

**Welcome to SWCC's  
TEAS Mathematics Preparation**

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**TEAS Mathematics**

Numbers

Rational Numbers

Algebra

Ratio and Proportions

Measurement

Graphs and Diagrams

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● **Real Numbers**

○ Rational and Irrational

**Rational**

Integers -3,-2,-1,0,1,2,3

Whole 0,1,2,3

Counting/Natural 1,2,3

**Irrational**

Non-terminating, non-repeating (ex.  $\pi = 3.14159$ )

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### Place Value

- 1,000,000 - Ones or Units
- 1,000,000 - Tens
- 1,000,000 - Hundreds
- 1,000,000 - Thousands
- 1,000,000 - Ten thousands
- 1,000,000 - Hundred thousands
- 1,000,000 - Millions

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### Whole Numbers

Add or Subtract - line up place values

Multiply –

$$\begin{array}{r} 123 \\ \times 36 \\ \hline 738 \\ 3690 \\ \hline 4,428 \end{array}$$

Divide

$$123/36$$

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### Key Words to indicate desired operations in word problems

- Addition - **Sum**, Add, Added to, Plus, Total
- Subtraction - Minus, Take away, From, Subtract, **Remaining**
- Multiplication - Multiply, **Product**, Times
- Division - Divide, **Quotient**, Divided by

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Practice Problems

1. Subtract 98,765 from 257,143

- 355,908
- 159,378
- 158,378
- 159,488

Use the chart below to answer question 2.

Employee Salaries	184,000
Supplies and Postage	9745
Phone and Utilities	6300
Office Rent	29,400
Travel	12,570

2. Find the total expenses listed in the annual budget

- 2,208,200
- 242,015
- 240,000
- 242,150

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## Integers

- Integers are the numbers (...,-3,-2,-1,0,1,2,3,...) The positive integers are also called counting numbers (1,2,3,...). The negative integers are the numbers (...,-3,-2,-1,) The number 0 is an integer that is neither positive or negative.
- The distance from zero is called the **absolute value** of a number.

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## Rules for adding and subtracting Integers

- When **adding** if signs are the same, add and keep the sign, if signs are different then subtract and take the sign of the larger digit.
- When **subtracting** simply add the opposite.

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The table below illustrates some rules for addition and subtraction of integers.

Original Problem	Rewritten as addition	Answer
3-7	3+(-7)	-4
-5-2	-5+(-2)	-7
4-(-6)	4+6	10
-9-(-8)	-9+8	-1

- This table illustrates an important fact. Just as the opposite of a number is a negative number, the opposite of a negative number is a positive number. That is,  $-(-n)=n$  for any number  $n$ .

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### Check Yourself

- What is the value of  $-(-(-3))$
- Add:  $-3 + 5$
- Subtract:  $-9 - 13$

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### Multiplying and Dividing Integers

- Multiply and divide as always and if the signs are the same the answer is positive (+) and if the signs are different the answer is negative (-).

Problem	# of negative signs	Answer
$-3 \times 6$	1	-18
$(-2)(-4)$	2	8
$(-3)(-15)(2)$	2	90
$-1 \times (-2) \times (-5)$	3	-10
$12/(-4)$	1	-3
$-20/(-5)$	2	4
$-42/7$	1	-6

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## Order of Operations

- **First**, perform operations in **parentheses**. Work on the innermost set of parentheses first, then work outwards. Example:  
 $4 + (3 \times (5 + 2)) = 4 + (3 \times 7) = 4 + 21 = 25$
- **Second**, simplify any **exponents**. An exponent is a way of devoting multiplication of a number times itself a designated number of times. For example,  $6 \times 6 \times 6 \times 6$  can be rewritten as  $6^4$  and  $8 \times 8$  can be rewritten as  $8^2$ .
- **Third**, complete multiplication and division from **left to right**. Example:  
 $2 \times 8 / 4 \times 2 = 16 / 4 \times 2 = 4 \times 2 = 8$   
 But,  $(2 \times 8) / (4 \times 2) = 16 / 8 = 2$
- **Finally**, do multiplication and division before addition and subtraction. Complete addition and subtraction from **left to right**.

