 2 COR(X,Y)

V[X] + V[Y] + 2 * (-0.5)

V[X+Y] = variance since it is equal distribution, mean, STD, variance are all the same. =.25

4.40

E[X] = 1 E[X^2] = 2 E[X^3] = 5 E[X^15] = 15

E[Y] = 2 E[Y^2] = 6 E[Y^3] = 22 E[Y^4] = 94

V[3X^2 - Y] = 138 V[X^2] = (9*(2)^4 - 2^2) V[Y] = 6 - 4

E[X^{4Y}4] 15*94 =1410

COV(X, X2) V[X^2] = 9 - 2^2 V[X] = 1 - 1 6 - 3 =3

V[X^{2Y}2] V[X^2] = 6 V[Y^2]1296-36 6+1260 =1266

4.56

```
sim <- sample(c(-10,-10,-10,0,0,14), 100000, replace = T)
mean(sim)
```

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## [1] -2.66214
```

```
var(sim)
```

```
## [1] 75.3414
```