ADELANTO ELEMENTARY SCHOOL DISTRICT

CURRICULUM & STUDY GUIDE for INSTRUCTIONAL AIDE ASSESSMENT

Requirement of the *No Child Left Behind Act of 2001*,

MATH

READING/LANGUAGE ARTS

ABILITY TO ASSIST

Introduction

In complying with the testing option requirement of the *No Child Left Behind Act of 2001* this study guide was prepared to assist Adelanto Elementary School District's paraprofessionals prepare for the test. The Booklet is split into two parts; the first part contains the **Math** section and the second part contains the **Reading/Language Arts** and **Ability to Assist.**

Special thanks and acknowledgement to various internet sites that provided information that was used to compile this curriculum.

New Paraprofessionals
(Hired After January 8, 2002)

- Paraprofessionals hired after January 8, 2002, must meet the following requirements if they work in Title I settings:
  - Completed at least two years of study at an institution of higher education; [or]
  - Obtain an associate's degree or higher; OR
  - Pass a state or local assessment designed to demonstrate knowledge of, and the ability to assist with instruction in **reading, writing or math**
  - This applies to all paraprofessionals working in program that receives Title I, Part A funds.

Title I, Part A SEC.1119 Paraprofessionals Hired After January 8, 2002

- ''(c) NEW PARAPROFESSIONALS.—
  - ''(1) IN GENERAL.— Each local educational agency receiving assistance under this part [Title I, Part A] shall ensure that all paraprofessionals hired after the date of enactment of the No Child Left Behind Act of 2001 **and working in a program supported with funds under this part shall have—**

Title I, Part A, SEC. 1119
Paraprofessionals Hired Before January 8, 2002

- (d) EXISTING PARAPROFESSIONALS.— Each local educational agency receiving assistance under this part shall ensure that all paraprofessionals hired before the date of enactment of the No Child Left Behind Act of 2001, and working in a program supported with funds under this part shall, not later than 4 years after the date of enactment [January 8, 2006] satisfy the requirements of subsection (c).

Paraprofessional Qualifications (cont.)

Each LEA receiving Title I funds must ensure that all paraprofessionals regardless of their hiring date, have a secondary school diploma or its recognized equivalent.

Exceptions to the New Qualifications for Two Groups of Paraprofessionals

The law provides for two groups of paraprofessionals to be exempted from the new criteria:

(1) **Translators** - Paraprofessionals who are proficient in English and a language other than English and who provides services primarily to enhance the participation of children in programs under this part by acting as a translator; or

(2) **Parental Involvement** - Paraprofessionals whose duties consist solely of conducting parental involvement activities consistent with section 1118.

Paraprofessional Work Clarified (§200.59)

New criteria for type of work that may be assigned to paraprofessionals

- one-on-one tutoring for eligible students, if tutoring is at time when student would not otherwise be taught by teacher
- assist with classroom management, such as organizing instructional and other materials
- provide assistance in computer laboratory
- conduct parental involvement activities
- provide support in library/media center
- act as translator

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Part 1

MATH

Fractions

.ttp://www.mathleague.com/help/fractions/fractions.htm#whatisafraction

'What is a Fraction?

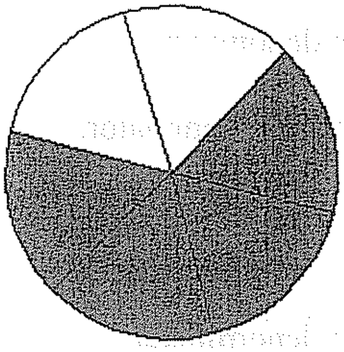
A fraction is a number that expresses part of a group. Fractions are written in the form $\frac{a}{b}$ or *a*/*b*, where a and b are whole numbers, and the number b is not 0. For the purposes of these web pages, we will denote fractions using the notation *a*/*b*,

though the preferred notation is generally $\frac{a}{b}$.

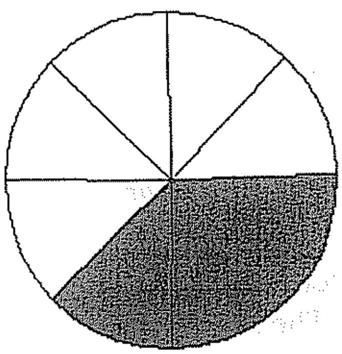
The number *a* is called the numerator, and the number *b* is called the denominator.

Examples:* *The following numbers are all fractions
1/2, 3/7, 6/10, 4/99

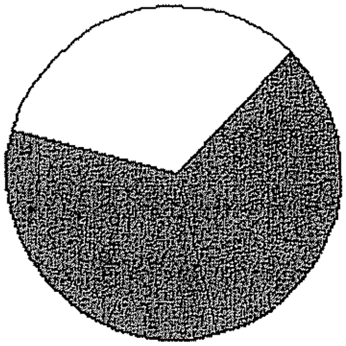
Example:* *The fraction 4/6 represents the shaded portion of the circle below. There are 6 pieces in the group, and 4 of them are shaded.



Example:* *The fraction 3/8 represents the shaded portion of the circle below. There are 8 pieces in the group, and 3 of them are shaded.



Example: The fraction 2/3 represents the shaded portion of the circle below. There are 3 pieces in the group, and 2 of them are shaded.



Equivalent Fractions

Equivalent fractions are different fractions which name the same amount.

Examples: The fractions 1/2, 2/4, 3/6, 100/200, and 521/1042 are all equivalent fractions. The fractions 3/7, 6/14, and 24/56 are all equivalent fractions.
We can test if two fractions are equivalent by cross-multiplying their numerators and denominators. This is also called taking the cross-product.

Example: Test if 3/7 and 18/42 are equivalent fractions.
The first cross-product is the product of the first numerator and the second denominator:
$3 \times 42 = 126$.
The second cross-product is the product of the second numerator and the first denominator:
$18 \times 7 = 126$.
Since the cross-products are the same, the fractions are equivalent.

Example: Test if 2/4 and 13/20 are equivalent fractions.
The first cross-product is the product of the first numerator and the second denominator:
$2 \times 20 = 40$.
The second cross-product is the product of the second numerator and the first denominator:
$4 \times 13 = 52$.
Since the cross-products are different, the fractions are not equivalent. Since the second cross-product is larger than the first, the second fraction is larger than the first.

Comparing Fractions

1. To compare fractions with the same denominator, look at their numerators. The larger fraction is the one with the larger numerator.
2. To compare fractions with different denominators, take the cross product. The first cross-product is the product of the first numerator and the second denominator. The second cross-product is the product of the second numerator and the first denominator. Compare the cross products using the following rules:

a. If the cross-products are equal, the fractions are equivalent.
b. If the first cross product is larger, the first fraction is larger.
c. If the second cross product is larger, the second fraction is larger.

Example: Compare the fractions 3/7 and 1/2.
The first cross-product is the product of the first numerator and the second denominator:
$3 \times 2 = 6$.
The second cross-product is the product of the second numerator and the first denominator:
$7 \times 1 = 7$.
Since the second cross-product is larger, the second fraction is larger.

Example: Compare the fractions 13/20 and 3/5.
The first cross-product is the product of the first numerator and the second denominator:
$5 \times 13 = 65$.
The second cross-product is the product of the second numerator and the first denominator:
$20 \times 3 = 60$.
Since the first cross-product is larger, the first fraction is larger.

Converting and Reducing Fractions

For any fraction, multiplying the numerator and denominator by the same nonzero number gives an equivalent fraction. We can convert one fraction to an equivalent fraction by using this method.

Examples: $1/2 = (1 \times 3)/(2 \times 3) = 3/6$

$2/3 = (2 \times 2)/(3 \times 2) = 4/6$

$3/5 = (3 \times 4)/(5 \times 4) = 12/20$

Another method of converting one fraction to an equivalent fraction is by dividing the numerator and denominator by a common factor of the numerator and denominator.

Examples: $20/42 = (20 \div 2)/(42 \div 2) = 10/21$

$36/72 = (36 \div 3)/(72 \div 3) = 12/24$

$9/27 = (9 \div 3)/(27 \div 3) = 3/9$

When we divide the numerator and denominator of a fraction by their greatest common factor, the resulting fraction is an equivalent fraction in lowest terms.

Lowest Terms

A fraction is in lowest terms when the greatest common factor of its numerator and denominator is 1. There are two methods of reducing a fraction to lowest terms.

Method 1:

Divide the numerator and denominator by their greatest common factor.

12/30 = (12 ÷ 6)/(30 ÷ 6) = 2/5

Method 2:

Divide the numerator and denominator by any common factor. Keep dividing until there are no more common factors.

12/30 = (12 ÷ 2)/(30 ÷ 2) = 6/15 = (6 ÷ 3)/(15 ÷ 3) = 2/5

Improper Fractions

Improper fractions have numerators that are larger than or equal to their denominators.

Examples: 11/4, 5/5, and 13/2 are improper fractions.

Mixed Numbers

Mixed numbers have a whole number part and a fraction part.

Examples:

$2\frac{3}{4}$ and $6\frac{1}{2}$ are mixed numbers also written as 2 3/4 and 6 1/2. In these web pages, we denote mixed numbers in the form *a b*/*c*.

Converting Mixed Numbers to Improper Fractions

To change a mixed number into an improper fraction, multiply the whole number by the denominator and add it to the numerator of the fractional part.

Examples:

2 3/4 = ((2 × 4) + 3)/4 =11/4

6 1/2 = ((6 × 2) + 1)/2 = 13/2

Converting Improper Fractions to Mixed Numbers

To change an improper fraction into a mixed number, divide the numerator by the denominator. The remainder is the numerator of the fractional part.

Examples:
$11/4 = 11 \div 4 = 2\ r3 = 2\ 3/4$

$13/2 = 13 \div 2 = 6\ r1 = 6\ 1/2$

Writing Decimals as Fractions
Writing a Fraction as a Decimal

Method 1 - Convert to an equivalent fraction whose denominator is a power of 10, such as 10, 100, 1000, 10000, and so on, then write in decimal form.

Examples:
$1/4 = (1 \times 25)/(4 \times 25) = 25/100 = 0.25$

$3/20 = (3 \times 5)/(20 \times 5) = 15/100 = 0.15$

$9/8 = (9 \times 125)/(8 \times 125) = 1125/1000 = 1.125$

Method 2 - Divide the numerator by the denominator. Round to the decimal place asked for, if necessary.

Example: $13/4 = 13 \div 4 = 3.25$

Example: Convert 3/7 to a decimal.

Round to the nearest thousandth.

We divide one decimal place past the place we need to round to, then round the result.

$3/7 = 3 \div 7 = 0.4285$ which equals 0.429 when rounded to the nearest thousandth.

Example: Convert 4/9 to a decimal.

Round to the nearest hundredth.

We divide one decimal place past the place we need to round to, then round the result.

$4/9 = 4 \div 9 = 0.4444\ldots$ which equals 0.44 when rounded to the nearest hundredth.

Rounding a Fraction to the Nearest Hundredth
Divide to the thousandths place. If the last digit is less than 5, drop it. This is particularly useful for converting a fraction to a percent, if we want to convert to the nearest percent.

$1/3 = 1 \div 3 = 0.333\ldots$ which rounds to 0.33

If the last digit is 5 or greater, drop it and round up.

$2/7 = 2 \div 7 = 0.285$ which rounds to 0.29

Subtraction and Addition

Adding and Subtracting Fractions

If the fractions have the same denominator, their sum is the sum of the numerators over the denominator. If the fractions have the same denominator, their difference is the difference of the numerators over the denominator. We do not add or subtract the denominators! Reduce if necessary.

Examples: 3/8 + 2/8 = 5/8

9/2 - 5/2 = 4/2 = 2

If the fractions have different denominators:
1) First, find the least common denominator.
2) Then write equivalent fractions using this denominator.
3) Add or subtract the fractions. Reduce if necessary.

Example: 3/4 + 1/6 = ?

The least common denominator is 12.

3/4 + 1/6 = 9/12 + 2/12 = 11/12.

Example: 9/10 - 1/2 = ?

The least common denominator is 10.

9/10 - 1/2 = 9/10 - 5/10 = 4/10 = 2/5.

Example: 2/3 + 2/7 = ?

The least common denominator is 21 - 2/3 + 2/7 = 14/21 + 6/21 = 20/21.

Adding and Subtracting Mixed Numbers

To add or subtract mixed numbers, simply convert the mixed numbers into improper fractions, then add or subtract them as fractions.

Example: 9 1/2 + 5 3/4 = ?

Converting each number to an improper fraction, we have 9 1/2 = 19/2 and 5 3/4 = 23/4.

We want to calculate 19/2 + 23/4. The LCM of 2 and 4 is 4, so

19/2 + 23/4 = 38/4 + 23/4 = (38 + 23)/4 = 61/4.

Converting back to a mixed number, we have 61/4 = 15 1/4.

The strategy of converting numbers into fractions when adding or subtracting is often useful, even in situations where one of the numbers is whole or a fraction.

Example: 13 - 1 1/3 = ?

In this situation, we may regard 13 as a mixed number without a fractional part. To convert it into a fraction, we look at the denominator of the fraction 4/3, which is 1 1/3 expressed as an improper fraction. The denominator is 3, and 13 = 39/3. So 13 - 1 1/3 = 39/3 - 4/3 = (39-4)/3 = 35/3, and 35/3 = 11 2/3.

Example: 5 1/8 - 2/3 = ?

This time, we may regard 2/3 as a mixed number with 0 as its whole part. Converting the first mixed number to an improper fraction, we have 5 1/8 = 41/8. The problem becomes

5 1/8 - 2/3 = 41/8 - 2/3 = 123/24 - 16/24 = (123 - 16)/24 = 107/24.

Converting back to a mixed number, we have 107/24 = 4 11/24.

Example: 92 + 4/5 = ?

This is easy. To express this as a mixed number, just put the whole number and the fraction side by side. The answer is 92 4/5.

Multiplication

Multiplying Fractions and Whole Numbers

To multiply a fraction by a whole number, write the whole number as an improper fraction with a denominator of 1, then multiply as fractions.

Example: $8 \times 5/21 = ?$
We can write the number 8 as 8/1. Now we multiply the fractions.
$8 \times 5/21 = 8/1 \times 5/21 = (8 \times 5)/(1 \times 21) = 40/21$
Example: $2/15 \times 10 = ?$
We can write the number 10 as 10/1. Now we multiply the fractions.
$2/15 \times 10 = 2/15 \times 10/1 = (2 \times 10)/(15 \times 1) = 20/15 = 4/3$

Multiplying Fractions and Fractions

When two fractions are multiplied, the result is a fraction with a numerator that is the product of the fractions' numerators and a denominator that is the product of the fractions' denominators.

Example: $4/7 \times 5/11 = ?$

The numerator will be the product of the numerators: 4×5, and the denominator will be the product of the denominators: 7×11.

The answer is $(4 \times 5)/(7 \times 11) = 20/77$.

Remember that like numbers in the numerator and denominator cancel out.

Example: $14/15 \times 15/17 = ?$

Since the 15's in the numerator and denominator cancel, the answer is

$14/15 \times 15/17 = 14/1 \times 1/17 = (14 \times 1)/(1 \times 17) = 14/17$

Example: $4/11 \times 22/36 = ?$

In the solution below, first we cancel the common factor of 11 in the top and bottom of the product, then we cancel the common factor of 4 in the top and bottom of the product.

$4/11 \times 22/36 = 4/1 \times 2/36 = 1/1 \times 2/9 = 2/9$

Multiplying Mixed Numbers

To multiply mixed numbers, convert them to improper fractions and multiply.

Example: 4 1/5 × 2 2/3 = ?.

Converting to improper fractions, we get 4 1/5 = 21/5 and 2 2/3 = 8/3. So the answer is

4 1/5 × 2 2/3 = 21/5 × 8/3 = (21 × 8)/(5 × 3) = 168/15 = 11 3/15.

Examples: 3/4 × 1 1/8 = 3/4 × 9/8 = 27/32.

3 × 7 3/4 = 3 × 31/4 = (3 × 31)/4 = 93/4 = 23 1/4.

Reciprocal

The reciprocal of a fraction is obtained by switching its numerator and denominator. To find the reciprocal of a mixed number, first convert the mixed number to an improper fraction, then switch the numerator and denominator of the improper fraction. Notice that when you multiply a fraction and its reciprocal, the product is always 1.

Example:

Find the reciprocal of 31/75. We switch the numerator and denominator to find the reciprocal: 75/31.

Example:

Find the reciprocal of 12 1/2. First, convert the mixed number to an improper fraction: 12 1/2 = 25/2. Next, we switch the numerator and denominator to find the reciprocal: 2/25.

Division

Dividing Fractions

To divide a number by a fraction, multiply the number by the reciprocal of the fraction.

Examples:

7 ÷ 1/5 = 7 × 5/1 = 7 × 5 = 35

1/5 ÷ 16 = 1/5 ÷ 16/1 = 1/5 × 1/16 = (1 × 1)/(5 × 16) = 1/80

3/5 ÷ 7/12 = 3/5 × 12/7 = (3 × 12)/(5 × 7) = 36/35 or 1 1/35

Dividing Mixed Numbers
To divide mixed numbers, you should always convert to improper fractions, then multiply the first number by the reciprocal of the second.

Examples:

1 1/2 ÷ 3 1/8 = 3/2 ÷ 25/8 = 3/2 × 8/25 = (3 × 8)/(2 × 25) = 24/50

1 ÷ 3 3/5 = 1/1 ÷ 18/5 = 1/1 × 5/18 = (1 × 5)/(1 × 18) = 5/18

3 1/8 ÷ 2 = 25/8 ÷ 2/1 = 25/8 × 1/2 = (25 × 1)/(8 × 2) = 25/16 or 1 9/16.

Simplifying
Simplifying Complex Fractions
A complex fraction is a fraction whose numerator or denominator is also a fraction or mixed number.

Example of complex fractions:

$$\frac{\frac{1}{4}}{\frac{2}{3}},\ \frac{\frac{3}{7}}{100},\ \frac{11}{\frac{2}{3}},\ \frac{23\frac{1}{5}}{\frac{2}{3}}$$ otherwise written as (1/4)/(2/3), (3/7)/100, 11/(2/3), and (23 1/5)/(2/3).

To simplify complex fractions, change the complex fraction into a division problem: divide the numerator by the denominator.

The first of these examples becomes.
(1/4)/(2/3) = 1/4 ÷ 2/3 = 1/4 × 3/2 = 3/8.

The second of these becomes

(3/7)/100 = 3/7 ÷ 100 = 3/7 × 1/100 = 3/700.

The third of these becomes

11/(2/3) = 11 ÷ 2/3 = 11 × 3/2 = 33/2 = 16 1/2.

The fourth of these becomes

(23 1/5)/(2/3) = 23 1/5 ÷ 2/3 = 116/5 ÷ 2/3 = 116/5 × 3/2 = 174/5 = 34 4/5.

Solving Math
Word Problems

There are two steps to solving math word problems:

1. translate the wording into a numeric equation
2. solve the equation!

Usually, once you get the math equation, you're fine.
But getting to the equation can seem difficult.
These strategies may help you translate,
but practice will determine your success.

- **Read the problem entirely**
  Get a feel for the whole problem
- **List information** and the variables you identify
  Attach units of measure to the variables (gallons, miles, inches, etc.)
- **Define what answer you need,**
  as well as its units of measure
- **Work in an organized manner**
  Working clearly will help you think clearly
    - Draw and label all graphs and pictures clearly
    - Note or explain each step of your process;
      this will help you track variables and remember their meanings
- **Look for "key" words**
  Certain words indicate certain mathematical operations:

Addition	**Subtraction**	**Multiplication**	**Division**	**Equals**
increased by more than combined together total of sum added to	decreased by minus, less difference between/of less than, fewer than	of times, multiplied by product of increased/decreased by a factor of (this one is both addition/subtraction AND multiplication!)	per, a out of ratio of, quotient of percent (divide by 100)	is, are, was, we, will be, gives, yields, sold for

Vocabulary

- **"Per" means "divided by"**
  as "I drove 90 miles on three gallons of gas, so I got 30 miles per gallon"
  Also 30 miles/gallon
- **"a" sometimes means "divided by"**
  as in "When I tanked up, I paid $3.90 for three gallons, so the gas was 1.30 a gallon, or $1.30/gallon
- **"less than"**
  If you need to translate "1.5 less than x", the temptation is to write "1.5 - x". DON'T! Put a "real world" situation in, and you'll see how this is wrong: "He makes $1.50 an hour less than me." You do NOT figure his wage by subtracting your wage from $1.50. Instead, you subtract $1.50 from your wage

- **"quotient/ratio of" constructions**
  If a problems says "the ratio of *x* and *y*",
  it means "***x* divided by *y***" or x/y or x÷y
- **"difference between/of" constructions**
  If the problem says "the difference of *x* and *y*",
  it means "*x* - *y*"

Examples

Wording	**Math expession**
What is the sum of 8 and y?	**8 + y**
4 less than y	**y - 4**
y multiplied by 13	**13y**
the quotient of y and 3	**y/3**
the difference of 5 and y	**5 - y**
the ratio of 9 more than y to y	**(y + 9)/y**
nine less than the total of a number (y) and two	**(y + 2) - 9 or y - 7**
The length of a football field is 30 yards more than its width. Express the length of the field in terms of its width y	**y + 30**
Twenty gallons of crude oil were poured into two containers of different size. Express the amount of crude oil poured into the smaller container in terms of the amount y poured into the larger container." The expression they're looking for is found by this reasoning: There are twenty gallons total, and we've already poured y gallons of it. That means that there are X gallons left.	**20 - y**

http://www.purplemath.com/index.htm

Word Problems Requiring Multiplication

http://www.free-ed.net/fr07/lfc/course070101_01/unit0305.htm

1. In the problem 9 x 6 = 54, the number 9 is the **multiplier** and 6 is the **multiplicand**. However, both numbers in any multiplication problem are called **factors**.

In the problem 6 x 7 = 42, the factors are 6 and 7.

2. In the problem 8 x 7 = 56, the **product** is 56 and the factors are ______ and ______.

In the problem 8 x 7 = 56, the ***product*** *is 56 and the factors are 7 and 8.*

3. What are the factors in 3 x 6 = 18?

4. 3, 6

4. If candy bars cost 15 cents each, then the price of 7 bars is found by ______ 15 and 7.

Multiplying

Six boys, each weighing 74 pounds, weigh a total of ______.

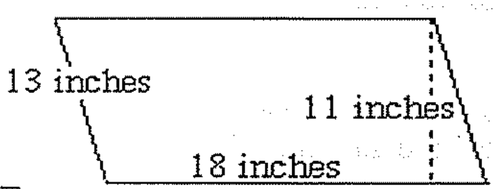
6 x 74 = 444 pounds.

5. If each ticket in a bundle of 2,000 tickets costs 76 cents, what is the cost of the bundle? ______

152,000 cents or $1,520.

6.

Use the formula A = BH to find the area of the parallelogram shown at the right.



____

A = B x H = 18 x 11 = 198 square inches

Word Problems Requiring Division

`\ttp://www.free-ed.net/fr07/lfc/course070101_01/unit0405.htm`

1.

In the problem at the right, 55 is the **divisor** and 948 is the **dividend**.

$55\overline{)\,948}$

In the problem at the right, the divisor is _______.

$78\overline{)\,9136}$

In the problem at the right, 55 is the **divisor** and 948 is the **dividend**.

$55\overline{)\,948}$

In the problem at the right, the divisor is 78.

$78\overline{)\,9136}$

2.

In the problem at the right, 67 is the **divisor** and 8,125 is the **dividend**.

$67\overline{)\,8125}$

In the problem at the right, the dividend is __________.

$724\overline{)\,41632}$

In the problem at the right, 67 is the **divisor** and 8,125 is the **dividend**.

$67\overline{)\,8125}$

In the problem at the right, the dividend is 41,632.

$724\overline{)\,41632}$

3. To find the average of the numbers 59, 68, and 62 add the numbers and divide the sum by 3.

Show the complete process needed to find the average of: 59, 68, and 62.

To find the average of the numbers 59, 68, and 62
add the numbers and divide the sum by 3.

Show the complete process needed to find the average of: 59, 68, and 62.
59 + 68 + 62 = 189 and 189 ÷ 3 = 63

4. Find the average of 257, 364, 295, and 308 by adding the numbers and dividing the sum by 4.

Find the average of 257, 364, 295, and 308 by adding the numbers and dividing the sum by 4.
The average is 306 because 1,224 ÷ 4 = 306

5. If 8,624 fluid ounces is to be equally distributed into 7 containers, what amount should be put in each container?

If 8,624 fluid ounces is to be equally distributed into 7 containers, what amount should be put in each container?

8624 ÷ 7 = 1232 fl oz

6.. Each tire in a sale is priced at $37. The total value of the tires is $2,775. Find the number of tires.

2,775 ÷ 37 = 75 tires

7. A total of 7,101 grams of gold is to be made into ornaments that weigh 9 grams each. How many ornaments can be made?
789 ornaments

Word Problems Requiring Percentage

http://www.800score.com/gre-guidec7view1a.html

A. Percentages

The word *percent* is abbreviated by the symbol % and is a fraction whose denominator is 100. 26% is equivalent to the fraction 26/100. To change a decimal number to a percent, we simply multiply by 100; the number 0.321 is equivalent to 32.1%. If a percentage is given, move the decimal two places to the left to express its equivalent decimal form.

Example 1
Convert 4% into a decimal and a fraction in lowest terms.