• **Please - Parenthesis, Excuse - Exponents, My - Multiply, Dear - Division, Aunt - Addition, Sally - Subtraction.**

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## Practice Problems

Problem	Steps	Explanation
$-2(3-5+2)$	$-2(-2+2)$ $-2(0)=0$	Subtract 5 from 3. Add -2 and 2. Multiply -2 and 0.
$2+6 \times 3$	$2+18=20$	Multiply 6 and 3. Add 2 and 18.
$(24/3) \times 5 - 6 + 2 \times 7 - 3$	$8 \times 5 - 6 + 2 \times 7 - 3$ $40 - 6 + 14 - 3 = 45$	Compute inside parentheses. Multiply and divide left to right. Add and subtract left right.

Perform the indicated operations:

1.  $(-3)(-2)(-5)$
2.  $5 + (-1)(7 - 8 + 3)$
3.  $(5 + 3) \times 2 - (4 - 5)$
4.  $3^2 + 1$
5.  $(3 - 1)^2 + 6 / 2$

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## Rational Numbers

Any number that can be expressed as a finite or repeating decimal.

Examples:

- $40/5$
- $7.999\dots$  (repeating decimal)
- $-6$
- $-8.542$  (finite decimal)
- $27/4$

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### Fractions

Any numbers that can be written in the form  $a/b$  where  $a$  and  $b$  are numbers and  $b$  is not equal to zero.

**Improper fraction** - numerator is bigger than denominator

**Mixed number** - a whole number and a fraction written together

$$8/5 = 1 \frac{3}{5}$$

**Equivalent fractions** -  $10/20$  and  $4/8$  can be reduced to  $1/2$

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### Prime Factorization:

- A factorization of which every number is prime.
- Prime number - A whole number that has exactly *two different* factors, *itself* and *1*.
- Examples:  $12 = 2 \times 2 \times 3$   
 $48 = 2 \times 2 \times 2 \times 2 \times 3$

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### Examples:

- $12/18 = 6 \times 2 / 6 \times 3 = 2/3$   
(six is the GCF of 12 and 18. Divide by the numerator and denominator by 6.)
- $24/80 = 8 \times 3 / 8 \times 10 = 3/10$   
(eight is the GCF of 24 and 80. Divide the numerator and the denominator by 8.)

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## Common Denominator

- A common denominator for two or more fractions is an integer that is divisible by each of the denominators. To **add or subtract two fractions**, you must have a common denominator. If the two denominators are not the same, first find a common denominator.

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## Examples:

- The fractions  $1/5$  and  $3/5$  have like denominators, and the two fractions  $2/3$  and  $5/12$  have unlike denominators. The denominators for the fractions  $1/5$  and  $3/5$  are alike, so we simply add the numerators to complete the sum:  
 $1/5 + 3/5 = 1+3/5 = 4/5$ .
- To add the two fractions  $2/3$  and  $5/12$ , we must first find a common denominator. The smallest common denominator for the two fractions is 12:  
 $2/3 = 2 \times 4 / 3 \times 4 = 8/12$ . We change the fraction  $2/3$  to  $8/12$  and add the numerator 8 to 5 to get 13 as shown below:  
 $2/3 + 5/12 = 8/12 + 5/12 = 13/12 = 12 + 1/12 = 12/12 + 1/12 = 1 \frac{1}{12}$

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## More examples:

- Consider the problem  $3/8 + 5/6$ . The number 48 divides evenly into both 8 and 6, so 48 is a common denominator. Rewrite  $3/8$  and  $5/6$  into equivalent fractions with 48 as the denominator:  
 $3/8 = (3 \times 6) / (8 \times 6) = 18/48$        $5/6 = (5 \times 8) / (6 \times 8) = 40/48$   
Since the two fractions now have a common denominator, we can add them together.  
 $18/48 + 40/48 = (18+40)/48 = 58/48$   
Since the two fractions now have a common denominator, we can add them together.  
 $18/48 + 40/48 = (18+40)/48 = 58/48$   
Since  $58/48$  is not in simplest form, find the GCF of both the numerator and denominator. Divide both by the GCF, and change the answer to a mixed fraction as shown.  
 $58/48 = 58/48 \div 2/2 = 29/24 = 1 \frac{5}{24}$   
Using the lowest common denominator (LCD), 24 we get:  
 $3/8 = 3 \times 3 / 8 \times 3 = 9/24$        $5/6 = 5 \times 4 / 6 \times 4 = 20/24$

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### Adding and Subtracting Like and Unlike Fractions

If two fractions are like fractions (having the same denominator) then their numerators may be added or subtracted, while the denominator stays the same. to find the answer. Ex.  $5/12 + 2/12 = 7/12$

If two fractions are unlike (having different denominators) then a common denominator must be determined before adding or subtracting.

