

Probability and Random Processes

ECS 315

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Discrete Random Variable



Office Hours:

BKD 3601-7

Monday 14:40-16:00

Friday 14:00-16:00

Roll a fair dice. Record the result.

$$X \sim \text{Uniform}(\{1,2,\dots,6\})$$

```
>> X = randi(6)
```

```
X =
```

```
5
```

Again, roll a fair dice. Record the result.

```
>> X = randi(6)
```

```
X =
```

```
6
```

Again, roll a fair dice. Record the result.

```
>> X = randi(6)
```

```
X =
```

```
1
```

Again, roll a fair dice. Record the result.

```
>> X = randi(6)
```

```
X =
```

```
6
```

Again, roll a fair dice. Record the result.

```
>> X = randi(6)
```

```
X =
```

```
4
```

Again, roll a fair dice. Record the result.

```
>> X = randi(6)
```

```
X =
```

```
1
```

```
>> X = randi(6,20,10)
```

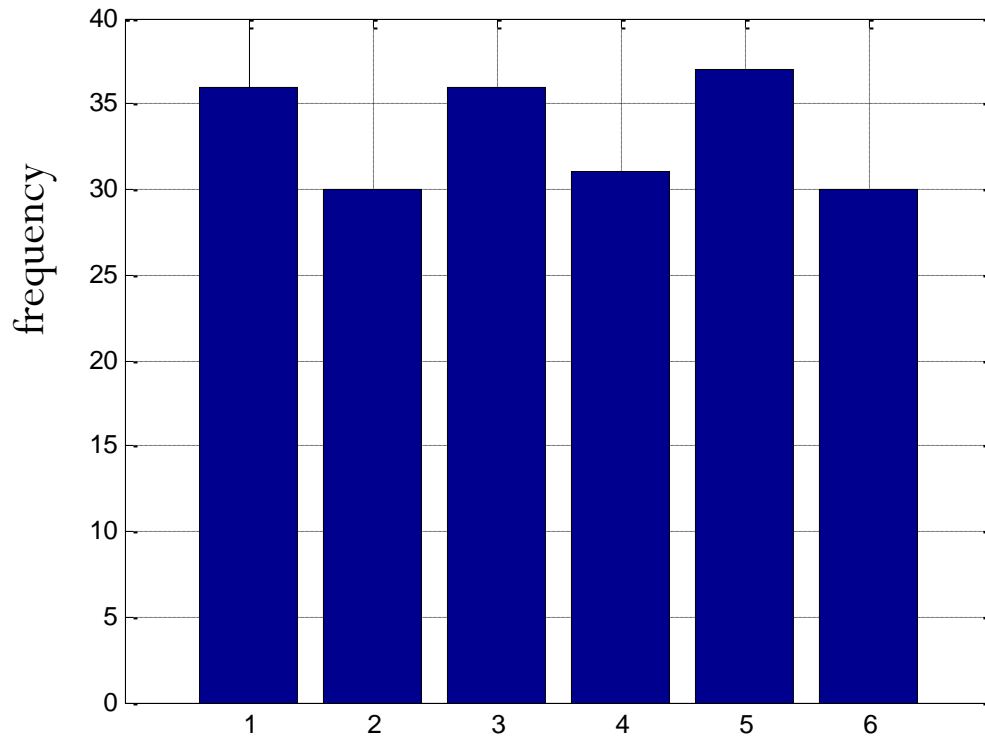
```
X =
```

2	5	3	4	5	2	1	2	6	3
4	3	4	1	5	4	3	1	6	4
6	4	5	1	3	5	2	2	4	5
6	2	5	2	4	5	5	2	1	1
1	5	2	6	1	3	3	3	2	6
6	1	5	2	1	1	6	1	3	5
6	2	4	5	4	2	2	6	5	3
3	1	1	2	5	6	2	6	1	3
5	1	1	6	6	1	1	3	1	3
1	5	3	3	1	5	1	3	2	2
3	5	6	2	4	4	6	3	4	4
6	2	3	2	3	6	4	6	5	4
5	6	4	4	1	1	4	3	4	5
6	1	2	3	3	3	1	1	3	5
4	3	5	3	1	1	6	5	4	4
1	3	2	5	5	6	4	3	2	3
6	5	4	4	2	1	3	2	5	5
6	5	5	4	4	5	4	3	2	4
5	2	6	6	1	5	3	1	5	3
5	3	6	2	4	6	1	1	2	6

