In [ ]:
```
# HIDDEN
from datascience import *
%matplotlib inline
import matplotlib.pyplot as plots
plots.style.use('fivethirtyeight')
import numpy as np
```

Data 8 Fall 2016 Midterm Review 10/12/16

Discussion of exam conditions; see video

Intervals and Bins

at least 7: >= 7
at most 7: <= 7
more than 7: > 7
between 2 an 7 inclusive: includes both end points

Python convention: intervals include the left end point but not the right
are.between: includes left, excludes right
tbl.hist: bins include left, exclude right
np.arange(start, end, step): includes start, excludes end

Histograms

- Quantitative data
- Horizontal axis drawn to scale
- Area of bar proportional to number/proportion/percent of entries in bin
- Height = area/width
- Density scale: Height = proportion/width, total area = 1
- Equivalent to percent/width, total area = 100
- Height measures crowdedness
- Statements like: "The left half of the bar contains half the proportion in the bar" assume that the entries are evenly distributed within the bar

Variable: length, measured in inches.
Height of a bar: 0.043% per inch

Suppose now you measure the lengths in feet. What's the height of the bar?
(12 * 0.043) % per foot

Examples

- "at random": uniformly at random
- "cards dealt from a deck": uniformly at random without replacement from standard deck (which will be described)
- coins, dice, etc fair unless otherwise specified

Questions involving multiple trials:

Ask yourself, "What does the first trial have to be?"

If you can answer that cleanly ("The first trial has to be of Type X"), almost inevitably your answer will a product of fractions.

If there's no clear answer, ask yourself what the second trial has to be. If you can answer that cleanly, again almost inevitably your answer will be a product of fractions. If you can't answer it cleanly, then there's more work to be done:
- try partitioning the event into all the distinct ways in which it can happen
- look at the complement and hope that it's simpler than the event itself

1. Win a bet with chance 1/100 each time, regardless of all other times. Chance of losing the first three bets: (99/100)*(99/100)*(99/100)

2. Bet as above. Chance of winning at least one of the first three bets: 1 - answer to (1)

3. Bet as above. Chance of winning none of the first three bets:
same as (1)

4. Two cards dealt from a deck. Chance of heart followed by spade:
(13/52)*(13/51)

5. Two cards dealt from a deck. Chance of two different suits:
(52/52)*(39/51)

6. Four cards dealt from a deck. Chance that all four suits are different:
(52/52)*(39/51)*(26/50)*(13/49)

7. Coin lands heads with chance 0.3. Tossed twice. Chance that two different faces appear:
HT or TH
0.3*0.7 + 0.7*0.3

Also can be done this way: 1 - P(HH or TT) = 1 - (0.3*0.3 + 0.7*0.7)

8. 5 cards, one of which has a gold star. Two cards dealt at random **without** replacement. Chance that second card is the one with the gold star:
1/5. Note the 5 in the denominator. The gold star card can be in any one of 5 equally likely positions

9. Standard deck of 52 cards. Deal cards (at random without replacement). Chance that the 43rd card is an ace:
4/52. Note the absence of 43 from the answer.