## Sample Problems

1. The following list of data represents highway fuel consumption in miles per gallon (mpg) for a random sample of 30 cars. Construct a grouped frequency table, histogram and frequency polygon for this data using five equal interval lengths and starting with the interval 13-20.

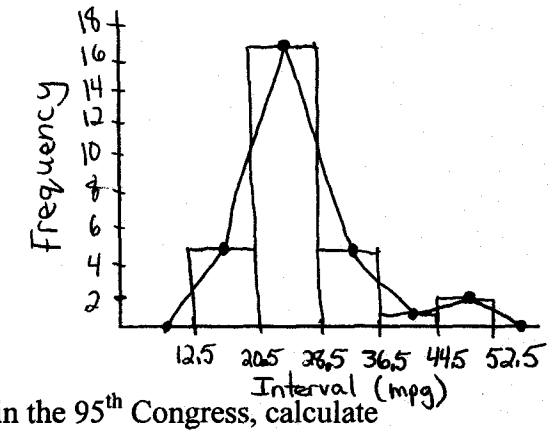
30,27,22,25,24,35,35,33,52,49,20,23,24,25,30,18,20,25,27,24,24,27,26,25,24,13,13, 21,28,37

$20 - 13 = 7$

$21+7=28$

$29+7=36$

| mpg | Tally | Frequency |
|---|---|---|
| 13-20 | ~~IIII~~ | 5 |
| 21-28 | ~~IIII~~ ~~IIII~~ ~~IIII~~ II | 17 |
| 29-36 | ~~IIII~~ | 5 |
| 37-44 | I | 1 |
| 45-52 | II | 2 |




2. Using the following frequency chart for ages of senators in the 95th Congress, calculate the mean, median and mode. Hint: you will need to calculate the midpoint for each class.

| Age (yrs) | Frequency | Midpoint | Product (f×m) |
|---|---|---|---|
| 30-39 | 6 | 34.5 | 207 |
| 40-49 | 26 | 44.5 | 1157 |
| 50-59 | 35 | 54.5 | 1907.5 |
| 60-69 | 21 | 64.5 | 1354.5 |
| 70-79 | 10 | 74.5 | 745 |
| 80-89 | 2 | 84.5 | 169 |
| Totals: | 100 | | 5440 |

To calculate midpoint: $\frac{30+39}{2} = 34.5$

mode - the interval 50-59 has the highest frequency 54.5 is the mode

$\mu = \frac{5540}{100} = 55.4$

Median data point $= \frac{\text{\# of data points} + 1}{2} = \frac{100+1}{2} = 50.5$ data point

Use the 50th + 51st data point These are within the interval 50-59

so the median is 54.5, the midpoint of that interval

3. The Pro Football Encyclopedia gave the following ages for a random sample of football players. Calculate the mean, median and mode.

24,23,25,23,30,29,28,26,33,29,24,37,25,23,22,27,28,25,31,29,25,22,31,29,22,28,27, 26,23,21

21, 22, 22, 22, 23, 23, 23, 23, 24, 24, 25, 25, 25, 25, 26, 26, 27, 27, 28, 28, 28, 29, 29, 29, 29, 30, 31, 31, 33, 37

$\bar{X} = \frac{795}{30} = 26.5$

To find the median: $\frac{30+1}{2} = 15.5$ Use the 15th + 16th numbers 26, 26

median = 26

Mode = 23, 25, 29

4. A reporter for the *Honolulu Star-Bulletin* was doing a news article about car theft in Honolulu. For a given 10-day period, the police reported the following number of car thefts;

3, 4, 6, 8, 8, 8, 8, 9, 10, 10

9,6,10,8,10,8,4,8,3,8

Calculate the mean, mode, and median.

$\bar{X} = \frac{74}{10} = 7.4$ median = 8 mode = 8

5. What is the mode for the following group of numbers:
1,2,3,4,5,8,9,10,12,13

no mode

6. Given the following grades for an entire class:
Hint: Is this a sample or a population? population
73, 99, 67, 67, 82, 86, 94, 87, 86, 82, 81, 67, 91, 73, and 50