Solution
To convert 4% into a decimal, we move the decimal point two places to the left:
4% = 0.04

To express 4% as a fraction, we divide by 100:
4/100 = 1/25

4% = 0.04 = 1/25

Example 2
If the price of a stock falls from $50 to $40, what is the percentage of decrease?

Solution
First, subtract the numbers resulting in the decrease: 50 - 40 = 10. Then divide by the original amount:
(50 - 40) / 50 = 10 / 50 = .2
Convert to a percentage by moving the decimal point two places to the right:
% decrease = 20%

Example 3
An employee is to mark up a piece of jewelry 120%. If it cost $100, what should its selling price be?

Solution
The amount of the markup is 1.2 × 100= $120
The selling price is then $100 + $120 = $220

Example 4

A college bookstore purchases trade books on a 40% margin, i.e., it purchases a trade book for 40% less than its retail price. What is the percentage markup based on its wholesale price?

Solution

Since the retail price is not given, the percentage markup that we seek must be the same for all trade books. Therefore, let the retail price of a trade book be \$100 (rather than the symbol x). Then the bookstore's purchase price is

100 - 100 × 0.4 = 100 - 40 = \$60

If a book sells for \$100 and costs \$60, its percentage markup is

%markup = (100 - 60) / 60 × 100 = 40 / 60 x 100 = 66%

Example 5

Kathy buys a bike for \$240 after a 40% markdown. What was the original price?

Solution

Let P be the original price. Then

P - P × 0.4 = 240

0.6P = 240

divide both sides by .6

therefore, P = \$400

Example 6

Find the number of residents of a city if 20% of them, or 6,200 people, ride bicycles.

Solution

Let R be the number of residents. The equation that represents the verbal statement is

0.2R = 6,200. R = 6200/.2 = 62000/2 = 31,000 people.

Example 7

Kent pays 20% taxes on income between \$10,000 and \$20,000 and 30% on income over \$20,000. The first \$10,000 is tax free. If he pays \$14,000 in taxes, what was his income?

Solution

Let Kent's income be L. Then the total tax is

0.2(20,000 - 10,000) + 0.3(L - 20,000) =14,000

2,000 + 0.3L - 6,000 = 14,000

0.3L = 14,000 + 4,000 = 18,000

L = 18,000/.3 = \$60,000

Example 8

How many gallons of pure water must be added to 100 gallons of a 4% saline solution to provide a 1% saline solution?

Solution

Let x be the gallons of pure water to be added. There are $100 \times 0.04 = 4$ *gallons of salt and 96 gallons of pure water in a 4% saline solution. The total number of gallons will be* $x + 100$. *The amount of salt will remain constant. Hence,*

$0.01(x + 100) = 4$
$0.01x + 1 = 4$
$0.01x = 3$
$x = 3/.01 = 300$ *gallons*

Charts and Graphs:

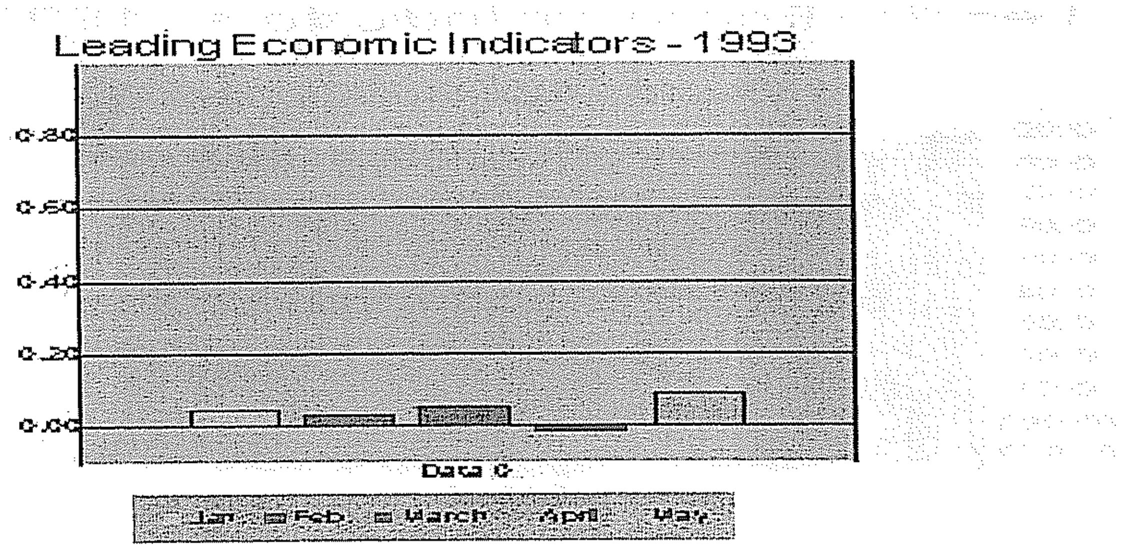
Showing statistical data visually -

In analyzing statistical arguments, often times the data is represented visually for increased impact. People are often able to understand or grasp more quickly the "meaning" behind data when it is presented visually. This has spawned all sorts of graphing programs or functions within programs with simplify this task. Unfortunately, it has also made it much easier to mis-represent the data so that conclusions (generalizations) can be drawn from the date which otherwise might not be warranted. For example, suppose I have data which tracks the status of a group of stocks which have been designated as those stocks which are the Leading Economic Indicators for the U.S. economy. The data for the first five months of the year are as follows:

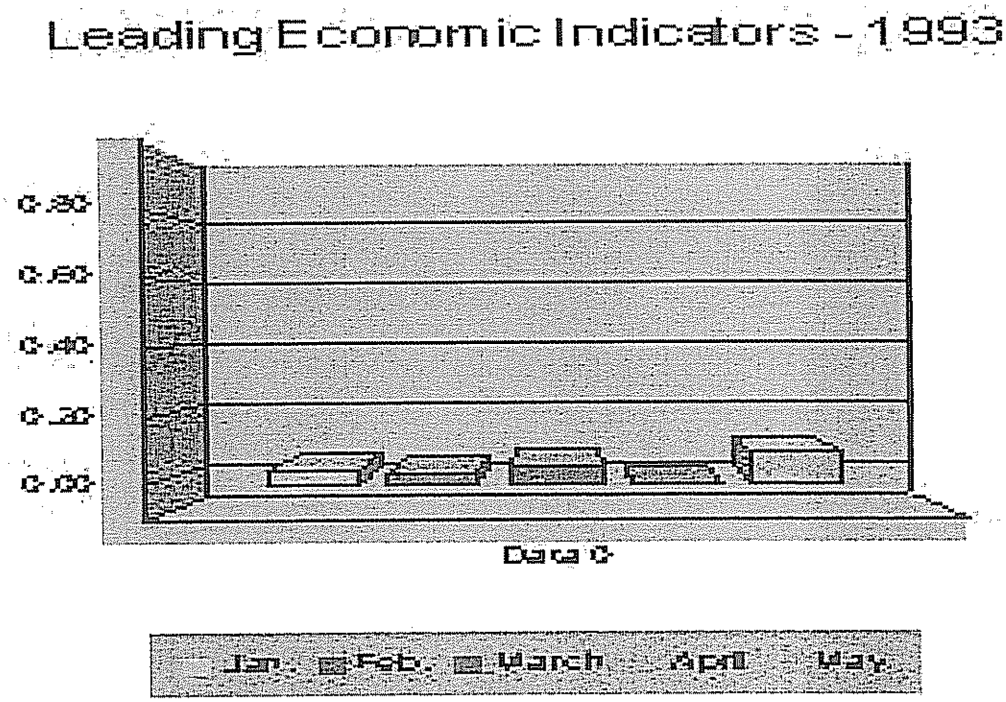
- January - +0.04
- February - +0.03
- March - +0.01
- April - -0.01
- May - +0.09

The key here is that while this is informative, it is not very interesting. Lets try plotting this on a graph. Since these figures are percentages, lets use 0-100% as our scale for the Y axis, and the months as our X axis. This produces a graph like this:

Well, that doesn't show much, does it? We need to do something to make the change in the data visible. Plotted this way, we cannot even see the data points. Besides that, there is no visual interest. Let's address the scaling problem first. Instead of using a 0-100% scale, why don't we reduce the top end of the scale to 1% and extend the bottom of the scale to -.1%. With these changes to the plot, we get this graph:



That helps a little - at least now we can see the data and the changes from month to month. But there is still no visual interest. Why don't we try a 3-D plot?



Now that is better - not only can we see the data, but it looks much better than our 2-D plot. The problem is, I cannot make any valid conclusions about the economy from this data - people would realize, by looking at the graph, that the change from April to May was not that great. Let's reduce the scale of the X axis from .1% to 0.04%.

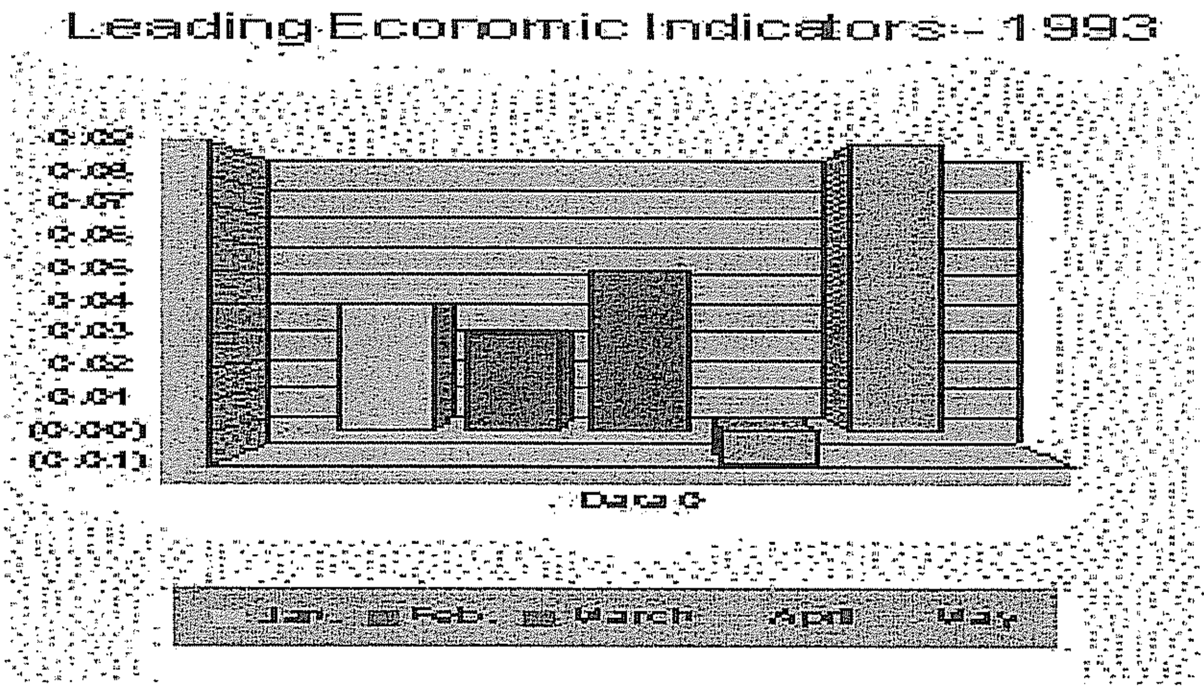

Leading Economic Indicators - 1993
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
(0.00)
(0.01)
Data 0
Jan. Feb. March April May

Chart and Graph Interpretation Percent

Tables, Charts, and Graphs (Data Interpretation)

Graphs and charts show the relationship of numbers and quantities in visual form. By looking at a graph, you can see at a glance the relationship between two or more sets of information. If such information were presented in written form, it would be hard to read and understand.

Here are some things to remember when doing problems based on data interpretation:

1.Take your time and read carefully. Understand what you are being asked to do before you begin figuring.

2.Check the dates and types of information required. Be sure that you are looking in the proper columns, and on the proper lines, for the information you need.

3. Check the units required. Be sure that your answer is in thousands, millions, or whatever the question calls for.

4. In computing averages, be sure that you add the figures you need and no others, and that you divide by the correct number of years or other units.

5. Be careful in computing problems asking for percentages.

6. (a) Remember that to convert a decimal into a percent you must multiply it by 100. For example, 0.04 is 4%.
(b) Be sure that you can distinguish between such quantities as 1% (1 percent) and .01% (one one-hundredth of 1 percent), whether in numerals or in words.
(c) Remember that if quantity X is greater than quantity Y, and the question asks what percent quantity X is of quantity Y, the answer must be greater than 100 percent

Example Set #28: Table Chart
Examples 1-5 are based on .his Table Chart.

The following chart is a record of the performance of a baseball team for the first seven weeks of the season.

	Games Won	Games Lost	Total No.of Games Played
First Week	5	3	8
Second Week	4	4	16
Third Week	5	2	23
Fourth Week	6	3	32
Fifth Week	4	2	38
Sixth Week	3	3	44
Seventh Week	2	4	50

1. How many games did the team win during the first seven weeks?
(A) 32
(B) 29
(C) 25
(D) 21
(E) 50

Choice B is correct. To find the total number of games won, add the number of games won for all the weeks, 5 + 4 + 5 + 6 + 4 + 3 + 2 = 29.

2. What percent of the games did the team win?
(A) 75%
(B) 60%
(C) 58%
(D) 29%
(E) 80%

Choice C is correct. The team won 29 out of 50 games or 58%.

3. According to the chart, which week was the worst for the team?
(A) second week
(B) fourth week
(C) fifth week
(D) sixth week
(E) seventh week

Choice E is correct. The seventh week was the only week that the team lost more games than it won.

4. Which week was the best week for the team?

(A) first week
(B) third week
(C) fourth week
(D) fifth week
(E) sixth week

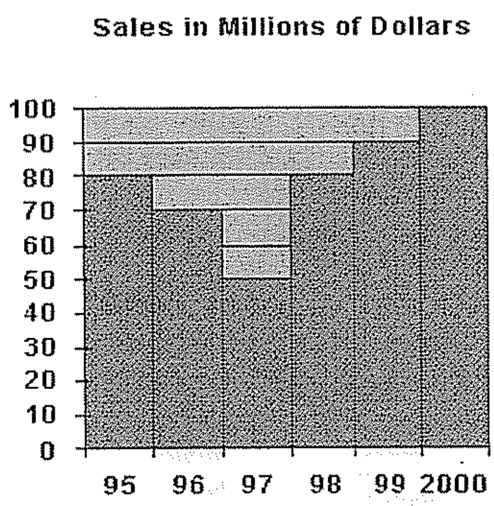
Choice B is correct. During the third week, the team won 5 games and lost 2, or it won about 70% of the games that week. Compared with the winning percentages for other weeks, the third week's was the highest.

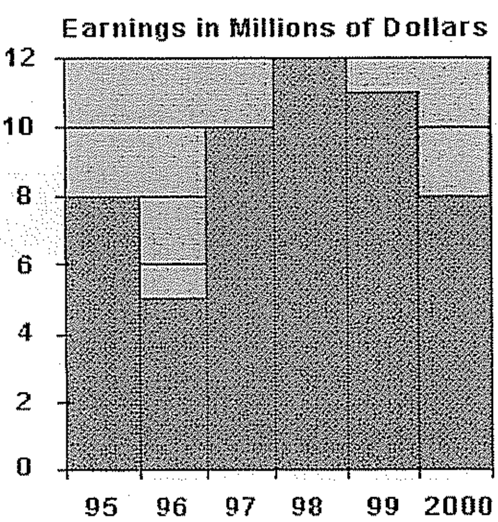
5. If there are fifty more games to play in the season, how many more games must the team win to end up winning 70% of the games?

(A) 39
(B) 35
(C) 41
(D) 34
(E) 32

Choice C is correct. To win 70% of all the games, the team must win 70 out of 100. Since it won 29 games out of the first 50 games, it must win (70 - 29) or 41 games out of the next 50 games.

Example Set #29: Interpreting Graphs





Answer the following questions based on the graph above.

1. During what two-year period did the company's earnings increase the most?

(A) 95-97
(B) 96-97
(C) 96-98

(D) 97-99
(E) 98-00
Reading from the graph, the company's earnings increased from $5 million in 1996 to $10 million in 1997, and then to $12 million in 1998. The two-year increase from '96 to '98 was $7 million--clearly the largest on the graph. The answer is (C).

2. During the years 1996 through 1998, what were the average earnings per year?
(A) 6 million
(B) 7.5 million
(C) 9 million
(D) 10 million
(E) 27 million

The graph yields the following information:
Year Earnings
1996 $5 million
1997 $10 million
1998 $12 million
To figure out the average, add (5 + 10 + 12)/3 = 9. The answer is (C).

3. In which year did earnings increase by the greatest percentage over the previous year?
(A) 96
(B) 97
(C) 98
(D) 99
(E) 2000

To find the percentage increase (or decrease), divide the numerical change by the original amount.

Year	Earnings	% increase from year before
1995	8	n/a
1996	5	decrease
1997	10	100%
1998	12	20%
1999	11	decrease
2000	8	decrease

The largest number in the right-hand column, 100%, corresponds to the year 1997. The answer is (B).

4. If the company's earnings are less than 10 percent of sales during a year, then the Chief Operating Officer will get a 50% pay cut. How many times between 1995 and 2000 did the Chief Operating Officer take a pay cut?

A) None
(B) One
(C) Two
(D) Three
(E) Four

Calculating 10 percent of the sales for each year yields Year, 10% of Sales (millions), Earnings (millions).

Year	10% of sales	Earnings	is 10% of sales greater than earnings?
1995	.10 x 80 = **8**	**8**	no cut
1996	.10 x 70 = **7**	**5**	cut
1997	.10 x 50 = **5**	**10**	no cut
1998	.10 x 80 = **8**	**12**	no cut
1999	.10 x 90 = **9**	**11**	no cut
2000	.10 x 100 = **10**	**8**	cut

Comparing the right columns shows that earnings were less than 10 percent of sales in 1996 and 2000. The answer is (C).

http://www.statcan.ca/english/edu/power/ch9/using/using.htm

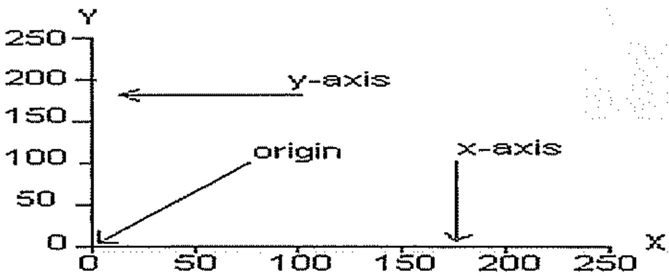
What is a Graph?

A graph is a visual representation of a relationship between, but not restricted to, two variables. A graph generally takes the form of a one- or two-dimensional figure such as a scatter plot. Although, there are three-dimensional graphs available, they are usually considered too complex to understand easily.

A graph commonly consists of two axes called the x-axis (horizontal) and y-axis (vertical). Each axis corresponds to one variable. The axes are labeled with different names, such as *Price* and *Quantity*.

The place where the two axes intersect is called the origin. The origin is also identified as the point (0,0).

Figure 1. Parts of a graph



A point on a graph represents a relationship. Each point is defined by a pair of numbers containing two co-ordinates (x and y). A co-ordinate is one of a set of numbers used to identify the location of a point on a graph.

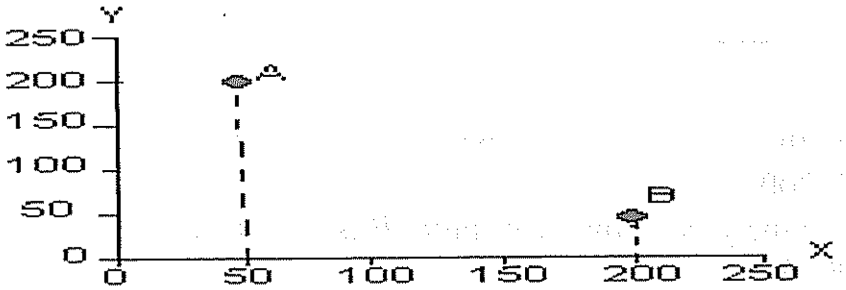
In the following section, you will learn how to determine both co-ordinates for any given point, and to correctly label the co-ordinates of a point.

Identifying the x-co-ordinate

The x-co-ordinate of a point is the value that tells you how far the point is from the origin on the (horizontal) x-axis. In order to find the x-co-ordinate of a point on any graph, draw a straight line from the point to intersect at a right angle with the x-axis. The number where the line intersects with the x-axis is the value of the x-co-ordinate.

'igure 2 is a graph with two points, A and B. Identify the x-co-ordinate of points A and B.

Figure 2. X-co-ordinate



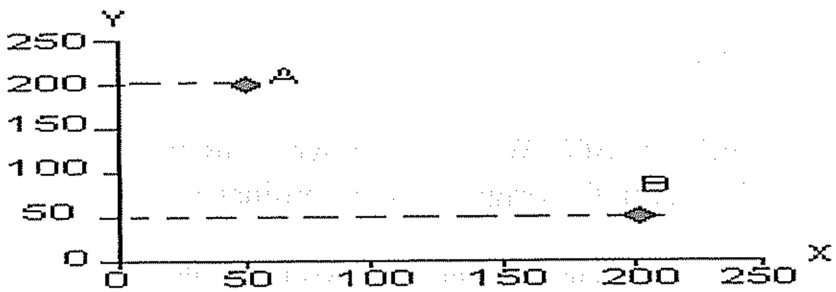
Answer: The x-co-ordinate of point A is 50, and the x-co-ordinate of point B is 200.

Identifying the y-co-ordinate

The y-co-ordinate of a point is the value that tells you how far away the point is from the origin on the vertical or y-axis. To find the y-co-ordinate of a point on a graph, draw a straight line from the point to intersect at a right angle with the y-axis. The number where the line intersects the y-axis is the value of the y-co-ordinate.

Identify the y-co-ordinate for point A and point B on Figure 3.

Figure 3. Y-co-ordinate

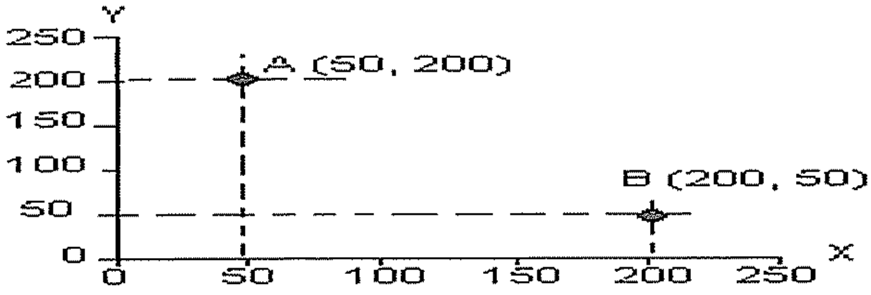


Answer: The y-co-ordinate of point A is 200, and the y-co-ordinate of point B is 50.

Identifying points on a graph

Once you have determined the co-ordinates of a point, you can label the points using ordered pair notation. This notation is simple—points are identified by stating their co-ordinates in the form of (x, y). Note that you must plot the x-co-ordinate first as in Figure 2. The x- and y-co-ordinates for each of points A and B are identified in Figure 4 below.

Figure 4. Plotting co-ordinates using ordered pair notation

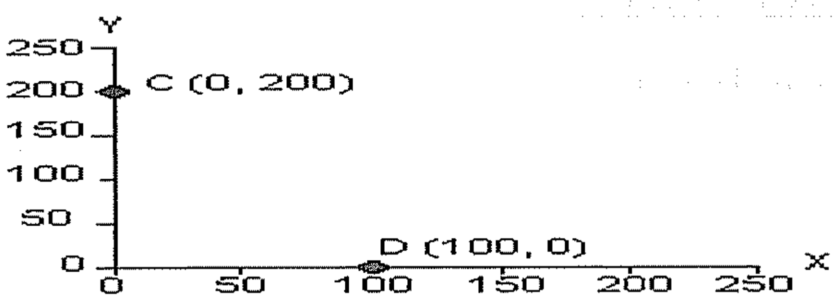


- The x-co-ordinate of point A is 50 and the y-co-ordinate of point A is 200. The co-ordinates of point A are therefore (50, 200).
- The x-co-ordinate of point B is 200 and the y-co-ordinate of point B is 50. The co-ordinates of point B are therefore (200, 50).

Points on the axes

If a point falls on an axis, you do not need to draw lines to determine the co-ordinates of the point. In Figure 5 below, point C lies on the y-axis and point D lies on the x-axis. When a point lies on an axis, one of its co-ordinates must be 0.

Figure 5. Points on the axes

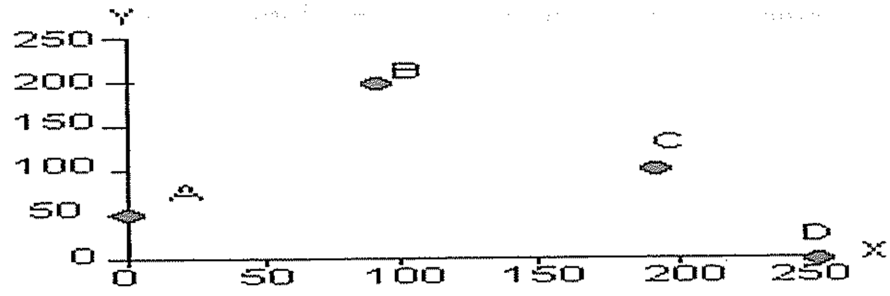


- Point C lies on the y-axis and has an x-co-ordinate of 0. When you move along the y-axis to find the y-co-ordinate, the point is 200 from the origin. The co-ordinates of point C are therefore (0, 200).
- Point D lies on the x-axis and has a y-co-ordinate of 0. If you move along the x-axis to find the co-ordinate, the point is 100 from the origin. The co-ordinates of point D are therefore (100, 0).

