

Margin of Error Practice

1. What random sample size would produce a margin of error of $\pm 1\%$?

$$\pm 1 = \pm \frac{100}{\sqrt{n}}$$

$$\sqrt{n} = 100^2$$

$$n = 10000$$

2. What margin of error can be expected when using a sample size of 500?

$$ME = \pm \frac{1}{\sqrt{500}} 100$$

$$\approx 4.5\%$$

3. What are some reasons that a research center might decide that a survey with a margin of error of $\pm 3\%$ would be more desirable than one with a margin of error of $\pm 2\%$?

from class ex. 3% \approx 1111 ppl

2% \approx 2500 ppl

- cost to survey 1111 vs 2500 ppl

- time

4. What is the range for the percent of students that text in class that the research center can expect from any random survey they conduct with a sample size of 2500?

$$ME = \pm \frac{1}{\sqrt{2500}} 100 = \pm \frac{1}{50} 100 = \pm 2\%$$

43% quoted incl. \rightarrow

range 41-45%

5. Using the question posed at the beginning of class about texting: If a survey with a random sample of 2500 students is conducted, is it possible that only 20% of the students could respond that they text during class? If so, how could this be possible?

margin of error = 2% \rightarrow 41-45%

only if data is grossly inaccurate

ie.. sample size of data was very small

Standard Deviation Practice

Form K

Find the mean, variance, and standard deviation for each data set. (sample)

6. 6, 13, 12, 9, 10

$$\bar{x} = 10$$

$$Var = 7.5$$

$$S_x = 2.7$$

7. 8, 16, 12, 15, 4

$$\bar{x} = 11$$

$$Var = 25$$

$$S_x = 5$$

8. 25, 18, 20, 19, 22, 16

$$\bar{x} = 20$$

$$Var = 10$$

$$S_x = 3.16$$

9. 27, 34, 45, 30, 26, 42

$$\bar{x} = 34$$

$$Var = 62.8$$

$$S_x = 7.92$$

Use a graphing calculator to solve the following problems.

10. The most recent test scores for a math class are displayed in the table below. What are the mean and the standard deviation for this data set?

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Score	77	86	79	94	65	82	76	97	65	77	89	78	84	79	88

$\bar{x} = 81.0\bar{6}$
 $S_x = 9.098$

11. Your sister's bowling scores for the last 12 games are displayed in the table below. What are the mean and standard deviation for this data?

Game	1	2	3	4	5	6	7	8	9	10	11	12
Score	212	187	176	205	193	229	201	175	203	216	227	235

$\bar{x} = 204.91\bar{6}$
 $S_x = 19.9$

Determine the whole number of standard deviations that include all of the following data values.

12. You brother is buying his textbooks for his first semester of college. The price of each of his books is shown in the table below. The mean of the data set is \$65.85, and the standard deviation is about 36. Within how many standard deviations of the mean do all of the prices fall?

Book	1	2	3	4	5	6
Price	\$25.60	\$57.00	\$38.25	\$126.40	\$84.00	\$63.85

$\bar{x} = 65.85$
 $\bar{x} \pm 1SD = 29.85 - 101.85$
 $\bar{x} \pm 2SD = -6.15 - 137.85$

2 standard deviations from mean

13. The table below shows the weights of the five starting players on a basketball team. Within how many standard deviations of the mean do all of the weights fall?

Player	1	2	3	4	5
Weight (lb)	146	189	246	178	203

$\bar{x} = 192.4$
 $S_x = 36.6$
 $\bar{x} \pm 1SD = 155.8 - 229$
 $\bar{x} \pm 2SD = 119.2 - 265.8$

w/in 2SD from mean

14. Open-Ended Describe an example of how it can be useful to know the standard deviation of a data set.

(varies)

15. Writing How is standard deviation similar to range and interquartile range?

SD shows how spread out the data is..

16. **Error Analysis** Your classmate calculated the standard deviation of the data set shown below and got 46.53. What error did she make? What is the correct standard deviation?

