Z-scores:
The number of Standard Deviations a value is from the mean.

Given the following statistics for a set of data:

$\bar{x}$ = 12. 5
σ_x = 2.1

Find the z-score for the data value x=18

$18 - 12.5 = \frac{5.5}{2.1}$

$z = 2.6$

Z-score Formula:

$$z = \frac{x - \bar{x}}{\sigma}$$

x = Data value

$\bar{x}$ = mean

σ = Standard Deviation

Use the following statistics of a set of data:

$\bar{x}$ = 35.5

σ = 1.5

Find the z-score for each data value to the nearest tenth.

a) x = 46

$z = \frac{46 - 35.5}{1.5}$

$z = 7$

b) x = 39

$\frac{39 - 35.5}{1.5}$

$z = 2.3$

Quiz scores:
12, 13, 15, 17, 17, 21, 22, 22, 22, 31

$\bar{x}$ = 19.2 σ=5.3

1. If your quiz was 21 find your z-score.

$z = \frac{21 - 19.2}{5.3}$

$z = .3$

2. If your quiz was 13 find your z-score.

$z = \frac{13 - 19.2}{5.3}$

$z = -1.2$

The mean on a test was 82.4 and the standard deviation was 3.6. Find your score on the test if you had a z-score of 1.3

$x = 87.08$

$(3.6)\frac{x - 82.4}{3.6} = 1.3(3.6)$

$x - 82.4 = 4.68$

$+82.4 \quad +82.4$

The standard deviation on a test was 5.2. Your score of 95 gave a z-score of 2.6. Find the mean on the test.

$(5.2)\cdot\frac{95 - \bar{x}}{5.2} = 2.6(5.2)$

$95 - \bar{x} = 13.52$

$-95 \quad -95$

$\frac{-\bar{x}}{-1} = \frac{-81.48}{-1}$

$\bar{x} = 81.48$

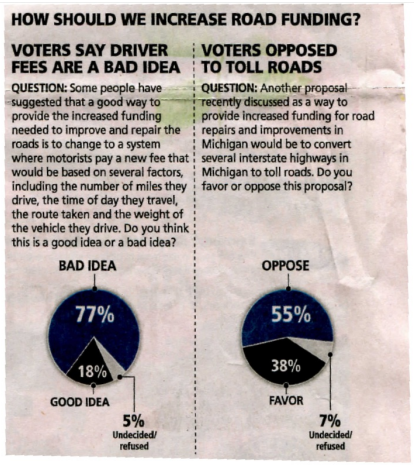
You can now finish Hwk #19 Sec 12-4

Pages 672-673

Problems 1, 2, 4, 5, 10-13, 15, 21

The governor wanted to know what percent of the people in Michigan were in favor of raising driver fees in order to produce enough money to fix the roads. How would he go about finding this out.

It's too costly and time consuming to try and actually ask everybody. A survey would then by used to ask a SAMPLE of all the people.



Section 12-5: Working With Samples

Population:
All of a certain item (The Whole Group)

Sample:
Part of the population.

Random Sample:
When all the members of the population are equally likely to be chosen.

Biased Sample:
When part of the population is overrepresented or underrepresented.

This may occur because of how a sample was taken or how a question is worded.

Why are the following methods or questions biased?

How could they be changed so that they are not biased?

1. You ask every fifth person leaving a Detroit Tigers baseball game which team they think is the best in baseball.

This is biased because it only includes those going to Tiger games so they would probably overwhelmingly vote for the Tigers. To be unbiased the survery should include people from all over the country.

2. Question on a survey:

Do you think that people should be allowed to continue killing deer?

The way this question is phrased makes you want to say NO. The question should simply be about allowing Hunting.

3. Do you want to eat a hamburger or the usual boring vegetable sandwich? The phrase "boring vegetable sandwich" makes it sound very unappetizing, making you want to pick hamburger. The question could be stated as: "do you want to eat a hamburger or a vegetable sandwich?"

