Math 1351 Review #1(answers)

1. Consider the data set $\{17, 99, 25, 97, 29, 40, 39, 96, 40, 95, 92, 89, 52, 71, 64\}$.

a) Complete the stem and leaf plot of the data values.

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

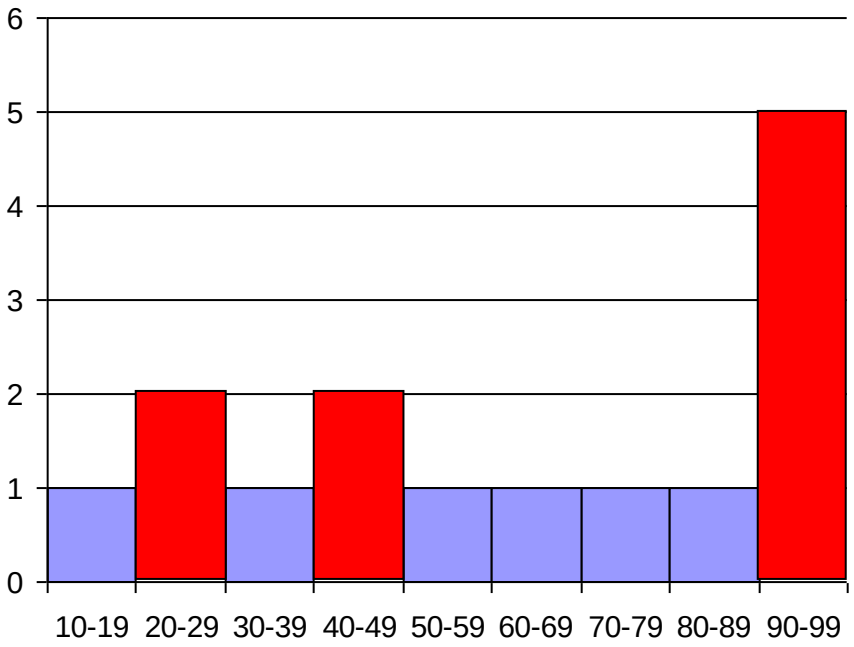
b) Complete the ordered stem and leaf plot of the data values.

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

c) Complete the grouped frequency table of the data values.

Interval	**Frequency**
10-19	1
20-29	2
30-39	1
40-49	2
50-59	1
60-69	1
70-79	1
80-89	1
90-99	5
Total	15

d) Complete the histogram of the data values.



e) Compute the mean of the data values.

$$\frac{17+99+25+97+29+40+39+96+40+95+92+89+52+71+64}{15}=\frac{945}{15}=\boxed{63}$$

f) Compute the median of the data values.

The median is the value in the 8th position. So the median is $\boxed{64}$.

g) Compute the mode of the data values.

The mode is $\boxed{40}$.

h) Compute the lower quartile of the data values.

			Q_1						median					
17	25	29	39	40	40	52	64	71	89	92	95	96	97	99

The lower quartile is $\boxed{39}$.

i) Compute the upper quartile of the data values.

									median		Q_3			
17	25	29	39	40	40	52	64	71	89	92	95	96	97	99

The upper quartile is $\boxed{95}$.

j) Compute the interquartile range of the data values.

$$IQR = Q_3 - Q_1 = 95 - 39 = \boxed{56}.$$

k) If an outlier is defined as a value which is more than 1.5 IQR units below the lower quartile or above the upper quartile, then determine all the outliers in this data set.

There are no outliers for this data set.

