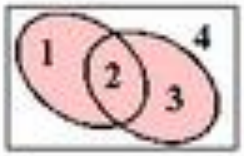
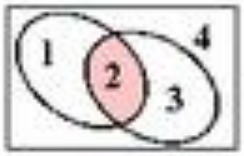
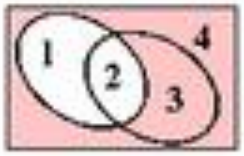
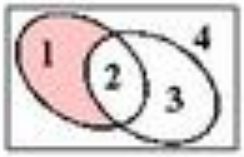
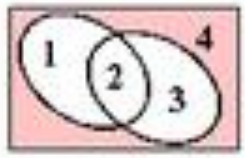
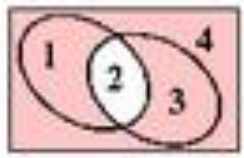
Algebra 2 Unit 8 Notes

Sets and Set notation

set notation	pronunciation	meaning	Venn diagram	answer
$A \cup B$	"A union B"	everything that is in either of the sets		{1, 2, 3}
$A \wedge B$ or $A \cap B$	"A intersect B"	only the things that are in both of the sets		{2}
A^c or $\sim A$	"A complement", or "not A"	everything in the universe outside of A		{3, 4}
$A - B$	"A minus B", or "A complement B"	everything in A except for anything in its overlap with B		{1}
$\sim(A \cup B)$	"not (A union B)"	everything outside A and B		{4}
$\sim(A \wedge B)$ or $\sim(A \cap B)$	"not (A intersect B)"	everything outside of the overlap of A and B		{1, 3, 4}

Algebra 2 Unit 8 Notes

Section 11-2 Probability

Experimental Probability	Theoretical Probability
experimental probability of an event: ***P(event)*** $= \frac{number\ of\ time\ the\ event\ occurs}{number\ of\ trials}$	If a sample space has n equally likely outcomes and an event A occurs in m of these outcomes, then the **theoretical probability** of event A is $P(A) = \frac{m}{n}$. 
Sample Space	**Equally Likely Outcomes**
The set of all possible outcomes to an experiment or activity.	**When each outcome in a sample space has the same chance of occurring.**

Section 11-3 Probability of Multiple Events

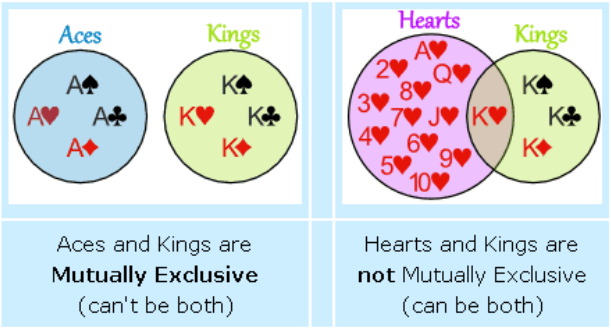
Dependent Events:
When the occurrence of one event affects how a second event can occur.
Example:

Picking the first affects the possible outcomes of picking the second card. The events are dependent.

Independent Events:
If the occurrence of one event does not affect the probability of the other.
Example:
Rolling a Dice and Flipping a Coin

Rolling the dice does not affect flipping a coin so these events are independent.

Mutually Exclusive Events
Two events that cannot happen at the same time are mutually exclusive. If *A and B* are mutually exclusive then P(A and B) = 0.



Probability of Mutually Exclusive Events:

$$P(A\ or\ B) = P(A) + P(B) - P(A\ and\ B)$$

Probability of Independent Events

$$P(A\ and\ B) = P(A) \cdot P(B)$$

Example:
Event A = picking a diet drink
Event B = picking fat-free chips

$$P(A \text{ and } B) = P(A) \cdot P(B)$$
$$= \frac{\text{number of diet drinks}}{\text{total number of drinks}} \cdot \frac{\text{number of bags of fat-free chips}}{\text{total number of bags of chips}}$$

Algebra 2 Unit 8 Notes

Section 11-4 Conditional Probability

Conditional Probability:
The probability that an event, *B*, will occur given that another <u>event *A*, has already occurred</u>.

P(B|A) means "Event B **given** Event A"

Example:
From the table what is $P(female|graduate\ school)$?

