Stat 451
9-29-16

Stem-and-leaf from last time:

2	3
3	
4	
5	5
6	566
7	159
8	5

(1)

We found $\tilde{x} = 66$

$Q_1 = 65$

$Q_3 = 75$

$IQR = Q_3 - Q_1 = 10$

lower fence $= Q_1 - 1.5\,IQR = 50$

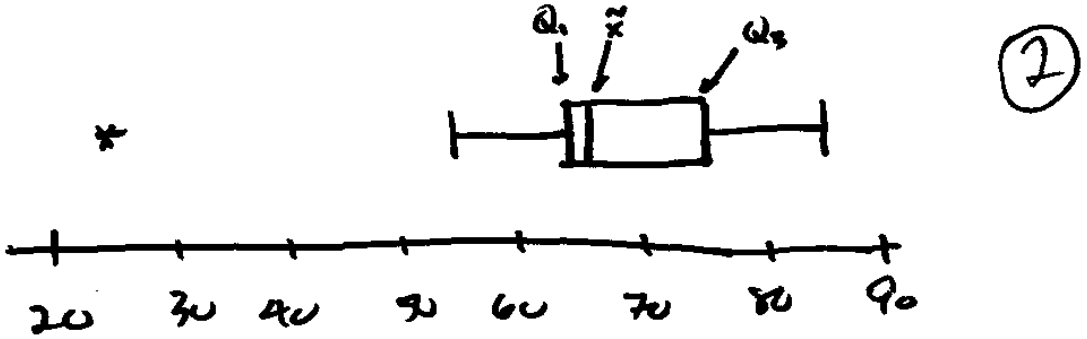
upper fence $= Q_3 + 1.5\,IQR = 90$

Any items outside of the fences are <u>outliers</u>

23 is an outlier

largest remaining value = 85, smallest = 55

(2)



Probability

<u>Experiment</u>: A process that leads to one of several possible outcomes

<u>Sample space</u>: The set of all possible outcomes

S

Event: A subset of S

Example 1: Flip a coin

$S = \{H, T\}$

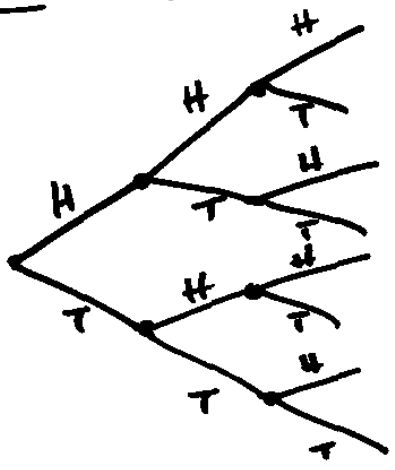
Example 2: Roll a 6-sided die

$S = \{1, 2, 3, 4, 5, 6\}$

Example 3: Flip 2 coins in sequence

$S = \{HH, HT, TH, TT\}$

Example 4: Flip 3 coins in sequence



$S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$

The probability of an event A is

$$P(A) = \frac{N(A)}{N}$$

$$0 \leq P(A) \leq 1$$

Example 4. Find the probability of getting exactly 2 heads

$$A = \{HHT, HTH, THH\}$$

$$P(A) = \frac{3}{8} = .375 = 37.5\%$$

Same example, but find prob. of getting 3 heads

$$B = \{HHH\}$$

$$P(B) = \frac{1}{8}$$

Example 5: Roll 2 dice in sequence + find the prob. that the sum is 9.

$N = 36$

$$S = \begin{Bmatrix} 11 & 12 & \cdots & 16 \\ 21 & 22 & \cdots & 26 \\ \vdots & & & \\ 61 & 62 & \cdots & 66 \end{Bmatrix}$$

$$A = \{36, 45, 54, 63\}$$

$$P(A) = \frac{4}{36} = \frac{1}{9}$$

Counting Rules

① Multiplication principle

If a process can be broken down into a sequence of steps, then the total # of outcomes is the product of the # at each step

Ex: randomly create a license plate with 3 letters followed by 3 numbers

$$N = 26 \times 26 \times 26 \times 10 \times 10 \times 10$$
$$= 26^3 \cdot 10^3 = 17{,}576{,}000$$

② Factorial rule

The number of ways of ordering or arranging n items is

$$n! = n(n-1)(n-2)\cdots 1$$

(3) Permutation rule

Start with n items. Select and rank r of them. The # of outcomes is

$$P_{n,r} = n(n-1)\cdots(n-r+1)$$

$$= \frac{n(n-1)\cdots(n-r+1)\cdot(n-r)\cdots 1}{(n-r)\cdots 1}$$

$$= \frac{n!}{(n-r)!}$$

Example: If a person is given a list of 20 films and asked to rank their top 3, how many different outcomes are possible?

$$P_{20,3} = \frac{20!}{17!} = 6840$$

$$\underline{20} \times \underline{19} \times \underline{18}$$

④ Combination rule

Start with n items. Select r of them, without keeping track of order.

The # outcomes is

$$C_{n,r} = \binom{n}{r} = \frac{P_{n,r}}{r!} = \frac{n!}{r!\,(n-r)!}$$

"n choose r"

Example: Deal 5 cards from a deck of 52.

How many possibilities are there? $\binom{52}{5}$

$= 2,598,960$

HW #1 due Oct 6

p. 31 #16

p. 35 #1, plus boxplot