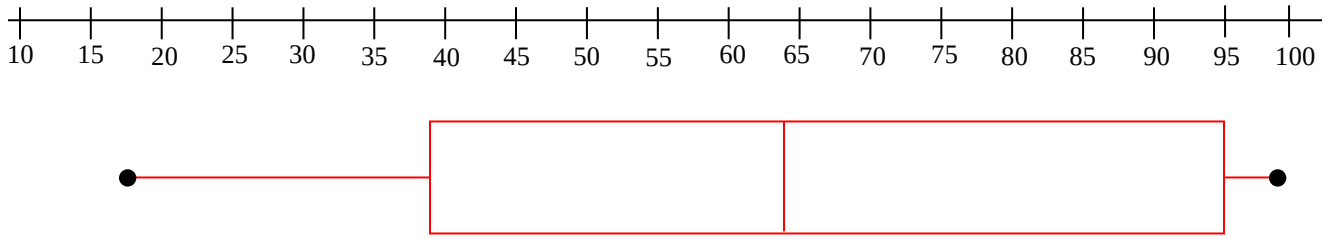
l) Find the percentile of 64 in this data set.

64 is greater than or equal to 8 of the values in the data set, so it's percentile is approximately $\boxed{53^{rd}}$.

m) Compute the range of the data values.

$$Range = 99 - 17 = \boxed{82}$$

n) Complete the box and whisker plot of the data values.



o) Complete the table, and use it to find the variance and standard deviation of the data set.

x	$x-\bar{x}$	$(x-\bar{x})^2$
17	–46	2116
99	36	1296
25	-38	1444
97	34	1156
29	-34	1156
40	-23	529
39	-24	576
96	33	1089
40	-23	529
95	32	1024
92	29	841
89	26	676
52	-11	121
71	8	64
64	1	1

$$\frac{2116+1296+1444+1156+1156+529+576+1089+529+1024+841+676+121+64+1}{15} = \frac{12618}{15}$$

So the variance is $\boxed{841.2}$, and the standard deviation is $\sqrt{841.2} \approx \boxed{29.00}$.

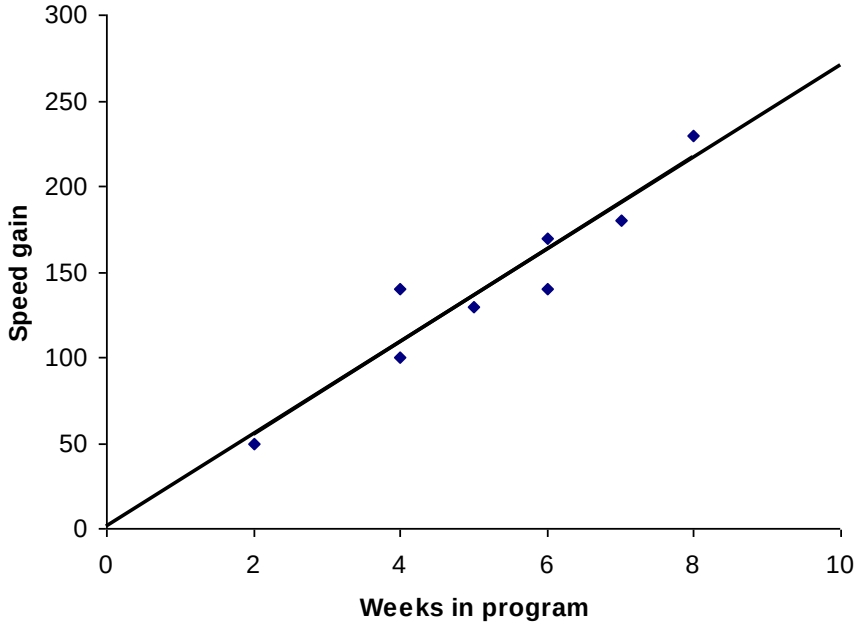
p) Determine the z-score of the data value 39.

$$\frac{39-63}{29} \approx \boxed{-.828}$$

2. Students taking a speed reading course produced the following gains in their reading speeds:

Weeks in the program	Speed gain
2	50
4	100
4	140
5	130
6	170
6	140
7	180
8	230

Here is a scatterplot of the data along with a regression line:



The equation of the regression line is $y = 26.9x + 1.5$.