Find the range: 99-50=49 Find the variance: 153.2 Find the standard deviation: 12.377

| $x$ | $\mu$ | $x-\mu$ | $(x-\mu)^2$ |
|---|---|---|---|
| 73 | 79 | -6 | 36 |
| 99 | 79 | 20 | 400 |
| 67 | 79 | -12 | 144 |
| 67 | 79 | -12 | 144 |
| 82 | 79 | 3 | 9 |
| 86 | 79 | 7 | 49 |
| 94 | 79 | 15 | 225 |
| 87 | 79 | 8 | 64 |
| 86 | 79 | 7 | 49 |
| 82 | 79 | 3 | 9 |
| 81 | 79 | 2 | 4 |
| 67 | 79 | -12 | 144 |
| 91 | 79 | 12 | 144 |
| 73 | 79 | -6 | 36 |
| 50 | 79 | -29 | 841 |
| | | ☺ | 2298 |

$\sigma^2 = \frac{2298}{15} = 153.2$

$\sigma = \sqrt{153.2} = 12.377$

7. Given the following prices of a random sample of used homes (in thousands):
Hint: Is this a sample or a population? sample
190, 145, 140, 110, 140, 140, 115, 100, 70, 100

Find the range: 190-70=120 Find the variance: 1100 Find the standard deviation 33.166

| $x$ | $\bar{x}$ | $x-\bar{x}$ | $(x-\bar{x})^2$ |
|---|---|---|---|
| 190 | 125 | 65 | 4225 |
| 145 | 125 | 20 | 400 |
| 140 | 125 | 15 | 225 |
| 110 | 125 | -15 | 225 |
| 140 | 125 | 15 | 225 |
| 140 | 125 | 15 | 225 |
| 115 | 125 | -10 | 100 |
| 100 | 125 | -25 | 625 |
| 70 | 125 | -55 | 3025 |
| 100 | 125 | -25 | 625 |
| | | ☺ | 9900 |

$s^2 = \frac{9900}{10-1} = \frac{9900}{9} = 1100$

$s = \sqrt{1100} = 33.166$

8. Normal Distribution Curve:

What percentage of area under the normal curve lies:

a. to the left of $\mu$ 50%

b. between $\mu-\sigma$ and $\mu+\sigma$ 68%

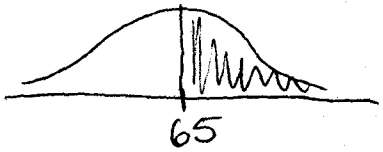
c. between $\mu-3\sigma$ and $\mu+3\sigma$ 99.7%

Hint: Use 68-95-99.7 rule

9. Assuming that the heights of college women are normally distributed, with a mean of 65 inches and standard deviation of 2.5 inches answer the following questions.

a. What percentage of women are taller than 65 inches?

50%




b. What percentage of women are shorter than 65 inches?

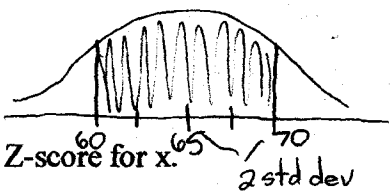
50%

c. What percentage of women are between 62.5 inches and 67.5 inches?

68%

d. What percentage of women are between 60 inches and 70 inches?

95%




10. Using the given population mean and standard deviation calculate the Z-score for x.

a. $\mu=14$, $\sigma=3$, $x=20$

$$z = \frac{20-14}{3} = 2$$

b. $\mu=140$, $\sigma=15$, $x=125$

$$z = \frac{125-140}{15} = -1$$

c. $\mu=32$, $\sigma=13$, $x=10$

$$z = \frac{10-32}{13} = -1.69$$

11. Using the given Normal Distribution Curve and assuming that the scores for the final exam in Math 114 are normally distributed with a mean of 75 and a standard deviation of 10 answer the following questions.

a. What percentage of students score above 75?

50%

b. What percentage of students scored below 75?

50%

c. What percentage of students scored between 65 and 85?

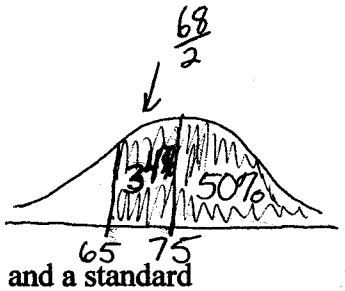
68%

d. What percentage of students scored between 55 and 95?

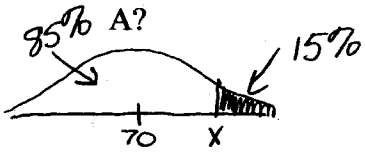
95%

e. If 65 is passing , what percentage of students passed the exam?