Quick quiz!

Answer the following questions using Figure 6 below.

1. Which points intersect with the y-axis?
2. Which point would be labelled with the ordered pair notation of (100, 200)?
3. Which points have a y-co-ordinate of 100?



Answers: 1. Point A   2. Point B   3. Point C

Plotting points on a graph

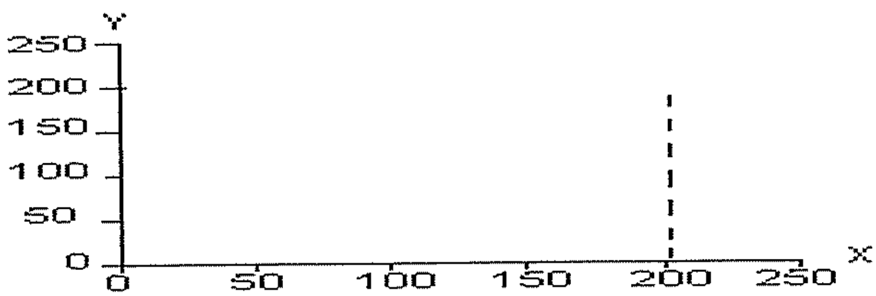
There are times when you will be given a point and will need to find its location on a graph. This process is often referred to as plotting a point. The process for plotting a point is shown below.

Plot the point (200, 150) using the following step-by-step approach.

Step 1

First, draw a perpendicular line extending out from the x-axis at the x-co-ordinate of the point. In the example, the x-co-ordinate is at 200.

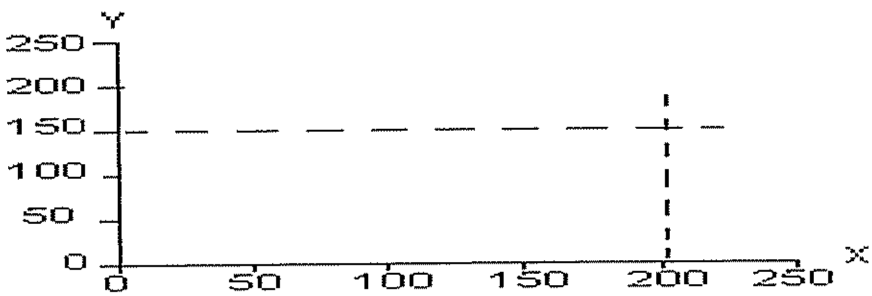
Figure 7.



Step 2

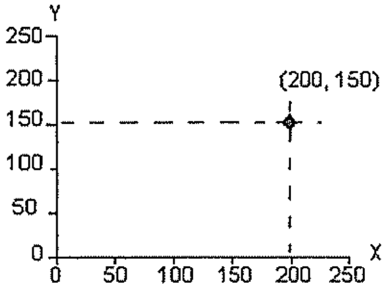
Then, draw a perpendicular line extending out from the y-axis at the y-co-ordinate of the point, the y-co-ordinate is at 150.

Figure 8.



Step 3
Finally, draw a dot where the two lines intersect. This is the point we are plotting (200, 150).

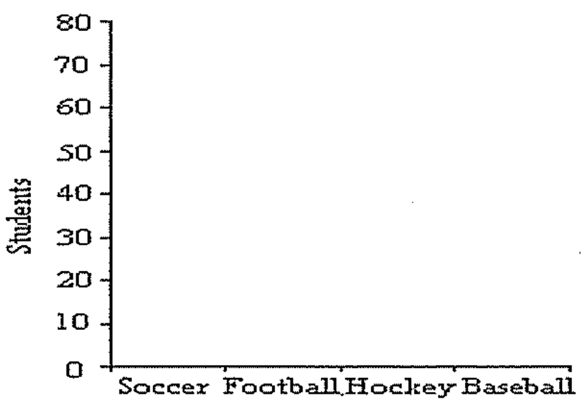
Figure 9.



Deciding on a scale

The scale of a graph is very important. It is determined by the data for each axis, and should be measured accordingly.

Figure 10. Team sport preferences, by Grade 9 students at Elm High



A survey was conducted of the Grade 9 students at Elm High. The students were asked which of the following four team sports they preferred.

The results were:

1. Soccer – 45 students
2. Football – 55 students
3. Hockey – 75 students
4. Baseball – 25 students

In Figure 10, these four preference categories have been placed on the x-axis, each representing the grouped data collected. Because the categories are nominal (names, not numbers) and describe qualitative (not quantitative) distinctions, the groups can be placed in any order on the axis.

On the y-axis, the data values range from 0 to 80 students. As mentioned earlier, your origin should be located at 0 where the x-axis and y-axis meet. Since the largest group of students by sport preference is 75, then it would be appropriate to end the scale at 80, resulting in a scale that ranges from 0 to 80. Depending on how the scale is arranged, the graph will not change, but its visual appearance might be altered.

The interval of the scale is the amount of space along the axis from one mark to the next. If the range of the scale is small, the general rule is to take the range of the scale and divide it by 10. Make this your interval. For ranges that are larger, the interval is typically 5, 10, 100, 500, 1,000, etc. Use numbers that divide evenly into 100, 1,000 or their multiples in order to provide a graph that is easy to understand.

In this case, if you take 80 and divide it by 5, you will get 16. However, it might be better to use 10 because it is easier to analyze. This provides a scale that is smaller, but still easy to use.

Summary

Knowing how to convey information graphically is important in the presentation of statistics. The following is a list of some general rules to keep in mind when preparing graphs.

A good graph

- accurately shows the facts
- grabs the reader's attention
- complements or demonstrates arguments presented in the text
- has a title and labels
- is simple and uncluttered
- shows data without altering the message of the data
- clearly shows any trends or differences in the data
- is visually accurate (i.e., if one chart value is 15 and another 30, then 30 should appear to be twice the size of 15).

Why use graphs when presenting data?
Graphs

- are quick and direct
- highlight the most important facts
- facilitate understanding of the data
- can convince readers
- can be easily remembered

Percents- links

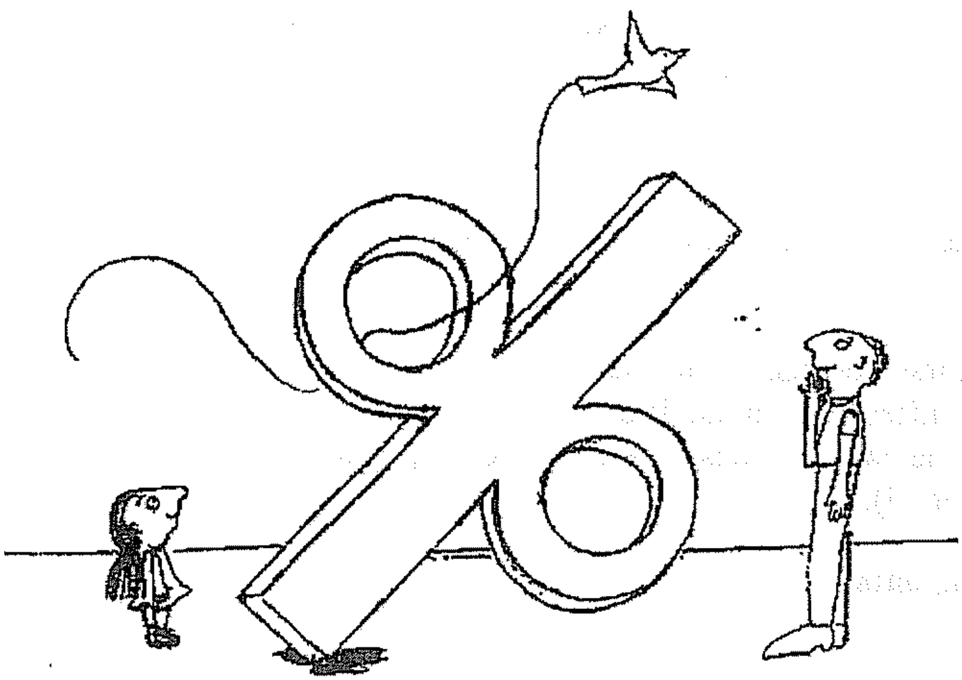
Percent

Chances and probability

What is a Percent?

A percent is a ratio of a number to 100. A percent can be expressed using the percent symbol %.

Example: 10 percent or 10% are both the same, and stand for the ratio 10:100.



Percent as a fraction
A percent is equivalent to a fraction with denominator 100.

Example: 5% of something = 5/100 of that thing.

Example: 2 1/2% is equal to what fraction?
Answer:
2 1/2% = (2 1/2)/100 = 5/200 = 1/40

Example: 52% most nearly equals which one of 1/2, 1/4, 2, 8, or 1/5?
Answer: 52% = 52/100. This is very close to 50/100, or 1/2.

Example: 13/25 is what %?
We want to convert 13/25 to a fraction with 100 in the denominator: 13/25 = (13 × 4)/(25 × 4) = 52/100, so 13/25 = 52%.
Alternatively, we could say: Let 13/25 be n%, and let us find n. Then 13/25 = n/100, so cross multiplying, 13 × 100 = 25 × n, so 25n = 13 × 100 = 1300. Then 25n ÷ 25 = 1300 ÷ 25, so n = 1300 ÷ 25 = 52. So 13/25 = n% = 52%.

Example: 8/200 is what %?
Method 1: 8/200 = (4 × 2)/(100 × 2), so 8/200 = 4/100 = 4%.
Method 2: Let 8/200 be n%. Then 8/200 = n/100, so 200 × n = 800, and 200n ÷ 200 = 800 ÷ 200 = 4, so n% = 4%.

Example: Write 80% as a fraction in lowest terms.
80% = 80/100, which is equal to 4/5 in lowest terms.

Percent as a decimal
Percent and hundredths are basically equivalent. This makes conversion between percent and decimals very easy.

To convert from a decimal to a percent, just move the decimal 2 places to the right. For example, 0.15 = 15 hundredths = 15%.

Example: 0.0006 = 0.06%

Converting from percent to decimal form is similar, only you move the decimal point 2 places to the left. You must also be sure, before doing this, that the percentage itself is expressed in decimal form, without fractions.

Example: Express 3% in decimal form. Moving the decimal 2 to the left (and adding in 0's to the left of the 3 as place holders,) we get 0.03.

Example: Express 97 1/4% in decimal form. First we write 97 1/4 in decimal form: 97.25. Then we move the decimal 2 places to the left to get 0.9725, so 97 1/4% = 0.9725. This makes sense, since 97 1/4% is nearly 100%, and 0.9725 is nearly 1.

Estimating percents

When estimating percents, it is helpful to remember the fractional equivalent of some simple percents.

100% = 1
(100% of any number equals that number.)

50% = 1/2 = 0.5
(50% of any number equals half of that number.)

25% = 1/4 = 0.25
(25% of any number equals one-fourth of that number.)

10% = 1/10 = 0.1
(10% of any number equals one-tenth of that number.)

1% = 1/100 = 0.01
(1% of any number equals one-hundredth of that number.)

Because it is very easy to switch between a decimal and a percent, estimating a percent is as easy as estimating a fraction as a decimal, and converting to a percent by multiplying by 100.

Example: Estimate 19 as a percent of 80.
As a fraction, 19/80 $\cong$ 20/80 = 1/4 =0.25 = 25%. The step used to estimate the percent occurred when we estimated 19/80 as 20/80.
The exact percent is actually 23.75%, so the estimate of 25% is only 1.25% off. (About 1 part in 100.)

Example: Estimate 7 as a percent of 960.
As a fraction, 7/960 $\cong$ 7/100 = 0.007 = 0.7%. The step used to estimate the percent occurred when we estimated 7/960 as 7/1000.
The exact percent, to the nearest thousandth of a percent, is actually 0.729%.
To estimate the percent of a number, we may convert the percent to a fraction, if useful, to estimate the percent.

Example: Estimate 13% of 72.
Twice 13% is 26%, which is very close to 25%, and 25%=1/4. We may multiply both sides by 1/2 to get an estimate for 13%: 13% $\cong$ 12.5% = 1/2 × 25% = 1/2 × 1/4 = 1/8. Using our estimate of 1/8 for 13%, 1/8 × 72 = 9, so we get an estimate of 9 for 13% of 72.
If we had calculated this exactly, 13% of 72 equals 9.36. It may look like we did a lot more work to get the estimate of 9 that just multiplying 72 by 0.13, but with practice, keeping in mind some simple percents and the fractions they are equal to will enable you to estimate some number combinations very quickly.

Example: Estimate 9.6% of 51.
Method 1: We could estimate 9.6% of 50. It would be easy to estimate 9.6% of 100, which is just 9.6. Since 50 is half of 100, we can just take half of 9.6, which is 4.8. The actual value of 9.6% of 51 is 4.896, so an estimate of 4.8 is pretty good.

Method 2: We could estimate 10% of 51, which is just 5.1. This is not as close an estimate as method 1, but is still a good estimate of the actual answer of 4.896.

Compound Interest

Compound interest is interest figured on the principal and any interest owed from previous years. The interest charged the first year is just the interest rate times the amount of the loan. The interest charged the second year is the interest rate, times the sum of the loan and the interest from the first year. The interest charged the third year is the interest rate, times the sum of the loan and the first two years' interest amounts. Continue figuring the interest in this way for any additional years of the loan.

Example: A bank charges 8% compound interest on a $600 loan, which is to be paid back in two years. It will cost the borrower 8% of $600 the first year, which is $48. The second year, it will cost 8% of $600 + $48 = $648, which is $51.84. The total amount of interest owed after the two years is $48 + $51.84 = $99.84. Note that this is more than the $96 that would be owed if the bank was charging simple interest.

Example: A bank charges 4% compound interest on a $1000 loan, which is to be paid back in three years. It will cost the borrower 4% of $1000 the first year, which is $40. The second year, it will cost 4% of $1000 + $40 = $1040, which is $41.60. The third year, it will cost 4% of $1040 + $41.60 = $1081.60, which is $43.26 (with rounding). The total amount of interest owed after the three years is $40 + $41.60 + 43.26 = $124.86.

Percent increase and decrease

Percent increase and decrease of a value measure how that value changes, as a percentage of its original value.

Example: A collectors' comic book is worth $120 in 1994, and in 1995 its value is $132. The change is $132 - $120 = $12, an increase in price of $12; since $12 is 10% of $120, we say its value increased by 10% from 1994 to 1995.

Example: A bakery makes a chocolate cake that has 8 grams of fat per slice. A new change in the recipe lowers the fat to 6 grams of fat per slice. The change is 8g - 6g = 2g, a decrease of 2 grams; since 2 grams is 25% of 8, we say that the new cake recipe has 25% less fat, or a 25% decrease in fat.

Example: Amy is training for the 1500 meter run. When she started training she could run 1500 meters in 5 minutes and 50 seconds. After a year of practice her time decreased by 8%. How fast can she run the race now? Her old time was 5 × 60 + 50 = 350 seconds, and 8% of 350 is 28, so she can run the race in 350 - 28 = 322 seconds (5 minutes and 22 seconds).

Example: A fishing magazine sells 110000 copies each month. The company's president wants to increase the sales by 6%. How many extra magazines would they have to sell to reach this goal? This problem is easy, since it only asks for the change in sales: 6% of 110000 equals 6600 more magazines.

Percent Discount

A discount is a decrease in price, so percent discount is the percent decrease in price.

Example: Chocolate bars normally cost 80 cents each, but are on sale for 40 cents each, which is 50% of 80, so the chocolate is on sale at a 50% discount.

Example: A compact disc that sells for $12 is on sale at a 20% discount. How much does the disc cost on sale? The amount of the discount is 20% of $12, which is $2.40, so the sale price is $12.00 - $2.40 = $9.60.

Example: Movie tickets sell for $8.00 each, but if you buy 4 or more you get $1.00 off each ticket. What percent discount is this? We figure $1 as a percentage of $8: $1.00/$8.00 × 100% = 12.5%, so this is a 12.5% discount.

Probability of an Outcome

The probability of an outcome for a particular event is a number telling us how likely a particular outcome is to occur. This number is the ratio of the number of ways the outcome may occur to the number of total possible outcomes for the event. Probability is usually expressed as a fraction or decimal. Since the number of ways a certain outcome may occur is always smaller or equal to the total number of outcomes, the probability of an event is some number from 0 through 1.

Example: Suppose there are 10 balls in a bucket numbered as follows: 1, 1, 2, 3, 4, 4, 4, 5, 6, and 6. A single ball is randomly chosen from the bucket. What is the probability of drawing a ball numbered 1? There are 2 ways to draw a 1, since there are two balls numbered 1. The total possible number of outcomes is 10, since there are 10 balls. **The probability of drawing a 1 is the ratio 2/10 = 1/5.**

Example: Suppose there are 10 balls in a bucket numbered as follows: 1, 1, 2, 3, 4, 4, 4, 5, 6, and 6. A single ball is randomly chosen from the bucket. What is the probability of drawing a ball with a number greater than 4? There are 3 ways this may happen, since 3 of the balls are numbered greater than 4. The total possible number of outcomes is 10, since there are 10 balls. **The probability of drawing a number greater than 4 is the ratio 3/10. Since this ratio is larger than the one in the previous example, we say that this event has a greater chance of occurring than drawing a 1.**

Example: Suppose there are 10 balls in a bucket numbered as follows: 1, 1, 2, 3, 4, 4, 4, 5, 6, and 6. A single ball is randomly chosen from the bucket. What is the probability of drawing a ball with a number greater than 6? Since none of the balls are numbered greater than 6, this can occur in 0 ways. The total possible number of outcomes is 10, since there are 10 balls. **The probability of drawing a number greater than 6 is the ratio 0/10 = 0.**

Example: Suppose there are 10 balls in a bucket numbered as follows: 1, 1, 2, 3, 4, 4, 4, 5, 6, and 6. A single ball is randomly chosen from the bucket. What is the probability of drawing a ball with a number less than 7? Since all of the balls are numbered greater than 7, this can occur in 10 ways. The total possible number of outcomes is 10, since there are 10 balls. **The probability of drawing a number less than 7 is the ratio 10/10 = 1.**
Note in the last two examples that a probability of 0 meant that the event would not occur, and a probability of 1 meant the event definitely would occur.

Example: Suppose a card is drawn at random from a regular deck of 52 cards. What is the probability that the card is an ace? There are 4 different ways that the card can be an ace, since 4 of the 52 cards are aces. There are 52 different total outcomes, one for each card in the deck. **The probability of drawing an ace is the ratio 4/52 = 1/13.**

Example:
Suppose a regular die is rolled. What is the probability of getting a 3 or a 6? There are a total of 6 possible outcomes. **Rolling a 3 or a 6 are two of them, so the probability is the ratio of 2/6 = 1/3.**

Estimation

http://www.aaamath.com/est.html

These pages teach estimation and rounding skills covered in K8 math courses. Each page has an explanation, interactive practice and challenge games about estimation.

Rounding Numbers:

- Rounding
- Nearest Ten
- Nearest Hundred
- Nearest Thousand
- Nearest Ten Thousand
- Nearest Hundred Thousand

Rounding Decimals To:

- Nearest Hundredth
- Nearest Tenth

Estimating

- Front End Estimation - Sums
- Front End Estimation - Differences
- Estimating Sums I
- Estimating Sums II
- Estimating Differences I
- Estimating Differences II
- Subtraction Using Estimation

Rounding Numbers

- **Rounding makes numbers that are easier to work with in your head.**
- **Rounded numbers are only approximate.**
- **An exact answer generally can not be obtained using rounded numbers.**
- **Use rounding to get a answer that is close but that does not have to be exact.**

How to round numbers

- **Make the numbers that end in 1 through 4 into the next lower number that ends in 0. For example 74 rounded to the nearest ten would be 70.**
- **Numbers that end in a digit of 5 or more should be rounded up to the next even ten. The number 88 rounded to the nearest ten would be 90.**

Rounding Numbers to the Nearest Ten

Rounded numbers are easier to work with in your head. These numbers are only approximate or close to the original number. You can not get an exact answer with rounded numbers but sometimes this is OK.

To round numbers to the nearest ten make the numbers that end in 1 through 4 into the next lower number that ends in 0. The number 74 rounded to the nearest ten would be 70. Numbers that end in a digit of 5 or more are rounded up to the next even ten. The number 88 rounded to the nearest ten would be 90.

Rounding to the Nearest Hundred

Rounded numbers are easier to work with in your head. Rounded numbers are only approximate. You can not get an exact answer with rounded numbers. Sometimes an exact answer is non needed.

To round numbers to the nearest hundred, make the numbers that end in 1 through 49 into the next lower number that ends in 00. For example 424 rounded to the nearest hundred would be 400. Numbers that have the last two digits of 50 or more should be rounded up to the next even hundred. The number 988 rounded to the nearest hundred would be 1000.

Rounding to the Nearest Thousand

Rounded numbers are easier to work with in your head. They are only approximate. An exact answer can not be obtained with these numbers. Sometimes an exact answer is not required.

To round numbers to the nearest thousand, make the numbers whose last three digits are 001 through 499 into the next lower number that ends in 000. For example, 6424 rounded to the nearest thousand is 6000. Numbers that have the last three digits of 500 or more should be rounded up to the next even thousand. The number 8788 rounded to the nearest thousand is 9000.

Rounding to the Nearest Ten Thousand

Rounded numbers are easier to work with in your head. They are only approximate. An exact answer can not be obtained with these numbers. Sometimes an exact answer is not required.

To round numbers to the nearest ten thousand, make the numbers whose last four digits are 0001 through 4999 into the next lower number that ends in 0000. For example 54,424 rounded to the nearest ten thousand would be 50,000. Numbers that have the last four digits of 5000 or more should be rounded up to the next even ten thousand. The number 78,988 rounded to the nearest ten thousand would be 80,000.

Rounding to the Nearest Hundred Thousand

Rounded numbers are easier to work with in your head. They are only approximate. An exact answer can not be obtained with these numbers. Sometimes an exact answer is not required.

To round numbers to the nearest hundred thousand, make the numbers whose last five digits are 00001 through 49999 into the next lower number that ends in 00000. For example 6,424,985 rounded to the nearest hundred thousand would be 6,400,000. Numbers that have the last five digits of 50000 or more should be rounded up to the next even hundred thousand. The number 8,988,987 rounded to the nearest hundred thousand would be 9,000,000.

Rounding Decimals to the Nearest Hundredth

Rounding decimals is very similar to rounding other numbers. If the thousandths place of a decimal is four or less, it is dropped and the hundredths place does not change. For example, rounding 0.843 to the nearest hundredth would give 0.84.

If the thousandths place is five through nine, the hundredths place is increased by one. The decimal 0.846 rounded to the nearest hundredth is 0.85.

Rounding Decimals to the Nearest Tenth

Rounding decimals is very similar to rounding other numbers. If the hundredths and thousandths places of a decimal is forty-nine or less, they are dropped and the tenths place does not change. For example, rounding 0.843 to the nearest tenth would give 0.8.

If the hundredths and thousandths places are fifty or more, the tenths place is increased by one. The decimal 0.866 rounded to the nearest tenth is 0.9

Estimating by front end estimation

Front end estimation mostly produces a closer estimate of sums or differences than the answer produced by adding or subtracting rounded numbers.

How to estimate a sum by front end estimation:

- Add the digits of the two highest place values
- Insert zeros for the other place values

- Example 1: 4496 + 3745 is estimated to be 8100 by front end estimation (i.e. 4400 + 3700).
- Example 2: 4496 + 745 is estimated to be 5100 by front end estimation (i.e. 4400 + 700).

Estimating by front end estimation

Front end estimation generally produces a better estimate of sums or differences than rounding before adding or subtracting.

How to Estimate a difference by front end estimation

- Subtract the digits of the two highest place values
- Insert zeros for the other place values
-
- Example: 7396 minus 3745 is estimated to be 3600 by front end estimation (i.e. 7300-3700).

Estimating a sum by rounding

A quick way to estimate the sum of two numbers is to round each number and then add the rounded numbers. This probably won't be the exact answer but it may be close enough for some purposes.

How to Estimate a sum by rounding.

- Round each term that will be added
- Add the rounded numbers

Some uses of rounding

- Checking to see if you have enough money to buy what you want.
- Getting a rough idea of the correct answer to a problem

Improving an Estimate of a sum by rounding

A quick way to estimate the sum of two numbers is to round each number and then add the rounded numbers. This probably won't be the exact answer but it may be close enough for some purposes.

How to Estimate a sum by Rounding.

- Round each term that will be added
- Add the rounded numbers

An estimate can sometimes be improved. If the sum of 345 + 440 were estimated, we would round 345 to 300 and 440 to 400. The estimate would be 300 + 400 or 700. Both numbers were rounded down. The number 345 was rounded down by 45 and 440 was rounded down by 40. Adding 45 + 40 gives 85, which rounds to 100. Therefore, a better estimate would be 800. The actual sum is 785.

How to Improve the Estimate.

- Round each term that will be added
- Add the rounded numbers
- If both are rounded down or both rounded up see if the amount of rounding is more than 50. If it is, add or subtract 100 to the estimate.
- If one number is rounded down and the other is rounded up a closer estimate will not be produced by this method.

Some uses of rounding are:

- Checking to see if you have enough money to buy what you want.
- Getting a rough idea of the correct answer to a problem

Estimating a difference by rounding

A quick way to estimate the difference between two numbers is to round each number and then subtract the rounded numbers. This probably won't be the exact answer but it may be close enough for some purposes.

