

1. (3 points) Construct a stem-and-leaf diagram for the following data.

| | | | | | | |
|----|-----|-----|-----|-----|-----|-----|
| 85 | 106 | 112 | 63 | 66 | 70 | 90 |
| 64 | 62 | 71 | 88 | 125 | 105 | 90 |
| 86 | 71 | 70 | 72 | 82 | 125 | 123 |
| 78 | 61 | 60 | 120 | 60 | 74 | 66 |

2. (2 points) Find the median of the data. 30 25 42 60 16 38 50 68

3. (2 points) Complete the following frequency table by filling in the class mark.

| Class Number | Class Limits | Class Mark | Frequency |
|--------------|--------------|------------|-----------|
| 1 | 21 - 27 | | 10 |
| 2 | 28 - 34 | | 5 |
| 3 | 35 - 41 | | 18 |
| 4 | 42 - 48 | | 20 |

4. (3 points) For the set of data in the table of problem 3, answer each question if possible. If the answer cannot be determined from the given information, write an X. How many pieces of data are

A) less than or equal 34 ?

B) greater than 35?

C) Between an including 21 and 34?

5. (3 points) Suppose on a national standard exam, a person gets a score of 552 out of 800 which places her in the 81st percentile. What this mean?

6. (4 points) For a large set of data, the mean is 640 with a standard deviation of 35. What percent of the data lies between 563 and 717? Use Chebyshev's theorem and round your % to two decimal places.

7. (3 points) Find the mean, standard deviation and variance of
140 165 128 145 134 138 146 172

8. (4 points) Find the mean and standard deviation of the data.

| Class Limits | Class Mark | Frequency |
|--------------|------------|-----------|
| 22 - 26 | | 5 |
| 27 - 31 | | 8 |
| 32 - 36 | | 15 |
| 37 - 41 | | 23 |
| 42 - 46 | | 14 |
| 47 - 51 | | 6 |

Mean =

Std Dev =

9. (4 points) A small company consists of the owner, seven managers, twenty salespersons, and nine technicians. Their annual salaries are listed in the following table. Find the mean and standard deviation of the annual salaries. Be sure to include the units of measurement.

| <u>Staff</u> | <u>Salary</u> |
|--------------|---------------|
| Owner | \$260,000 |
| Managers | \$122,000 |
| Salesperson | \$157,000 |
| Technicians | \$ 92,000 |

mean =

std dev =

10. (4 points – 2 points each) Suppose that for the states in the U.S, the mean and standard deviation of crimes rates are, respectively 49.48 and 12.75. Use the **Empirical Rule** to answer each question.

(a) What percent of the states have incidences of crime between 36.73 and 62.23?

(b) In what interval will 99.7% of the crimes rates fall?

11. (3 points) The standard deviations of two production processes are computed to be as follows:

| <u>Process A</u> | <u>Process B</u> |
|------------------|------------------|
| 56.03 mm | 55.98 mm |

Which process, A or B, is more consistent? Why?

12. (4 points) A production process is constructed so that if in a sample of manufactured units, the **variance** is greater than 0.15 square centimeters, the process is considered out-of-control. Following are measurements (in centimeters) made on the process. Determine if the process is in or out-of-control and justify your answer mathematically.

21.8 21.6 21.9 21.7 21.0 22.1

Choose one of the following:

In control because

Out-of-control because

13. (4 points) A student scored a 92 on a philosophy exam that had a mean of 85 and standard deviation of 6 and a 28 on a economics exam that had a mean of 23 and standard deviation of 4.2. Relative to her classes, on which exam did she do better. Justify your answer with the appropriate computations.

She did better on her exam
because in that class her z - score of of
was higher than that of her class,
which was .

14. (3 points) Consider a data set with a computed mean, median, and standard deviation.
- a) If only the smallest number in the set was decreased in value, what would be the effect on the mean, if any? (Would it increase, decrease, or stay the same?)
-
- b) If only the highest number in the set was decreased in value but to a value still greater than the median, what would be the effect on the median, if any? (Would it increase, decrease, or stay the same?)
-
- c) If the smallest number was decreased in value, what would be the effect on the standard deviation, if any? (Would it increase, decrease, or stay the same?)
-

15. (3 points) Suppose that for a set of 7 pieces of data:

$$\sum x = 169$$

$$\sum x^2 = 4123$$

Compute both the mean and standard deviation. Use the formulas on your formula sheet.

16. (3 points) Some data sets include values so high or so low that they seem to stand apart from the rest of the data. These data are called *outliers*. Outliers may be from data collection errors, data entry errors, or simply valid but unusual values. Outliers in a data set can be identified using the *interquartile* range, the difference between the third and first quartiles of the data set. That is,

$$IQR = Q_3 - Q_1$$

Data values below

$$Q_1 - 1.5 \times IQR$$

or above

$$Q_3 + 1.5 \times IQR$$

are potential outliers.

For the following set of data, $Q_1 = 61.5$ and $Q_3 = 71.5$.

Identify any potential outliers. Show your work for verification.