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
High Temperature (°F)	76°	82°	63°	69°	79°	84°	75°

use variance of population

26.9

Determining Outliers Practice

Find the outlier of the data set using each of the methods learned in class. Show work:

17. 43, 69, 49, 78, 88, 54, 73, 194, 54, 59, 70

$$IQR = 78 - 54 = 24$$

$$1.5IQR = 36$$

$$Q1 - 1.5IQR = 54 - 36 = 18$$

$$Q3 + 1.5IQR = 78 + 36 = 114$$

194 = outlier

$$\bar{x} = 75.54$$

$$s_x = 41.52$$

$$\bar{x} \pm (s_x)3$$

$$-49 \rightarrow 200.1$$

No outlier

18. 40, 62, 47, 68, 12, 78, 49, 65, 49, 52, 63

$$IQR = 65 - 47 = 18$$

$$1.5(18) = 27$$

$$47 - 27 = 20$$

$$65 + 27 = 92$$

12 is outlier

~~No outliers~~

$$\bar{x} = 53.18$$

$$s_x = 17.59$$

$$\bar{x} \pm 3(s_x)$$

$$41 - 105.95$$

No outliers

19. 44, 67, 52, 72, 82, 55, 70, 200, 55, 57, 68

$$IQR = 72 - 55 = 17$$

$$1.5(17) = 25.5$$

$$55 - 25.5 = 29.5$$

$$72 + 25.5 = 97.5$$

200 is outlier

$$\bar{x} = 74.72$$

$$s_x = 42.935$$

$$\bar{x} \pm 3(s_x)$$

$$-54 - 203.5$$

20. 164, 175, 126, 135, 159, 143, 55

$$IQR = 164 - 126 = 38$$

$$1.5(38) = 57$$

$$126 - 57 = 69$$

$$164 + 57 = 221$$

55 outlier

~~No outlier~~

$$\bar{x} = 136.7$$

$$s_x = 39.8$$

$$\bar{x} \pm 3(s_x)$$

$$17.3 - 256.1$$

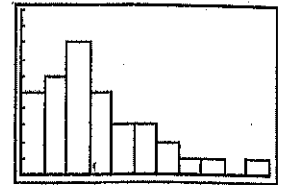
No outlier

21. KENNEL The manager of a kennel records the weights for a sample of dogs currently being housed.

Weight (pounds)
31, 67, 8, 37, 12, 87, 14, 34, 105, 57, 42, 8, 16, 54, 17, 20, 72, 23, 27, 63, 24, 52, 14, 44, 27, 5, 28, 22, 33, 15, 6, 36, 41, 21, 46

a. Use a graphing calculator to create a histogram. Then describe the shape of the distribution.

+skew



[0, 110] scl: 10 by [0, 10] scl: 1

b. Describe the center and spread of the data using either the mean and standard deviation or the five-number summary. Justify your choice.

b/c +skew

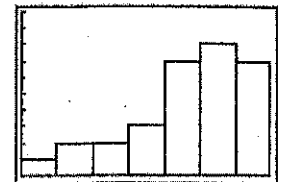
range: 4-105 lbs

*min: 4
Q1: 16
med: 28
Q3: 46
max: 105*

1/2 of data between 16 & 46

22. CAMP The enrollment for a biannual computer camp over the past 15 years is shown.

Number of Participants
45, 68, 55, 25, 48, 36, 61, 52, 31, 8, 41, 58, 40, 55, 68, 47, 60, 28, 44, 63, 18, 68, 50, 57, 37, 16, 56, 40, 50, 68



[0, 70] scl: 10 by [0, 10] scl: 1

a. Use a graphing calculator to create a box-and-whisker plot. Then describe the shape of the distribution.