Ex.  $1/12 + 5/6 = 1/12 + 10/12 = 11/12$

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### Check Yourself

1.  $4/5 + 2/15$
2.  $3 - 5 1/3$
3.  $3/15 - 2/25$
4.  $1 3/4 + 3$

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### Multiplying and Dividing Fractions

- To **multiply** fractions, simply multiply the numerator times the numerator and denominator by the denominator. Reduce the resulting fraction to lowest terms.
- To **divide** fractions, rewrite the problem as multiplication by multiplying by the reciprocal of the second fraction.

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 Check Yourself 

1.  $2 \frac{3}{8} \times \frac{2}{3}$
2.  $\frac{5}{3} / \frac{4}{15}$
3.  $3 + \frac{2}{3} \times \frac{9}{10}$
4.  $4 \frac{2}{3} / 6$

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 Ordering Fractions by Size 

- To put fractions in order from least to greatest simply cross multiply.  
Denominator of first fraction time numerator of second and visa versa.
- Example: Which fraction is greater?
  - $\frac{2}{3}$  or  $\frac{3}{4}$
  - $\frac{4}{7}$  or  $\frac{5}{9}$

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 Decimals 

- To change a fraction to a decimal divide the numerator by the denominator.
- Example:  $\frac{3}{8} = \frac{3.000}{8} = .375$

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### Decimal Place Value Chart

1	.01	.001	.0001	.00001
Tenths	Hundredths	Thousandths	Ten Thousandths	Hundred Thousandths

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### Adding and Subtracting Decimals

- When adding and subtracting decimals the place values must be lined up.
- Find the sum of .2473, .025, .9, and 2.64.

$$\begin{array}{r}
 0.2473 \\
 0.025 \\
 0.9 \\
 +2.64 \\
 \hline
 3.8123
 \end{array}$$


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### Multiplying and Dividing Decimals

- When multiplying decimals, multiply as you would a whole number. To determine the place of the decimal point count the total number of digits to the right of the decimal and the move the decimal in the solution to the left that many places.
- When dividing decimals change the divisor to a whole number

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## Rounding Decimals

- To round a number to a decimal place value, you must first be familiar with the place value chart, and then look to the right of the desired place value. If the digit is 5 or greater, round up, and if less than the desired digit stays the same and everything after it becomes zeros.

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## Algebra

- In algebra, **variables** are used to represent unknown values. A variable is usually represented by a letter or symbol. The number in front of the variable is called the **coefficient**.
- An **algebraic expression** contains variables and numbers separated by addition, subtraction, multiplication, or division symbols. Ex.  $2x + 4$
- An **algebraic equation** is an algebraic expression with an equal sign. Ex.  $2x + 4 = 7$
- To **evaluate an algebraic expression**, substitute a numeric value for the variable and perform the indicated operations. Ex. Evaluate the expression  $3x - 5$  when  $x = 4$ .

$$3(4) - 5 = 12 - 5 = 7$$

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## Adding Algebraic Expressions

- Only expressions having the same variable(s) also called "like terms" can be combined using addition and subtraction. Ex.  $2x + 7x = 9x$  but  $2x + 9y$  cannot be combined into one term.

### Check Yourself

- Combine like terms to simplify the following expressions.
- 1.  $2x - 5y + 7x$
- 2.  $y - 3x + 4x + y$

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### Multiplying Algebraic Expressions

- Multiplying algebraic expressions requires several steps. When multiplying a **monomial** (one term) with a binomial (two terms), the monomial must be multiplied by each term in the **binomial**.
- Ex.  $3x(2x - 1) = 6x^2 - 3x$
- When multiplying a binomial by a binomial, the terms in the first binomial must each be multiplied by the terms in the second binomial.
- Ex.  $(2x - 3)(4x + 2) = 8x^2 - 8x - 6$        $(5x + 1)(x - 2) = 5x^2 - 9x - 2$

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### Equations

$$\begin{array}{r} X + 7 = 13 \\ - 7 \quad -7 \\ \hline x = 6 \end{array}$$

$$\begin{array}{r} 2x - 6 = 10 \\ + 6 \quad + 6 \\ \hline 2x = 16 \\ \frac{2x}{2} = \frac{16}{2} \\ x = 8 \end{array}$$

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### Practice Problems

- Jamal's age is 3 less than twice Henry's age. The sum of Jamal and Henry's ages is 39. How old is Jamal?
  - 14
  - 39
  - 21
  - 25
- What is the solution of the equation  $3x - 7 = 8$ ?
  - $x = 2$
  - $x = 1/3$
  - $x = 5$
  - $x = 12$
- If  $y = 4x - 3$  what is the value of  $y$  when  $x = -2$ ?
  - 11
  - 5
  - 11
  - 5