Generate X 200 times. Put the results in a table of size 20×10



Histogram



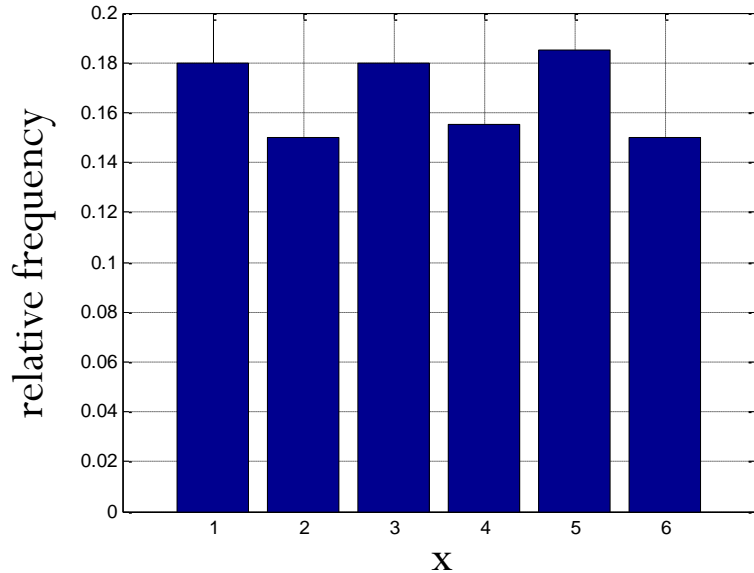
```
[N, x] = hist(reshape(X,1,prod(size(X))),1:6)
```

```
bar(x,N)
```

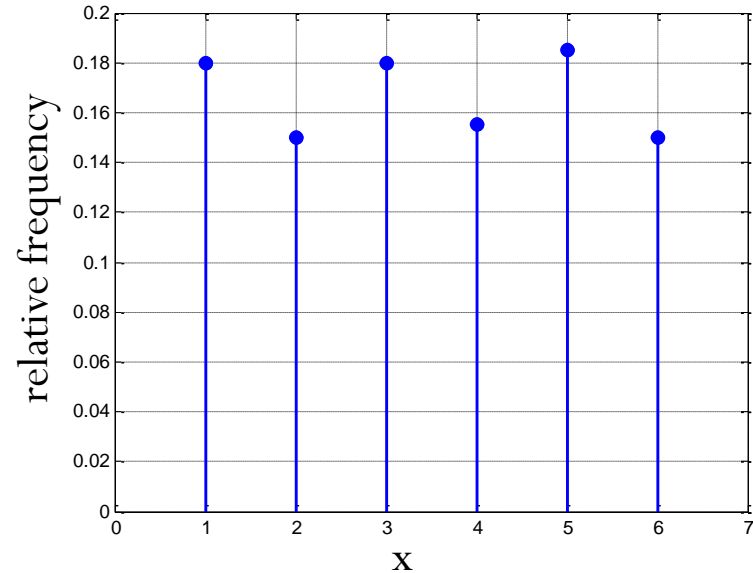
```
Grid on
```



Relative Frequency



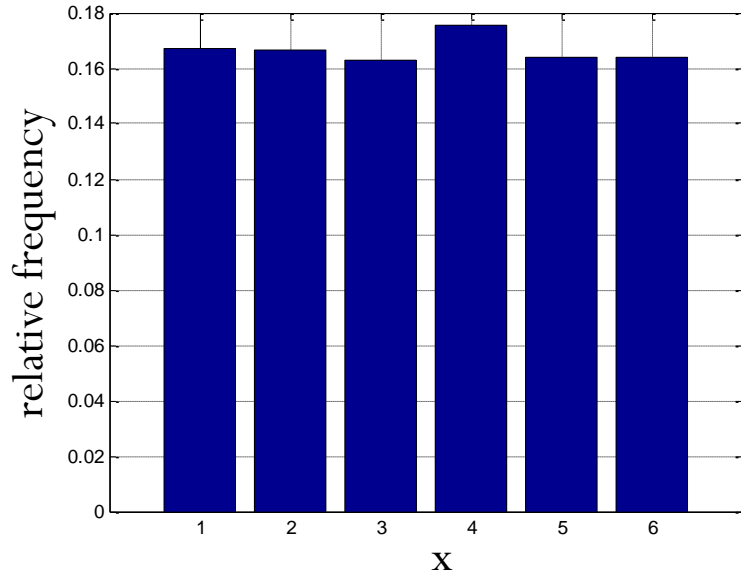
```
rf = N/prod(size(X))  
bar(x,rf)  
grid on
```