- Round each term that will be subtracted
- Subtract the rounded numbers

An estimate can sometimes be improved. If the sum of 645 - 450 were estimated, we would round 645 to 600 and 450 to 500. The estimate would be 600 - 500 or 100. One number was rounded down and the other was rounded up. The number 645 was rounded down by 45 and 450 was rounded up by 50. Adding 45 + 50 gives 95, which rounds to 100. Therefore, a better estimate would be 200. The actual difference is 195.

How to Improve the Estimate.

- Round each term that will be subtracted
- Subtract the rounded numbers
- If one is rounded down and the other up see if the amount of rounding is more than 50. If it is add 100 to or subtract 100 from the estimate.
- If both numbers are rounded down or both are rounded up a closer estimate will not be produced by this method.

Statistics

http://www.aaamath.com/B/sta.htm

- Statistical Mean or Average - 1 digit numbers
- Statistical Median - 1 digit numbers
- Statistical Range - 1 digit numbers
- Statistical Mode
- Statistical Mean or Average - 2 digit numbers
- Statistical Median - 2 digit numbers
- Statistical Range - 2 digit numbers
- Statistical Mean or Average - 3 digit numbers
- Statistical Median - 3 digit numbers
- Statistical Range - 3 digit numbers

Statistical Mean

The statistical mean is commonly called the average:

To find the mean of a group of numbers:

- **Add the numbers together**
- **Divide by how many numbers were added together**

Statistical Median

The statistical median is middle number of a group of numbers that have been arranged in order by size. If there is an even number of terms, the median is the mean of the two middle numbers:

To find the median of a group of numbers:

- **Arrange the numbers in order by size**
- **If there is an odd number of terms, the median is the center term.**
- **If there is an even number of terms, add the two middle terms and divide by 2.**

Statistical Range

The statistical range is the difference between the lowest and highest valued numbers in a set of numbers.

To find the range of a group of numbers:

- **Arrange the numbers in order by size**
- **Subtract the smallest number from the largest number.**

Statistical Mode

The statistical mode is the number that occurs most frequently in a set of numbers.

Exponents.

- Evaluate Squares
- Evaluate Squares II
- Evaluate Cubes
- Evaluate Exponents
- Evaluate Integers with Exponents
- Powers by Multiplication

Calculations involving exponents.

- Area of a Square
- Area of a Circle
- Surface Area of a Cube
- Surface Area of a Cylinder
- Volume of a Cube
- Volume of a Cone
- Volume of a Cylinder
- Volume of a Sphere

To find the mode of a group of numbers:

- **Arrange the numbers in order by size.**
- **Determine the number of instances of each numerical value.**
- **The numerical value that has the most instances is the mode.**
- **There may be more than one mode when two or more numbers have an equal number of instances and this is also the maximum instances**
- **A mode does not exist if no number has more than one instance.**

Example: The mode of 2, 4, 5, 5, 5, 7, 8, 8, 9, 12 is 5.

Exponents

http://www.mathleague.com/help/decwholeexp/decwholeexp.htm#exponents

Exponents (Powers of 2, 3, 4, ...)

Exponential notation is useful in situations where the same number is multiplied repeatedly.

The number being multiplied is called the base, and the exponent tells how many times the base is multiplied by itself.
Example:
$4 \times 4 \times 4 \times 4 \times 4 \times 4 = 4^6$

The base in this example is 4, the exponent is 6.

We refer to this as four to the sixth power, or four to the power of six.

Examples:
$2 \times 2 \times 2 = 2^3 = 8$
$1.1^2 = 1.1 \times 1.1 = 1.21$

$0.5^3 = 0.5 \times 0.5 \times 0.5 = 0.125$

$10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1000000$

Observe that the base may be a decimal.

Special Cases:
A number with an exponent of two is referred to as the *square of a number.*

The square of a whole number is known as a *perfect square.* The numbers 1, 4, 9, 16, and 25 are all perfect squares.

A number with an exponent of three is referred to as the *cube of a number.*

The cube of a whole number is known as a *perfect cube.* The numbers 1, 8, 27, 64, and 125 are all perfect cubes.

Note:
A number written with an exponent of 1 is the same as the given number.
$23^1 = 23$.

Pre-Algebra and Algebra Word Problems

http://www.mathgoodies.com/lessons/vol7/challenge_vol7.html

1. An agent charges $150 per gig to book a rock band, plus $75 per month for travel expenses. What was his monthly fee if he booked 6 gigs for the band last month?

ANSWER BOX: $ ____ CLEAR

RESULTS BOX: ____________

2. A gardener charges $8 per square foot to lay sod. If a garden is 7 feet long by 7 feet wide, how much will he charge to lay sod?

ANSWER BOX: $ ____ CLEAR

RESULTS BOX: ____________

3. Six people in a club will share the expenses of a party that costs $240. How much will Katie pay if the club owes her $8?

ANSWER BOX: $ ____ CLEAR

RESULTS BOX: ____________

4. Evaluate the following expression:

$$\frac{{}^{-}30 + [18 \div (5-14) + 4^2]}{25 - 3^2 + {}^{-}8}$$

ANSWER BOX: ____ CLEAR

RESULTS BOX: ____________

5. **Jesse spends $5 a day on lunch. Which algebraic expression correctly represents the amount of money he will spend on lunch in x days?**

- x - 5
- 5x
- 5 + x
- None of the above

RESULTS BOX:

6. **Which algebraic expression correctly represents this phrase?**
The quotient of twelve and seven times a number, decreased by five

- $\frac{12}{7n} - 5$
- $5 - \frac{12}{7n}$
- $5 - \frac{7}{12n}$
- None of the above

RESULTS BOX:

7. **Which algebraic equation correctly represents this sentence?**
A number increased by eight is nineteen.

- 19 - y = 8
- 19 + y = 8
- y + 8 = 19
- None of the above

8. **Which algebraic equation correctly represents this sentence?**

Twenty-five is three times a number, decreased by eight.

- ( ) 25 = 3w - 8
- ( ) 3 = 25w - 8
- ( ) 3 = 25w + 8
- ( ) None of the above

RESULTS BOX:

9. **Which sentence correctly represents this algebraic equation?**
15 = 16y - 3

- ( ) Fifteen is sixteen times the difference of three and a number.
- ( ) Fifteen is sixteen times the difference of a number and three.
- ( ) Fifteen times three is sixteen times a number.
- ( ) None of the above

RESULTS BOX:

10. **Which sentence correctly represents this algebraic equation?**
$\frac{3y}{5} = 30$

- ( ) The quotient of five and three times a number is thirty.
- ( ) The quotient of three times a number and five is thirty.
- ( ) Thirty is the product of three times a number and five.
- ( ) None of the above

RESULTS BOX:

Order of Operations

Rule 1: First perform any calculations inside parentheses.

Rule 2: Next perform all multiplications and divisions, working from left to right.

Rule 3: Lastly, perform all additions and subtractions, working from left to right.

http://www.mathgoodies.com/lessons/vol7/order_operations.html

When performing arithmetic operations there can be only one correct answer. We need a set of rules in order to avoid this kind of confusion. Mathematicians have devised a standard order of operations for calculations involving more than one arithmetic operation.

Example 1: Evaluate each arithmetic expression using the rules for order of operations.

a) 6 + 7 x 8
c) (25 - 11) x 3
b) 16 ÷ 8 - 2
d) 6 x (5 + 4) ÷ 3 - 7

a)	6 + **7 x 8**	= 6 + 56	= 62	Multiplication (Rule 2), then addition (Rule 3).
b)	**16 ÷ 8** - 2	= 2 - 2	= 0	Division (Rule 2), then subtraction (Rule 3).
c)	**(25 - 11)** x 3	= 14 x 3	= 42	Parentheses (Rule 1), then multiplication (Rule 2).
d)	6 x **(5 + 4)** ÷ 3 - 7	= 6 x 9 ÷ 3 - 7		Parentheses (Rule 1).
	6 x 9 ÷ 3 - 7	= 54 ÷ 3 - 7		Perform multiplication before division since multiplication is to the left of division in the problem (Rule 2).
	54 ÷ 3 - 7	= 18 - 7		
	18 - 7	= 11		Subtraction (Rule 3).

In Example 1(d), you will notice that multiplication and division were performed from left to right. According to Rule 2, since multiplication occurred first in the problem, it was performed first. Let's look at another example.

Example 2: **Evaluate each arithmetic expression using the rules for order of operations.**

a) 150 ÷ (6 + 3 x 8) - 5

b) 8 x 7 + 28 ÷ (12 + 16) - 3

c) 9 - 5 ÷ (8 - 3) x 2 + 6

a)	150 ÷ (6 + **3 x 8**) - 5	= 150 ÷ (6 + 24) - 5	Evaluate operations within parenthesis first (Rule 1). Perform multiplication first (Rule 2), then addition (Rule 3).
	150 ÷ **(6 + 24)** - 5	= 150 ÷ 30 - 5	
	150 ÷ 30 - 5	= 5 - 5	Perform division (Rule 2).
	5 - 5	= 0	Perform subtraction (Rule 3).
b)	8 x 7 + 28 ÷ **(12 + 16)** - 3	= 8 x 7 + 28 ÷ 28 - 3	Parentheses (Rule 1).
	8 x 7 + 28 ÷ 28 - 3	= 56 + 28 ÷ 28 - 3	Perform multiplication before division since multiplication is to the left of division in the problem (Rule 2).
	56 + **28 ÷ 28** - 3	= 56 + 1 - 3	
	56 + 1 - 3	= 57 - 3	Perform addition before subtraction since addition is to the left of subtraction in the problem (Rule 3).
	57 - 3	= 54	
c)	9 - 5 ÷ **(8 - 3)** x 2 + 6	= 9 - 5 ÷ 5 x 2 + 6	Parentheses (rule 1).
	9 - **5 ÷ 5** x 2 + 6	= 9 - 1 x 2 + 6	Perform division before multiplication since division is to the left of multiplication in the problem (Rule 2).
	9 - **1 x 2** + 6	= 9 - 2 + 6	
	9 - 2 + 6	= 7 + 6	Perform subtraction before addition since subtraction is to the left of addition in the problem (Rule 3).
	7 + 6	= 13	

In Example 2, multiplication and division are performed in the order in which they occur in the problem (Rule 2). The same thing holds for addition and subtraction (Rule 3).

Example 3: Evaluate the arithmetic expression below:

$$\frac{36-6}{12+3}$$

Solution: When a problem includes a <u>fraction bar</u> (also called a vinculum), perform all calculations above and below the fraction bar BEFORE the division.

So $\frac{36-6}{12+3}$ is really $\frac{(36-6)}{(12+3)}$

$$\frac{(36-6)}{(12+3)} = \frac{30}{15} = 2$$

Example 4: Write an arithmetic expression for this problem. Then evaluate the expression using the order of operations.

Mr. Smith charged Jill $32 for parts and $15 per hour for labor to repair her bicycle. If he spent 3 hours repairing her bike, how much does Jill owe him?

32 + 3 x 15 = 32 + **3 x 15** = 32 + 45 = 77

Solution: Jill owes Mr. Smith $77.

Summary: When evaluating arithmetic expressions, the order of operations is:

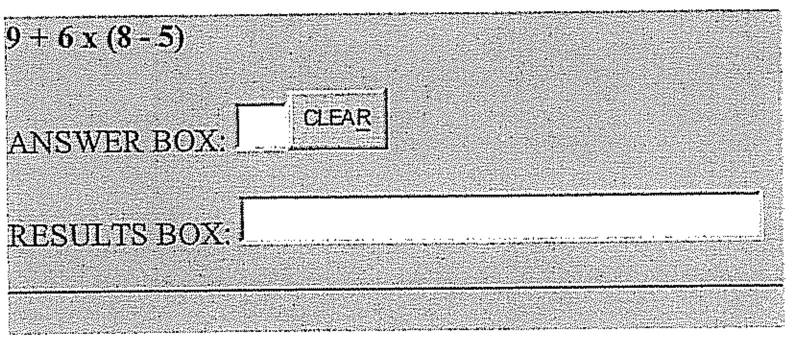
1: Simplify all operations inside parentheses.

2: Perform all multiplications and divisions, working from left to right.

3: Perform all additions and subtractions, working from left to right.

Exercises

Directions: Complete each exercise by applying the rules for order of operations. Click once in an ANSWER BOX and type in your answer; then click ENTER. After you click ENTER, a message will appear in the RESULTS BOX to indicate whether your answer is correct or incorrect. To start over, click CLEAR.
http://www.mathgoodies.com/lessons/vol7/order_operations.html



Simplifying Expressions

When faced with an expression like $4x + 5(3x - 12)$, what do we do first? Let's see: PEMDAS says work in parentheses first, but $3x$ and 12 are unlike. Hmm, let's try the **distributive law**:

$4x + 5(3x - 12)$
$= 4x + 5(3x) - 5(12)$
$= 4x + 15x - 60$
$= 19x - 60$. This problem was no problem!

What about $(4x + 5)(3x - 12)$? Is this the same as $4x + 5(3x - 12)$?

No, the parentheses change it. Here we can use the distributive law twice:

$(\mathbf{4x + 5})(3x - 12)$

$= (\mathbf{4x + 5})(3x) - (\mathbf{4x + 5})(12)$

$= 12x^2 + 15x - 48x - 60$ (remember to change the sign on that last term)

$= 12x^2 - 33x - 60$. That worked, but it was long.

Is this the only way? No. The best way? No. Use the "FOIL system":

First, Outside, Inside, Last.

$(\mathbf{4x + 5})(3x - 12)$
. . . . F . . . . . . O . . . . . . I . . . . . . L . . . .
$= (4x)(3x) - (4x)(12) + (5)(3x) - (5)(12)$
$= 12x^2 - 48x + 15x - 60 = 12x^2 - 33x - 60$. Better!

Here's another example: . . .
$(n + 3)(n - 3) = n^2 - 3n + 3n - 9 = n^2 - 9$.
Notice the "middle terms" cancel, and we're left with what's called the **difference of two squares.**
In general, $(a + b)(a - b) = a^2 - b^2$. Also see the factoring section.

Equations

http://www.aaamath.com/B/equ.htm

Evaluating Expressions

Evaluating Expressions with one Variable

Evaluating Expressions with two Variables

Equations

Equations 1

Equations 2

Equations 3

Equations 4

Equations 5

Inequalities

Inequalities

Addition Equations

1 digit numbers

2 digit numbers

3 digit numbers

4 digit numbers

5 digit numbers

6 digit numbers

Subtraction Equations

1 digit numbers

2 digit numbers

3 digit numbers

4 digit numbers

5 digit numbers

6 digit numbers

Integer Addition Equations

1 digit numbers

2 digit numbers

3 digit numbers

4 digit numbers

Integer Subtraction Equations

1 digit numbers

2 digit numbers

3 digit numbers

4 digit numbers

Evaluating Expressions with one Variable

A mathematical expression can have a variable as part of the expression. If x=3, the expression 7x + 4 becomes 7 * 3 + 4 which is equal to 21 + 4 or 25. To evaluate an expression with a variable, simply substitute the value of the variable into the expression and simplify.

Evaluating Expressions with two Variables

A mathematical expression can have variables as part of the expression. If x=3, and y=5, the expression 7x + y - 4 becomes 7 * 3 +5 - 4 which is equal to 21 + 5 - 4 or 22. To evaluate an expression with two or more variables, substitute the value of the variables into the expression and simplify.

Equations 1

An equation is a mathematical statement that has two expressions separated by an equal sign. The expression on the left side of the equal sign has the same value as the expression on the right side.

One or both of the expressions may contain variables. Solving an equation means manipulating the expressions and finding the value of the variables.

An example might be:x = 4+8
to solve this equation we would add 4 and 8 and find that x = 12.

Equations 2

An equation is a mathematical statement that has two expressions separated by an equal sign. The expression on the left side of the equal sign has the same value as the expression on the right side.

One or both of the expressions may contain variables. Solving an equation means manipulating the expressions and finding the value of the variables.

An example might be:x - 3 = 5
To keep an equation equal, we must do exactly the same thing to each side of the equation. If we add (or subtract) a quantity from one side, we must add (or subtract) that same quantity from the other side.
to solve this equation we would add 3 to both sides. The equation would become x - 3 + 3 = 5 + 3. This becomes x = 5 + 3 or x = 8.

Equations 3

An equation is a mathematical statement that has two expressions separated by an equal sign. The expression on the left side of the equal sign has the same value as the expression on the right side.

One or both of the expressions may contain variables. Solving an equation means manipulating the expressions and finding the value of the variables.

For example solve the equation: $7x = 21$
To keep both sides of an equation equal, we must do exactly the same thing to each side of the equation. If we multiply (or divide) one side by a quantity, we must multiply (or divide) the other side by that same quantity.
In order to solve this equation we would divide both sides by 7. The equation would become $7x/7 = 21/7$. When simplified, this would become $x = 21/7$ or $x = 3$.
It is possible to substitute the value of x back into the original equation $7*3=21$.

Equations 4

An equation is a mathematical statement that has two expressions separated by an equal sign. The expression on the left side of the equal sign has the same value as the expression on the right side.

One or both of the expressions may contain variables. Solving an equation means manipulating the expressions and finding the value of the variables.

For example solve the equation: $7x = 21$
To keep both sides of an equation equal, we must do exactly the same thing to each side of the equation. If we multiply (or divide) one side by a quantity, we must multiply (or divide) the other side by that same quantity.
In order to solve this equation we would divide both sides by 7. The equation would become $7x/7 = 21/7$. When simplified, this would become $x = 21/7$ or $x = 3$.
It is possible to substitute the value of x back into the original equation $7*3=21$.

Equations 5

An equation is a mathematical statement that has two expressions separated by an equal sign. The expression on the left side of the equal sign has the same value as the expression on the right side.

One or both of the expressions may contain variables. Solving an equation means manipulating the expressions and finding the value of the variables.

For example solve the equation: 8x-2=14
To keep both sides of an equation equal, we must do exactly the same thing to each side of the equation. First, add two to each side of the equation so that 8x-2+2=14+2 or 8x=16. If we multiply (or divide) one side by a quantity, we must multiply (or divide) the other side by that same quantity.
In order to solve this equation we would divide both sides by 8. The equation would become 8x/8 = 16/8. When simplified, this would become x = 16/8 or x = 2.
It is possible to substitute the value of x back into the original equation 8*2-2=14.

Solving an Inequality

An inequality is similar to an equation. There are two expressions separated by a symbol that indicates how one expression is related to the other. In an equation such as 7x = 49, the = sign indicates that the expressions are equivalent. In an inequality, such as 7x > 49, the > sign indicates that the left side is larger than the right side.

To solve the inequality 7x > 49, we follow the same rules that we did for equations. In this case, divide both sides by 7 so that x > 7. This means that x is a value and it is always larger than 7, and never equal to or less than 7.

The "less than" symbol (<) may also be seen in inequalities.

Addition Equations

Addition equations with 1 digit numbers

http://www.aaamath.com/B/equ18cx2.htm

An equation is a mathematical statement that has an expression on the left side of the equals sign (=) with the same value as the expression on the right side. An example of an equation is $2 + 2 = 4$.

One of the terms in an equation may not be known and needs to be determined. The unknown term may be represented by a letter such as x (e.g. $2 + x = 4$). The equation is solved by finding the value of the unknown x that makes the two sides of the equation have the same value.

Use the subtractive equation property to find the value of x in addition equations. The subtractive equation property states that the two sides of an equation remain equal if the same number is subtracted from each side.

Example:
$5 + x = 12$
$5 + x - 5 = 12 - 5$
$0 + x = 7$
$x = 7$
Check the answer by substituting (7) for x in the original equation. The answer is correct if the expressions on each side of the equals sign have the same value.
$5 + 7 = 12$

Addition equations with 2 digit numbers

http://www.aaamath.com/B/equ27fx2.htm

An equation is a mathematical statement that has an expression on the left side of the equals sign (=) with the same value as the expression on the right side. An example of an equation is $22 + 22 = 44$.

One of the terms in an equation may not be known and needs to be determined. The unknown term may be represented by a letter such as x (e.g. $22 + x = 44$). The equation is solved by finding the value of the unknown x that makes the two sides of the equation have the same value.

Use the subtractive equation property to find the value of x in addition equations. The subtractive equation property states that the two sides of an equation remain equal if the same number is subtracted from each side.

Example:
50 + x = 120
50 + x - 50 = 120 - 50
0 + x = 70
x = 70
Check the answer by substituting (70) for x in the original equation. The answer is correct if the expressions on each side of the equals sign have the same value.
50 + 70 = 120

Addition equations with 3 digit numbers

http://www.aaamath.com/B/equ38ix2.htm

An equation is a mathematical statement that has an expression on the left side of the equals sign (=) with the same value as the expression on the right side. An example of an equation is 222 + 222 = 4222.

One of the terms in an equation may not be known and needs to be determined. The unknown term may be represented by a letter such as x (e.g. 222 + x = 444). The equation is solved by finding the value of the unknown x that makes the two sides of the equation have the same value.

Use the subtractive equation property to find the value of x in addition equations. The subtractive equation property states that the two sides of an equation remain equal if the same number is subtracted from each side.

Example:
500 + x = 1200
500 + x - 500 = 1200 - 500
0 + x = 700
x = 700
Check the answer by substituting (700) for x in the original equation. The answer is correct if the expressions on each side of the equals sign have the same value.
500 + 700 = 1200

Addition equations with 4 digit numbers

http://www.aaamath.com/B/equ38jx2.htm

An equation is a mathematical statement that has an expression on the left side of the equals sign (=) with the same value as the expression on the right side. An example of an equation is 2222 + 2222 = 4444.

One of the terms in an equation may not be known and needs to be determined. The unknown term may be represented by a letter such as x (e.g. 2222 + x = 4444).

The equation is solved by finding the value of the unknown x that makes the two sides f the equation have the same value.

Use the subtractive equation property to find the value of x in addition equations. The subtractive equation property states that the two sides of an equation remain equal if the same number is subtracted from each side.

Example:
$5000 + x = 12000$
$5000 + x - 5000 = 12000 - 5000$
$0 + x = 7000$
$x = 7000$
Check the answer by substituting (7000) for x in the original equation. The answer is correct if the expressions on each side of the equals sign have the same value.
$5000 + 7000 = 12000$

Addition equations with 5 digit numbers

http://www.aaamath.com/B/equ516x2.htm

An equation is a mathematical statement that has an expression on the left side of the equals sign (=) with the same value as the expression on the right side. An example of an equation is 22222 + 22222 = 44444.

One of the terms in an equation may not be known and needs to be determined. The unknown term may be represented by a letter such as x (e.g. 22222 + x = 44444). The equation is solved by finding the value of the unknown x that makes the two sides of the equation have the same value.

Use the subtractive equation property to find the value of x in addition equations. The subtractive equation property states that the two sides of an equation remain equal if the same number is subtracted from each side.

Example:
$50000 + x = 120000$
$50000 + x - 50000 = 120000 - 50000$
$0 + x = 70000$
$x = 70000$
Check the answer by substituting (70000) for x in the original equation. The answer is correct if the expressions on each side of the equals sign have the same value.
$50000 + 70000 = 120000$

Addition equations with 6 digit numbers

http://www.aaamath.com/B/equ516x3.htm

An equation is a mathematical statement that has an expression on the left side of the equals sign (=) with the same value as the expression on the right side. An example of an equation is 222222 + 222222 = 444444.

One of the terms in an equation may not be known and needs to be determined. The unknown term may be represented by a letter such as x (e.g. 222222 + x = 444444). The equation is solved by finding the value of the unknown x that makes the two sides of the equation have the same value.

Use the subtractive equation property to find the value of x in addition equations. The subtractive equation property states that the two sides of an equation remain equal if the same number is subtracted from each side.

Example:
500000 + x = 1200000
500000 + x - 500000 = 1200000 - 500000
0 + x = 700000
x = 700000
Check the answer by substituting (700000) for x in the original equation. The answer is correct if the expressions on each side of the equals sign have the same value.
500000 + 700000 = 1200000

Subtraction Equations

Subtraction equations with 1 digit numbers

http://www.aaamath.com/B/equ18dx2.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is 6 - 4 = 2.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. x - 4 = 2).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
x - 5 = 7
x - 5 + 5 = 7 + 5
x - 0 = 12
x = 12
12 - 5 = 7

Check the answer by substituting the value of x (12) back into the equation.

