Exam I /75

Name: Key

Formulas

$\bar{x} = \frac{\sum x}{n}$

$s^2 = \frac{\sum(x-\bar{x})^2}{n-1}$

$IQR = Q_U - Q_L$

$Range = Max - Min$

$z = \frac{observation-mean}{st.deviation} = \frac{x-\mu}{\sigma}$

Chebyshev's between kσ: $\left[\left(1 - \frac{1}{k^2}\right) * 100\right]\%$

Combinations: $\binom{n}{k} = nCr = \frac{n!}{r!(n-r)!}$

Permutations with replacement: $nPr = \frac{n!}{(n-r)!}$

Permutations with replacement: $nPr = n^r$

Permutations into k groups: $\frac{N!}{n_1!*n_{2!}\ldots n_{k!}}$

$P(A) = \frac{n(A)}{n(S)}$

$P(A^c) = 1 - P(A)$

$P(A|B) = \frac{P(A \cap B)}{P(B)}$

$P(A \cap B) = P(A)P(B|A) = P(B)P(A|B)$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Independence: 1) If $P(A|B) = P(A)$
2) If $P(B|A) = P(B)$
3) If $P(A \cap B) = P(A)P(B)$

Mutually Exclusive (disjoint): If $P(A \cap B) = 0$

1) **(12 points)** Gallup conducted a telephone poll asking 1,024 American adults aged 18 and older what party they aligned with and whether or not they approved of same-sex marriage. The result of the survey was that 60% of Americans approve of same-sex marriage with a margin of error of 4%.

a) **(2 points)** What is the population of this experiment?

American adults 18 and older

b) **(2 points)** What is the sample of this experiment?

1,024 Americans 18 and older sampled

c) **(2 points)** What is/are the variable(s) of this experiment and what type is each variable?

Party alignment - Qualitative

Stance on same-sex marriage - Qualitative

d) **(2 points)** What is the reported statistic for the study?

$\hat{p} = .60$

e) **(2 points)** What is a reasonable interval estimate for the parameter?

$.60 - .04 = .56$
$.60 + .04 = .64$

(.56, .64) is a reasonable interval

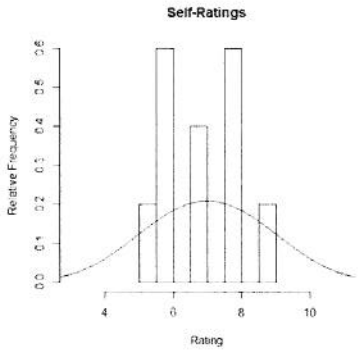
f) **(2 points)** Is this a designed experiment or an observational study?

This is a observational study.

2) **(16 points)** The survey of the class showed the following self-ratings from 1 to 10, ten being most attractive:

5, 6, 6, 6, 7, 7, 8, 8, 8, 9;

$\sum x = 70$; $\sum (x - \bar{x})^2 = 14$



a) **(2 points)** Is this data skewed? If so, which way is it skewed?

No, though an argument for it being bimodal is reasonable.

b) **(2 points)** Without calculating the mean or the median what should their relationship be? (Use part a.)

Mean = median

c) **(4 points)** Calculate an appropriate measure of center for these data.

mean = $\bar{x} = \frac{\Sigma x}{n} = \frac{70}{10} = 7$

median = 7

d) **(4 points)** Calculate an appropriate measure of spread for these data.

st. dev = $\sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}} = \sqrt{\frac{14}{10-1}} = \sqrt{1.55} = 1.247$

range = max - min = 9 - 5 = 4

IQR = $Q_3 - Q_1$ = 8 - 6 = 2

e) **(4 points)** What percent of data could I expect between two standard deviations of the mean?

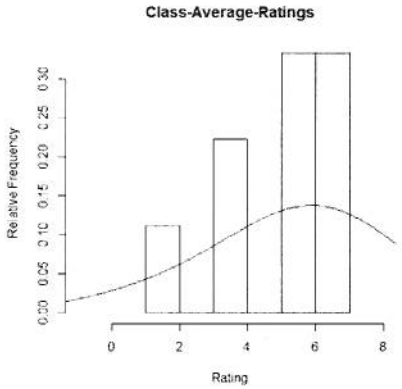
Empirical Rule states 95% between two st. dev (Bell shaped)

Chebyshev's Rule states 75% between two st. dev (Bimodal)

3) **(16 points)** The survey of the class showed the following class-average-ratings from 1 to 10, ten being most attractive:

1, 6, 6, 6, 7, 7, 8, 8, 8, 9;

$\sum x = 48$; $\sum (x - \bar{x})^2 = 32$



a) **(2 points)** Is this data skewed? If so, which way is it skewed?

Skewed left

b) **(2 points)** Without calculating the mean or the median what should their relationship be? (Use part a.)

mean < median

c) **(4 points)** Calculate an appropriate measure of center for these data.

median = 7

d) **(4 points)** Calculate an appropriate measure of spread for these data.

IQR = 8 - 6 = 2

e) **(4 points)** What percent of data could I expect between three standard deviations of the mean?

Chebyshev's Rule states $88.\overline{88}\%$ between three st. dev.

4) **(5 points)** Domino's Pizza offers twenty four toppings for their pizzas. If I were to order a different two-topping pizza every day how many days would it take for me to try every two-topping pizza dominoes can make.

$$\binom{24}{2} = \frac{24!}{2!(24-2)!} = \frac{24\cdot 23\cdot 22\cdot\cdots\cdot 1}{(2\cdot 1)(22\cdot 21\cdot\cdots\cdot 1)} = \frac{24\cdot 23}{(2\cdot 1)} = \frac{552}{2} = 276$$

5) **(5 points)** At home I have 91 books. I have a giant bookshelf that I'd like to put the books on - how many different ways I could put the books on the shelf?

$${}_{91}P_{91} = \frac{91!}{(91-91)!} = 91\cdot 90\cdots 1 \quad \leftarrow \text{This number is } \underline{\text{HUGE}}!$$

6) **(16 points)** (http://www.gallup.com/poll/183272/record-high-americans-support-sex-marriage.aspx)
A new Gallup poll on the support of same-sex marriage had very interesting results. It was reported that 60% of Americans support same-sex marriage. Given an American aligns with the Democrat Party the probability they support same-sex marriage is 76%. Given an American aligns with the Republican Party the probability they support same-sex marriage is 37%. Given an American aligns with the Independent Party the probability they support same-sex marriage is 64%.

a) **(2 points)** What's the probability that a randomly selected American does support same-sex marriage?

60%

b) **(2 points)** What's the probability that a randomly selected American doesn't support same-sex marriage?

$1 - 60\% = .40 \rightarrow 40\%$

c) **(2 points)** What's the probability that a randomly selected American supports same-sex marriage given they align with the independent party?

$P(S|I) = 64\%$

d) **(5 points)** If 42% of Americans align with the Independent party, what's the probability a randomly selected American is Independent and supports of same-sex marriage?

$$P(I \cap S) = P(I)\,P(S|I)$$
$$= (.42)(.64)$$
$$= .2688$$

e) **(5 points)** If 42% of Americans align with the Independent party, what's the probability a randomly selected American is Independent and doesn't support same-sex marriage?

$$P(I \cap S^c) = P(I)\,P(S^c|I)$$
$$= (.42)(1-.64)$$
$$= .1512$$