Student Genders

	Males (in thousands)	Females (in thousands)
Two-year colleges	1866	2462
Four-year colleges	4324	5517
Graduate schools	1349	1954

$$P(female|graduate) = \frac{1954}{3303} \approx 0.59\ or\ 59\%$$

Contingency table or *two-way frequency table:*
A table that contains data from two different categories.

Example:

	Sport Utility Vehicle (SUV)	Sports Car	Totals
male	21	39	60
female	135	45	180
Totals	156	84	240

ADD (male row: 21 + 39 = 60; female row: 135 + 45 = 180; Totals row: 156 + 84 = 240)

Row Totals

MathBits.com

Column Totals

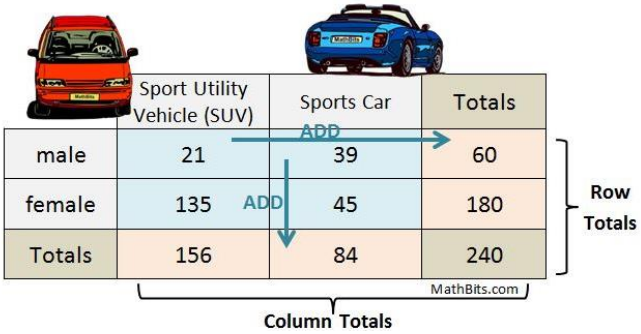
The sum of the row totals equals the sum of the column totals.

Formula for Conditional Probability:

$$P(B \mid A) = \frac{P(A \text{ and } B)}{P(A)}$$

Using the formula for conditional probability, you can calculate a conditional probability from other probabilities.

Example:
What is the probability that a customer owns a sports car given that the customer is male?



	Sport Utility Vehicle (SUV)	Sports Car	Totals
male	21	39	60
female	135	45	180
Totals	156	84	240

ADD (male row: 21 + 39 = 60; female row: 135 + 45 = 180; Totals row: 156 + 84 = 240)

Row Totals

MathBits.com

Column Totals

$$P(male\ and\ sports\ car) = 39/240$$

-

$$P(male) = 60/240$$

$$P(sports\ car|male) = \frac{P(male\ and\ sports\ car)}{P(male)}$$

$$= \frac{\frac{39}{240}}{\frac{60}{240}} = \frac{0.1625}{0.2667} = 0.61\ or\ 61\%$$

Section 11-5 Probability Models

Algebra 2 Unit 8 Notes

Probability Models: **You can use probability models to simulate how equally likely outcome may occur.** **Random number tables, number cubes and coin flips are commonly used to generate the random data in a simulation**	**Random Numbers:** **Sets of digits (i.e., 0, 1, 2, 3, 4, 5, 6, 7, 8, 9) arranged in a random order.** **A random number table contains randomly generated digits from 0 to 9.** 13962 70992 65172 28053 43905 46941 72300 11641 00504 48658 38051 59408 61274 57238 47267 35303 43753 21159 16239 50595

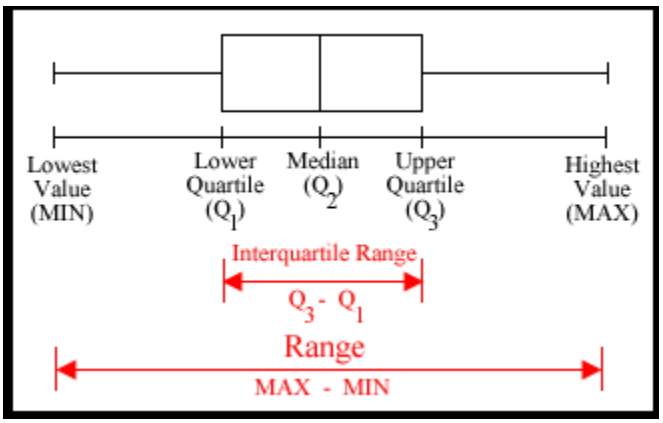
Section 11-6 Analyzing Data

Measures of Central Tendency			
Mean	**Median**	**Mode**	**Range**
"the average"	**the "middle"**	**the "most often"**	**the "spread"**
$\frac{\text{the sum of the data values}}{\text{the number of values}}$	**-must first put data in order from least to greatest.**	**-find the value that is repeated most often**	**-find the difference between the greatest value and the least value**
Symbol : $\overline{x}$	**-if the number of values is odd, then the median is the number in the middle.**	**-could have more than one mode**	
best when data is symmetrical	**-if the number of values is even, the locate the 2 middle numbers and divide by 2.**		