Subtraction equations with 2 digit numbers

http://www.aaamath.com/B/equ28fx2.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is 60 - 40 = 20.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. x - 40 = 20).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
x - 50 = 70
x - 50 + 50 = 70 + 50
x - 0 = 120
x = 120

Check the answer by substituting the value of x (120) back into the equation.
120 - 50 = 70

Subtraction equations with 3 digit numbers

http://www.aaamath.com/B/equ38mx2.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is 600 - 400 = 200.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. x - 400 = 200).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
x - 500 = 700
x - 500 + 500 = 700 + 500
x - 0 = 1200
x = 1200
Check the answer by substituting the value of x (1200) back into the equation.
1200 - 500 = 700

Subtraction equations with 4 digit numbers

http://www.aaamath.com/B/equ38lx2.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is 6000 - 4000 = 2000.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. x - 4000 = 2000).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
x - 5000 = 7000
x - 5000 + 5000 = 7000 + 5000
x - 0 = 12000
x = 12000
Check the answer by substituting the value of x (12000) back into the equation.
12000 - 5000 = 7000

Subtraction equations with 5 digit numbers

http://www.aaamath.com/B/equ516x4.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is 60000 - 40000 = 20000.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. x - 40000 = 20000).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
x - 50000 = 70000
x - 50000 + 50000 = 70000 + 50000
x - 0 = 120000
x = 120000
Check the answer by substituting the value of x (120000) back into the equation.
120000 - 50000 = 70000

Subtraction equations with 6 digit numbers

http://www.aaamath.com/B/equ516x5.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is 600000 - 400000 = 200000.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. x - 400000 = 200000).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
x - 500000 = 700000
x - 500000 + 500000 = 700000 + 500000
x - 0 = 1200000
x = 1200000
Check the answer by substituting the value of x (120000) back into the equation.
1200000 - 500000 = 700000

Addition Equations

Addition equations with 1 digit integers

http://www.aaamath.com/B/equ65_x2.htm

An equation is a mathematical statement that has an expression on the left side of the equals sign (=) with the same value as the expression on the right side. An example of an equation is 2 + (- 6) = - 4. One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. 2 + x = - 4).
The solution of an equation is finding the value of the unknown x. To find the value of x we can use the subtractive equation property which says: "The two sides of an equation remain equal if the same number is subtracted from each side." We may also use the additive equation property which says: "The two sides of an equation remain equal if the same number is added to each side."
Example:
- 5 + x = 4
- 5 + x + 5 = 4 + 5
0 + x = 9
x = 9
Check the answer by substituting the answer (9) back into the equation.
- 5 + 9 = 4

Addition equations with 2 digit integers

http://www.aaamath.com/B/equ65_x3.htm

An equation is a mathematical statement that has an expression on the left side of the equals sign (=) with the same value as the expression on the right side. An example of an equation is 20 + (- 60) = - 40.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. 20 + x = - 40).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the subtractive equation property which says: "The two sides of an equation remain equal if the same number is subtracted from each side." We may also use the additive equation property which says: "The two sides of an equation remain equal if the same number is added to each side."

Example:
- 50 + x = 40
- 50 + x + 50 = 40 + 50
0 + x = 90
x = 90
Check the answer by substituting the answer (90) back into the equation.
- 50 + 90 = 40

Addition equations with 3 digit integers

http://www.aaamath.com/B/equ75_x2.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is 200 + (- 600) = - 400.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. 200 + x = - 400).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the subtractive equation property which says: The two sides of an equation remain equal if the same number is subtracted from each side. We may also use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
- 500 + x = 400
- 500 + x + 500 = 400 + 500
0 + x = 900
x = 900
Check the answer by substituting the answer (900) back into the equation.
- 500 + 900 = 400

Addition equations with 4 digit integers

http://www.aaamath.com/B/equ85_x3.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is 2000 + (- 6000) = - 4000.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. 2000 + x = - 4000).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the subtractive equation property which says: The two sides of an equation remain equal if the same number is subtracted from each side. We may also use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
- 5000 + x = 4000
- 5000 + x + 5000 = 4000 + 5000
0 + x = 9000
x = 9000
Check the answer by substituting the answer (9000) back into the equation.
- 5000 + 9000 = 4000

Integer Subtraction Equations

Subtraction equations with 1 digit integers

http://www.aaamath.com/B/equ65_x4.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is - 2 - (- 6) = 4.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. - 2 + x = 4).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the subtractive equation property which says: The two sides of an equation remain equal if the same number is subtracted from each side. We may also use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
x - (- 5) = 4
x + 5 = 4
x + 5 - 5 = 4 - 5
x + 0 = - 1
x = - 1
Check the answer by substituting the answer (- 1) back into the equation.
- 1 - (- 5) = 4

Subtraction equations with 2 digit integers

http://www.aaamath.com/B/equ65_x5.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is - 20 - (- 60) = 40.
One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. - 20 + x = 40).
The solution of an equation is finding the value of the unknown x. To find the value of x we can use the subtractive equation property which says: The two sides of an equation remain equal if the same number is subtracted from each side. We may also use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:
x - (- 50) = 40
x + 50 = 40
x + 50 - 50 = 40 - 50
x + 0 = - 10
x = - 10
Check the answer by substituting the answer (- 10) back into the equation.
- 10 - (- 50) = 40

Subtraction equations with 3 digit integers

http://www.aaamath.com/B/equ75_x3.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is - 200 - (- 600) = 400.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. - 200 + x = 400).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the subtractive equation property which says: The two sides of an equation remain equal if the same number is subtracted from each side. We may also use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:

$x - (-500) = 400$

$x + 500 = 400$

$x + 500 - 500 = 400 - 500$

$x + 0 = -100$

$x = -100$

Check the answer by substituting the answer (- 100) back into the equation.

$-100 - (-500) = 400$

Subtraction equations with 4 digit integers

http://www.aaamath.com/B/equ85_x2.htm

An equation is a mathematical statement such that the expression on the left side of the equals sign (=) has the same value as the expression on the right side. An example of an equation is - 2000 - (- 6000) = 4000.

One of the terms in an equation may not be know and needs to be determined. Often this unknown term is represented by a letter such as x. (e.g. - 2000 + x = 4000).

The solution of an equation is finding the value of the unknown x. To find the value of x we can use the subtractive equation property which says: The two sides of an equation remain equal if the same number is subtracted from each side. We may also use the additive equation property which says: The two sides of an equation remain equal if the same number is added to each side.

Example:

$x - (-5000) = 4000$

$x + 5000 = 4000$

$x + 5000 - 5000 = 4000 - 5000$

$x + 0 = -1000$

$x = -1000$

Check the answer by substituting the answer (- 1000) back into the equation.

$-1000 - (-5000) = 4000$

Prime Numbers Prime Factorization

http://amby.com/educate/math/2-1_fact.html

An integer greater than one is prime if its only positive divisors are itself and one (otherwise it is composite). For example: 15 is composite because it has the two prime divisors 3 and 5.

The first 1,000 primes - This is a list of the first 1,000 primes

There are different methods which can be utilized to find the prime factorization of a number. One way is to repeatedly divide by prime numbers:

EXAMPLE 1. **Prime factorization of 96 (by division):**

$96 \div \mathbf{2} = 48$
$48 \div \mathbf{2} = 24$
$24 \div \mathbf{2} = 12$
$12 \div \mathbf{2} = 6$
$6 \div \mathbf{2} = 3$
$3 \div \mathbf{3} = 1$

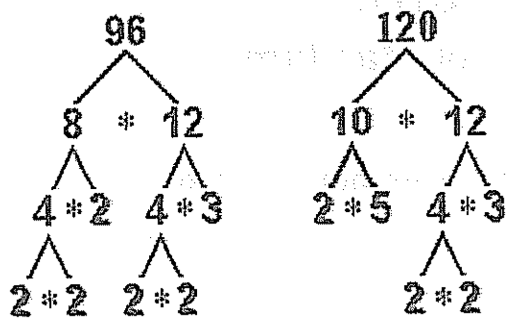
$96 = 2 * 2 * 2 * 2 * 2 * 3$

EXAMPLE 2. **Prime factorization of 120 (by division):**

$120 \div \mathbf{2} = 60$
$60 \div \mathbf{2} = 30$
$30 \div \mathbf{2} = 15$
$15 \div \mathbf{3} = 5$
$5 \div \mathbf{5} = 1$

$120 = 2 * 2 * 2 * 3 * 5$

Another way to approach the task is to choose ANY pair of factors and split *these* factors until all the factors are prime:



2*2*2*2*2*3=96 2*2*2*3*5=120

Traditionally, the factors are listed in order from least to greatest.

> While the product would be the same regardless of the order of the factors, it is much easier to compare or evaluate expressions if the factors are listed in this order.

Determining the prime factors can be challenging. While it's good to know *HOW* to do it, on most standardized tests you'll only have to select the *one right answer* choice to show that you understand the concept.

The CORRECT answer:
- *must* be only PRIME numbers
- *must* multiply together to give the specified quantity.

Greatest Common Factor

http://www.aaamath.com/fra66g-grt-com-fac.html

The Greatest Common Factor is the largest number that is a common factor of two or more numbers.

To find the greatest common factor:

- Determine if there is a common factor of the numbers. A common factor is a number that will divide into both numbers evenly. Two is a common factor of 4 and 14.
- Divide both of the numbers by this common factor.
- Repeat this process with the resulting numbers until there are no more common factors.
- Multiply all of the common factors together to get the Greatest Common Factor

Least Common Multiple

http://www.aaamath.com/B/fra66ix2.htm

The Least Common Multiple (LCM) is the smallest number that two or more numbers will divide into evenly.

How to find the Least Common Multiple of two numbers:

- Find the Greatest Common Factor (GCF) of the numbers
- Multiply the numbers together
- Divide the product of the numbers by the GCF.

Example: Find the LCM of 15 and 12

- Determine the Greatest Common Factor of 15 and 12 which is 3
- Either multiply the numbers and divide by the GCF (15*12=180, 180/3=60)
- OR - Divide one of the numbers by the GCF and multiply the answer times the other number (15/3=5, 5*12=60)

Factors

http://www.aaamath.com/B/fra72ax2.htm

A number may be made by multiplying two or more other numbers together. The numbers that are multiplied together are called factors of the final number. All numbers have a factor of one since one multiplied by any number equals that number. All numbers can be divided by themselves to produce the number one. Therefore, we normally ignore one and the number itself as useful factors.

The number fifteen can be divided into two factors which are three and five.

The number twelve could be divided into two factors which are 6 and 2. Six could be divided into two further factors of 2 and 3. Therefore the factors of twelve are 2, 2, and 3.

If twelve was first divided into the factors 3 and 4, the four could be divided into factors of 2 and 2. Therefore the factors of twelve are still 2, 2, and 3.

There are several clues to help determine factors.

- Any even number has a factor of two
- Any number ending in 5 has a factor of five
- Any number above 0 that ends with 0 (such as 10, 30, 1200) has factors of two and five.

To determine factors see if one of the above rules apply (ends in 5, 0 or an even number). If none of the rules apply, there still may be factors of 3 or 7 or some other number.

Coordinate System

http://math.rice.edu/~lanius/pres/map/mapcoo.htm

Coordinate systems

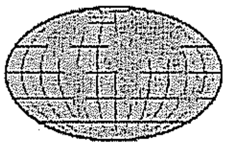
Numeric methods of representing locations on the earth's surface.

Latitude and Longitude

The most commonly used coordinate system today is latitude and longitude- angle measures, expressed in degrees, minutes, and seconds.

Equator and Prime Meridian

The Equator and the Prime Meridian are the reference lines used to measure latitude and longitude. The equator which lies halfway between the poles is a natural reference for latitude. A line through Greenwich, England, just outside London, is the Prime Meridian.



Latitude- Parallels that run east-west.
Longitude- Meridians that run north-south.

Latitude runs from 0° at the equator to 90°N or 90°S at the poles. These lines of latitude, called parallels, run in an east-west direction. Lines of longitude, called meridians, run in a north-south direction intersecting at both poles. Longitude runs from 0° at the prime meridian to 180° east or west, halfway around the globe.

More on Degrees, Minutes, and Seconds

On the globe, one degree of latitude equals approximately 70 miles. One minute is just over a mile, and one second is around 100 feet. Length of a degree of longitude varies, from 69 miles at the equator to 0 at the poles. Because meridians converge at the poles, degrees of longitude tend to 0.

Longitude and Time

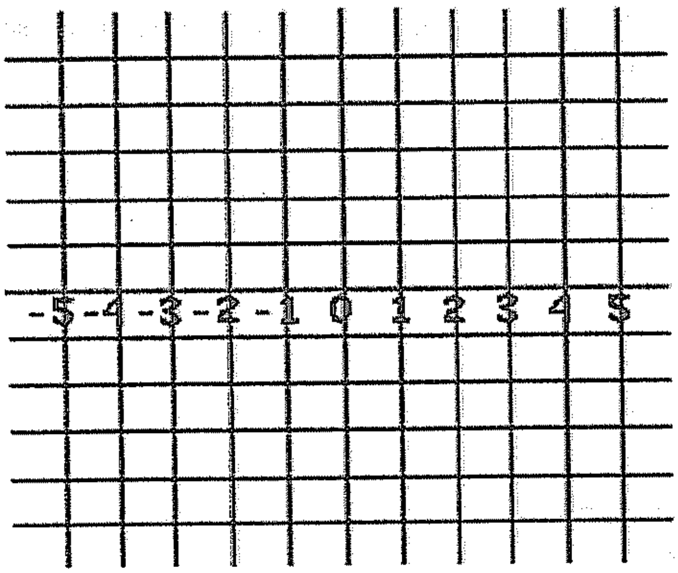
Since the earth rotates 360 degrees every 24 hours, or 15 degrees every hour, it's divided into 24 time zones- 15 degrees of longitude each. When it is noon at Greenwich, it is 10:00 A.M. 30 degrees W., 6:00 A.M. 90 degrees W., and midnight at 180 degrees on the opposite side of the earth.

Historical Note

The planet gave no clear direction on selecting the Prime Meridian, as it did with the equator lying half-way between the poles as the 0 degree of latitude. As late as 1881, there were 14 different prime meridians still being used on topographic survey maps alone. The International Meridian Conference of 1884 adopted the Prime Meridian line passing through the Greenwich Observatory near London, England. Take a trip down the Prime Meridian and explore the countries that lie on it.

Introduction to the Coordinate Plane and Coordinates Discussion

Mentor: Please, draw a straight horizontal line at the center of your graphing paper. As we count: "Zero, one, two, three.." we put the numbers on the line, one number per line of the graph paper. When we count backwards, we distinguish the numbers that come before zero by placing a "-" sign in front of them, so it goes: "Two, one, zero..." Make sure that you evenly space the numbers, since the distance from 1 to 2 should be the same as the distance from 2 to 3.

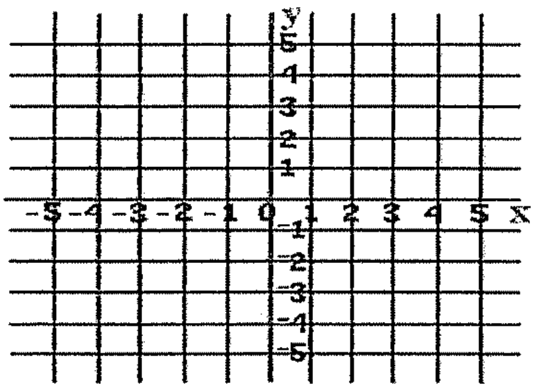


Student: Minus one, minus two, minus three...

Mentor: What we have now is called a "number line" or "coordinate line." It can be used to describe where a point is on the line. To give the exact "address" of a point, we just look at how far the point is from zero, using a minus sign for numbers to the left of zero.

Student: So the address of this point (Student highlights 4) is 4, and the address of this point (Student highlights -5) is -5.

Mentor: Now we want to get more freedom of movement. We will let our points be anywhere on the paper, not only on the line. To give an address for the points that are not on the number line we will need to make a vertical number line. Draw a vertical line through the zero of the horizontal number line. Now label it with positive numbers above the horizontal number line and the negative numbers below the horizontal number line. Instead of saying horizontal number line and vertical number line all the time let's call the by their mathematical names. The horizontal number line is called the x-axis and the vertical number line is axis.

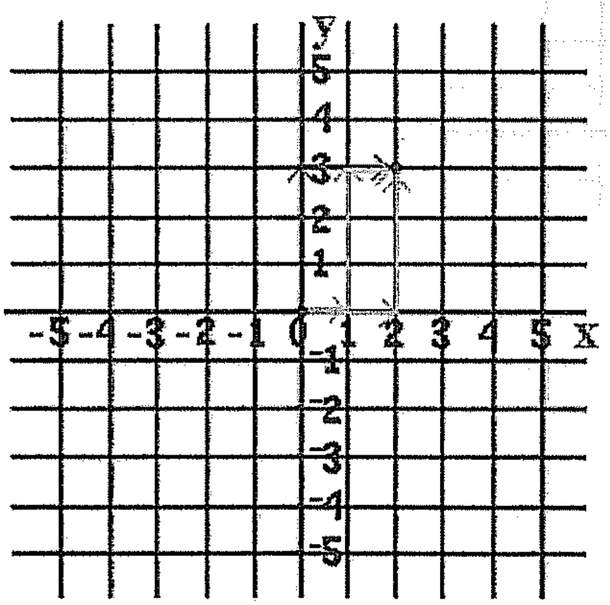


We still count from zero, but now we will need more than just one number to give the exact "address" of a point. For example, can you describe how to get to this point (Mentor highlights (2, 3)) from zero? We can think about the grid as streets, and the squares as blocks, so we are only allowed to go by the grid lines.

Student: Well, I would go up three blocks and then right two blocks.

Mentor: Sure. How else can we get there?

Student: We can first go two blocks to the right, and then three blocks up.



Student: Or we can go one right, three up, and one more right.

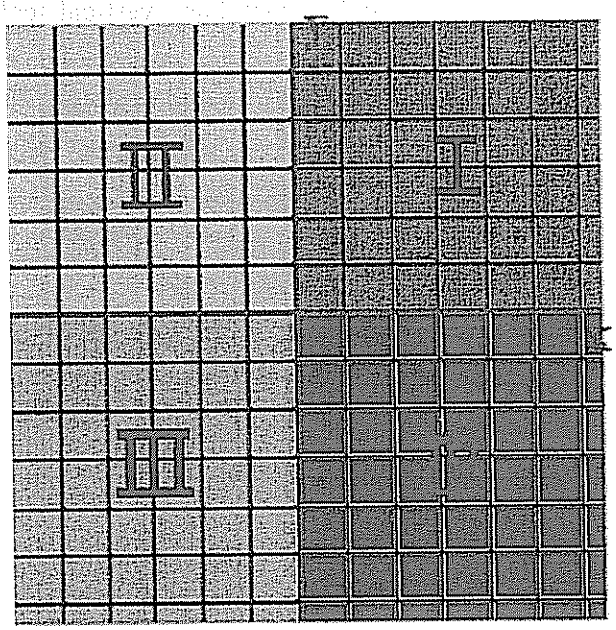
Mentor: There are many ways to get from one point to another point. To create a standard way of referring to points, mathematicians came to an agreement that they will always name the point after one special way of walking. Starting from zero, we go all the way to the right or to the left, counting steps: one, two. Then we go up or down: one, two three steps up. Then we write the number of steps like that: (2,3). Again, the first number is "left-right," the second "up-down." A minus sign means either left or down. So, if our point is (-2, -3), we go two steps to the left, and then three steps down. Do you remember the names of our number lines?

Student: Yes, the horizontal line is called the x-axis and the vertical line is called the y-axis.

Mentor: Can any one think of a better way to describe the address of a point instead of (left-right, up-down)?

Student: Could we call the address by the names of the lines?

Mentor: Yes, so the address of a point would be described as (x,y) instead of (left-right, up-down). The mathematical term for the address of a point is called coordinates. Now does everyone see how the x-axis and y-axis divide our paper into four sections?



Student: Yes and I bet they have names too! **Mentor:** You are right! These sections are called quadrants.

Student: Are they called quadrants because there are four of them and there are four sides to a quadralateral?

Mentor: Good observation! We get our prefix "quad" from the Latin word "quattuor" which means four. Each of these quadrants are referred to by a roman numeral.

1. **The first quadrant** contains all the points with positive x and positive y coordinates and is represented by the roman numeral I.
2. **The second quadrant** contains all the points with negative x and positive y coordinates and is represented by the roman numeral II.
3. **The third quadrant** contains all the points with negative x and negative y coordinates and is represented by the roman numeral III.
4. **The fourth quadrant** contains all the points with positive x and negative y coordinates and is represented by the roman numeral IV.

Student: Will any point that has an address of (positive, negative) be in the fourth quadrant?

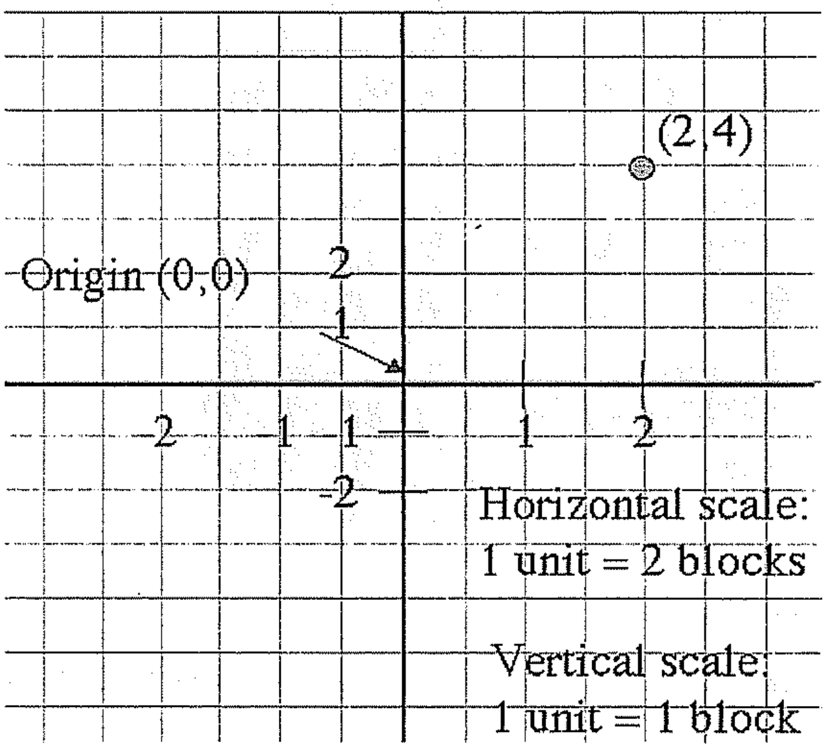
Mentor: Yes, but let's use the correct vocabulary. Any point that has **coordinates** of (positive, negative) is in the fourth quadrant.

What is the Simple Coordinates Game

http://www.shodor.org/interactivate/activities/pcoords/index.html#

This activity allows the user to plot points on the coordinate plane and to read the coordinates of a point plotted by the computer.

The Cartesian coordinate system was formalized by Rene Descartes in the 17th century to help visualize functions via plotting function values as ordered pairs. In this system a grid of evenly spaced horizontal and vertical lines is drawn, a center or "origin" is chosen, and horizontal and vertical scales are chosen. Here's an example:



Notice that the horizontal and vertical scales are different, but each one considered alone is evenly spaced. Also, the blue point is labeled with its *Cartesian coordinates*, the horizontal and vertical movement from the origin, in that order. This is the mathematical convention for naming points.

Another name for the horizontal movement value is the *abscissa*, and the vertical movement is the *ordinate*. These terms are more rare now than they used to be, but you might still hear them being used.

Graphs: four guidelines

.f you have decided that using a graph is the best method to relay your message, then there are four guidelines to remember:

1. **Define your target audience.**
   Ask yourself the following questions to help you understand more about your audience and what their needs are:
   - Who is your target audience?
   - What do they know about the issue?
   - What do they expect to see?
   - What do they want to know?
   - What will they do with the information?
2. **Determine the message(s) to be transmitted.**
   Ask yourself the following questions to figure out what your message is and why it is important:
   - What do the data show?
   - Is there more than one main message?
   - What aspect of the message(s) should be highlighted?
   - Can all of the message(s) be displayed on the same graphic?
3. **Determine the nature of the message(s).**
   Consider the following instructions and their appropriate terms when labelling the graph or describing features of it in accompanying text:

If your graph will...	*Use the following terms...*
describe components	share of, percent of the, smallest, the majority of
compare items	ranking, larger than, smaller than, equal to
establish a time series	change, rise, growth, increase, decrease, decline, fluctuation
determine a frequency	range, concentration, most of, distribution of x and y by age
analyse relationships in data	increase with, decrease with, vary with, despite, correspond to, relate to
do any combination of the above actions	e.g., 'percentage of dropouts among the 15 to 24 age group has increased because of....'

4. **Experiment with different types of graphs and select the most appropriate.**
   - pie chart (description of components)
   - horizontal bar graph (comparison of items and relationships, time series)
   - vertical bar graph (comparison of items and relationships, time series, frequency distribution)
   - line graph (time series and frequency distribution)
   - scatterplot (analysis of relationships)

Determining Line Equations

The slope of a line is the quotient of the difference between y-coordinates and the difference between x-coordinates.

slope = $(y_2 - y_1)/(x_2 - x_1)$ where (x_1, y_1) and (x_2, y_2) are any two points on the line, and $x_1 \neq x_2$.

The x-intercept of a line is the x-coordinate of a point where the line crosses the the x-axis (y = 0).
x-intercept = (x, 0)

The y-intercept of a line is the y-coordinate of a point where the line crosses the y-axis (x = 0).
y-intercept = (0, y)

Line equation in the standard form is written as **ax + by = c** (where a, b, and c are numerals, and x and y are variables). Line equation in the slope-intercept form is written as **y = mx + b** (where m and b are numerals, and x and y are variables) in which m is the slope and b is the y-intercept.

An equation of a line can be derived in four steps if two points are given.

Example: Write an equation of the line passing through the points (-3, 1) and (4, -2).

Answer: Step 1: Find the slope.

$(x_1, y_1) = (-3, 1)$
$(x_2, y_2) = (4, -2)$

slope = [(-2)-1]/[4-(-3)] = -3/7

Step 2: Write the line equation in the slope-intercept form with the slope given.

m = -3/7
y = mx + b
y = (-3/7)x + b

Step 3: Find the y-intercept through one of the given points.

