Discrete Response Model
Lecture 1

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Computing Probabilities of Binomial Probability Model

Field Goal Kicking (cont.)

Suppose $\pi = 0.6$, $n = 5$. What are the probabilities for each possible value of w?

Note: It is important that we write down the formula so that we know what we are computing before using a computer program or statistical package for the computation.

$$P(W=0) = \frac{n!}{w!(n-w)!}\pi^{w}(1-\pi)^{n-w}$$

$$= \frac{5!}{0!(5-0)!}0.6^{0}(1-0.6)^{5-0} = 0.4^{5} \approx 0.0102$$

Field Goal Kicking (cont.)

For W=0,…,5, we obtain

W	P(W = w)
0	0.0102
1	0.0768
2	0.2304
3	0.3456
4	0.2592
5	0.0778

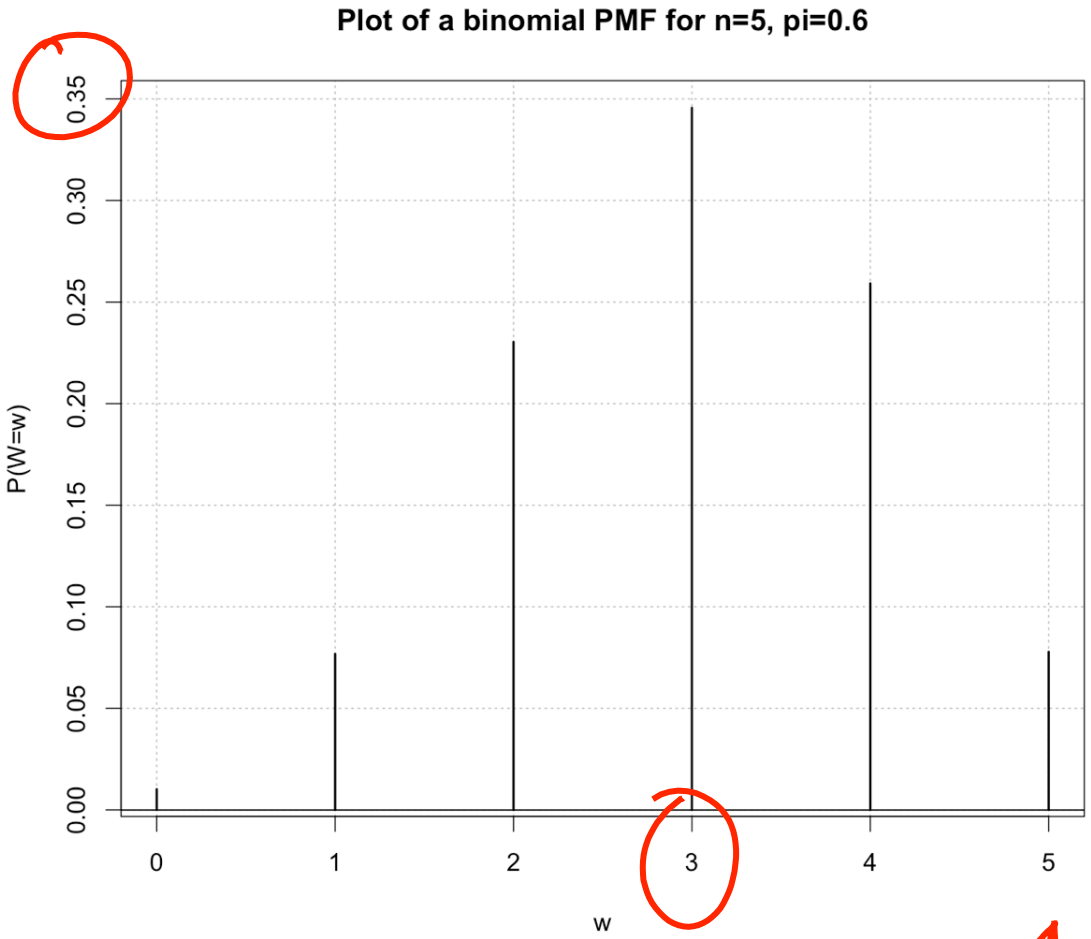
$E(W) = n\pi = 5*0.6 = 3$ and

$Var(W) = n\pi(1-\pi) = 5*0.6*(1 - 0.6) = 1.2$

Implementation in R:

```
> dbinom(x = 1, size = 5, prob = 0.6)
[1] 0.0768
> dbinom(x = 0:5, size = 5, prob = 0.6)
[1] 0.01024 0.07680 0.23040 0.34560 0.25920 0.07776
> pmf<-dbinom(x = 0:5, size = 5, prob = 0.6)
> pmf.df<-data.frame(w = 0:5, prob = round(x = pmf, digits = 4))
> pmf.df
  w   prob
1 0 0.0102
2 1 0.0768
3 2 0.2304
4 3 0.3456
5 4 0.2592
6 5 0.0778
```

Visualize the Results in R:




```
plot(x = pmf.df$w, y = pmf.df$prob, type = "h", xlab = "w",
   ylab = "P(W=w)", main = "Plot of a binomial PMF for n=5, pi=0.6",
   panel.first = grid(col="gray", lty="dotted"),
   lwd = 2)
abline(h = 0)
```

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