11-6 Data Analysis – Representing Data

Algebra 2 Unit 8 Notes

Box and Whisker plots

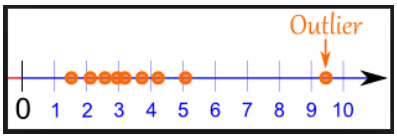


Q_1 – The first quartile (the 25th percentile):
The middle of the lower half of the data
One-fourth of the data lies below the first quartile and three-fourths lies above.

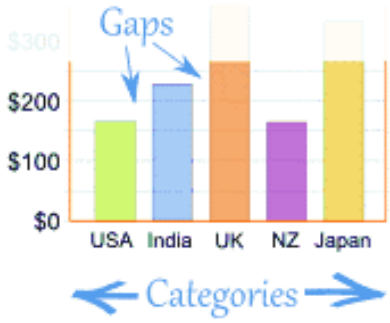
Q_2 – The second quartile (the 50th percentile):
Another name for the median of the entire set of data.

Q_3 – The third quartile (the 75th percentile):
The middle of the upper half of the data.
Three-fourths of the data lies below the third quartile and one-fourth lies above.

Outlier:
An outlier is an element of a data set that distinctly stands out from the rest of the data.

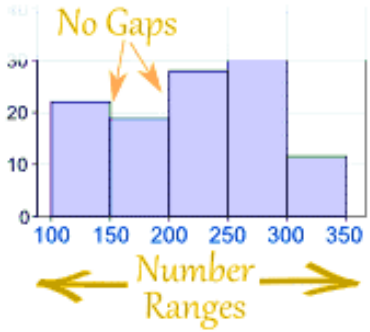


Bar Graphs: gaps



The information above is qualitative.

Histogram: No gaps



The information above is quantitative.

Algebra 2 Unit 8 Notes

Circle Graph (pie chart):
A table of value can be shown as a circle graph.

Immigration to the United States, 2007

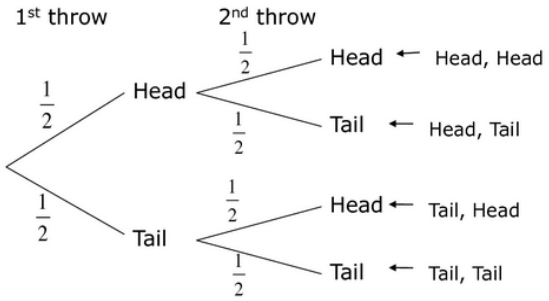
Place of Origin	Immigrants (1000's)
Africa	89.2
Asia	359.4
Europe	120.8
North America	331.7
South America	102.6

Source: Department of Homeland Security

Probability Tree diagrams

Example

A coin is tossed twice. Complete the probability tree diagram showing all the possible outcomes and the probability of each. What is the probability of the two tosses giving the same result?



Variance
The average of the squared differences from the mean.
The symbol for variance is the Greek letter sigma.

$$\sigma^2$$

The formula for variance is :

$$\sigma^2 = \frac{\sum(x - \overline{x})^2}{n}$$

x	$\overline{x}$	$x - \overline{x}$	$(x - \overline{x})^2$
6.9	7.4	−0.5	0.25
8.7	7.4	1.3	1.69
7.6	7.4	0.2	0.04
4.8	7.4	−2.6	6.76
9.0	7.4	1.6	2.56
		Sum	11.30

Make a table.

Find difference between each value and the mean. Square the differences.

Add the squares of the differences.

The variance for this problem is:

$$\sigma^2 = \frac{\sum(x - \overline{x})^2}{n} = \frac{11.3}{5} = 2.26$$

Standard Deviation
The measure of how spread out the numbers are:
The symbol for standard deviation is

$$\sigma$$

and is the square root of the variance:

The formula for standard deviation is:

$$\sigma = \sqrt{\frac{\sum(x - \overline{x})^2}{n}}$$

x	$\overline{x}$	$x - \overline{x}$	$(x - \overline{x})^2$
6.9	7.4	−0.5	0.25
8.7	7.4	1.3	1.69
7.6	7.4	0.2	0.04
4.8	7.4	−2.6	6.76
9.0	7.4	1.6	2.56
		Sum	11.30

Make a table.