-skew

b. Describe the center and spread of the data using either the mean and standard deviation or the five-number summary. Justify your choice.

b/c -skew

data ranges from 8 - 68

*min 8
Q1 37
med 49
Q3 58
max 68*

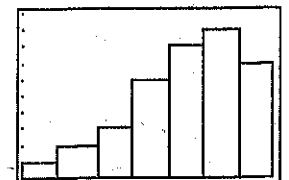
1/2 data between 37 & 58

23. TESTING SITES The total number of students taking the SAT at a sample of testing centers is shown.

Number of Students
105, 86, 98, 112, 92, 72, 102, 96, 112, 76, 117, 107, 88, 104, 90, 68, 105, 82, 75, 115, 97, 106, 82, 64, 103, 58, 96, 102, 118, 95, 87, 102, 81, 116, 97, 110

a. Use a graphing calculator to create a histogram. Then describe the shape of the distribution.

negatively skewed

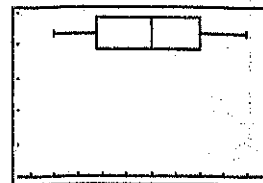


[50, 120] scl: 10 by [0, 10] scl: 1

b. Describe the center and spread of the data using either the mean and standard deviation or the five-number summary. Justify your choice. *b/c data is neg. skew*

24. BARBER A barber keeps track of the total number of customers he has each day for a sample of days.

Number of Customers
16, 18, 22, 10, 24, 13, 14, 22, 16, 20, 11, 20, 18, 10, 19, 12, 14, 20, 11, 8



[5, 25] scl: 2 by [0, 5] scl: 1

a. Use a graphing calculator to create a box-and-whisker plot. Then describe the shape of the distribution.

~~skewed~~ Symmetric

b. Describe the center and spread of the data using either the mean and standard deviation or the five-number summary. Justify your choice. *b/c data is symmetric*

$$\bar{x} = 15.9$$

$$s_x = 4.7$$

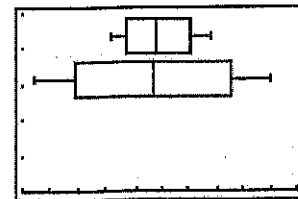
25. OLYMPICS The medal counts for the 2002 and 2010 Winter Olympics are shown.

2002
37, 3, 5, 2, 30, 11, 5, 1, 9, 14, 26, 11, 6, 3, 15, 1, 3, 11, 3, 23, 5, 8, 16, 3, 6, 1

2010
3, 8, 1, 25, 2, 34, 2, 3, 11, 13, 7, 17, 11, 4, 2, 8, 3, 13, 17, 7, 4, 36, 2, 1

a. Use a graphing calculator to construct a box-and-whisker plot for each set of data. Then describe the shape of each distribution.

+ Skew



[20, 70] scl: 5 by [0, 5] scl: 1

b. Compare the distributions using either the means and standard deviations or the five-number summaries. Justify your choice. *b/c + skewed data*

2002

$$\text{min/max} = 1 - 37$$

$$Q_1/Q_3 = 3 \text{ \& } 14$$

2010

$$\text{min/max} = 1 - 36$$

$$Q_1/Q_3 = 2.5 \text{ \& } 13$$

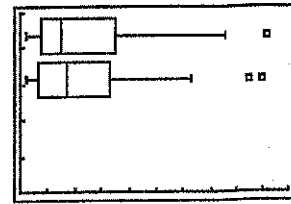
\approx same range

\approx middle 50% of data v. similar distribution

26. TEMPERATURES The monthly average low temperatures for two cities are shown.

Boston, MA
22, 57, 46, 24, 31, 41, 64, 50, 28, 59, 65, 38

Astoria, OR
36, 51, 37, 42, 54, 39, 53, 42, 46, 38, 50, 47



[0, 40] scl: 4 by [0, 5] scl: 1

- a. Use a graphing calculator to construct a box-and-whisker plot for each set of data. Then describe the shape of each distribution.