IQR=

Outlier:

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 65 | 69 | 72 | 67 | 68 | 74 | 64 | 50 |
| 60 | 4 | 55 | 75 | 73 | 67 | 71 | 62 |
| 52 | 66 | 63 | 80 | 61 | 64 | 74 | 65 |

Math 10 Exam #1, Probable Solutions

①

| | |
|----|----------|
| 6 | 36421006 |
| 7 | 0110284 |
| 8 | 5326 |
| 9 | 00 |
| 10 | 68 |
| 11 | 2 |
| 12 | 5530 |

⑤

| L1 | L2 |
|----|----|
| 24 | 5 |
| 29 | 8 |
| 34 | 15 |
| 39 | 23 |
| 44 | 14 |
| 49 | 6 |

1-var stats 4, 12

$$\bar{X} = 37.6$$

$$S = 6.7$$

⑫ out of control if $S^2 > .15$
 in control if $S^2 \leq .15$

1-var stats 4

| L1 |
|------|
| 21.8 |
| 21.6 |
| 21.9 |
| 21.7 |
| 21.0 |
| 22.1 |

$S_x = .376386$
 square this to get the variance.
 $(.376386)^2 \Rightarrow S^2 = .14 < .15$

② Put the numbers in ascending order
 14 25 30 38 42 50 60 63

⑨

| L1 | L2 |
|---------|----|
| 200,000 | 1 |
| 122,000 | 7 |
| 157,000 | 20 |
| 92,000 | 9 |

$$\bar{X} = \$137,357$$

$$S = \$34,530$$

In Control since the variance is less than .15.

$$\frac{38+42}{2} = \frac{80}{2} = 40$$

③

| | |
|-------|----|
| 21-27 | 24 |
| 28-34 | 31 |
| 35-41 | 38 |
| 42-48 | 45 |

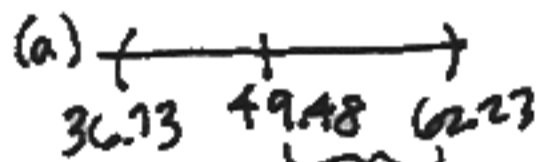
⑩ Empirical Rule
 1 std dev: 68% $\mu = 49.48$
 2 - - - : 95% $\sigma = 12.75$
 3 - - - : 99.7%

⑬ $Z_p = \frac{92-85}{6} = 1.16$

$Z_E = \frac{28-23}{4.2} = 1.19$

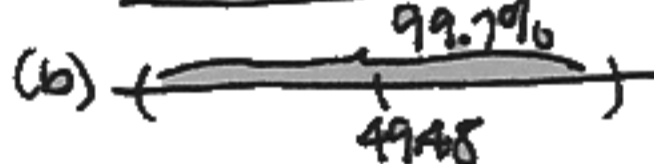
| | |
|------------|------|
| Economics | 1.19 |
| Philosophy | 1.16 |

④ A) less than 34: $10+5=15$
 B) greater than 35: X
 C) $10+5=15$



$$\frac{62.23 - 49.48}{12.75} = 1$$

So, 68% ②



99.7% → 3 std devs.

$$3 \times 12.75 = 38.25$$

$$\text{So, } 49.48 - 3 \times 12.75 = 11.23$$

$$49.48 + 3 \times 12.75 = 87.73$$

11.23 to 87.73 ②

⑭ (a) Decrease ①

(b) Stay the same ①

(c) Increase ①

⑤ 81% of all the people who took this exam scored her score (552/800) or lower. ③

⑮ $\sum X = 169$ $\sum X^2 = 4123$

$$\bar{X} = \frac{\sum X}{n} = \frac{169}{7} = 24.1$$

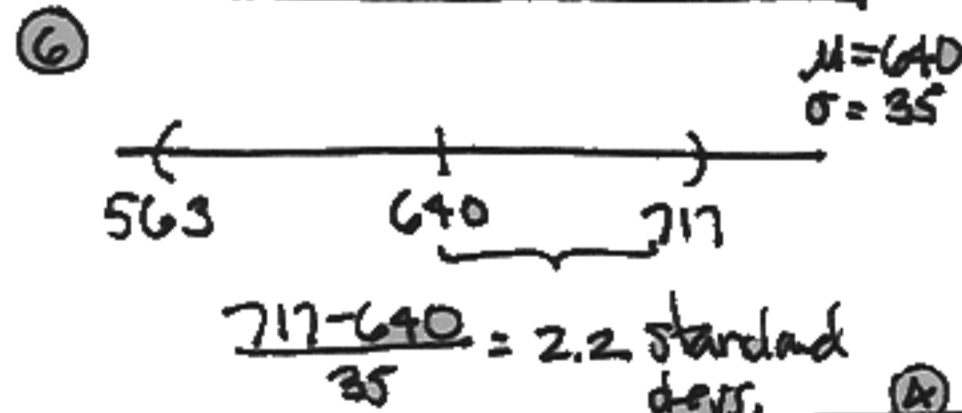
$$S = \sqrt{\frac{\sum X^2 - (\sum X)^2}{n(n-1)}}$$

$$S = \sqrt{\frac{7(4123) - 169^2}{7(7-1)}}$$

$$S = \sqrt{\frac{(7 \times 4123 - 169^2) / (7 \times 6)}{6}} = 2.7$$

$$\bar{X} = 24.1$$

$$S = 2.7$$



Then $1 - \frac{1}{2.2^2} = .793 \approx$ At least 79% ②

⑪ Process B is more consistent because it has the smaller std dev - the smaller variation.

⑯ $Q_1 = 1.5 \times IQR$
 $61.5 - 1.5 \times 10 = 46.5$

$Q_3 + 1.5 \times IQR$
 $76.5 + 1.5 \times 10 = 91.5$

only 4 < 46.5 and none > 91.5

⑦

| L1 |
|-----|
| 140 |
| 160 |
| 128 |
| 145 |
| 139 |
| 138 |
| 146 |
| 172 |

1-var stats 4

$$\bar{X} = 146$$

$$S = 15.1$$

$$S^2 = 229.4$$