Find difference between each value and the mean. Square the differences.

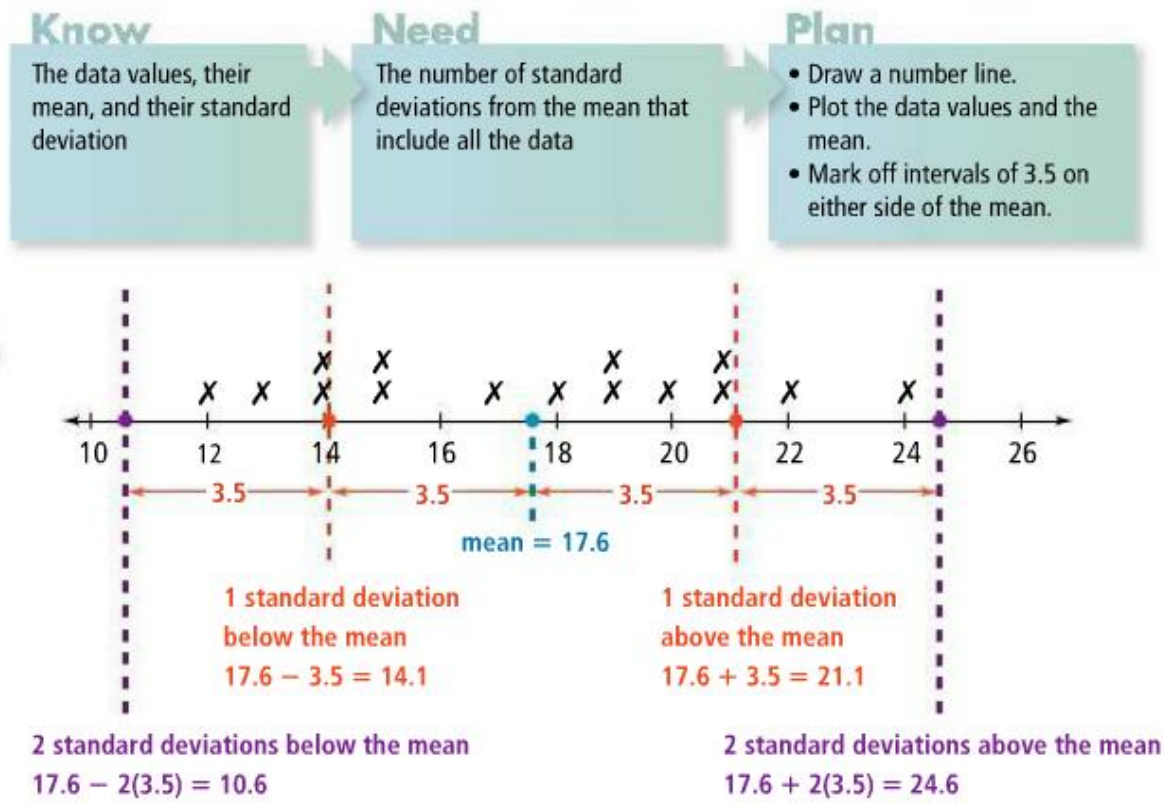
Add the squares of the differences.

The standard deviation for this problem is:

$$\sigma = \sqrt{\sigma^2} = \sqrt{2.26} \approx 1.5$$

Algebra 2 Unit 8 Notes

You can use standard deviation to describe data:



Algebra 2 Unit 8 Notes

Section 11-8 Samples and Surveys

take note

Key Concepts Sampling Types and Methods

For a **convenience sample**, select any members of the population who are conveniently and readily available.

For a **self-selected sample**, select only members of the population who volunteer for the sample.

For a **systematic sample**, order the population in some way, and then select from it at regular intervals.

In a **random sample**, all members of the population are equally likely to be chosen.

take note

Key Concepts Study Methods

In an **observational study**, you measure or observe members of a sample in such a way that they are not affected by the study.

In a **controlled experiment**, you divide the sample into two groups. You impose a treatment on one group but not on the other "control" group. Then you compare the effect on the treated group to the control group.

