Name: Key

Math 345, Elementary Statistics – Crawford

Exam 1-B

7 March 2018

Score	
1	/6
2	/18
3	/8
4	/16
5	/10
6	/16
7	/12
8	/16
Total	/100

- No books or notes (in any form) allowed. Having a phone out during the exam will result in an automatic 0 grade.
- You may use a calculator and the formula sheet.
- Clearly indicate your answers.
- ***Show all your work*** – partial credit may be given for written work.
- Problems # 1 and 2 will be used to determine extra credit for Quiz 1.
- Good Luck!

Version A #3

1. (6 pts). Dr. Crawford collects 30 homework problems and she randomly selected 4 problems to grade.

(a). How many possible different groups of 4 problems could she choose?

$${}_{30}C_4 = \boxed{27405}$$

(b). You did not do exactly 4 problems in the homework. What is the probability that the 4 that she randomly picked are the exact same 4 that you did not do?

$$P(\text{picked same } 4) = \frac{1}{27405} \approx \boxed{\begin{array}{c} 3.64 \times 10^{-5} \\ .0000364 \end{array}}$$

2. (18 pts). The following table summarizes results from tests of an experiment to test the effectiveness of an experimental vaccine for children (based on data from USA Today).

	Developed Flu	Did Not Develop Flu
Vaccine Treatment	14	1056
Placebo	95	437
total	109	

total 1602

(a). If one of the subjects is randomly selected, find the probability getting one who had the vaccine treatment or developed flu.

$$P(V \text{ or } F) = \frac{14+1056+95}{1602} = \frac{1165}{1602} = \boxed{0.727}$$

Version A (c)

(b). If one of the subjects is randomly selected, find the probability of getting one who had the vaccine treatment and developed the flu.

$$P(V \text{ and } F) = \frac{14}{1602} \approx \boxed{0.00874}$$

simultaneously

Version A (b)

(c). If two of the subjects are randomly selected without replacement, find the probability that they both developed the flu.

$$P(F \text{ and } F) = \frac{109}{1602} \cdot \frac{108}{1601} = \boxed{.00459}$$

(d). If one of the subjects is randomly selected, find the probability of getting someone who developed the flu given that the subject received the placebo.

$$P(F|P) = \frac{95}{532} \approx \boxed{0.179}$$

total placebo
95 + 437
= 532

3. (8 pts). Suppose a college department has 8 faculty, 5 alumni directors, and 42 graduating seniors. They want to form a committee that is comprised of 3 faculty, 2 alumni directors, and 5 graduating seniors. How many possible ways could they form such a committee?

Faculty	Alumni	Seniors
$_8C_3$	$_5C_2$	$_{42}C_5$
56	10	850668

$56 \times 10 \times 850668 = \boxed{476{,}374{,}080}$

4. (16 pts). The following measurements were recorded for the drying time, in hours, of a certain brand of latex paint.

3.4 2.5 4.8 2.9 3.6 2.8 3.3 5.6 3.7 2.8

Find each of the following. [You may use the built in STAT/LIST features of your calculator when possible.]

(a). mean

$\boxed{3.54}$

Calculator 1-Var Stats.

(b). median

$\boxed{3.35}$

Calculator 1-Var stats

(c). mode

$\boxed{2.8}$

(d). midrange

$\dfrac{\text{min}+\text{max}}{2} = \dfrac{2.5+5.6}{2}$

$\boxed{4.05}$

(e). range

$5.6-2.5$

$= \boxed{3.1}$

(f). (sample) standard deviation

$\boxed{0.97}$

Calculator 1-Var stats

(g). (sample) variance

$S_x^2 = (0.973196337 4)^2$

$= \boxed{0.95}$

5. (10 pts). Consider the following sorted data giving the weights in pounds from a sample of anesthetized wild bears.

34 80 140 166 180 | 204 220 262 332 344 348 360 416

13 values

(a). Find the percentile corresponding to 204 pounds.

rounding up.