Through (-3, 1):
1 = (-3/7)(-3) + b
1 = (9/7) + b
(9/7) + b - (9/7) = 1 - (9/7)
b = (7/7) - (9/7)
b = -2/7

Through (4, -2):
-2 = (-3/7)(4) + b
-2 = (-12/7) + b
(-12/7) + b + (12/7) = (-2) + (12/7)
b = (-14/7) + (12/7)
b = -2/7

tep 4: Write the line equation in the slope-intercept form or in the standard form with the slope and the y-intercept given.

$y = (-3/7)x + (-2/7)$
$y = (-3/7)x - (2/7)$
$7 \times y = 7 \times [(-3/7)x - (2/7)]$
$7y = -3x - 2$
$7y + 3x = -3x - 2 + 3x$
$3x + 7y = -2$

slope-intercept form: $y = (-3/7)x + (-2/7)$ or $y = (-3/7)x - (2/7)$
standard form: $3x + 7y = -2$

An equation of a line can be derived in three steps if one point and the slope are given.

Example: Write an equation of the line with the slope of 5 passing through the point (-2, -11).

Answer: Step 1: Write the line equation in the slope-intercept form with the slope given.

$m = 5$
$y = mx + b$
$y = 5x + b$

Step 2: Find the y-intercept through the given point.

Through (-2, -11):
$-11 = 5(-2) + b$
$-11 = (-10) + b$
$(-10) + b + 10 = (-11) + 10$
$b = -1$

Step 3: Write the line equation in the slope-intercept form or in the standard form with the slope and the y-intercept given.

$y = 5x + (-1)$
$y = 5x - 1$
$5x - 1 - y = y - y$
$5x - y - 1 = 0$
$5x - y - 1 + 1 = 0 + 1$
$5x - y = 1$

slope-intercept form: $y = 5x + (-1)$ or $y = 5x - 1$
standard form: $5x - y = 1$

Slope and y-intercept

http://www.math.com/school/subject2/lessons/S2U4L2GL.html

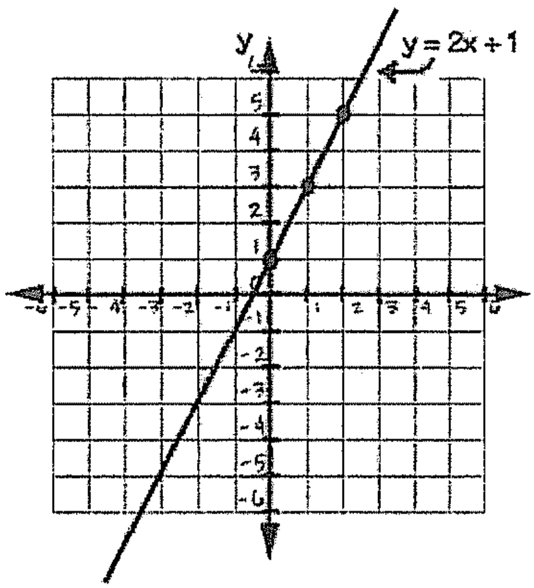
Every straight line can be represented by an equation: y = mx + b. The coordinates of every point on the line will solve the equation if you substitute them in the equation for x and y.

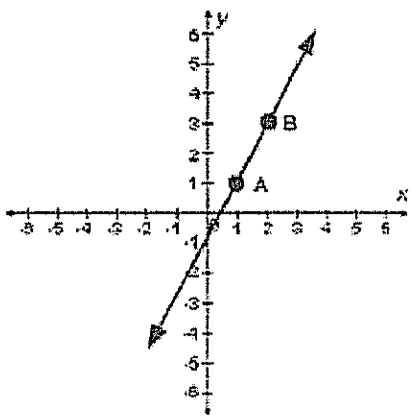
The slope *m* of this line - its steepness, or slant - can be calculated like this:

$$m = \frac{\text{change in y-value}}{\text{change in x-value}}$$

The equation of any straight line, called a linear equation, can be written as: y = *m*x + b, where *m* is the slope of the line and b is the y-intercept. Show Me

The y-intercept of this line is the value of y at the point where the line crosses the y axis. Show Me





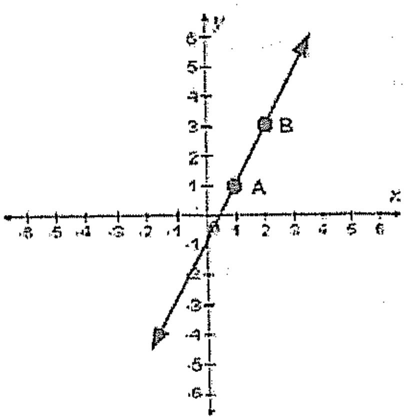
Slope

http://www.math.com/school/subject2/lessons/S2U4L2DP.html

We're familiar with the word "slope" as it relates to mountains. Skiers and snowboarders refer to "hitting the slopes." On the coordinate plane, the steepness, or slant, of a line is called the slope. Slope is the ratio of the change in the y-value over the change in the x-value. Carpenters and builders call this ratio the "rise over the run." Using any two points on a line, you can calculate its slope using this formula.

$$\text{slope} = \frac{\text{change in y value}}{\text{change in x value}} = \frac{\text{rise}}{\text{run}}$$

Let's use these two points to calculate the slope m of this line.
A = (1,1) and B = (2,3)



Subtract the y value of point A from the y-value of point B to find the change in the y value, which is 2. Then subtract the x value of point A from the x value of point B to find the change in x, which is 1. The slope is 2 divided by 1, or 2.

$$m = \frac{3-1}{2-1} = \frac{2}{1} = 2$$

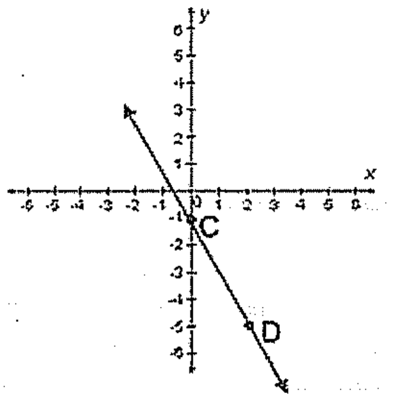
When a line has **positive slope**, like this one, it rises from left to right.

WATCH OUT! Always use the same order in the numerator and denominator!

It doesn't really matter whether you subtract the values of point A from the values of point B, or the values of point B from the values of point A. Try it - you'll get the same answer both ways. **But you must use the same order for both the numerator and denominator!**

You can't subtract the y value of point A from the y value of point B, and the x value of point B from the x value of point A - your answer will be wrong.

Let's look at another line. This line has a **negative slope**, it falls from left to right. We can take any two points on this line and find the slope. Let's take C (0, -1) and D (2, -5).



Using these two points, we can calculate the slope of this line. We subtract the y value of point C from the y value of point D, and the x value of point C from the x value of point D, and divide the first value by the second value. The slope is -2.

Y-Intercept

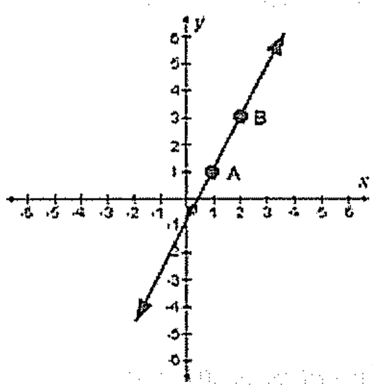
There's another important value associated with graphing a line on the coordinate plane. It's called the "y intercept" and it's the y value of the point where the line intersects the y- axis. For this line, the y-intercept is "negative 1." You can find the y-intercept by looking at the graph and seeing which point crosses the y axis. This point will always have an x coordinate of zero. This is another way to find the y-intercept, if you know the equation, the y-intercept is the solution to the equation when x = 0.

Equations

Knowing how to find the slope and the y-intercept helps us to graph a line when we know its equation, and also helps us to find the equation of a line when we have its graph. The equation of a line can always be written in this form, where m is the slope and b is the y-intercept:

$$y = mx + b$$

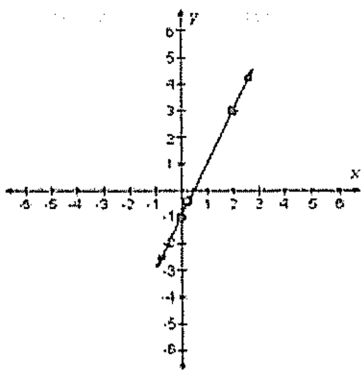
Let's find the equation for this line. Pick any two points, in this diagram, A = (1, 1) and B = (2, 3).



We found that the slope m for this line is 2. By looking at the graph, we can see that it intersects the y-axis at the point (0, –1), so –1 is the value of b, the y-intercept. Substituting these values into the equation formula, we get:

$$y = 2x - 1$$

The line shows the solution to the equation: that is, it shows all the values that satisfy the equation. If we ubstitute the x and y values of a point on the line into the equation, you will get a true statement. We'll try it with the point (2, 3).



Let's substitute x = 2 and y = 3 into the equation. We get "3 = 3", a true statement, so this point satisfies the equation of the line.

Geometry

Names of Polygons by Number of Sides and Angles

http://www.aaamath.com/B/geo318x4.htm

Name	Sides	Angles
Triangle	3	3
Quadrilateral	4	4
Pentagon	5	5
Hexagon	6	6
Heptagon	7	7
Octagon	8	8
Nonagon	9	9
Decagon	10	10

Identifying Types of Triangles by Angles

http://www.aaamath.com/B/geo318x3.htm

Types of triangles based on their angles

- **A RIGHT triangle has one 90° angle.**
- **An OBTUSE triangle has one angle that is greater than 90°.**
- **An ACUTE triangle has all three angles less than 90°.**

Identifying Triangles by their Sides

http://www.aaamath.com/B/geo318x2.htm

Types of triangles based on their sides

- **An EQUILATERAL triangle has all three sides the same length.**
- **An ISOSCELES triangle has two sides with the same length.**
- **A SCALENE triangle has all three sides different lengths.**

Finding the Third Angle of a Triangle

http://www.aaamath.com/B/geo612x5.htm

The sum of the interior angles of a triangle are equal to 180°. To find the third angle of a triangle when the other two angles are known subtract the number of degrees in the other two angles from 180°.

Example: How many degrees are in the third angle of a triange whose other two angles are 40° and 65°? Answer: 180° - 40° -65° = 75°

Finding the Fourth Angle of a Quadrilateral
http://www.aaamath.com/B/geo612x3.htm

The sum of the interior angles of a quadrilateral are equal to 360°. To find the fourth angle of a quadrilateral when the other three angles are known, subtract the number of degrees in the other three angles from 360°.

Example: How many degrees are in the fourth angle of a quadrilateral whose other three angles are 80° and 110° and 95°? Answer: 360° - 80° - 110° - 95° = 75°

Calculating the Area of a Square
http://www.aaamath.com/B/geo78_x4.htm

How to find the area of a square:

- The area of a square can be found by multiplying the base times itself. This is similar to the area of a rectangle but the base is the same length as the height.
- If a square has a base of length 6 inches its area is 6*6=36 square inches

Calculating the Area of a Rectangle
http://www.aaamath.com/B/geo78_x3.htm

How to find the area of a rectangle:

- The area of a rectangle can be found by multiplying the base times the height.
- If a rectangle has a base of length 6 inches and a height of 4 inches, its area is 6*4=24 square inches

Calculating the Area of a Triangle
http://www.aaamath.com/B/geo78_x6.htm

How to find the area of a triangle:

- The area of a triangle can be found by multiplying the base times the one-half the height.
- If a triangle has a base of length 6 inches and a height of 4 inches, its area is 6*2=12 square inches

Finding the Area of a Circle
http://www.aaamath.com/B/geo612x2.htm

How to find the area of a circle:

- The area of a circle can be found by multiplying pi ($\pi = 3.14$) by the square of the radius
- If a circle has a radius of 4, its area is 3.14*4*4=50.24
- If you know the diameter, the radius is 1/2 as large.

Calculating the Perimeter of a Square
http://www.aaamath.com/B/geo78_x8.htm

The perimeter of a square is the distance around the outside of the square. A square has four sides of equal length. The formula for finding the perimeter of a square is 4*(Length of a Side).

Calculating the Perimeter of a Rectangle
http://www.aaamath.com/B/geo78_x7.htm

The perimeter of a rectangle is the distance around the outside of the rectangle. A rectangle has four sides with opposite sides being congruent. The formula for finding the perimeter is Side A + Side B + Side A + Side B. This could also be stated as 2*Side A + 2*Side B or 2*(Side A + Side B)

Calculating the Perimeter of a Parallelogram
http://www.aaamath.com/B/geo78_x9.htm

The perimeter of a parallelogram is the distance around the outside of the parallelogram. A parallelogram has four sides with opposite sides being congruent. The formula for finding the perimeter is Side A + Side B + Side A + Side B. This could also be stated as 2*Side A + 2*Side B or 2*(Side A + Side B).

Calculating the Circumference of a Circle
http://www.aaamath.com/B/geo612x4.htm

The circumference of a circle is the distance around the outside of the circle. It could be called the perimeter of the circle.

How to find the circumference of a circle:

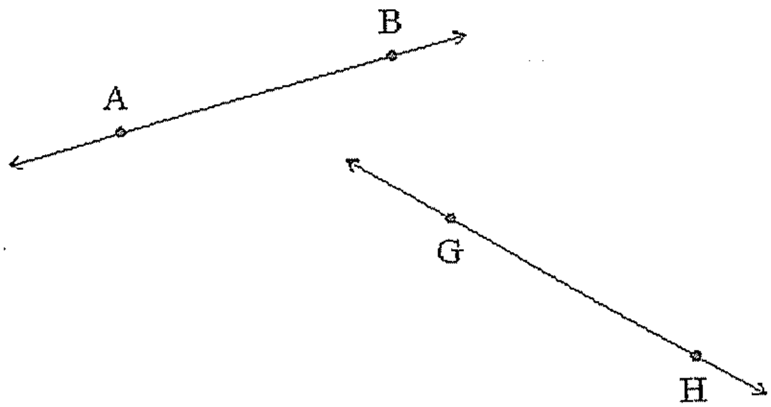
- The circumference of a circle can be found by multiplying pi ($\pi = 3.14$) by the diameter of the circle.
- If a circle has a diameter of 4, its circumference is 3.14*4=12.56
- If you know the radius, the diameter is twice as large

Geometry Basics

Lines

A line is one of the basic terms in geometry. We may think of a line as a "straight" line that we might draw with a ruler on a piece of paper, except that in geometry, a line extends forever in both directions. We write the name of a line passing through two different points A and B as "line AB" or as $\overleftrightarrow{AB}$, the two-headed arrow over AB signifying a line passing through points A and B.

Example: The following is a diagram of two lines: line AB and line HG.

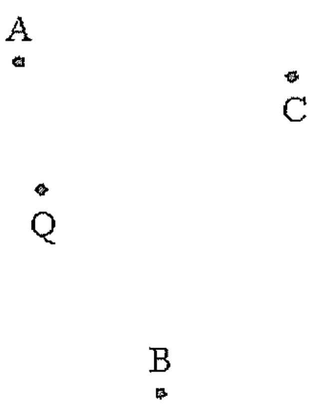


The arrows signify that the lines drawn extend indefinitely in each direction.

Points

A point is one of the basic terms in geometry. We may think of a point as a "dot" on a piece of paper. We identify this point with a number or letter. A point has no length or width, it just specifies an exact location.

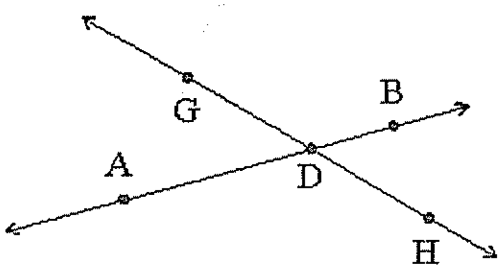
Example: The following is a diagram of points A, B, C, and Q:



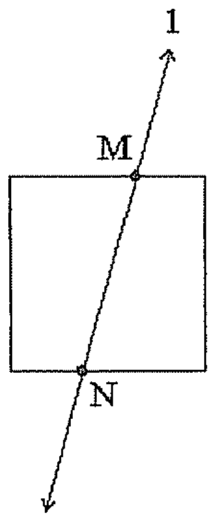
Intersection

The term intersect is used when lines, rays, line segments or figures meet, that is, they share a common point. The point they share is called the point of intersection. We say that these figures intersect.

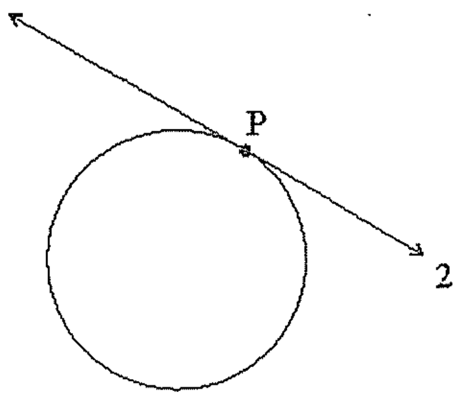
Example: In the diagram below, line AB and line GH intersect at point D:



Example: In the diagram below, line 1 intersects the square in points M and N:



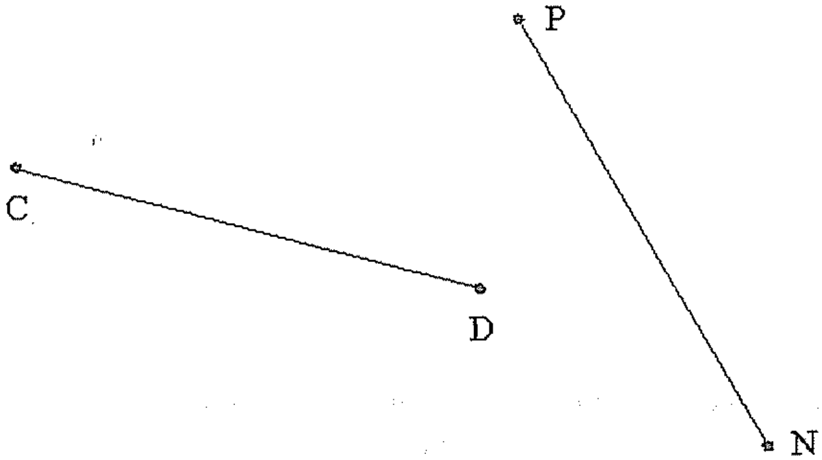
Example: In the diagram below, line 2 intersects the circle at point P:



Line Segments

A line segment is one of the basic terms in geometry. We may think of a line segment as a "straight" line that we might draw with a ruler on a piece of paper. A line segment does not extend forever, but has two distinct endpoints. We write the name of a line segment with endpoints A and B as "line segment AB" or as $\overline{AB}$. Note how there are no arrow heads on the line over AB such as when we denote a line or a ray.

Example: The following is a diagram of two line segments: line segment CD and line segment PN, or simply segment CD and segment PN.

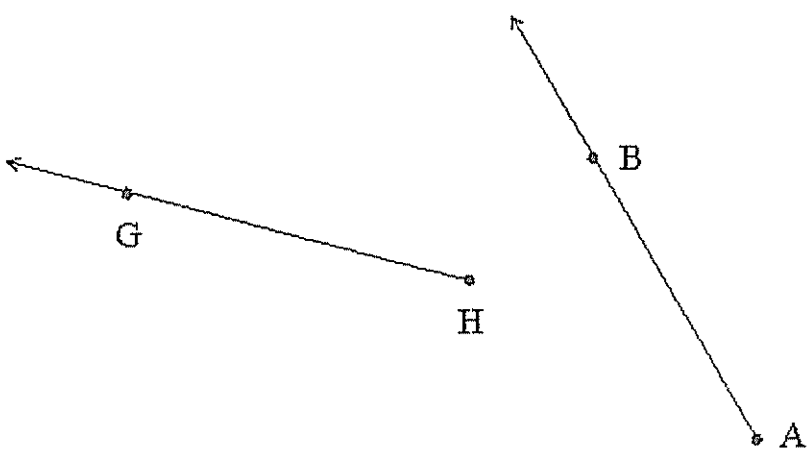


Rays

A ray is one of the basic terms in geometry. We may think of a ray as a "straight" line that begins at a certain point and extends forever in one direction. The point where the ray begins is known as its endpoint.

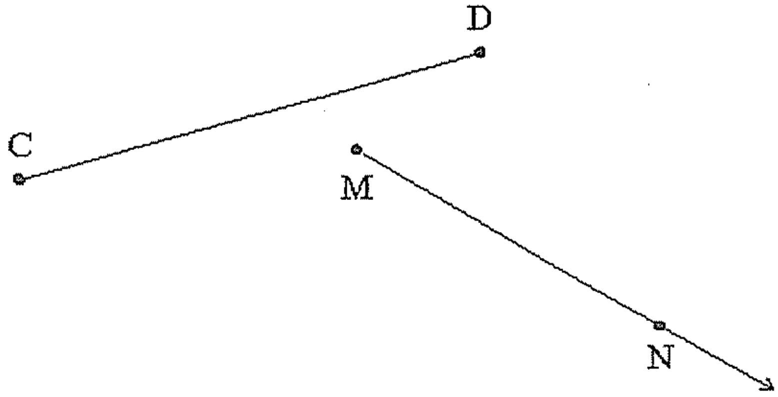
We write the name of a ray with endpoint A and passing through a point B as "ray AB" or as $\overrightarrow{AB}$. Note how the arrow heads denotes the direction the ray extends in: there is no arrow head over the endpoint.

Example: The following is a diagram of two rays: ray HG and ray AB.



Endpoints

An endpoint is a point used to define a line segment or ray. A line segment has two endpoints; a ray has one. Example: The endpoints of line segment DC below are points D and C, and the endpoint of ray MN is point M below:



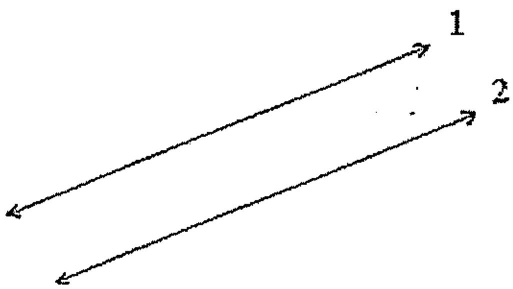
Parallel Lines

Two lines in the same plane which never intersect are called parallel lines. We say that two line segments are parallel if the lines that they lie on are parallel. If line 1 is parallel to line 2, we write this as

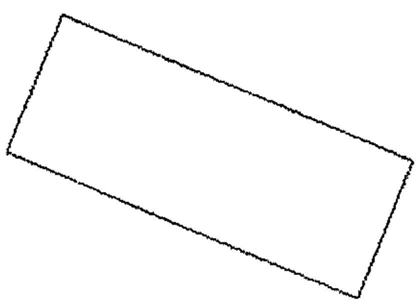
line 1 || line 2

When two line segments DC and AB lie on parallel lines, we write this as

segment DC || segment AB. Example: Lines 1 and 2 below are parallel.



Example: The *opposite* sides of the rectangle below are parallel. The lines passing through them never meet.



Part 2

READING/LANGUAGE ARTS

What is Reading Comprehension?

ccording to Webster's Dictionary, comprehension is "the capacity for understanding fully; the act or action of grasping with the intellect." Webster also tells us that reading is "to receive or take in the sense of (as letters or symbols) by scanning; to understand the meaning of written or printed matter; to learn from what one has seen or found in writing or printing.

Comprehension = understanding

dentifying words on a page does not make someone a successful reader. When the words are understood and transcend the pages to become thoughts and ideas then you are truly reading. Comprehension therefore is the capacity for understanding those thoughts and ideas. Applying what you have read and understood becomes the successful conclusion.

Comprehension Regulation:

ou can become an active, effective reader through comprehension regulation. This is a method for consciously controlling the reading process. Comprehension regulation involves the use of preplanned strategies to understand text. It is a plan for getting the most out of reading. It allows you to have an idea of what to expect from the text. Most importantly, it gives you techniques to use when you are experiencing difficulties.

As an active reader, you can get an idea of what the writer is trying to communicate by:

- etting goals based on your purpose for reading
- reviewing the text to make predictions
- elf-questioning
- canning
- Relating new information to old

Determining your Purpose:

There are many different purposes for reading. ometimes you read a text to learn material, sometimes you read for pure pleasure, and sometimes you need to follow a set of directions. As a student, much of your reading will be to learn assigned material. You get information from everything you read and yet you don't read everything for the same reason or in the same way or at the same rate. Each purpose or reason for reading requires a different reading approach. Two things that influence how fast and how well you read are the characteristics of the text and the characteristics of you, the reader.

Characteristics of the text:

- ize and style of the type (font)
- ictures and illustrations
- Author's writing style and personal perspectives
- Difficulty of the ideas presented

Characteristics of the reader:

- ackground knowledge (how much you already know about the material or related concepts)
- eading ability - vocabulary and comprehension
- Interest
- Attitude

Skills for being an effective reader and for increasing comprehension are:

- inding main ideas and supporting details/evidence
- Making inferences and drawing conclusions
- ecognizing a text's patterns of organization
- erceiving conceptual relationships
- Testing your knowledge and understanding of the material through application

Five Thinking Strategies of Good Readers

. **Predict: Make educated guesses.** ood readers make predictions about thoughts, events, outcomes, and conclusions. As you read, your predictions are confirmed or denied. If they prove invalid, you make new predictions. This constant process helps you become involved with the author's thinking and helps you learn.

2. **Picture: Form images.** or good readers, the words and the ideas on the page trigger mental images that relate directly or indirectly to the material. Images are like movies in your head, and they increase your understanding of what you read.