In a **survey**, you ask every member of the sample a set of questions.

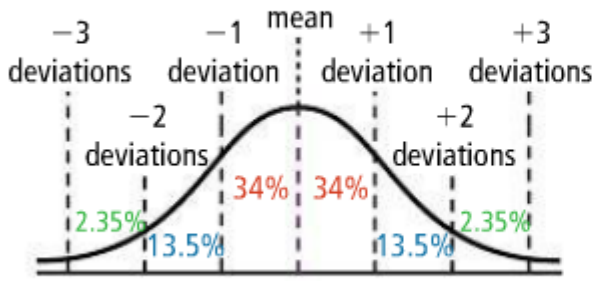
Algebra 2 Unit 8 Notes

Section 11-10: Normal Distributions

A normal distribution has data that vary randomly from the mean. The graph of a normal distribution is a normal curve.

take note

Key Concept Normal Distribution

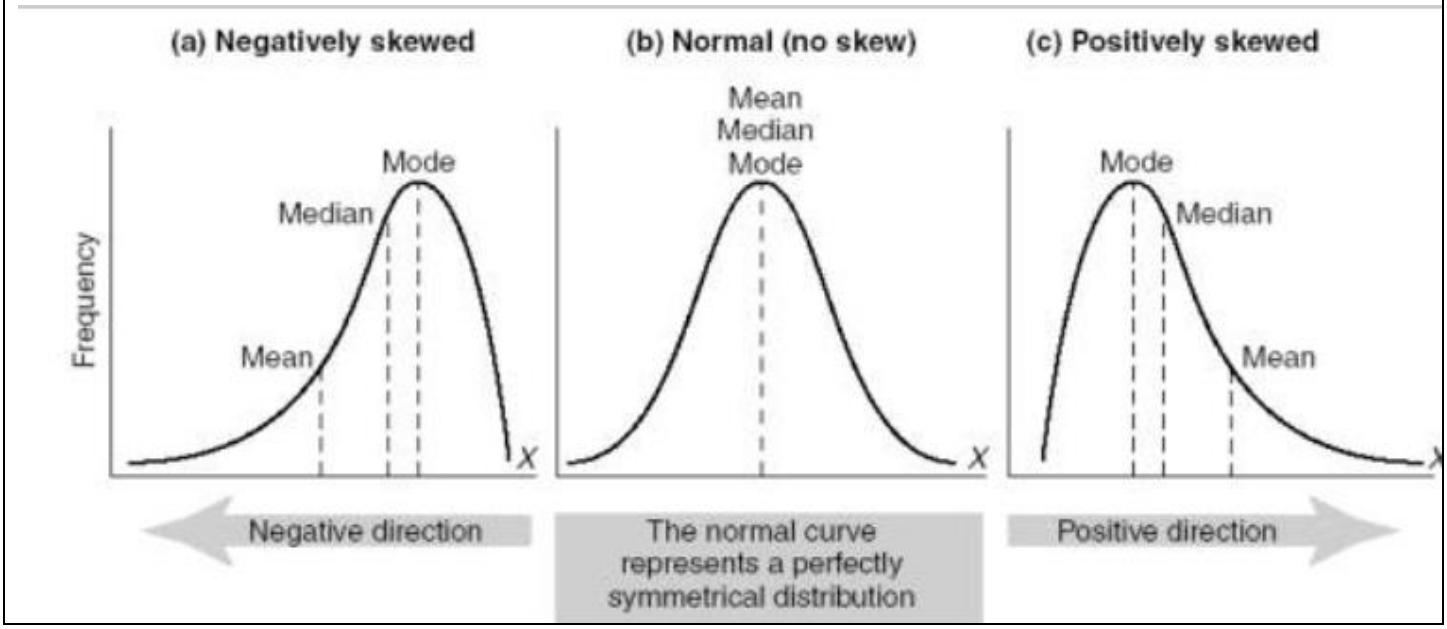


In a normal distribution,

- 68% of data fall within one standard deviation of the mean
- 95% of data fall within two standard deviations of the mean
- 99.7% of data fall within three standard deviations of the mean

A normal distribution has a symmetric bell shape centered on the mean.

Sometimes data is not normal distributed. A data set could have a distribution that is *skewed*



Algebra 2 Unit 8 Notes