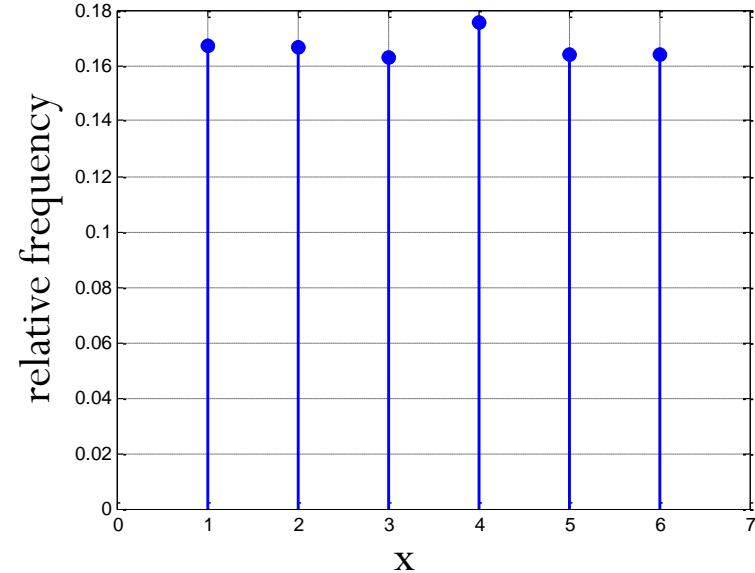
```
stem(x,rf,'filled','LineWidth',1.5)  
grid on
```



With larger number of samples



```
rf = N/prod(size(X))  
bar(x,rf)  
grid on
```



```
stem(x,rf,'filled','LineWidth',1.5)  
grid on
```

```
X = randi(6,100,100);
```



Flip an unfair coin 10 times. (The probability of getting heads for each time is 0.3.)

Count the number of heads.

$$X \sim \text{binomial}(10, 0.3)$$

```
>> X = binornd(10,0.3)
```

```
X =
```

```
3
```

Again, flip an unfair coin 10 times. Count #H.

```
>> X = binornd(10,0.3)
```

```
X =
```

```
2
```

Again, flip an unfair coin 10 times. Count #H.

```
>> X = binornd(10,0.3)
```

```
X =
```

```
2
```

Again, flip an unfair coin 10 times. Count #H.

```
>> X = binornd(10,0.3)
```

```
X =
```

```
5
```

Again, flip an unfair coin 10 times. Count #H.

```
>> X = binornd(10,0.3)
```

```
X =
```

```
1
```

Again, flip an unfair coin 10 times. Count #H.

```
>> X = binornd(10,0.3)
```

```
X =
```

```
4
```

```
>> X = binornd(10,0.3,20,10)
```