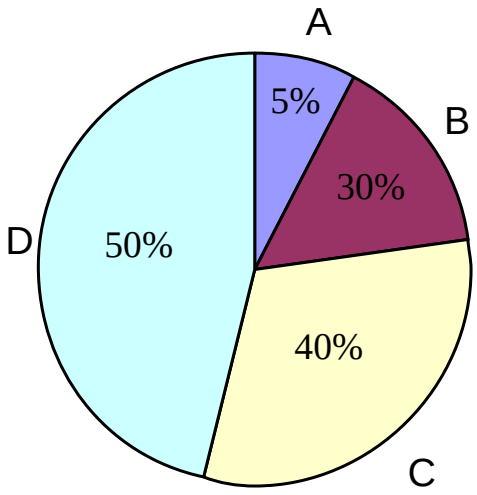
a) Would you say that speed gain and weeks in program are positively correlated, negatively correlated, or uncorrelated?

Since the regression line is reasonably close to the points and has a positive slope, they are positively correlated.

b) Using the equation of the regression line, predict the speed gain of a student after 3 weeks in the program.

$$26.9(3) + 1.5 = \boxed{82.2}$$

3. Describe at least two problems you see with the following pie chart.



Problems:
The 50% sector is less than half of the circle.
The sum of the percentages is 125%.
The 30% sector is not 6 times the size of the 5% sector.
The 40% sector is not 1/3 larger than the 30% sector.
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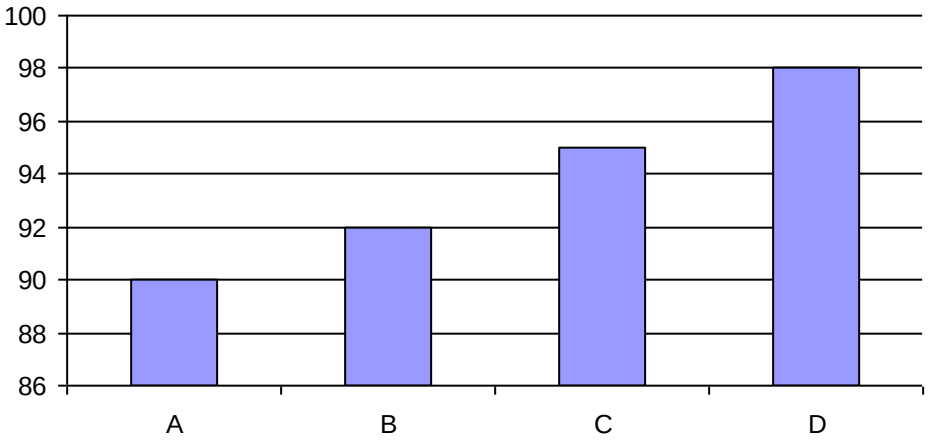
4. What could be done in the following bar graph to deemphasize the differences in the categories?



The vertical scale could be started at 0 instead of 86.

5. Steve took the ACT in 2016, and received a score of 22. If the mean and standard deviation for that year were 20.9 and 4.9, respectively,

a) What percentile is he in?

$\frac{22-20.9}{4.9} \approx .224$, so from the table on page 454, he is in approximately the $\boxed{58^{th}}$ percentile.

b) What percent of all the students who took the exam had a score better than his?

Approximately 42% of the students who took the test had a better score.

6. A survey found that the number of hours spent studying by Math for Elementary Teachers per week is normally distributed. The mean number of hours is 5 with a standard deviation of 3.72. If 200 students were surveyed, approximately how many of them spent more than 8 hours studying?

$\frac{8-5}{3.72} \approx .806$, so from the table on page 454, this is approximately the 79^{th} percentile. This means that approximately 21% are larger, and 21% of 200 is $\boxed{42}$.

7. A biologist wants to estimate the number of fish in a lake. As part of the study, 250 fish are caught, tagged, and released back into the lake. Later, 500 fish are caught and examined. Of the 500 fish caught, 18 have tags, and the rest don't.

a) Identify the population being studied.

The population is the fish in the lake.

b) Identify the sample actually observed.

The sample is the 500 fish caught.

c) Identify any possible sources of bias.

Possible biases:
The fish may have been caught in only one portion of the lake.
The method of capture might exclude some types of fish.
Tagged fish may be more or less likely to be caught again.
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