4. Should the underpaid and overworked city workers get a pay raise? By using the phrase "underpaid and overworked" you are more likely to sympathize with their plight and say that they deserve a raise. The question should be state without any bias, such as: "should city workers get a pay raise?"

5. What is your current age?

10 or less
10 to 20
20 to 30
30 to 40
40 to 50
50 or greater

each of these is a 10 yr interval

To be unbiased they should continue with 10 year intervals

but this covers more than 10 years so it may be overrepresented.

Results of the driver fee survey:

In favor of raising fees = 108

Against raising fees = 462

TOTAL 570

What percent of people favor raising driver fees to fix the roads? $\frac{108}{570} \approx 18.9\%$

This is called the Sample Proportion

Sample Proportion:

The ratio of: $\dfrac{\text{\# times an event occurs}}{\text{Sample Size}}$

Sample Proportion:

Example:
In a sample of 500 TV viewers, 159 watch the 11:00pm news. Find the sample proportion.

$\frac{159}{500} = 31.8\%$

Law of Large Numbers:

The variation in a set of data decreases as the sample size increases.

In general, the larger the data set the smaller the standard deviation.

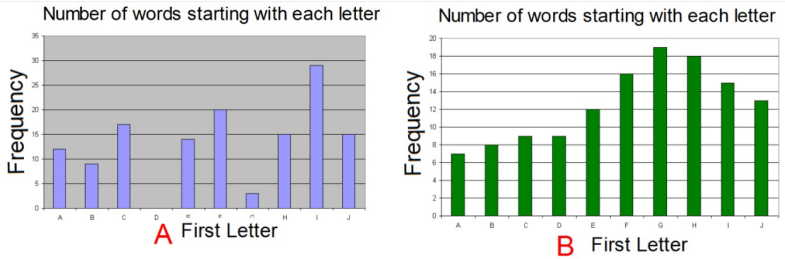
Sample	Score	Stand Dev
A	4.4	1.4
B	4.6	0.6
C	4.6	1.2

Which sample was most likely the greatest in size?

B, Because it has the smallest σ

Which sample was most likely the smallest?

A, Because it has the largest σ



The two charts show the number of words found in two a sample passage from two different books. Which sample was most likely the largest?

B, because it appears to have the least variation

According to a CNN/Time poll, among likely voters, Murkowski and Miller each take 37 percent while Democrat Scott McAdams is pulling 23 percent with a 3.5 percent margin of error.

37% ± 3.5 → 33.5% TO 40.5%

Margin of Error:

A range of values that most likely contains the actual population proportion.

Usually given as ±%.

A poll leading up the election shows that Jones is favored by 43% of the people. The poll has a margin of error of ±4%. What is the range of voters that can be expected to vote for Jones?

43% ± 4%

43 − 4 to 43 + 4

39% to 47%

A poll in a local election shows that Berg is leading Pomeroy by 58% to 45%. The margin of error is 5%.

What range of percentage of votes can Berg expect to receive?

58 ± 5 = 53% to 63%

What range of percentage of votes can Pomeroy expect to receive?

45 ± 5 = 40% to 50%

Should Berg be confident of winning?

Yes. The least Berg can expect is 53% and the most Pomeroy can expect is 50%. Therefore, even with the margin of error factored in Berg still holds a lead of at least 3%.

The same poll a month ago showed the pair in a statistical dead heat, with Berg edging Pomeroy by three points, with a 4.5 percent margin of error

If Berg is leading by only 3% and the margin of error of ±4.5% is applied Berg could actually be losing by as much as 1.5%:

If Berg's percent is lowered by 4.5% and Pomeroy's percent is raised by 4.5%, Pomeroy could be ahead by as much as 6%.

Margin of Error Formula:

$$\pm\frac{1}{\sqrt{n}}$$

n = sample size

Convert this to a percent by x100.