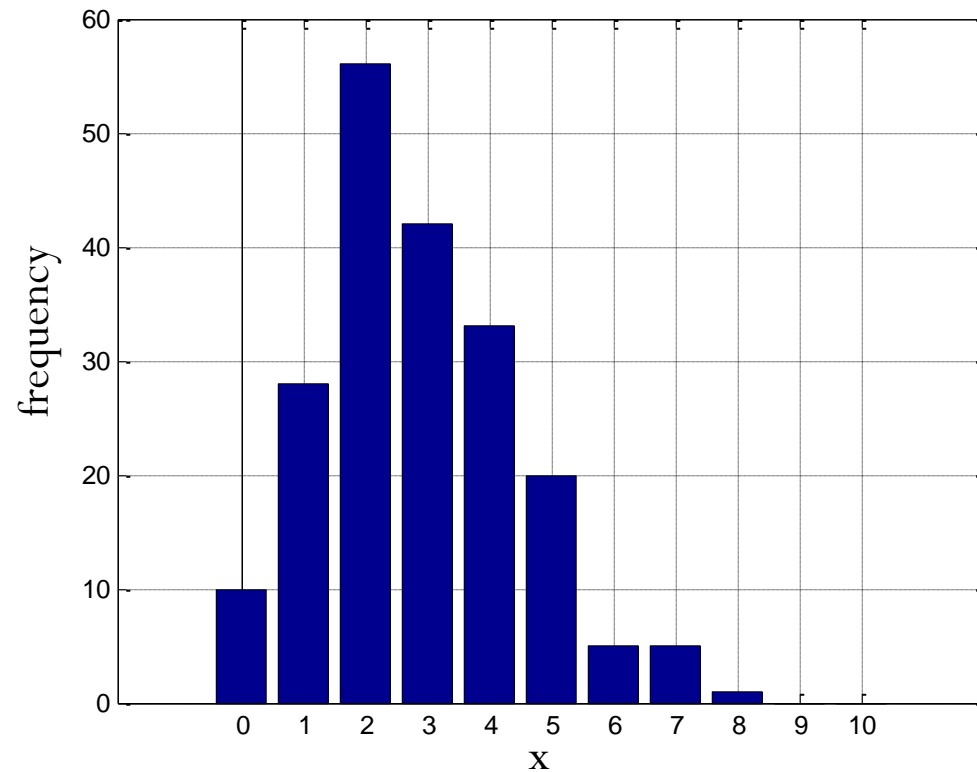
```
X =
```

3	4	4	5	7	2	2	2	2	1
3	5	3	1	0	4	2	1	2	3
5	2	2	6	4	2	2	4	3	1
1	2	2	4	2	4	3	3	3	5
4	1	4	3	3	4	2	2	2	2
2	1	3	1	5	2	5	2	1	2
4	0	3	3	2	1	2	1	3	1
4	4	0	2	3	6	2	3	1	1
5	0	3	3	7	1	3	1	3	8
1	2	4	4	1	5	2	4	5	1
5	2	4	6	3	2	3	3	5	0
2	4	0	0	2	2	3	2	0	2
4	3	3	2	2	2	1	2	7	4
2	4	2	1	3	3	4	3	5	2
5	3	2	3	4	2	3	3	1	2
2	6	2	3	4	4	4	5	6	7
5	1	2	4	3	3	0	5	0	2
1	4	1	3	1	4	2	4	2	4
5	2	2	3	3	5	3	5	2	1
4	2	4	3	2	5	7	2	3	1

Generate X 200 times. Put the results in a table of size 20x10



Histogram: $X \sim \text{binomial}(10, 0.3)$



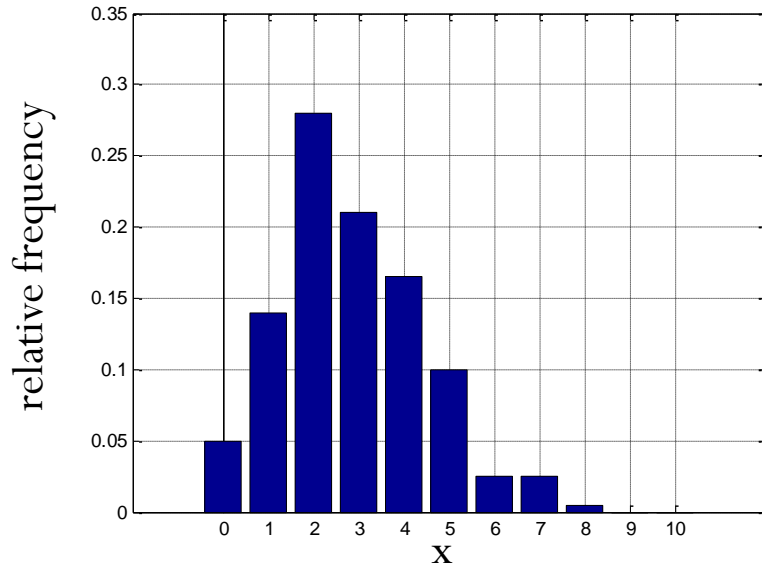
```
[N, x] = hist(reshape(X, 1, prod(size(X))), 0:10)
```

```
bar(x, N)
```