3. **Relate: Draw comparisons.** When you relate your existing knowledge to the new information in the text, you are embellishing the material and making it part of your framework of ideas. A phrase of a situation may remind you of a personal experience or something that you read or saw in a film. uch related experiences help you digest the new material.

. **Monitor: Check understanding.** Monitor your ongoing comprehension to test your understanding of the material. eep an internal summary or synthesis of the information as it is presented and how it relates to the overall message. Your summary will build with each new detail, and as long as the message is consistent, you will continue to form ideas. If, however, certain information seems confusing or erroneous, you should stop and seek a solution to the problem. You must monitor and supervise you own comprehension. Good readers seek to resolve difficulties when they occur; they do not keep reading when they are confused.

5. **Correct gaps in understanding.** Do not accept gaps in your reading comprehension. They may signal a failure to understand a word or a sentence. top and resolve the problem. Seek solutions, not confusion. This may mean rereading a sentence or looking back at a previous page for clarification. If an unknown word is causing confusion, the definition may emerge through further reading. When good readers experience gaps in comprehension, they do not perceive themselves as failures; instead, they reanalyze the task to achieve better understanding.

Identifying Topics, Main Ideas, and Supporting Details

nderstanding the ***topic***, the ***gist***, or the larger conceptual framework of a textbook chapter, an article, a paragraph, a sentence or a passage is a sophisticated reading task. eing able to draw conclusions, evaluate, and critically interpret articles or chapters is important for overall comprehension in college reading. Textbook chapters, articles, paragraphs, sentences, or passages all have topics and main ideas. The ***topic*** is the broad, general theme or message. It is what some call the sub ect. The ***main idea*** is the "key concept" being expressed. ***Details***, ma or and minor, support the main idea by telling how, what, when, where, why, how much, or how many. Locating the topic, main idea, and supporting details helps you understand the point(s) the writer is attempting to express. Identifying the relationship between these will increase your comprehension.

What is a paragraph?

A paragraph is a collection of related sentences dealing with a single topic. To be as effective as possible, a paragraph should contain each of the following: **Unity, Coherence, A Topic Sentence,** and **Adequate Development.** As you will see, all of these traits overlap. Using and adapting them to your individual purposes will help you construct effective paragraphs.

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1. Unity:

The entire paragraph should concern itself with a single focus. If it begins with a one focus or major point of discussion, it should not end with another or wander within different ideas.

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2. Coherence:

Coherence is the trait that makes the paragraph easily understandable to a reader. You can help create coherence in your paragraphs by creating logical bridges and verbal bridges.

logical bridges:

- The same idea of a topic is carried over from sentence to sentence
- Successive sentences can be constructed in parallel form

verbal bridges:

- ey words can be repeated in several sentences
- Synonymous words can be repeated in several sentences
- ronouns can refer to nouns in previous sentences
- Transition words can be used to link ideas from different sentences

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3. A topic sentence:

A topic sentence is a sentence that indicates in a general way what idea or thesis the paragraph is going to deal with. Although not all paragraphs have clear-cut topic sentences, and despite the fact that topic sentences can occur anywhere in the paragraph (as the first sentence, the last sentence, or somewhere in the middle), an easy way to make sure your reader understands the topic of the paragraph is to put your topic sentence near the beginning of the paragraph. (This is a good general rule for less experienced writers, although it is not the only way to do it).

4. Adequate development

The topic (which is introduced by the topic sentence) should be discussed fully and adequately. Again, this varies from paragraph to paragraph, depending on the author's purpose, but writers should beware of paragraphs that only have two or three sentences. It's a pretty good bet that the paragraph is not fully developed if it is that short.

Some methods to make sure your paragraph is well-developed:

- se examples and illustrations
- Cite data (facts, statistics, evidence, details, and others)
- Examine testimony (what other people say such as quotes and paraphrases)
- se an anecdote or story
- Define terms in the paragraph
- Compare and contrast
- Evaluate causes and reasons
- Examine effects and consequences
- Analyze the topic
- Describe the topic
- ffer a chronology of an event (time segments)

Grasping the Main Idea:

A paragraph is a group of sentences related to a particular topic, or central theme. Every paragraph has a key concept or main idea. The main idea is the most important piece of information the author wants you to know about the concept of that paragraph.

When authors write they have an idea in mind that they are trying to get across. This is especially true as authors compose paragraphs. An author organizes each paragraph's main idea and supporting details in support of the topic or central theme, and each paragraph supports the paragraph preceding it.

A writer will state his/her main idea explicitly somewhere in the paragraph. That main idea may be stated at the beginning of the paragraph, in the middle, or at the end. The sentence in which the main idea is stated is the ***topic sentence*** of that paragraph.

The topic sentence announces the general theme (or portion of the theme) to be dealt with in the paragraph. Although the topic sentence may appear anywhere in the paragraph, it is usually first - and for a very good reason. This sentence provides the focus for the writer while writing and for the reader while reading. When you find the topic sentence, be sure to underline it so that it will stand out not only now, but also later when you review.

Identifying the Topic:

The first thing you must be able to do to get at the main idea of a paragraph is to identify the topic - the sub ect of the paragraph. Think of the paragraph as a wheel with the topic being the hub - the central core around which the whole wheel (or paragraph) spins. Your strategy for topic identification is simply to ask yourself the question, "What is this about?" Keep asking yourself that question as you read a paragraph, until the answer to your question becomes clear. Sometimes you can spot the topic by looking for a word or two that repeat. Usually you can state the topic in a few words.

Let us try this topic-finding strategy. Reread the first paragraph on this page - the first paragraph under the heading **Grasping the Main Idea**. Ask yourself the question, "What is this paragraph about?" To answer, say to yourself in your mind, "The author keeps talking about paragraphs and the way they are designed. This must be the topic - paragraph organization." Reread the second paragraph of the same section. Ask yourself "What is this paragraph about?" Did you say to yourself, "This paragraph is about different ways to organize a paragraph"? That is the topic. ext, reread the third paragraph and see if you can find the topic of the paragraph. How? Write the topic in the margin next to this paragraph. Remember, getting the main idea of a paragraph is crucial to reading.

The bulk of an ***expository paragraph*** is made up of supporting sentences (ma or and minor details), which help to explain or prove the main idea. These sentences present facts, reasons, examples, definitions, comparison, contrasts, and other pertinent details. They are most important because they sell the main idea.

The last sentence of a paragraph is likely to be a concluding sentence. It is used to sum up a discussion, to emphasize a point, or to restate all or part of the topic sentence so as to bring the paragraph to a close. The last sentence may also be a transitional sentence leading to the next paragraph.

Of course, the paragraphs you'll be reading will be part of some longer piece of writing - a textbook chapter, a section of a chapter, or a newspaper or magazine article. Besides expository paragraphs, in which new information is presented and discussed, these longer writings contain three types of paragraphs: ***introductory, transitional***, and ***summarizing***.

Introductory paragraphs tell you, in advance, such things as ( ) the main ideas of the chapter or section; (2) the extent or limits of the coverage; (3) how the topic is developed; and (4) the writer's attitude toward the topic. ***Transitional*** paragraphs are usually short; their sole function is to tie together what you have read so far and what is to come - to set the stage for succeeding ideas of the chapter or section. ***Summarizing*** paragraphs are used to restate briefly the main ideas of the chapter or section. The writer may also draw some conclusion from these ideas, or speculate on some conclusion based on the evidence he/she has presented.

All three types should ***alert*** you: the introductory paragraph of things to come; the transitional paragraph of a new topic; and the summarizing paragraph of main ideas that you should have gotten.

Exercise:

Read the following paragraph and underline the stated main idea. Write down in your own words what you are able to conclude from the information.

The rules of conduct during an examination are clear. o books, calculators or papers are allowed in the test room. Proctors will not allow anyone with such items to take the test. Anyone caught cheating will be asked to leave the room. His or her test sheet will be taken. The incident will be reported to the proper authority. At the end of the test period, all materials will be returned to the proctor. Failure to abide by these rules will result in a failing grade for this test.

Answer:

You should have underlined the first sentence in the paragraph - this is the stated main idea. What can be concluded from the information is: If you do not follow the rules, you will automatically fail the test. This concluding information is found in the last sentence.

Moving Day
By Laura G. Smith

1 We felt a little like spies. My little brother and I had our noses pressed firmly against the window in our front den as we watched our new neighbors unpacking their U-Haul van. The license plate on their SU passively announced that they had moved from the state of West Virginia. I decided it was my civic duty to welcome them to Lexington, Kentucky!

2 The people who used to live next door were pretty antisocial most of the time. I was hoping things would be different with this family, so I decided to march right over and meet them. I prayed that I wouldn't totally embarrass myself.

3 As I approached their somewhat conventional-looking house, they didn't seem to notice me. They were too busy haphazardly unloading boxes off of the truck and piling them in the front yard. The two youngest kids were getting in the way more than they were helping. It was absolute bedlam! I was ust about to chicken out and head back home when the oldest boy came blundering towards me clutching a piece of poster board under his arm.

4 "Hi there!" I said in my friendliest voice. "I'm Erin from next door. I guess we're about to be neighbors!" Standing with a startled look on his face, the boy was hesitant to speak. "So what's that poster under your arm?" I asked, trying to ease the awkwardness.

5 "This is a diagram of my new bedroom," he answered in a more grown-up voice than I expected to hear. "It shows where we're planning to put my bed, the dresser, my desk, and a lot of other stuff. I drew it myself. Isn't it cool?" I glanced at the drawing, offered an approving nod, and asked him his name.

6 "Well, my full name is Anthony oseph Atkins, but you can call me Tony for short."

7 " ice to meet you Tony. Can I help you carry some stuff to your room?"

8 "There really isn't much to carry since most of my things were burned up in the fire," Tony replied in a very candid manner.

9 "What fire?" I asked, trying not to make a big deal of it.

10 About that time Tony's dad walked up and flashed a warm smile as he put his arm around his son. Then he winked at Tony hoping it would serve as a tacit reminder that he should introduce his new friend. Picking up on the hint, the young boy complied. "Dad, this is Erin, our new next-door neighbor."

11 "I'm glad to meet you Erin. I'm Mr. Atkins."

12 Tony's dad was amazingly even-tempered, considering all of the confusion he was dealing with. I wanted to ask him about the fire, but I thought it might seem rude. "It's nice to meet you too," I replied instead. "I feel like I've interfered with your moving day, Mr. Atkins. Please don't let me keep you from your work."

13 "That's no problem at all," said Mr. Atkins, sitting down on one of the moving boxes. "We have ample time to get the ob done before dark. Besides, I think we could all use a little break. Tony, were you about to tell Erin about the night our house in West Virginia caught on fire?"

14 Tony's eyes grew wide with excitement. "You tell her, Dad!" he exclaimed.

15 Mr. Atkins explained the whole story. He said the firemen were pretty sure the fire started inside one of the upstairs walls when an electrical wire shorted out. It spread incredibly quickly throughout the whole second floor of the house, but Mr. and Mrs. Atkins were asleep in their room downstairs and didn't wake up right away.

16 "Tony was a brave young man that night," his father said proudly. "He was instrumental in making sure his brothers got out of bed and escaped safely before the fire engulfed their bedrooms. The torrid flames caused irreparable damage to the furniture and other things in the boys' rooms. But that night we realized ust how much we have to be thankful for. Our family was safe, and that's all that really mattered."

17 "Guess what else happened?" Tony blurted out. "A couple of weeks after the fire, my dad found out about his ob transfer to Lexington. He said it would be better to wait until after we moved to replace everything we lost in the fire. So I guess my room will be kind of bare for a while."

18 "It sounds like you'll be putting that fancy diagram to good use when it comes time to pick out your new furniture, Tony. But for right now, I guess I'd better let you guys get back to work!"

19 As I walked home, I had a funny feeling that I had known the Atkins a long time. I was hoping they had the same funny feeling about me.

Name ______________________________ Date ________________

Moving Day

1. Why did the Atkins move to Lexington? (A) Mr. Atkins was transferred by his employer (B) They had no where to live when their house burned down (C) They thought it would be a nicer place to live (D) Tony's mom got a new job in Lexington	2. If the Atkins' former house was in the Southeastern part of West Virginia, how many miles would you estimate they had to drive to get to their new house in Lexington, Kentucky? (A) 525 miles (B) 25 miles (C) 175 miles (D) 1,050 miles
3. According to the story, how might you describe the outward appearance of the Atkins' new home? (A) Two-story (B) Traditional (C) Brick (D) Modern	4. What was Mrs. Atkins doing in the story? (A) She was at the grocery store (B) The story doesn't say what she was doing (C) She was unpacking boxes in the house (D) She was still in West Virginia
5. Why do you think Erin was a little nervous about meeting the new neighbors? (A) Because she didn't want to get stuck helping them unpack their boxes (B) Because she was shy (C) Because she didn't really like children (D) Because the last neighbors weren't very friendly	6. How would you describe Mr. Atkins' personality? (A) Rude (B) Overwhelmed (C) Restless (D) Calm
7. The Atkins were absolutely devastated by the fire that destroyed the up-stairs of their home. (A) False (B) True	8. Why do you think Erin felt like she had known the Atkins a long time? (A) Because they reminded her of the neighbors who used to live next door (B) Because Tony looked just like Erin's little brother (C) Because the Atkins shared a personal story that helped Erin learn more about them (D) Because she had probably met them before and just forgot about it

Problem Answers:

1 (D) Mr. Atkins was transferred by his employer
2 (B) 175 miles
3 (D) Traditional
4 (C) The story doesn't say what she was doing
5 (C) Because the last neighbors weren't very friendly
6 (A) Calm
7 (A) False
8 (B) Because the Atkins shared a personal story that helped Erin learn more about them

A Brawny Bookworm
By Laura G. Smith

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1 Bruce Brockman stands at a handsome six feet, two inches tall and has the brain and brawn that ust naturally attract his peers. As the star quarterback on the varsity football team, Bruce's popularity is no big surprise. But there is one thing about him that his friends think is a little weird—Bruce Brockman is a bookworm.

2 Every day during his free period, Bruce hangs out in the elementary school library, putting resources back in alphabetical order or reading classics like Tom Sawyer or Robin Hood to the students. His friends give him endless grief about it, calling him a peon. They insist that his obsession with reading is some sort of social malady.

3 Bruce's dad first began introducing him to the rudimentary steps of reading when he was barely four years old. When the vocabulary was over his head, his father would put it in the vernacular so he could grasp the meaning. Mr. Brockman was meticulous about finding creative ways to animate each story, encouraging Bruce to proffer ideas about what might happen next. The unguarded thoughts of this eager young reader allowed him to imagine he was right in the middle of the same dramatic circumstances the characters were facing.

4 One imaginary ourney took Bruce through the eerie domicile of a homely, peevish hunchback. Struggling to find his way out of the unsightly creature's dungeon, the long, winding corridors seemed inextricable. In the blink of an eye, a celestial being clothed in a glimmering, yellowish gown appeared. Her gentle countenance was calming. "Behold, I have come to rescue you," she pronounced, as she whisked Bruce off to safety.

5 Bruce whittled away countless hours in his room, in what seemed like only moments, pursuing both fictional and factual adventure.

6 Over the years, many of Bruce's teachers provided him with liberal quantities of used books to fuel his desire to read. One glance at his bedroom, and this popular ock's greatest passion is apparent—it's like walking into a giant book repository! Ninety linear feet of shelving line the walls, displaying hundreds of books Bruce has amassed during his sixteen years.

7 Bruce's dad seems to get a charge out of telling him he should sell his literary collection to help defray his college expenses. "It's a reasonable request from a dad who knows best!" he would say. Mr. Brockman is always quick to come up with a clever quip or a witty epigram to get his point across. And granted, Bruce is pretty gullible, but he knows there's no way his dad would want him to unload his prized possessions. To the contrary, it's likely they'll be adding more shelves in Bruce's room to accommodate his ever-expanding collection.

8 Whether it's an Alfred Hitchcock murder mystery or a biography of the life of Abe Lincoln, Bruce finds intrigue and imagery sandwiched between the covers of each writing. He might envision himself as a town sheriff staring at a murderous outlaw through the barrel of a 3 -caliber rifle. Or perhaps he'll become caught up in the middle of a legal battle, having been unjustly accused of libel.

9 But when Bruce doesn't have his nose between printed pages, he does stuff his friends would refer to as "normal." As a matter of fact, he's working up the nerve right now to ask Cynthia Hopkins to the homecoming dance. If he's lucky enough for fantasy and reality to intersect, he'll soon be moving across the dance floor with the most glamorous girl he knows.

A Brawny Bookworm

1. According to the story, do you think being popular is what's most important to Bruce? Why or why not? (A) No, he does what he enjoys no matter what others think (B) No, he doesn't have many friends, so I guess he doesn't care if he's popular (C) Yes, that's why he reads to other students (D) Yes, that's why he plays football	2. What do you think is the main reason Bruce developed a passion for reading? (A) He was probably born with the desire (B) He knew it would help him be a better student (C) He likes to read so he can be alone (D) His dad spent a lot of time reading with him when he was young
3. When Bruce's dad put words in the "vernacular," he (A) Pronounced the words distinctly (B) Explained what the words meant using every-day language (C) Defined the words (D) Wrote them out	4. What does Bruce seem to enjoy most about reading? (A) Learning historical facts (B) Impressing girls with all the stuff he knows (C) Imagining what it's like to be one of the characters in the book (D) Adding to his book collection
5. Based on the story, which of the following statements is an opinion (rather than a fact)? (A) Bruce once read a book about a homely hunchback (B) Bruce is a star quarterback on the football team (C) Bruce will probably work in the library again next year (D) Bruce has a passion for reading	6. Which term does not describe Mr. Brockman's personality? (A) Encouraging (B) Creative (C) Witty (D) Impatient

Answers

1 (A) No, he does what he enjoys no matter what others think
2 (D) His dad spent a lot of time reading with him when he was young
3 (B) Explained what the words meant using every-day language
4 (C) Imagining what it's like to be one of the characters in the book
5 (C) Bruce will probably work in the library again next year 6 (D) Impatient

GETTING YOUR IDEAS INTO A LOGICAL SEQUENCE

Back to The Question

Ideas in academic writing need to be presented in a logical sequence so they can be followed clearly by your reader. This applies to the ideas in the paragraph and the ideas in the whole essay or report. So far, we have looked at the simple process of putting a paragraph together. Academic paragraphs need to present ideas clearly. They also need to show what and how you think.

The main cultures that use English as their native language, have a very linear concept of how ideas should be presented. This is not the case in all cultures. Some cultures express themselves in circles, some in loops, and some in spirals.

To be understood, you need to present your ideas in the language of your readers, but also in the way that is expected. The way ideas are expressed in your culture, is as valid as the way they are expressed in English speaking cultures. However, the people who read and mark your essays and reports have certain expectations. If you want to get good grades, your job is to discover what those expectations are and try to fulfil them. Writing in a clear, logical fashion is the first step.

Step 1. Logical order based on time

Here is a simple exercise to help you write in a logical order. The order will be based on the time you did different things this morning.

1. I got up.
2. I got dressed.
3. I washed my face.
4. I made breakfast.
5. I ate breakfast.
6. I cleaned my teeth.
7. I brushed my hair.
8. I put on my shoes.
9. I went outside.
10. I locked the door.
11. I got on my bicycle.
12. I came to school.

First get the ideas in order

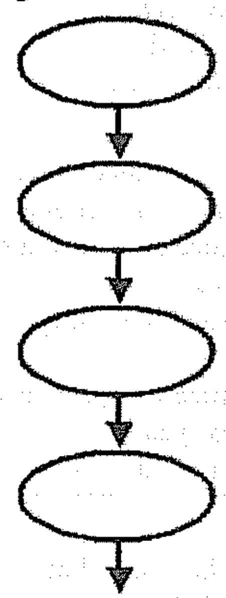

Figure 1. Logical Sequence of time

Practice sequence of sentences

http://www.oswego.org/testprep/ela4/a/sentencesequencep.cfm

Multiple Meaning Words

Write or tell two sentences for each word below. Be sure to use the word as a noun in one sentence and as a verb in the other sentence. Click on a word to check your answers.

Multiple Word Meaning

Write or tell two sentences for each word below. Be sure to use the word as a noun in one sentence and as a verb in the other sentence. Click on a word to check your answers.

crash	pet	dance	cut	paw
dread	post	string	smell	fire
wish	fight	pack	love	color
shape	break	track	farm	point
bend	corner	shot	spring	might
police	stamp	trick	crack	taste
burn	walk	whisper	tire	shine
trap	camp	bomb	shop	place
cover	staple	shout	float	station
plan	talk	fence	swing	name
set	paint	cry	store	shell
map	block	pay	touch	review
list	brush	snack	cure	fit
guess	respect	oil	dress	thunder
snap	paper	board	snow	field
stop	hope	wash	hit	flood
raise	soil	pin	picture	mark
spy	crown	spell	hold	fool
skate	attack	lounge	shovel	pump
jerk	grin	rub	dream	drill
roast	trade	doctor	fish	help
crowd	bowl	joke	roll	chain
signal	mistake	harm	blossom	whistle
junk	patch	master	guard	beach
report	drug	salt	wiggle	hammer
scare	notice	share	trust	light

1. crash: I had a car crash. Tom will try not to crash into the pole.
2. pet: I have a golden lab for a pet. Sara and Jenna like to pet dogs.
3. dance: The middle school will have a dance. I will dance the jitterbug.
4. cut: Bill has a cut on his finger. Tam will cut out the pictures.
5. paw: My dog's paw is big. The horse will paw at the snow to find grass.
6. dread: My dread of birds causes me problems. Marla dreads taking tests.
7. post: Gary pounded the post into the dirt. The teacher will post the grades.
8. string: The guitar string broke. He has to string beads in preschool.
9. smell: Kids sweating have a smell. Sue can smell a skunk.
10. fire: We will build a fire and roast marshmallows. The boss will fire him.
11. wish: Make a wish and blow out the candles. He will wish for a football.
12. fight: There was a fight in the parking lot. He will fight for his life
13. pack: The wolf pack killed the zebra. Jeff has to pack his suitcase.
14. love: My love for you grows everyday. Tom and Tam love each other.
15. color: Green is my favorite color. Tony will color in her coloring book.
16. shape: A diamond is a shape. Try to shape the clay into an animal.
17. break: The employee took a break. Dusty will try not to break his new toy.
18. track: The train goes on a track. The detectives will track the criminal.
19. farm: We bought a farm. The farmer will farm 150 acres of corn.
20. point: The scissors have a sharp point. It's not polite to point.
21. bend: We went around a bend in the road. Don't bend the card.
22. corner: The car went around the corner. The hyenas will corner the lion.
23. shot: The shot hurt. The hunter shot the deer.
24. spring: The spring on the mattress is sprung. Spring out of bed each day!
25. might: He has a lot of power and might. I might go to the movies.
26. police: The police captured the criminal. Police the area for any litter.
27. stamp: I bought a book of stamps. The teacher will stamp the paper "A".
28. trick: The dog performed a trick. John will trick Tim into doing his work.
29. crack: Open the window just a crack. Tam will crack the nuts.
30. taste: The taste of the candy was sour. I will taste the cookies.
31. burn: Terry got a 3rd degree burn on his arm. Tara will burn the candle.
32. walk: Gary and I went for a long walk. Will you please walk the dog?
33. whisper: Larry heard the whisper of the wind. Whisper the answer to me.
34. tire: We had to buy 4 new tires for the van. The kids tire me out.
35. shine: The shine of the window caused a glare. I need to shine my shoes.
36. trap: My uncle set a trap to catch a raccoon. He likes to trap skunk, too.
37. camp: Adam went to scout camp. We camp on weekends in our camper.
38. bomb: A bomb blew up the federal building. We will bomb our enemies.
39. shop: At the bridal shop, the girl bought a gown. I will shop for clothes.
40. place: Can you come to my place? Tom will place the glass on the shelf.
41. cover: Put the cover on the box. Please cover the meat so it won't spoil.
42. staple: We need to buy staples. Staple the papers together, please.
43. shout: Nick heard a shout for help. Please don't shout inside.
44. float: Missy made a root beer float. The duck can float on the water.
45. station: The kids toured the fire station. Station yourself on lookout duty.
46. plan: Teachers make lesson plans. Lets plan a party.
47. talk: I heard talk of a robbery. Can we talk some time?
48. fence: They put a fence around the yard. The vet will fence in his back lot.
49. swing: Susie put a swing in her back yard. Will you swing with me?
50. name: What is your name? What will you name your baby?

