$n=29$
$\bar{x}=81$
$s=8.5$
min = 6
max = 96.5

55

Name: Key

Summer 2008 – Math 5
Quiz #2

Instructions: All work must be shown that supports the final answer. A calculator may be used, but the formulas and appropriate work must be shown to support the final answer, even if it was achieved using a calculator. You may not use any human help for the completion of this exam. Use of your homework, tests, notes, book and non-human internet support is acceptable. Good luck! This quiz is due at 1:15 on Monday, June 30. You have a fifteen minute grace period. After 1:15 the percent possible will go down by 20% every 15 minutes that it is late (at 1:15 you can only get an 80%, at 1:30 you can only get a 60%, at 1:45 you can only get 40%, at 2:00 you can only get 20%.)

1. For the following data which are the ages of US Presidents on their respective inauguration days, answer the questions that follow:

   57, 61, 57, 57, 58, 57, 61, 54, 68, 51, 49, 64, 50, 48, 65,
   52, 56, 46, 54, 49, 50, 47, 55, 55, 54, 42, 51, 56, 55, 51,
   54, 51, 60, 62, 43, 55, 56, 61, 52, 69, 64, 46, 54

a) Find the variance and then calculate the standard deviation. +2½

$$s^2=\frac{n\sum x^2-(\sum x)^2}{n(n-1)}=\frac{43(130829)-(2357)^2}{43(42)}=\frac{5625647-5555449}{1806}=\frac{70198}{1806}$$

$$=38.86932447\approx\boxed{38.9\,yr^2}\qquad S=\sqrt{S^2}=\sqrt{38.86932447}=6.234526804\approx\boxed{6.2\,yr.}$$

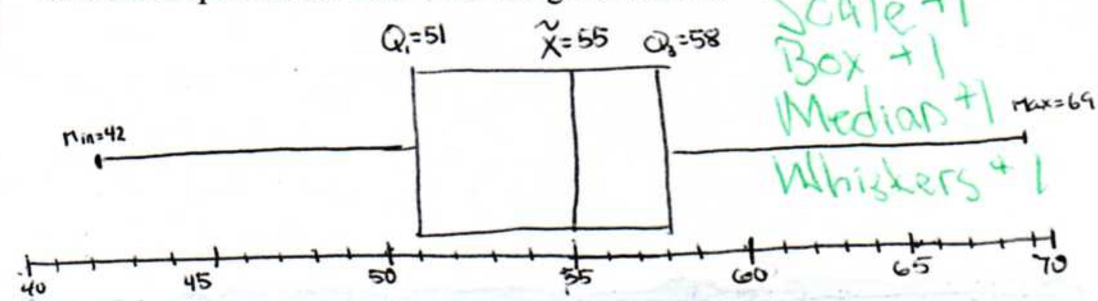
+½ +½ +½ +½ +½

b) Give the 5 number summary for the data. Show indicator/locator functions for median and 1st quartile. +3½

$L_{25}=\frac{1}{4}(43)=10.75\uparrow 11$ +½ $\quad L_{50}=\frac{1}{2}\cdot 43=21.5\uparrow 22$ +½

min = 42
$Q_1=51$ $\quad Q_3=58$ +½ each
$\tilde{x}=55$ $\quad$ max = 69

c) Create a boxplot for the data. Don't forget to scale it. +4



Scale +1
Box +1
Median +1
Whiskers +1

d) Using the boxplot, what are your observations about the shape of the data? +1

Since the median is not in the middle & is to the right this indicates left skew. or Symmetry & explanation
Box is fairly centered and median is only 1 unit toward rt. of box so fairly symmetric

e) Now use the criteria for skewness to support or question your visual inspection of the shape of the data using the boxplot. +1

mode = 54

$\bar{x}=\frac{2357}{43}=54.81395349\approx 54.8$

$\tilde{x}=55$

mean ≈ median ≈ mode
∴ Symmetric

or

mean left of median ∴ left skew

Pearson Skewness $I=\frac{3(54.8-55)}{6.2}=-0.09677$

Not less than −1 so ≈ symmetric

Is negative though! → Left

+12

Mean +1

f) +3 Calculate the z-score for the data point that represents the median and the 3rd quartile.

+1 $Z_{\tilde{x}} = \frac{55-54.8}{6.2} = \frac{0.2}{6.2} = 0.032258064 5 \approx 0.03$

+1 $Z_{Q_3} = \frac{58-54.8}{6.2} = \frac{3.2}{6.2} = 0.5161290323 \approx 0.52$

Note: Use exact $\bar{x}$ & s
0.0298411484
≈0.03
0.5110326108
≈0.51

g) +1 For this data, which is more appropriate the Empirical Rule or Chebyshev's Rule? Why? (The why must be answered for full credit.)

Empirical Rule b/c ≈symmetric or Chebyshev's b/c left skewed

Must agree w/ d & e

h) +1 What percent of the data would you expect to find within 2 standard deviations of the mean? Be sure to indicate how you arrived at the percentage.

95% if g) is Empirical / $1 - \frac{1}{2^2} = 75\%$ if g) is Chebyshev's

i) +2 In what range would you expect to find the percentage of data that you indicated in h)?

$\bar{x} \pm 2s \Rightarrow 54.8 \pm 2(6.2) = 54.8 \pm 12.4$ +1

(42.4, 67.2) is range expect 95%/75% +½ +½

j) +1 What is the actual percentage of data between the 2 points indicated in i)? If a point is an actual data point, use it in the calculation.