34% + 50% = 84%




12. The scores of a science test are normally distributed with a mean of 70 and a standard deviation of 5. If the top 15% of the students get A's, what is the cut-off score for an A?




Look up area of .85 in body of table to find z-score

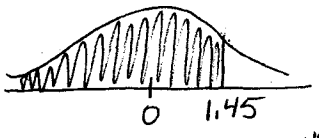
.8508 is the closest value

z = 1.04 $\quad 1.04 = \frac{x-70}{5}$ $\quad 5.2 = x - 70$

x = 75.2

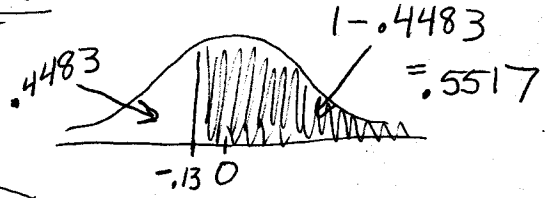
13. Given the following z-scores on a standard normal distribution find the percent of the total area under the standard normal curve.

a. area to the left of $z = 1.45$




92.65%

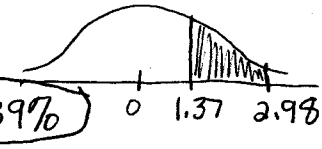
b. area to the right of $z = -0.13$




55.17%

c. area between $z = 1.37$ and $z = 2.98$

.9986 - .9147 = .0839

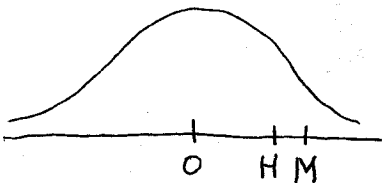



8.39%

14. Ashley earned an 89 on her History midterm and an 81 on her Math midterm. In the History class the mean score was an 82 with a standard deviation of 5. In the Math class the mean score was 76 with a standard deviation of 3.

a. Convert each score to a standard z-score.

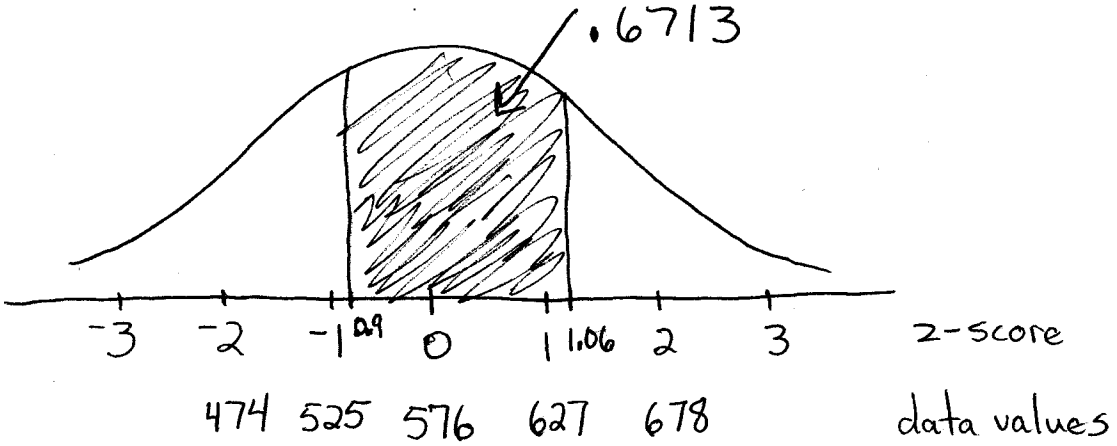
History $\frac{89-82}{5} = 1.4$ Math $\frac{81-76}{3} = 1.67$




b. On which test did she do better compared to the rest of the class? Explain.

She did better on her math test.
In history she did better than 91.92% of the class and in math she did better than 95.25% of the class.

15. Cabrini College finds that the instructors drive an average of 576 miles per month, per person, with a standard deviation of 51 miles. What is the probability that an instructor drives between 530 and 630 miles per month?




$$z = \frac{630-576}{51} = 1.059 = 1.06$$

$$z = \frac{530-576}{51} = -0.902 = -0.90$$

Look up 1.06 in table area = .8554

Look up −0.90 in table area = .1841

$$\begin{array}{r} .8554 \\ -\ .1841 \\ \hline .6713 \end{array}$$

The probability that an instructor drives between 530 and 630 miles is 0.6713