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### Problems Continued

4. Combine the terms in the algebraic expression

$$3x - 2y + 7x - 5y$$

- a.  $xy$
- b.  $10x - 7$
- c.  $3xy$
- d.  $10x + 3y$

5. Multiply  $(x - 7)(2x + 1)$

- a.  $2x^2 - 7$
- b.  $3x - 7$
- c.  $2x^2 - 13x - 7$
- d.  $2x^2 + 15x - 7$

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### Percents

- Percent means per hundred
- To change a percent to a fraction put the percent over 100. Ex.  $35\% = 7/20$
- To change a percent to a decimal move the decimal two places to the left and drop the percent sign.
- To find a percent of a number change the percent to a decimal and multiply by the number.

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### Practice Problems

1. 12 is 20 % of what number?

- 1. 2.40
- 2. 240
- 3. 60
- 4. .60

2. The 18 students who received an "A" in a math class made up 30% of the students in the class. Find the total number of students in the class.

- 1. 18
- 2. 60
- 3. 30
- 4. 54

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## Ratios and Proportions

- A ratio is a comparison of two numbers by division.
- A proportion is two equal ratios.
- If the members of a club consist of 12 men and 17 women, the ratio of men to women in the club is 12 to 17 or 12:17 or 12/17
- If a 3-gallon punch recipe serves 25 people, we can use a proportion to determine how many gallons of punch are need to serve 60 people.
  - $\frac{3 \text{ gallons}}{25 \text{ people}} = \frac{x \text{ gallons}}{60 \text{ people}}$

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## Practice Problems

- Solve the proportion  $\frac{3}{x} = \frac{4}{12}$ 
  - 9
  - 1
  - 1/9
  - 144
- If you can travel 180 miles in 3 hours, how long will it take you to travel 300 miles at the same speed?
  - 1 4/5 hrs
  - 2 hrs
  - 5 hrs
  - 8 hrs

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## Inequalities

Inequalities are expressions that are not equal. The symbols are as follows:

- > Greater than
- < Less than
- ≤ Less than or equal to
- ≥ Greater than or equal to

The method for solving inequalities is the same as solving equations however, if you multiply or divide by a negative value in the final step of the equation then the inequality symbol must be reversed.

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**Examples**

$$2x - 1 \leq 15$$

$$2x \leq 16$$

$$x \leq 8$$
  

$$-3x + 5 \geq 17$$

$$\underline{-3x \geq 12}$$

$$\begin{array}{r} -3 \quad -3 \\ x \leq -4 \end{array}$$


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**Measurement**

English Units of Measurement

Length	Volume	Weight
1 foot = 12 inches	1 cup = 8 oz	1 pound (lb) = 16 oz
1 yard = 3 feet	1 pint = 2 cups	1 ton = 2,000 lbs.
1 mile = 5, 280 feet	1 quart = 2 pints	
	1 gallon = 4 quarts = 128 oz.	

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**Metric Units of Measurement**

King	Henry	Died	Monday	Drinking	Chocolate	Milk
Kilo	Hecto	Deka	Meters, Liters, & Grams	Deci	Centi	Milli
1,000	100	10	1	.1	.01	.001

**English & Metric Equivalences**

1 liter	≈	1 quart (1.06 quarts)
1 kilogram	≈	2.2 pounds
2.54 cm	=	1 inch
1 oz	≈	28 grams
1 meter	≈	1 yard (1.09 yds)

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### Practice Problems

- Complete the following:
  - 3 pounds = \_\_\_\_\_ ounces
  - 20 cups = \_\_\_\_\_ quarts
  - 200 centigrams = \_\_\_\_\_ grams
  - 3 kilometers = \_\_\_\_\_ meters
  - 1 quart = \_\_\_\_\_ ounces
- Approximately how many inches are in 12.75 centimeters?
  - 32.385 in
  - 5.02 in
  - 32.385 cm
- How many inches are in 2 1/2 yards?
  - 90 in
  - 10 in
  - 7.5 in
  - 30 in

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### Midpoint

- The midpoint between two points on a line can be determined by adding the two values and dividing by 2.
- $\frac{A + B}{2}$

Find the midpoint between -8 and 12.  
 $-8 + 12 = 4 / 2 = 2$

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### Formulas

**Circle**

Circumference	$C = 2\pi r$	Where r is the radius of the circle
Area	$A = \pi r^2$	Where r is the radius of the circle

**Triangle**

Perimeter	$P = a + b + c$	Where a, b, and c are the lengths of the triangle
Area	$A = \frac{1}{2}bh$	Where b is the base and h is the height

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### Formulas (cont'd.)