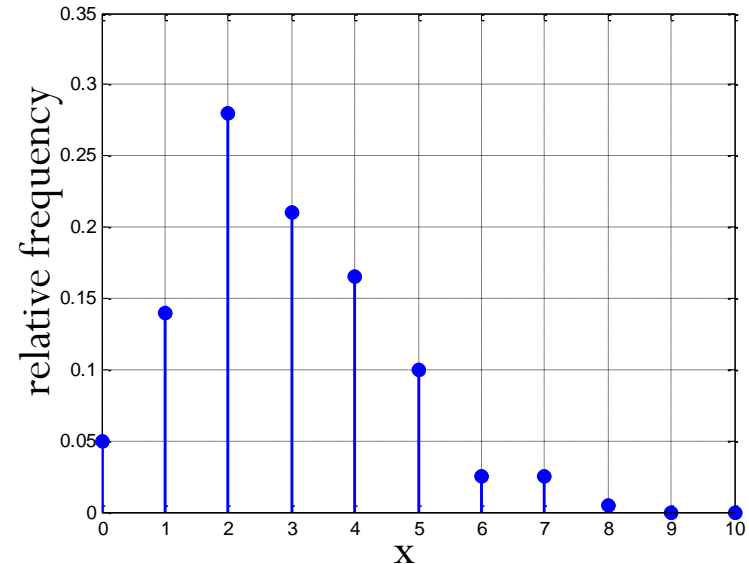
```
Grid on
```



Relative Freq.: $X \sim \text{binomial}(10, 0.3)$



```
rf = N/prod(size(X))  
bar(x,rf)  
grid on
```

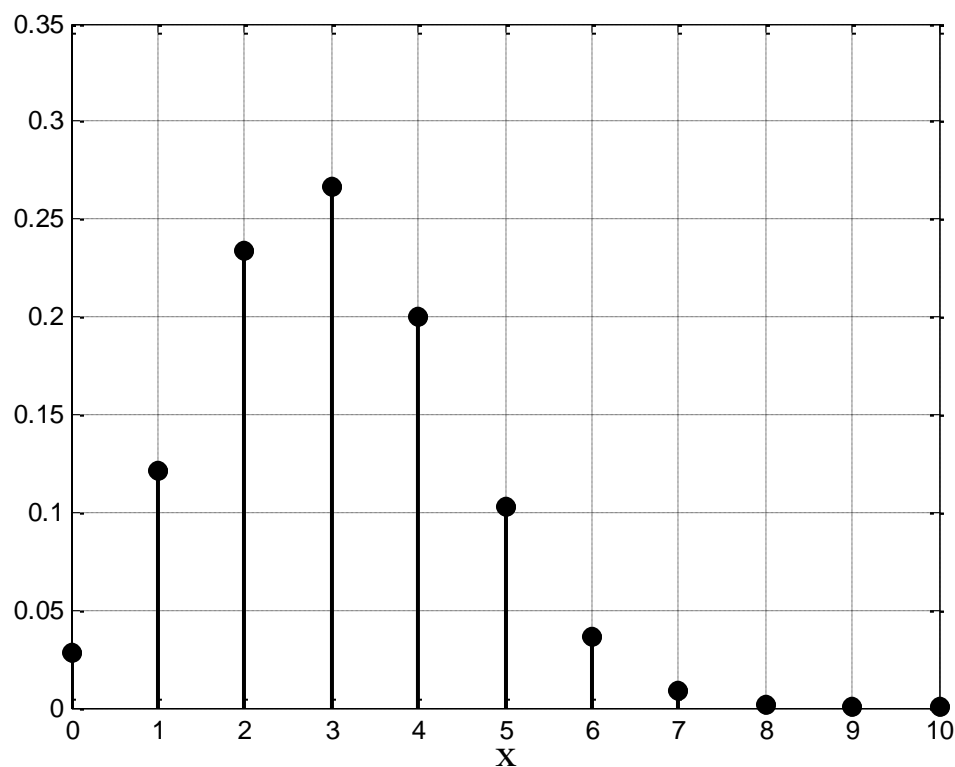


```
stem(x,rf,'filled','LineWidth',1.5)  
grid on
```



