Stat 451
1-11-18

(1)

Stem-and-leaf from last time:

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

$n = 9$

$\tilde{x} = 66$

$Q_1 = 65$

$Q_3 = 75$

$IQR = Q_3 - Q_1 = 75 - 65 = 10$

lower fence $= Q_1 - 1.5\,IQR = 65 - 15 = 50$

upper fence $= Q_3 + 1.5\,IQR = 75 + 15 = 90$

23 is an outlier

smallest remaining value $= 55$

largest " " $= 85$

(2)

smallest remaining value $= 55$

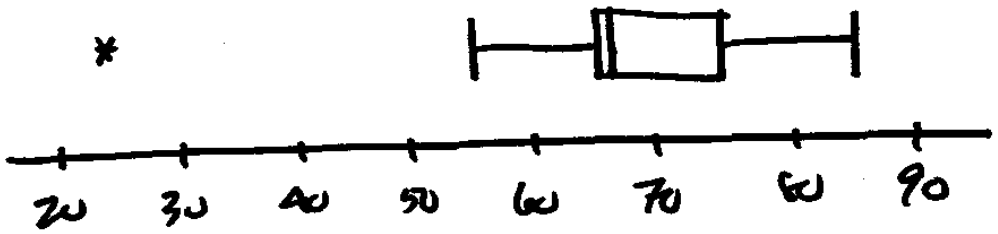
$Q_1 = 65$

$Q_2 = 66$

$Q_3 = 75$

largest remaining value $= 85$

Box plot



Probability

Experiment: A process that leads to one of several possible outcomes

Sample space S: The set of all possible outcomes of an experiment

Event: a subset of the sample space

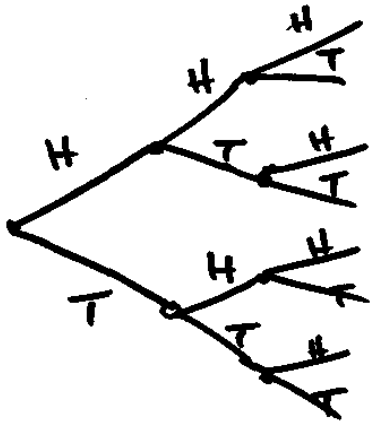
Example 1: Flip a coin $S = \{H, T\}$

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

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

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

In Example 4: Find the probability of getting exactly 2 heads

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

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

Example 5: Roll 2 dice in sequence. Find the probability that the sum is 9.

$N = 36$

$$S = \begin{Bmatrix} 11 & 12 & \cdots & 16 \\ 21 & 22 & \cdots & 26 \\ 31 & 32 & \cdots & 36 \\ \vdots & & & \\ 61 & 62 & \cdots & 66 \end{Bmatrix}$$

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

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

Counting Rules

(1) Multiplication principle

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

Example: Randomly create an Oregon license plate consisting of 3 letters followed by 3 digits.

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

(2) Factorial rule

The number of ways of ordering or arranging n objects is

$$n \times (n-1) \times (n-2) \times \dots \times 1 = n!$$

(3) Permutation rule

Start with n items. Select and rank (order, arrange) r of the items. The # of outcomes is

$$P_{n,r} = n \times (n-1) \times (n-2) \times \dots \times (n-r+1)$$

$$= \frac{n(n-1)(n-2)\cdots(n-r+1)\ (n-r)(n-r-1)\cdots 1}{(n-r)(n-r-1)\cdots 1}$$

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

Example: A person is given a list of 20 films. They are asked to select & rank their favorite 3. How many outcomes are possible?

$$P_{20,3} = 20 \cdot 19 \cdot 18 \quad \text{OR} \quad P_{20,3} = \frac{20!}{17!}$$

$$= 6840$$

HW #1 due Thu Jan 18

p. 31 #16

p. 35 #1, plus box plot

16. The following data show the starting salaries, in \$1000 per year, for a sample of 15 senior engineers:

152 169 178 179 185 188 195 196 198 203 204 209 210 212 214

(a) Assuming that the 15 senior engineers represent a simple random sample from the population of senior engineers, estimate the population mean and variance.

(b) Give the sample mean and variance for the data on second-year salaries for the same group of engineers if
(i) if each engineer gets a \$5000 raise, and
(ii) if each engineer gets a 5% raise.

1. The following is a stem and leaf display of $n = 40$ solar intensity measurements (integers in watts/m^2) on different days at a location in southern Australia. The (optional) first column of the stem and leaf plot contains a leaf count in a cumulative fashion from the top down to the stem that contains the median and also from the bottom up to the stem that contains the median. The stem containing the median has its own leaf count, shown in parentheses. Thus, $18 + 4 + 18$ equals the sample size.

4	67	3 3 6 7
8	68	0 2 2 8
11	69	0 1 9
18	70	0 1 4 7 7 9 9
(4)	71	5 7 7 9
18	72	0 0 2 3
14	73	0 1 2 4 4 5
8	74	0 1 3 6 6 6
2	75	0 8

(a) Obtain the sample median and the 25th and the 75th percentiles.

(b) Obtain the sample interquartile range.

(c) What sample percentile is the 19th ordered value?