#### Rectangle

Perimeter	$P = 2L + 2W$	Where L is the length and W is the width
Area	$A = LW$	

#### Square

Perimeter	$P = 4S$	Where S is the length of a side of the square
Area	$A = S^2$	

#### Volume

Cube	$V = LWH = S^3$	Length, width, and height have the same measure, S.
Prism (box)	$V = LWH$	Length x width x height.
Circular cylinder	$V = \pi r^2 H$	r is the radius of the base. H is the height of the cylinder.

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### Pythagorean Theorem

In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

$$a^2 + b^2 = c^2$$

This formula is used when given a right triangle where two lengths are known and we are looking for the dimensions of the third.

$$5^2 + b^2 = 13^2$$

$$25 + b^2 = 169$$

$$b^2 = 144$$

$$b = 12$$

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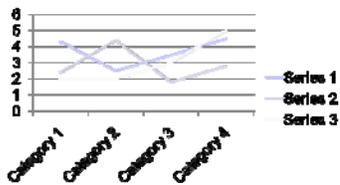
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### Graphs and Diagrams

#### Line Graphs




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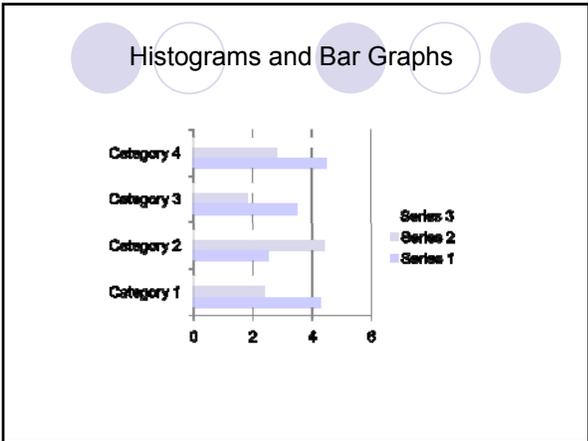
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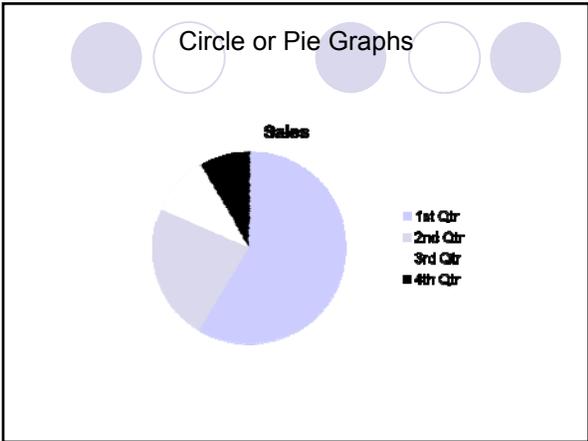
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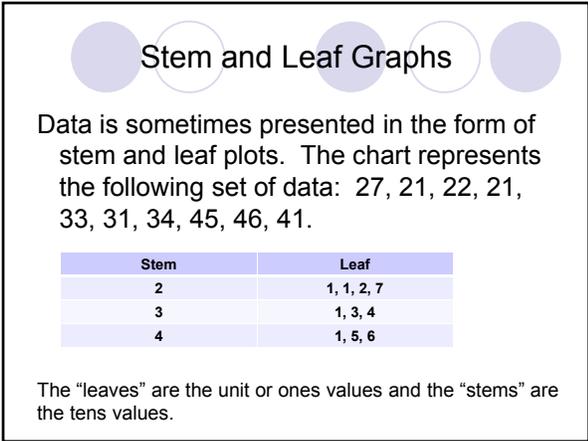
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# Statistics

- Statistics often represents data in graphs and diagrams using measures of central tendency. (Mean, Median, Mode, Range, and Standard Deviation)
- **Mean** also known as the average can be found by adding the values of each data and dividing by the total number of data.
- The **median** of a set of data is the middle-most value after ordering the values from least to greatest.
- The **mode** of a set of data is the number that occurs the most in the data set.
  
- Find the mean, median, and mode of the following data:  
2, 5, 6, 1, 8, 11, 15, 2, 10

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