both symmetric

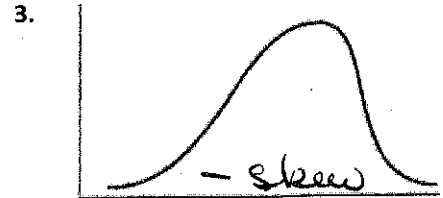
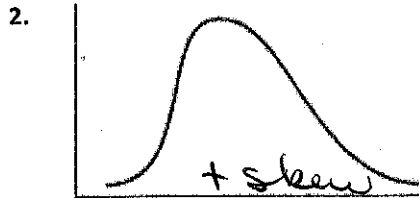
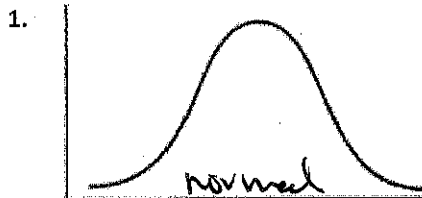
- b. Compare the distributions using either the means and standard deviations or the five-number summaries. Justify your choice.

<u>Astoria</u>	<u>Boston</u>
$\bar{x} = 44.6$	$\bar{x} = 43.8$
$s_x = 6.2$	$s_x = 14.8$

* Avg temps are \approx equal but Boston's temps fluctuate/vary much more than Astoria's temps

Normal Distributions Practice

Identify each of the distributions as *positively skewed*, *negatively skewed*, or *normally distributed*.



In a normal distribution, what percent of the values lie:

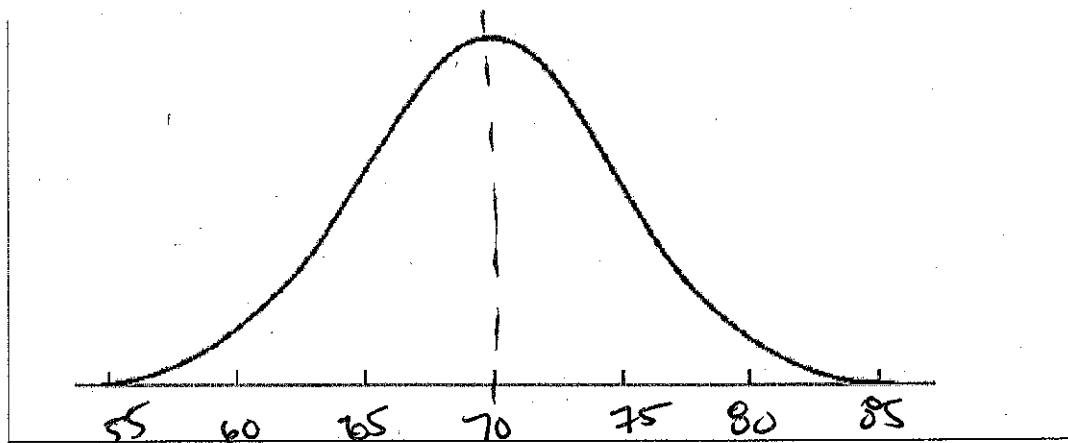
4. below the mean? 50% 5. above the mean? 50%

6. within one standard deviation of the mean? 68%

7. within two standard deviations of the mean? 95%

8. within three standard deviations of the mean? 99.7%

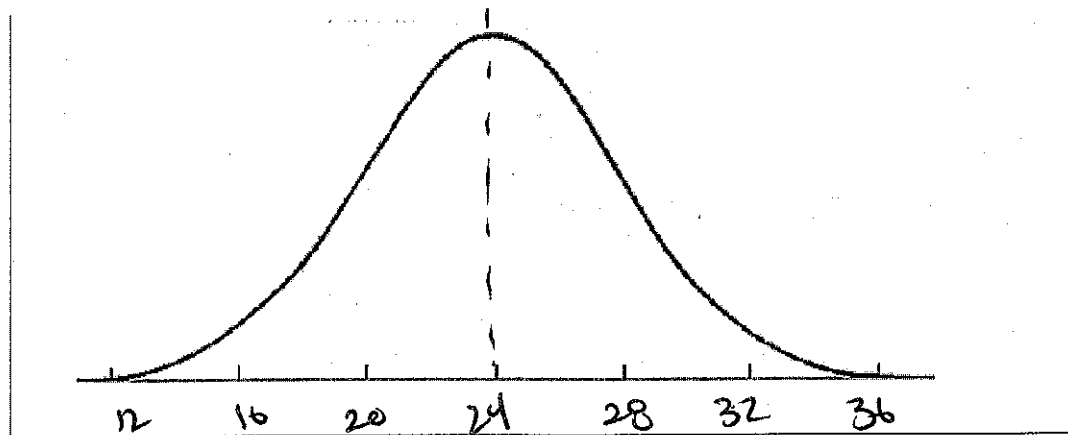
9. 2000 freshmen at State University took a biology test. The scores were distributed normally with a mean of 70 and a standard deviation of 5. Label the mean and three standard deviations from the mean.