pmf for $X \sim \text{binomial}(10, 0.3)$

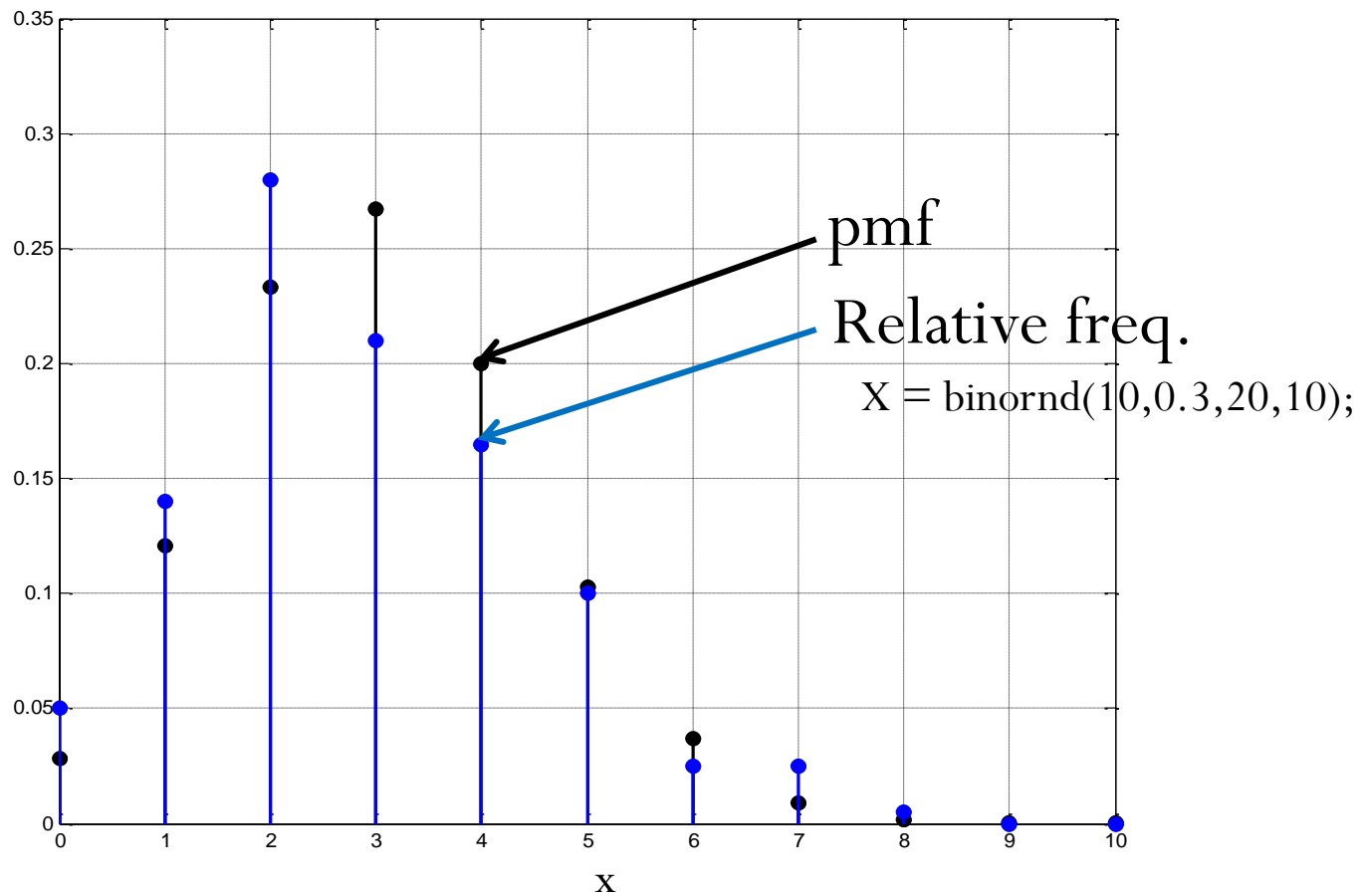
$$p_X(x) = \binom{10}{x} 0.3^x (1 - 0.3)^{10-x}$$



