9:56am

Practice Problems for Exam 1

1. 10, 6, 2, 7, 100

a) $\bar{x} = \frac{16+9+100}{5} = \frac{125}{5} = 25$

median: 2, 6, (7), 10, 100 median = 7

b) The median is better. The outlier, 100, distorts the mean.

c)

x	$x-\bar{x}$	$(x-\bar{x})^2$
2	$2-25=-23$	$(-23)^2 = 529$
6	$6-25=-19$	$(-19)^2 = 361$
7	$7-25=-18$	$(-18)^2 = 324$
10	$10-25=-15$	$(-15)^2 = 225$
100	$100-25=75$	$75^2 = 5625$

$7064 = \Sigma(x-\bar{x})^2$

$$s = \sqrt{\frac{7064}{5-1}} = 42.02$$

d) No. The standard deviation measures how spread out from the mean the dataset is. Adding k to each value doesn't change the spread of the data. Think of a dotplot, adding k to each data value will simply shift the dotplot to a new location, the shape (hence the deviation) will remain the same. An algebraic argument would also work.

e) Yes, the lowest score is an outlier and increases the spread of the data about the mean. Hence, removing it will cause the st. dev. to decrease.

2. a) 250

b) $\approx 36/200$

c) $36 + 8 + 6 \approx 50$

2. d) $\bar{x} \pm 2s = 269 \pm 2(14.2) = 269 \pm 28.4$

$(240.6, 297.4) \approx (240, 300)$

e) $9 + 36 + 60 + 50 + 25 + 15 = 195$ about $\frac{195}{200} \approx .975$

f) The data are approx bell-shaped so the Empirical Rule will give a better approx. of the % of data in the interval in part (d). Empirical Rules says about 95% of the data will be in the interval, which is close to the actual percent (97.5%).

3. a) $P(D) = \frac{27+18}{100} = \frac{45}{100}$

b) $P(F|D) = 18/45$

c) $P(D \cup F) = P(D) + P(F) - P(D \cap F)$

$= \frac{45}{100} + \frac{30}{100} - \frac{18}{100}$

$= 57/100$

	D	R	C	Tot
M	27	36	7	70
F	18	10	2	30
Tot	45	46	9	100

d) Yes. a person cannot be both a democrat and republican at the same time. If the person is in one of these parties, that excludes them from being in the other party.

e) i) $P(D_1) \cdot P(D_2|D_1) = \frac{45}{100} \cdot \frac{44}{99} = 0.2$

Sampling WOR

ii) P(at least one Dem) = 1 − P(no Democrats)

= 1 − P(not Dem. first person) · P(2nd person not dem | 1st pers not dem)

$= 1 - \frac{55}{100} \cdot \left(\frac{54}{99}\right) = 0.7$

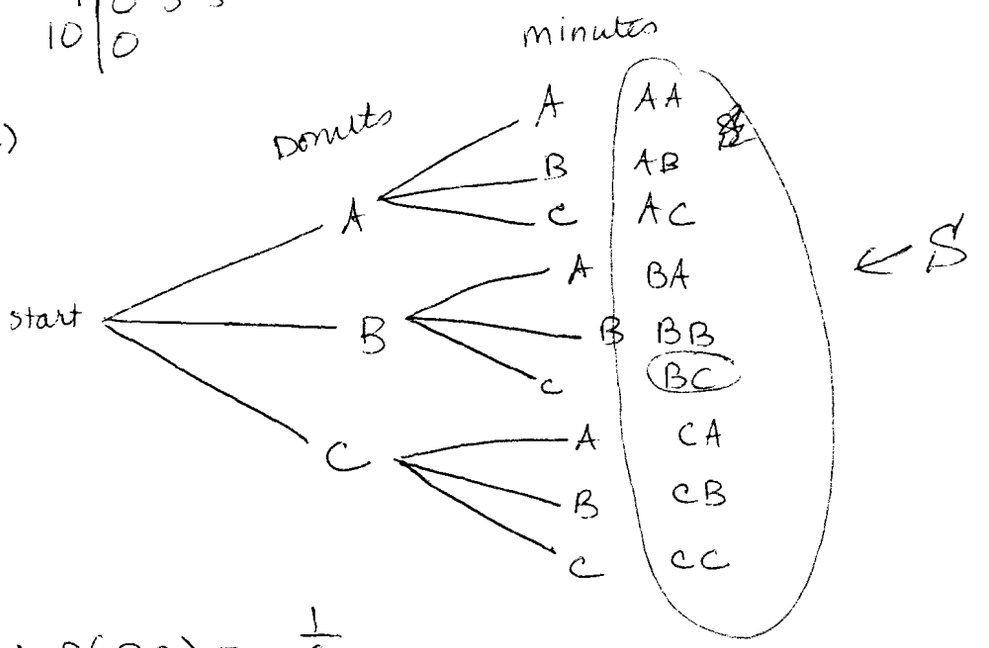
4. a)

	position	value
Q_1	$\frac{1}{4}(28+1) = 7.25$	$63 + 0.25(66-63) = 63.75 = Q_1$
m	$\frac{1}{2}(29) = 14.5$	$\frac{76+79}{2} = 77.5 = m$
Q_3	$\frac{3}{4}(29) = 21.75$	$85 + 0.75(88-85) = 87.25 = Q_3$

4b)

4	7 9 9
5	3 7
6	1 3 6 6
7	2 3 5 5 6 9
8	1 2 5 5 5 5 8 8 9
9	0 5 5
10	0

5. a)



b) $P(BC) = \frac{1}{9}$

c) D = same person both tasks = {AA, BB, CC}

$P(D) = 3/9 = 1/3$

d) B ≥ 1 task = {AB, BA, BB, BC, CB}

$P(B \geq 1 \text{ task}) = 5/9$

e) $P(\text{Bob no task}) = 1 - P(\text{Bob} \geq 1 \text{ task}) = 1 - 5/9 = 4/9$

6) a) $r = \frac{S_{xy}}{S_x S_y}$ $\quad S_{xy} = \frac{\Sigma xy - \frac{1}{n}\Sigma x \Sigma y}{n-1} = \frac{2459.87 - \frac{1}{6}(47)(273.3)}{6-1}$

$= 63.804$

Calculator gives: $S_x = 2.31$

$S_y = 28.85$

$r = \frac{63.804}{2.31(28.85)} = 0.96$

b) $\text{slope} = b = \frac{S_{xy}}{S_x^2} = \frac{63.804}{2.31^2} = 11.96$

$\text{intercept} = a = \bar{y} - b\bar{x} = 273.3/6 - (11.96)(47/6) = -48.1$

#6 ~~4~~6) $y = -48.1 + 11.96x$

c) For every year age increases, the predicted score increases by about 12 points.

d) $\hat{y} = -48.1 + 11.96(9) = 59.54$

7 a) qualitative

b) quantitative, continuous

c) qualitative

d) qualitative

e) quantitative – discrete

f) quantitative - continuous