$\frac{5}{13} \times 100 = 38.46 \Rightarrow$ $\boxed{39^{th} \text{ percentile}}$

Also accept 38th percentile for rounding down (book rounds to nearest integer)

(b). Find the 70^{th} percentile.

$L = 13(.70) = 9.1 \Rightarrow$ Round up to 10

$\boxed{P_{70} = 344}$

Version A

Find 60^{th} percentile.

$L = 13(.60) = 7.8$

$\Rightarrow$ Round up to 8

$\boxed{P_{60} = 262}$

6. (16 pts). In the 87th Academy Awards, Eddie Redmayne won for best actor at the age of 33 and Julianne Moore won for best actress at the age of 54. For all best actors, the mean age is 44.1 years and the standard deviation is 8.9 years. For all best actresses, the mean age is 36.2 years and the standard deviation is 11.5 years.

(a). Relative to their genders, did Eddie Redmayne or Julianne Moore have the more extreme age when winning the Oscar?

ER: $z = \frac{33 - 44.1}{8.9} = -1.25$

JM: $z = \frac{54 - 36.2}{11.5} = 1.55$ ← Larger z-score

$\Rightarrow$ Further from the mean.

Julianne Moore's age was more extreme

(b). Using the range rule of thumb, find the values separating best actor ages that are significantly low or significantly high.

Actors

$\mu - 2\sigma = 44.1 - 2(8.9) = 26.3$

$\mu + 2\sigma = 44.1 + 2(8.9) = 61.9$

Sig. Low values are 26.3 or less

Sig. High values are 61.9 or higher

Actresses (Version A)

$\mu - 2\sigma = 36.2 - 2(11.5) = 13.2$

$\mu + 2\sigma = 36.2 + 2(11.5) = 59.2$

Sig. Low ages are 13.2 or less

Sig. High ages are 59.2 or higher

7. (12 pts). Given the following probability distribution, find the mean and standard deviation using the formulas $\mu = \sum x \cdot P(x)$ and $\sigma = \sqrt{\sum[x^2 \cdot P(x)] - \mu^2}$.

[Show your computations, preferably by adding new columns to the given table.]

x	$P(x)$	$x \cdot P(x)$	x^2	$x^2 \cdot P(x)$
0	0.12	0	0	0
2	0.43	0.86	4	1.72
3	0.28	0.84	9	2.52
5	0.17	0.85	25	4.25

Sum ⇒ $\sum x \cdot P(x)$ $\boxed{\mu = 2.55}$

sum $\sum x^2 P(x)$ 8.49

$\sigma^2 = \sum x^2 \cdot P(x) - \mu^2$

$= 8.49 - (2.55)^2$

$= 1.9875$

$\sigma = \sqrt{1.9875}$

$\approx \boxed{1.41}$

8. (16 pts). A survey sponsored by the Vision Council showed that 79% of adults need correction (glasses, contacts, surgery, etc.) for their eyesight. If 20 adults are randomly selected,

$n = 20$ $p = .79$ Binomial Prob. Dist.

(a). Find the probability that 14 of them need correction for their eyesight.

$P(14) = \text{binompdf}(20, .79, 14) \approx \boxed{0.123}$

(b). Find the probability that at least 19 of them need correction for their eyesight.

binompdf

$P(X \geq 19) = P(19 \text{ or } 20) = P(19) + P(20) = 0.04766 + .00896$

$\approx \boxed{.0566}$

OR $P(X \geq 19) = 1 - P(\overline{X \geq 19}) = 1 - P(X \leq 18)$

$= 1 - \text{binomcdf}(20, .79, 18) = 1 - 0.94337 \approx \boxed{.0566}$

(c). Using probability, is 19 a significantly high number of adults requiring eyesight correction?

$P(X \geq 19) = .0566 \not\leq .05$ ⇒ $\boxed{\text{19 is not significantly high}}$

from (b)

(d). What is the mean and standard deviation for the number of adults requiring eyesight correction in this group of 20?

$\mu = np = 20(.79) = \boxed{15.8}$

$\sigma = \sqrt{npq} = \sqrt{20(.79)(.21)} = \sqrt{3.318} \approx \boxed{1.82}$