Answer the following questions based on the data:

- a) What percentage of scores are between scores 65 and 75? 68%
- b) What percentage of scores are between scores 60 and 70? 47.5%
- c) What percentage of scores are between scores 60 and 85? 97.35%
- d) What percentage of scores is less than a score of 55? .15%
- e) What percentage of scores is greater than a score of 80? 2.5%
- f) Approximately how many biology students scored between 60 and 70? $.475(2000) = 950$
- g) Approximately how many biology students scored between 55 and 60? $.0235(2000) = 47$

10. 500 juniors at Central High School took the ACT last year. The scores were distributed normally with a mean of 24 and a standard deviation of 4. Label the mean & three standard deviations from the mean.



Answer the following questions based on the data:

- a) What percentage of scores are between scores 20 and 28? 68%
- b) What percentage of scores are between scores 16 and 32? 95%
- c) What percentage of scores are between scores 16 and 28? 81.5%

- d) What percentage of scores is less than a score of 12? $.15%$
- e) What percentage of scores is greater than a score of 24? $50%$
- f) Approximately how many juniors scored between 24 and 28? $.34(500) = 170$
- g) Approximately how many juniors scored between 20 and 28? $.68(500) = 340$
- h) Approximately how many juniors scored between 24 and 32? $.475(500) \approx 237.5$
- i) Approximately how many juniors scored between 16 and 20? $.135(500) \approx 67.5$
- j) Approximately how many juniors scored higher than 32? $.025(500) \approx 12.5$

11. Here are the scores for a recent test in Culinary Arts.

90 90 95 100 80 80 75 80 70 60 95 100 100
100 75 80 90 90 90 70 70 80 85 90 90 85

using σ

Answer the following questions regarding this set of data.

Median = 87.5 Mean = 85 Mode = 90 Standard Deviation = 10.6 Variance = ~112

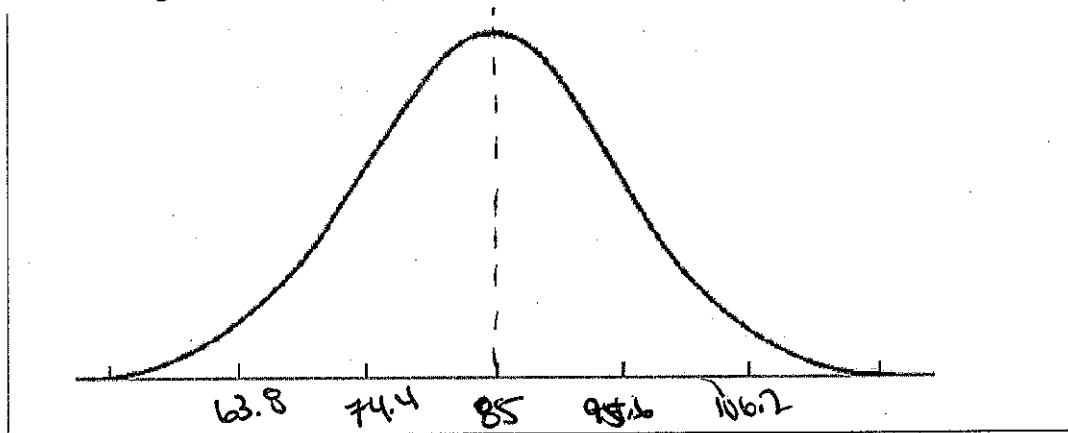
How many scores are within 1 standard deviation of the mean? 21