Count # of pts. between 42.4 & 67.2 → 40 +½

$\frac{40}{43} \cdot 100\% \doteq 93\%$ +½

2. An OB/GYN wants to learn whether the amount of prenatal care and the expectation of a pregnancy are associated. In an attempt to investigate, he randomly selected 939 women and asked them if their pregnancy has been intended, unintended or mistimed and if they had received prenatal care before 3months, sometime between 3 to 5 months or after 5 months (or never). Based on the following information, answer the questions below. Use correct round-off.

593 intended pregnancies and 64 unintended pregnancies received care before 3 months, 26 intended pregnancies and 19 mistimed pregnancies received care sometime between 3 and 5 months and 11 unintended pregnancies and 16 mistimed pregnancies received care after 5 months. There were a total of 652 intended pregnancies, 83 unintended pregnancies and 204 mistimed pregnancies.

See p. 575 of Sullivan

a) +8 Create a contingency table to summarize the data.

	Intended	Unintended	Mistimed	
<3	593 +½	64 +½	204-16-19 169 +½	939-53-60 826 +½
3-5	26 +½	83-64-11 8 +½	19 +½	26+8+19 53 +½
>5	652-593-26 33 +½	11 +½	16 +½	33+11+16 60 +½
	652 +½	83 +½	204 +½	652+83+204 939 +½

+16

b) +2½ What is the probability that a randomly chosen pregnancy was unintended? +½

$$P(\text{unintended}) = \frac{83}{939} = 0.0883919063 \approx \boxed{0.0884}$$

c) +2½ What is the probability that a randomly chosen pregnancy was unintended or mistimed?

$$P(\text{unintend} \cup \text{mistimed}) = P(\text{unintend}) + P(\text{mistimed})$$

$$\frac{83}{939} + \frac{204}{939} = \frac{287}{939} = 0.3056443024 \approx \boxed{0.306}$$ +½

d) +2½ What is the probability that a randomly chosen pregnancy was mistimed or care was received after 5 months?

$$P(\text{mistimed} \cup >5\text{mo}) = P(\text{mistimed}) + P(>5\text{mo}) - P(\text{mistimed} \cap >5\text{mo})$$

$$\frac{204}{939} + \frac{60}{939} - \frac{16}{939} = \frac{248}{939} \approx \boxed{0.264}$$ +½

0.264

e) +2½ What is the probability that a randomly chosen pregnancy was unintended and care was received after 5 months?

$$P(\text{unintended} \cap >5\text{mo}) = \frac{11}{939} = 0.01171459 \approx \boxed{0.0117}$$ +½

f) +2½ What is the probability that a randomly chosen unintended pregnancy received care after 5 months?

$$P(>5\text{mo.} \mid \text{unintended}) = \frac{P(>5\text{mo.} \cap \text{unintended})}{P(\text{unintended})} = \frac{11/939}{83/939}$$

$$= 11/83 = 0.1325301205 \approx \boxed{0.133}$$ +½

3. There are 34 peanut butter M&M's (the others are all chocolate) in my jar which contains 100 M&M's. What is the probability of randomly selecting

a) +2½ A peanut butter M&M from the jar?

$$P(PB) = 34/100 = \boxed{0.34}$$ +½

b) +1 A non-peanut butter M&M from the jar?

$$P(\text{chocolate}) = 1 - P(PB) = 1 - 0.34 = \boxed{0.66}$$

c) +1 If I pick up a handful of 5 M&M's are these 5 M&M's that I chose considered independent events? Support your answer.

No, b/c I am not replacing them before I choose another.

d) +4 What is the probability that in picking up a handful of 5 M&M's that all 5 are peanut butter (Hint: The 1st is **and** the 2nd is **and** the 3rd etc. are peanut butter)

+1 0.00434

$$P(\text{all are PB in 5}) = P(1^{st} PB) \cdot P(2^{nd} PB) \cdot P(3^{rd} PB) \cdot P(4^{th} PB) \cdot P(5^{th} PB)$$

$$= \frac{34}{100} \cdot \frac{33}{99} \cdot \frac{32}{98} \cdot \frac{31}{97} \cdot \frac{30}{96} = 0.0036959114$$

+½ +½ +½ +½ +½ ≈ 0.0037 +½

Mult. +1

+21

4. Using counting theory find the following probabilities.

a) A combination lock is opened by the correct 3 numbers in sequence with choices of numbers being 0 through 9. Numbers can be repeated. What is the probability of randomly choosing the correct combination to such a lock?

+1½

Sequence of events for which each has a choice of 10 possible outcomes

+1 $10^3 = 1000$

$\boxed{P(1\text{ correct}) = 1/1000}$ +½

b) What is the probability of arranging the following letters into the word that I am thinking of? IPFALIUN

+1½

Typo: Not suppose to have an extra I
w/ extra I makes 8 letters w/ 2 same
$\frac{8!}{2!}$ Permutations

8 letters arrange in order & can't repeat

$8! = 40,320$ +1

$\boxed{P(\text{my word}) = 1/40,320}$ +½

c) To win the lottery the winner must choose 5 numbers from 1 through 36 in any order. Give the probability of winning this lottery.

+1½

↳ combination

${}_{36}C_5 = 376,992$ +1

$\boxed{P(\text{winning combo}) = 1/376,992}$ +½

d) What is the probability of drawing (in order, without replacement) an ace of diamonds, an ace of spades, an ace of hearts?

+1½

↳ Permutation

${}_{52}P_3 = 132,600$ +1

$\boxed{P(\text{winning hand}) = 1/132,600}$ +½

Note: As most are such small #'s I have left them as fractions to show where the answers came from.

+6