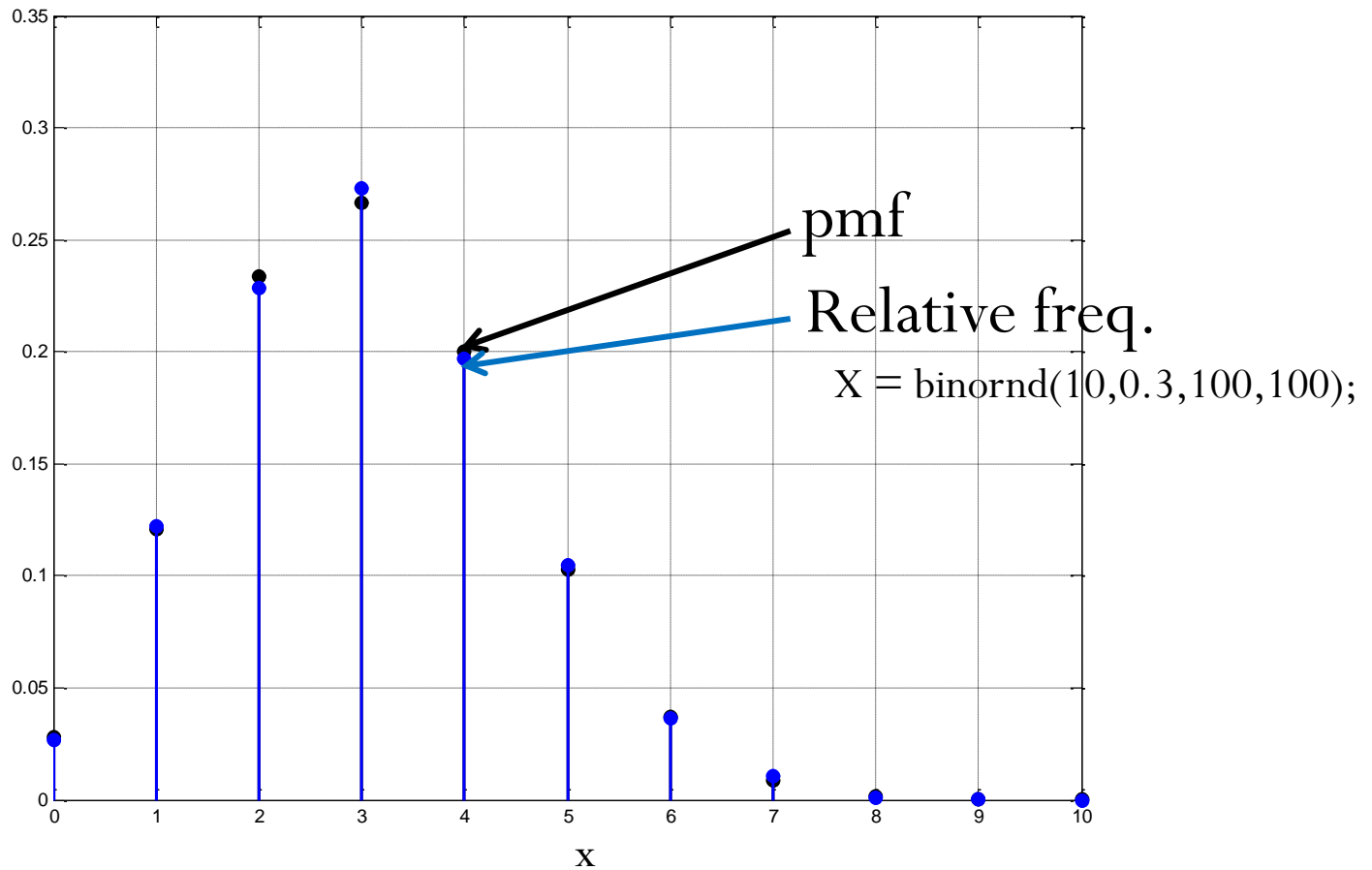
```
p = binopdf(x,10,0.3)
stem(x,p,'k','filled','LineWidth',1.5); grid on
```



$X \sim \text{binomial}(10, 0.3)$



$X \sim \text{binomial}(10, 0.3)$



Publishing Success

- **Publishing success** is so **unpredictable** that even if our novel is destined for the best-seller list, numerous publishers could miss the point and send those letters that say thanks but no thanks.
- In fact, many books destined for great success had to survive not just rejection, but repeated rejection.
- J. K. **Rowling**'s first **Harry Potter** manuscript was rejected by **nine** publishers.
- Lesson: Suppose four publishers have rejected your manuscript.
 - Your intuition and the bad feeling in the pit of your stomach might say that the rejections by all those publishing experts mean your manuscript is no good.
 - We all know from experience that if several tosses of a coin come up heads, it doesn't mean we are tossing a two-headed coin.



Box Office Success

- Hollywood's unpredictability
- Does luck play a far more important role in box office success (and failure) than people imagine?
- There are reasons for a film's box office performance
 - but those reasons are so complex and the path from green light to opening weekend so vulnerable to unforeseeable and uncontrollable influences that
 - educated guesses about an unmade film's potential aren't much better than flips of a coin.
- Studio executive David Picker:
 - "If I had said yes to all the projects I turned down, and no to all the other ones I took, it would have worked out about the same."



Don't give up

- Successful people in every field are almost universally members of a certain set—the set of people who don't give up.

