Week 1 Worksheet

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1. A random variable X is defined to be the difference between the higher values and the lower value when two dice are thrown. If they have the same value, X is defined to be zero.

a) Find the probability distribution for X

b) Find the expected value of X

c) Calculate $E(X^2)$

d) Calculate the population variance and the standard deviation of X

e) Find the variance of the random variable X in (4) using the equation $\sigma_x^2 = E(X^2) - \mu_x^2$. Does it equal your answer from part (d)?

2. Prove that if Y=b, where b is a constant, COV(X,Y) = 0

3. Prove if Y=V+W, var(Y) = var(V) + var(W) + 2cov(V,W)

4. Consider data gathered on adult domestic cats' body weight and heart weight:

```
##      cat body_weight heart_weight
## [1,]   1         2.0          6.5
## [2,]   2         2.2          7.6
## [3,]   3         2.4          9.1
## [4,]   4         2.4          7.3
## [5,]   5         3.6         11.8
```

a) What is the sample mean of Body Weight
b) What is the sample variance of Heart Weight
c) What is the sample correlation coefficient between Body Weight and Heart Weight