σ 74.4 - 95.6

How many scores are within 2 standard deviations of the mean? 26

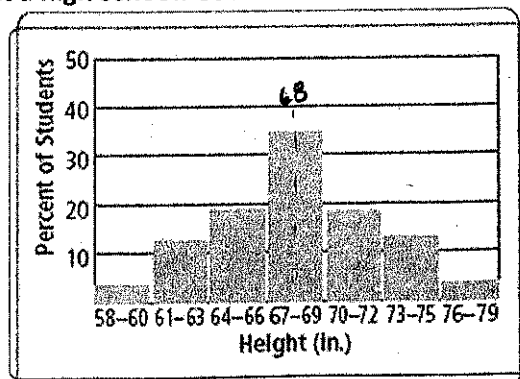
2σ 63.8 - 106.2

Hint: Drawing the curve will help answer the last two questions!!!



The bar graph below displays the heights of the students at a high school. Use the graph to answer the following questions.

Skip
did not provide σ ... oops!



12. Approximately what percent of students are between 61 in. and 67 in. tall?

X

13. Approximately what percent of students are between 64 in. and 75 in. tall?

X

14. Approximately what percent of students are between 70 in. and 79 in. tall?

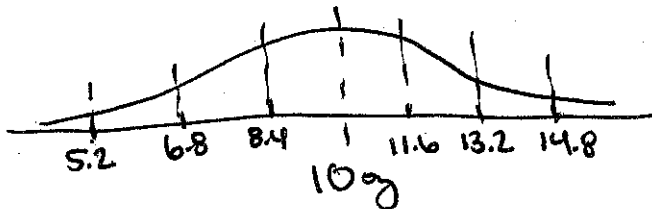
X

15. Reasoning Your mother has a rose garden. Every day, she sprays fertilizer on the roses in one section of the garden. Do you expect that the heights of the rose bushes in her garden are normally distributed? Explain why or why not.

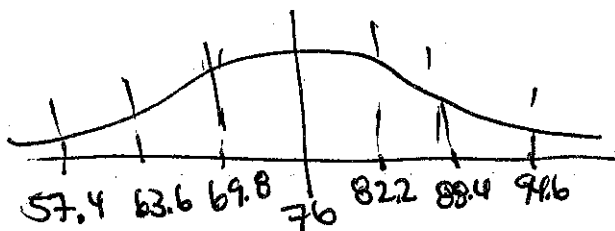
No - comparing 2nd diff set of values
fertilized vs non fertilized

Sketch a normal curve to represent each of the following normal distributions.

16. The average weight of a tomato in a tomato garden is 10 oz. The standard deviation is 1.6 oz. Sketch a normal curve showing the tomato weights at one, two, and three standard deviations from the mean.



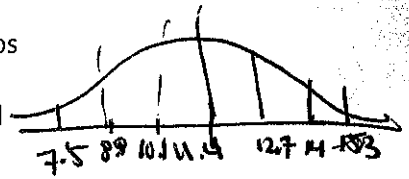
17. The average score on a math test is 76. The standard deviation is 6.2. Sketch a normal curve showing the test scores at one, two, and three standard deviations from the mean.



Draw a normal curve to solve the following problems.

18. A local bakery makes chocolate chip cookies. The number of chocolate chips in the cookies is approximately normally distributed, with mean 11.4 and standard deviation 1.3. What percent of the cookies have between 8.8 and 14 chocolate chips?

95%



19. The bakery described in Exercise 18 sold 200 chocolate chip cookies. How many of the cookies had less than 8.8 chocolate chips?

$$2.35\% + 1.5\% = 2.5\% \rightarrow 0.025(200) = 5$$

20. Reasoning One of the cookies sold by the bakery had 18 chocolate chips. Would this be considered an outlier? Explain why or why not.

yes - it is outside the standard metric of 3σ from the mean

in fact it is outside 5 σ from mean (which ≈ 17.9 chips)