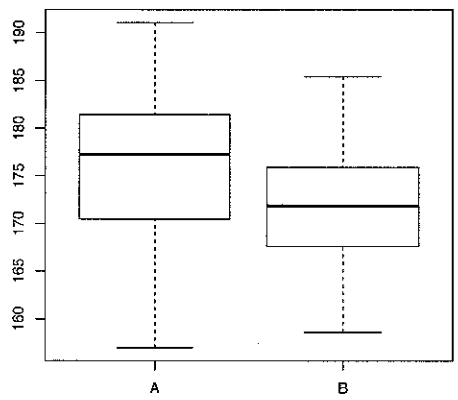
1. Consider the boxplot for the hights of two groups of moose,



(a) What is the sample median of group A? $\tilde{x} \approx 177.5$

(b) Which group has a larger variance? A

(c) What percentage of the moose are higher than 167.5cm in group B? (approximately) $\simeq$ %75

(d) Compare the symmetry and skewness of the two groups.

The data in group B are symmetric while they are skewed to left (have long left tail) in group A.

2. Consider a data set of size $n = 5$ with sample median, $\tilde{x} = 12.5$, sample mean, $\bar{x} = 14.65$ and sample variance $s^2 = 106$. Construct a new data set by adding 3.5 to all data values and then deviding each by 4. Calculate the sample median, sample mean, and the sample variance for the new data set.

$$\tilde{x}_{new} = \frac{12.5 + 3.5}{4}$$

$$\bar{x}_{new} = \frac{14.65 + 3.5}{4}$$

$$s^2_{new} = \frac{106}{16}$$

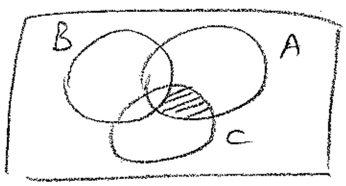
3. If A, B, and C are events, draw a Venn diagram involving A, B, and C and shade the area corresponding to the events,

(a) $(A \cap C) \cap \bar{B}$

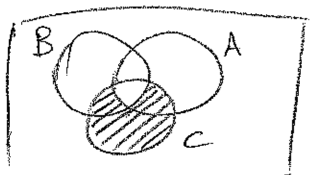
(b) $C \cap (\bar{A} \cup \bar{B})$

(c) $[A \cap (\overline{B \cup C})] \cup [B \cap (\overline{A \cup C})] \cup [C \cap (\overline{A \cup B})]$

(a)

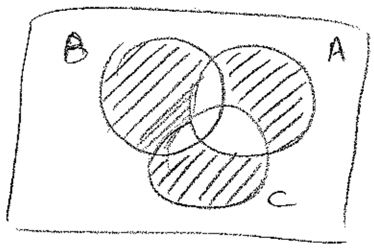


(b)



(1)

(c)



4. Consider a box containing fifteen frogs. Five of these frogs are overweight, five are underweight and the other five are just in shape. If we let the frogs out of the box one by one in random order,

   (a) What is the probability that all the overweight frogs come out among the first ten frogs?

   revised * (b) What is the probability that after letting ten frogs out ~~only~~ no more than two types of frogs are left in the box?

   (c) What is the probability that two of each type of frogs come out among the first six frogs?

(a) $$\frac{\binom{5}{5}\binom{10}{5}}{\binom{15}{10}} = .0839$$

(b) $$\frac{\binom{3}{1}\binom{5}{5}\binom{10}{5}}{\binom{15}{10}} = .252$$

(c) $$\frac{\binom{5}{2}\binom{5}{2}\binom{5}{2}}{\binom{15}{6}} = \boxed{.199}$$ → revised

5. In a particular clas the following information is known regarding the eye collor and the type of chocolate that they consume,

eye collor/ chocolate	white	milk	dark
blue	15%	10%	7%
brown	13%	8%	10%
black	16%	10%	11%

e.g. 15% of the students have blue eys and like white chocolate.

(1) (a) What is the probability that a randomly selected student either has black eyes or likes dark chocolate?

(1) (b) If a randomly selected student has blue eyes what is the probability that s/he likes milk chocolate?

(1) (c) If a randomly selected student has either brown or blue eyes, what is the probability that s/he likes white chocolate?

W: the event that a randomly selected student likes white chocolate

M: ~ ~ ~ ~ ~ ~ ~ ~ milk ~

D: ~ ~ ~ ~ ~ ~ ~ ~ dark ~

A: ~ ~ ~ ~ ~ ~ ~ has blue eyes

B: ~ ~ ~ ~ ~ ~ ~ ~ brown ~

C: ~ ~ ~ ~ ~ ~ ~ ~ black ~

(a) $P(C \cup D) = P(C) + P(D) - P(C \cap D)$

$= (.16 + .1 + .11) + (.07 + .1 + .11) - (.11)$

$= .54$

(b) $P(M \mid A) = \dfrac{P(M \cap A)}{P(A)} = \dfrac{.1}{.15 + .1 + .07} = \dfrac{.1}{.32} = .31$

→ revised (*)

(c) $P(W \mid (A \cup B)) = \dfrac{P(W \cap (A \cup B))}{P(A \cup B)} = \dfrac{P(W \cap A) + P(W \cap B)}{P(A) + P(B)}$

$= \dfrac{.15 + .13}{.32 + .31} = .44$

6. Let S, B, I denote respectively the events that my sister, my brother and I decide to have pancakes for breakfast in a weekend. If the probability of the events are $P(S) = .7$, $P(B) = .5$ and $P(I) = .4$ and we live in different cities in different parts of the world (the events are independent), what is the probability that in a particular weekend

   (a) all three of us have pancakes for breakfast?

   (b) at least one of us has pancakes for breakfast?

   (c) Only my brother has pancakes for breakfast?

   (d) Exactly one of us has pancake for breakfast?

(a) $p(S \cap B \cap I) = p(S)p(B)p(I) = .7 \times .5 \times .4$

$$= .14$$

(b) $P(S \cup B \cup I) = p(S) + P(B) + P(I)$

$$- p(S)p(B) - p(S)p(I) - p(B)p(I)$$

$$+ p(S)p(B)p(I)$$

$$= .91$$

(c) $P(B \cap (\overline{S \cup I})) = P(\bar{S})p(B)p(\bar{I})$

$$= .3 \times .5 \times .6$$

$$= .09$$

(d) $p(B)p(\bar{S})p(\bar{I}) + p(S)p(\bar{B})p(\bar{I}) + p(I)p(\bar{B})p(\bar{S})$

$$= .09 + .7 \times .5 \times .6 + .4 \times .5 \times .3$$

$$= .36$$