51. set: The couple got a set of dishes for a gift. Set the spiker in volleyball.
52. paint: She chose was blue paint. Now she will paint her house.
53. cry: Mason heard the cry of the hawk. Riley will cry when his mom leaves.
54. store: I need you to go to the store for me. I will store my toys in the box.
55. shell: Katie found a shell at the beach. Lets shell the peas.
56. map: Karrie bought a map of the USA. Now we can map out our trip.
57. block: Jayden ran around the block. In football, you need to block.
58. pay: You will get your pay every 2 weeks. Shane will pay his bills.
59. touch: Hugs are a good touch. Please don't touch the wet paint.
60. review: Lets have a review for math. Bryan needs to review his work.
61. list: Make a list of things you need at the store. Matt will list the items here.
62. brush: I bought a hair brush. You should brush your teeth every day.
63. snack: Mom made me a snack after school. Don't snack before supper.
64. cure: I hope they find a cure for cancer. Can you cure my hiccups?
65. fit: I feel physically fit. The 60 year old can still fit into her wedding dress.
66. guess: My guess is 129 jellybeans. Guess how old I am?
67. respect: Ryan has respect for his coach. Please respect your elders.
68. oil: Our car needs an oil change. Chad will oil his bike chain.
69. dress: Katie bought a new dress. Tina will dress her doll in a bathing suit.
70. thunder: I heard thunder last night. Maybe it will thunder again tonight.
71. snap: My jeans have a snap on them. Jenna will snap her coat.
72. paper: I bought a ream of white paper. We will paper the bathroom.
73. board: The man sawed a board. Board up the windows for the hurricane.
74. snow: Last winter, we had 72" of snow. It will snow again this week.
75. field: The farmer planted his field. The 2nd baseman will field the ball.
76. stop: There is a stop sign. The policeman will stop the car for speeding.
77. hope: Our hope is that you will get well. Adam hopes he will get a pickup.
78. wash: I did 3 loads of wash. Go and wash the van, please.
79. hit: The boxer took a hit to the face. That house got hit by a tornado.
80. flood: There was a flood, in Madison, in 1993. Every spring it floods.
81. raise: The employee would like a raise. On Memorial Day we raise the flag.
82. soil: The farm has fertile soil. Chad will soil his shirt digging in the dirt.
83. pin: Does anyone have a safety pin? I will pin up the hem on your jeans.
84. picture: I bought a picture for my house. Picture a rainbow in your mind.
85. mark: You made a mark on the wall. Mark where you are in your book.
86. spy: Larry hired a spy to solve the murder of his wife. I spy a butterfly.
87. crown: The queen is wearing her crown. The king will crown his son.
88. spell: The witch will cast a spell on you. Riley can spell his name.
89. hold: Grab a hold of the line. The mother will hold her baby to nurse.
90. fool: What a fool he is for smoking. Jerry tried to fool his teacher.
91. skate: Katie got new ice skates. She will skate for 2 hours this Saturday.
92. attack: William had a heart attack. The army will attack the enemy.
93. lounge: Look in the teacher's lounge. Can we lounge around today?
94. shovel: Gary bought a new shovel. Adam shovels snow for the neighbors.
95. pump: My grandma had a water pump. She had to pump water daily.
96. jerk: He is a real jerk. The fish will jerk your line.
97. grin: The model has a nice grin. Wipe that grin off your face.
98. rub: I need a back rub. Try to rub the spot of the carpet.
99. dream: Last night I had a dream. Sometimes I dream about you.
100. drill: Gary used a drill to make the hole. Can you drill a hole in this board?

101. <u>roast</u>: Tam made a roast for supper. Tom will roast the turkey in the oven.
102. <u>trade</u>: Painting is a trade. I will trade football cards with you.
103. <u>doctor</u>: Kristen went to the doctor. The nurse will doctor your injury.
104. <u>fish</u>: Bill caught a 10 lb. fish. He likes to fish for walleyes.
105. <u>help</u>: Do you need any help? Katie will help you with math.
106. <u>crowd</u>: There was a crowd at the mall. Try not to crowd in line.
107. <u>bowl</u>: Put the ingredients in the bowl. Gary will bowl tonight.
108. <u>joke</u>: The comedian told a joke. Don't joke about someone's health.
109. <u>roll</u>: Please pass the rolls. Jayden can roll over now.
110. <u>chain</u>: Put the chain around the tree. Chain Kassie up to the tree.
111. <u>signal</u>: Stop at the signal. Signal when you are going to turn.
112. <u>mistake</u>: Everyone makes mistakes. People mistake me for Tam.
113. <u>harm</u>: The tornado did a lot of harm. Smoking harms your lungs.
114. <u>blossom</u>: The blossom is a pretty pink. The flower will blossom soon.
115. <u>whistle</u>: The referee blew his whistle. Matt will whistle when he is ready.
116. <u>junk</u>: Katie likes to collect junk. I will junk this old bike.
117. <u>patch</u>: Mary put a patch on her shirt. Ann will patch her jeans.
118. <u>master</u>: Slaves worked for their master. Mason will master his numbers.
119. <u>guard</u>: The guard policed the prison. Guard your valuables on a trip.
120. <u>beach</u>: Let's go to the beach. The whale will beach himself on the beach.
121. <u>report</u>: I wrote a report on AIDS. Please report to the principal's office.
122. <u>drug</u>: Don't take drugs. The doctor will drug his patient before surgery.
123. <u>salt</u>: Adam likes salt on his popcorn. Katie will salt it for him.
124. <u>wiggle</u>: That girl has a wiggle when she walks. Don't wiggle in your chair.
125. <u>hammer</u>: Tom bought a new hammer. Try to hammer the nail in the wood.
126. <u>scare</u>: I had a scare when I fell. The storm will scare Bill.
127. <u>notice</u>: Put the notice on the bulletin board. I notice you have a new dress.
128. <u>share</u>: This is your share of the candy. Kristen will share her clothes.
129. <u>trust</u>: We put money in the trust fund. Parents want to trust their children.
130. <u>light</u>: Turn on the light. This candle will light our way.

What is the word for a word that has multiple meanings based upon how it is pronounced e.g. minute (as in 60 seconds) or minute (as in very, very small)?

The word you are looking for is **homograph**. This covers words spelt in the same way but of different meaning or origins (e.g. *pole* =piece of wood or metal and *pole* as in *North Pole*, as well as words of identical spelling but different pronunciation (e.g. *lead* noun and *lead* verb).

Punctuation/Capitalization/Spelling

Brief Overview of Punctuation: Semicolon, Colon, Parenthesis, Dash, Quotation Marks, and Italics

http://owl.english.purdue.edu

Punctuation marks are signals to your readers. In speaking, we can pause, stop, or change our tone of voice. In writing, we use the following marks of punctuation to emphasize and clarify what we mean. Punctuation marks discussed in other OWL documents include commas at http://owl.english.purdue.edu/handouts/grammar/g_comma.html, apostrophes at http://owl.english.purdue.edu/handouts/grammar/g_apost.html, quotation marks at http://owl.english.purdue.edu/handouts/grammar/g_quote.html, and hyphens at http://owl.english.purdue.edu/handouts/grammar/g_hyphen.html.

Semicolon ;

In addition to using a semicolon to join related independent clauses in compound sentences, you can use a semicolon to separate items in a series if the elements of the series already include commas. (For more help with independent clauses, look here: http://owl.english.purdue.edu/handouts/grammar/g_clause.html.)

embers of the band include Harold Rostein, clarinetist; Tony Aluppo, tuba player; and Lee Jefferson, trumpeter.

Colon :

Use a colon . . .

in the following situations:	for example:
after a complete statement in order to introduce one or more directly related ideas, such as a series of directions, a list, or a quotation or other comment illustrating or explaining the statement.	The daily newspaper contains four sections: news, sports, entertainment, and classified ads. The strategies of corporatist industrial unionism have proven ineffective: compromises and concessions have left labor in a weakened position in the new "flexible" economy.
in a business letter greeting.	Dear Ms. Winstead:
between the hour and minutes in time notation.	5:30 p.m.
between chapter and verse in biblical references.	Genesis 1:18

Parentheses ( )

Parentheses are occasionally and sparingly used for extra, nonessential material included in a sentence. For example, dates, sources, or ideas that are subordinate or tangential to the rest of the sentence are set apart in parentheses. Parentheses always appear in pairs.

> efore arriving at the station, the old train (someone said it was a relic of frontier days) caught fire.

Dash --

Use a dash (represented on a typewriter, a computer with no dashes in the type font, or in a handwritten document by a pair of hyphens with no spaces) . . .

in the following situations:	for example:
to emphasize a point or to set off an explanatory comment; but don't overuse dashes, or they will lose their impact.	To some of you, my proposals may seem radical--even revolutionary. In terms of public legitimation--that is, in terms of garnering support from state legislators, parents, donors, and university administrators--English departments are primarily places where advanced literacy is taught.
for an appositive phrase that already includes commas.	The boys--Jim, John, and Jeff--left the party early.

For more help with appositives, look here:
http://owl.english.purdue.edu/handouts/grammar/g_appos.html

As you can see, dashes function in some ways like parentheses (used in pairs to set off a comment within a larger sentence) and in some ways like colons (used to introduce material illustrating or emphasizing the immediately preceding statement). But comments set off with a pair of dashes appear less subordinate to the main sentence than do comments in parentheses. And material introduced after a single dash may be more emphatic and may serve a greater variety of rhetorical purposes than material introduced with a colon.

Quotation Marks " "

Use quotation marks . . .

in the following situations:	for example:
to enclose direct quotations. Note that commas and periods go inside the closing quotation mark in conventional American usage; colons and semicolons go outside; and placement of question and exclamation marks depends on the situation (see our quotation marks document).	He asked, "Will you be there?" "Yes," I answered, "I'll look for you in the foyer."
to indicate words used ironically, with reservations, or in some unusual way; but don't overuse quotation marks in this sense, or they will lose their impact.	History is stained with blood spilled in the name of "civilization."

Underlining and *Italics*

Underlining and italics are not really punctuation, but they are significant textual effects used conventionally in a variety of situations. Before computerized word-processing was widely available, writers would underline certain terms in handwritten or manually typed pages, and the underlining would be replaced by italics in the published version.

in the following situations:	for example:
to indicate titles of complete or major works such as magazines, books, newspapers, academic journals, films, television programs, long poems, plays of three or more acts	Faulkner's last novel was *The Reivers*. The Simpson's offers hilarious parodies of American culture and family life.
foreign words that are not commonly used in English	Wearing blue jeans is *de rigueur* for most college students.
words used as words themselves	The English word nuance comes from a Middle French word meaning "shades of color."
words or phrases that you wish to emphasize	The very *founding principles* of our nation are at stake!

Capitals

Use capital letters in the following ways:

• The first words of a sentence

example When he tells a joke, he sometimes forgets the punch line.

• The pronoun "I"

example The last time I visited Atlanta was several years ago.

• Proper nouns

(the names of specific people, places, organizations, and sometimes things)

examples

Worrill Fabrication Company	Livingston, Missouri
Golden Gate Bridge	Atlantic Ocean
Supreme Court	Mothers Against Drunk Driving

• Family relationships

(when used as proper names)

examples

I sent a thank-you note to Aunt Abigail, but not to my other aunts.

Here is a present I bought for Mother.

Did you buy a present for your mother?

• The names of God, specific deities, religious figures, and holy books

examples:

God the Father	Moses
the Virgin Mary	Shiva
the Bible	Buddha
the Greek gods	Zeus

Exception: Do not capitalize the non-specific use of the word "god."

example: The word "polytheistic" means the worship of more than one god.

◦ Titles preceding names, but not title that follow names

examples

She worked as the assistant to Mayor Hanolovi.

I was able to interview Miriam Moss, mayor of Littonville.

◦ Directions that are names

(North, South, East, and West when used as sections of the country, but not as compass directions)

examples

The Patels have moved to the Southwest.

Jim's house is two miles north of Otterbein.

◦ The days of the week, the months of the year, and holidays

(but not the seasons used generally)

examples

Halloween	winter
October	spring
Friday	fall

Exception: Seasons are capitalized when used in a title.

example: The Fall 1999 semester

◦ The names of countries, nationalities, and specific languages

examples

Costa Rica	French
Spanish	English

◦ The first word in a sentence that is a direct quote

example Emerson once said, "A foolish consistency is the hobgoblin of little minds."

◦ The major words in the titles of books, articles, and songs

(but not short prepositions or the articles "the," "a," or "an," if they are not the first word of the title)

example One of Ringo's favorite books is The Catcher in the Rye.

◦ Members of national, political, racial, social, civic, and athletic groups

examples:

Green Bay Packers	Democrats

◦ Periods and events

(but not century numbers)

examples:

Victorian Era	Constitutional Convention
Great Depression	sixteenth century

◦ Trademarks

examples:

Pepsi	IBM
Honda	Microsoft Word

◦ Words and abbreviations of specific names

(but not names of things that came from specific things but are now general types)

examples:

Freudian	UN
NBC	french fries
pasteurize	italics

Spelling

http://owl.english.purdue.edu/handouts/grammar/g_spelhomo.html

Forms to remember

Accept, Except

- **accept** verb meaning to receive or to agree: He **accepted** their praise graciously.
- **except** preposition meaning all but, other than: Everyone went to the game **except** Alyson.

For more information on these words, plus exercises, see our document on accept/except and affect/effect.

Affect, Effect

- **affect** verb meaning to influence: Will lack of sleep **affect** your game?
- **effect** noun meaning result or consequence: Will lack of sleep have an **effect** on your game?
- **effect** verb meaning to bring about, to accomplish: Our efforts **have effected** a major change in university policy.

A memory-help for affect and effect is **RAVEN**: **R**emember, **A**ffect is a **V**erb and **E**ffect is a **N**oun.

For more information on these words, plus exercises, see our document on accept/except and affect/effect.

Advise, Advice

- **advise** verb that means to recommend, suggest, or counsel: I **advise** you to be cautious.
- **advice** noun that means an opinion or recommendation about what could or should be done: I'd like to ask for your **advice** on this matter.

Conscious, Conscience

- **conscious** adjective meaning awake, perceiving: Despite a head injury, the patient remained **conscious**.
- **conscience** noun meaning the sense of obligation to be good: Chris wouldn't cheat because his **conscience** wouldn't let him.

Idea, Ideal

- **idea** noun meaning a thought, belief, or conception held in the mind, or a general notion or conception formed by generalization: Jennifer had a brilliant **idea** -- she'd go to the Writing Lab for help with her papers!
- **ideal** noun meaning something or someone that embodies perfection, or an ultimate object or endeavor: Mickey was the **ideal** for tutors everywhere.
- **ideal** adjective meaning embodying an ultimate standard of excellence or perfection, or the best; Jennifer was an **ideal** student.

Its, It's

- **its** possessive adjective (possesive form of the pronoun it): The crab had an unusual growth on **its** shell.
- **it's** contraction for it is or it has (in a verb phrase): **It's** still raining; **it's** been raining for three days. (Pronouns have apostrophes only when two words are being shortened into one.)

Lead, Led

- **lead** noun referring to a dense metallic element: The X-ray technician wore a vest lined with **lead**.
- **led** past-tense and past-participle form of the verb to lead, meaning to guide or direct: The evidence **led** the jury to reach a unanimous decision.

Than, Then

Than	used in comparison statements: He is richer **than** I. used in statements of preference: I would rather dance **than** eat. used to suggest quantities beyond a specified amount: Read more **than** the first paragraph.
Then	a time other than now: He was younger **then**. She will start her new job **then**. next in time, space, or order: First we must study; **then** we can play. suggesting a logical conclusion: If you've studied hard, **then** the exam should be no problem.

Their, There, They're

- **Their** possessive pronoun: They got **their** books.
- **There** that place: My house is over **there**. (This is a place word, and so it contains the word here.)
- **They're** contraction for they are: **They're** making dinner. (Pronouns have apostrophes only when two words are being shortened into one.)

To, Too, Two

- **To** preposition, or first part of the infinitive form of a verb: They went **to** the lake **to** swim.
- **Too** very, also: I was **too** tired to continue. I was hungry, **too**.
- **Two** the number 2: **Two** students scored below passing on the exam.

Two, twelve, and between are all words related to the number 2, and all contain the letters tw.
Too can mean also or can be an intensifier, and you might say that it contains an extra o ("one too many")

We're, Where, Were

- **We're** contraction for we are: **We're** glad to help. (Pronouns have apostrophes only when two words are being shortened into one.)
- **Where** location: **Where** are you going? (This is a place word, and so it contains the word here.)
- **Were** = a past tense form of the verb be: They **were** walking side by side.

Your, You're

- **Your** possessive pronoun: **Your** shoes are untied.
- **You're** contraction for you are: **You're** walking around with your shoes untied. (Pronouns have apostrophes only when two words are being shortened into one.)

One Word or Two?

All ready/already

- **all ready**: used as an adjective to express complete preparedness
- **already**: an adverb expressing time

At last I was **all ready** to go, but everyone had **already** left.

All right/alright

- **all right**: used as an adjective or adverb; older and more formal spelling, more common in scientific academic writing: Will you be **all right** on your own?
- **alright**: Alternate spelling of all right; less frequent but used often in journalistic and business publications, and especially common in fictional dialogue: He does **alright** in school.

All together/altogether

- **all together**: an adverb meaning considered as a whole, summed up: **All together**, there were thirty-two students at the museum.
- **altogether**: an intensifying adverb meaning wholly, completely, entirely: His comment raises an **altogether** different problem.

Anyone/any one

- **anyone**: a pronoun meaning any person at all: **Anyone** who can solve this problem deserves an award.
- **any one**: a paired adjective and noun meaning a specific item in a group; usually used with of: **Any one** of those papers could serve as an example.

Note: There are similar distinctions in meaning for everyone and every one

Anyway/any way

- **anyway**: an adverb meaning in any case or nonetheless: He objected, but she went **anyway**.
- **any way**: a paired adjective and noun meaning any particular course, direction, or manner: **Any way** we chose would lead to danger.

Awhile/a while

- **awhile**: an adverb meaning for a short time; some readers consider it nonstandard; usually needs no preposition: Won't you stay **awhile**?
- **a while**: a paired article and noun meaning a period of time; usually used with for: We talked for **a while**, and then we said good night.

Maybe/may be

- **maybe**: an adverb meaning perhaps: **Maybe** we should wait until the rain stops.
- **may be**: a form of the verb be: This **may be** our only chance to win the championship.

Words that Sound Alike Practice

http://owl.english.purdue.edu/handouts/interact/g_spelhomoEX1.html

Accept and Except

ac•cept (transitive verb) [Middle English, from Middle French *accepter*, from Latin *acceptare*, frequentative of *accipere* to receive, from *ad-* toward + *capere* to take]

a: to receive willingly <*accept* a gift b: to be able or designed to take or hold (something applied or added) <a surface that will not *accept* ink

2: to give admittance or approval <to *accept* her as one of the group>

3a: to endure without protest or reaction <*accept* poor living conditions> b: to regard as proper, normal, or inevitable <the idea is widely *accepted*> c: to recognize as true; believe <refused to *accept* the explanation>
4a: to make a favorable response to <*accept* an offer> b: to agree to undertake (a responsibility) <*accept* a job>
5: to assume an obligation to pay; also: to take in payment <we don't *accept* personal checks>

1. ex•cept (preposition) [Originally past participle; see meaning 3, below] with the exclusion or exception of <open daily *except* Sundays>

2. ex•cept (conjunction)

: on any other condition than that; unless <you face punishment *except* if you repent
2: with the following exception <was inaccessible *except* by boat
3: only (often followed by that) <I would go *except* that it's too far

3. ex•cept (transitive verb) [Latin *exceptus*, past participle of *excipere* to take or draw out, to except; *ex-* out + *capere* to take]

To take or leave out (anything) from a number or a whole; to exclude; to omit <if we only *except* the unfitness of the judge, the trial was a perfect enactment of justice <Adam and Eve were forbidden to touch the *excepted* tree (past participle)

Would you like to try an interactive exercise on using *accept* and *except* correctly?

Affect and Effect

Affect

1. af•fect (transitive verb) [Middle English, from *affectus*, past participle of *afficere*]

to produce an effect upon, as a: to produce a material influence upon or alteration in <paralysis *affected* his limbs b: to act upon (as a person or a person's mind or feelings) so as to bring about a response; influence

Effect

1. ef•fect (noun) [Middle English, from Middle French & Latin; Middle French, from Latin *effectus*, from *efficere* to bring about, from *ex-* out (of) + *facere* to make, do]

a: purport; intent <the *effect* of their statement was to incite anger b: basic meaning; essence <her argument had the *effect* of a plea for justice
2: something that inevitably follows an antecedent (as a cause or agent) <environmental devastation is one *effect* of unchecked industrial expansion
3: an outward sign; appearance <the makeup created the *effect* of old age on their faces
4: accomplishment; fulfillment <the *effect* of years of hard work
5: power to bring about a result; influence <the content itself of television is therefore less important than its *effect*
6 plural: movable property; goods <personal *effects*
7a: a distinctive impression <the color gives the *effect* of being warm b: the creation of a desired impression <her tears were purely for *effect* c (1): something designed to produce a distinctive or desired impression, usually used in plural (2) plural: *special effects*
: the quality or state of being operative; operation <the law goes into *effect* next week

in effect: in substance; virtually <the committee agreed to what was *in effect* a reduction in the hourly wage>
to the effect: with the meaning <issued a statement *to the effect* that he would resign>

Meanings for less common uses:

Affect:

2. af•fect (transitive verb)

1: to make a display of liking or using; cultivate <*affect* a worldly manner
2: to put on a pretense of; feign <*affect* indifference, though deeply hurt

3. af•fect (noun) [pronunciation: stress on first syllable, unlike verb forms of this word]
the conscious subjective aspect of an emotion considered apart from bodily changes <he displayed a distressing lack of *affect*

Effect

2. ef•fect (transitive verb)

1: to cause to come into being <the citizens were able to *effect* a change in government policy
2a: to bring about often by surmounting obstacles; accomplish <*effect* a settlement of a dispute b: to put into operation <the duty of the legislature to *effect* the will of the citizens

Usage: The confusion of the verbs *affect* and *effect* not only is quite common but has a long history. The verb *effect* was used in place of *affect* (1, above) as early as 1494 and in place of *affect* (2, above) as early as 1652. If you think you want to use the verb *effect* but are not certain, check the definitions here. The noun *affect* is sometimes mistakenly used for the noun *effect*. Except when your topic is psychology, you will seldom need the noun *affect*.

Would you like to try an interactive exercise on using *affect* and *effect* correctly?

Correct Word Usage

Word Usage Guide

This list contains some terms or words often confused or misused. Familiarize yourself with these and use them appropriately in your writing.
http://www.wsu.edu:8080/~brians/errors/errors.html

http://www.pnl.gov/ag/usage/confuse.html

A, AN Use *an* before a vowel sound; use *a* before a consonant sound.
Examples: *an apple, a pear, an hour, a horse*

ADDITIONALLY Don't use *additionally* to substitute for *in addition*.
Original: *Additionally, we would like to see your January report.*

Revision: *In addition, we would like to see your January report.*

AFFECT, EFFECT *Effect* can be either a noun or a verb; *affect* can only be a verb (except in the specialized jargon of psychology). As a verb, *effect* means "to bring about." As a verb *affect* means "to have an impact on."

Examples: *The* ***effect*** *of his decision was far reaching.* ***(verb)***

His decision ***effected*** *vast changes in the company.* ***(noun)***

His decision ***affected*** *every employee in the company.* ***(verb)***

ALL RIGHT, ALRIGHT *Alright* does not exist as a word; the correct term is *all right.*

ALMOST, MOST Do not use *most* as a substitute for *almost.*

Original: *I eat ice cream most every day for dessert.*

Revision A: I *eat ice cream almost every day for dessert.*

Revision B: M*ost days, I eat ice cream for dessert.*

AMOUNT, NUMBER Use *amount* with things thought of in bulk (that you can't count), and use *number* with things thought of as individual items (that you can count).

Examples: *The number of mistakes in the report was astonishing.*

The amount of homework in that course is enormous.

CRITERIA, CRITERION Remember that *criteria* is plural; the singular form of the word is *criterion.*

FEWER, LESS Be sure to use the correct one of these two words. *Fewer* refers to items you can count, like bricks; *less* refers to mass amounts (things you can't count).

Examples: *This line is for people buying fewer than ten items.*
We had less rain than usual last year.

FIRST, FIRSTLY *Firstly* – like *secondly, thirdly, lastly,* etc. – is an unnecessary attempt to add the "ly" form to an adverb. *First, last, second,* etc. can be adverbs in their own right.

Original: *Firstly, I'll explain the rules. Secondly, we'll try the exercise.*

Revision: *First, I'll explain the rules. Second, we'll try the exercise.*

HOPEFULLY Do not use *hopefully* as a sort of whole-clause modifier. When you do, *hopefully* is a dangling modifier.

Original: *Hopefully, the booklet will contain all the answers you need.*

Revision A: *We hope the booklet will contain all the answers you need.*

Revision B: *Gazing at me hopefully, Sandy said, "May I have a cookie?"*

I.E., E.G. Always be sure that you're using the correct one of these two Latin abbreviations:

- *i.e.* is the abbreviation for *id est*, and it means "that is."
- *e.g.* is the abbreviation for *exempli gratia*, meaning "for example."
- Of course, you could always just stick to the good old English equivalents – *that is* and *for example*.

INSURE, ENSURE Both of these words mean "to make secure or certain." Use *insure* if you're writing about insurance, guaranteeing the value of life or property; use *ensure* other times when you mean "to make secure from harm."

ITS, IT'S, ITS' Be sure to use the correct word:

- *It's* is the contraction meaning "it is."
- *Its* is the personal pronoun meaning "belonging to it."
- *Its'* is NOT A WORD!

PLAN ON *Plan on* plus an "ing" verb is a colloquialism for *plan to* plus a verb.

Original: *I plan on graduating next year.* Revision: *I plan to graduate next year.*

REASON IS BECAUSE *Reason is because* is a colloquial expression that people use when they mean *reason is that.*

Original: *The reason is because our sales force is very aggressive.*

Revision: *The reason is that our sales force is very aggressive.*

SET UP, SETUP Use the correct form.

- *Setup* is one word when it's used as a noun or adjective:

Setup instructions were in the box. The setup took two hours.

- *Set up* is two words when it's used as a verb:

We will set up for the meeting after work hours on Friday.

SHALL, WILL At one time, *shall* was used for first-person constructions and *will* was used for second- and third- person (*I shall go; he will go*). This distinction has largely passed from vogue, and now *will* is usually considered correct with all persons (*I will go; he will go*). However, *shall* is still used with all persons to emphasize determination, as in the following: *Employees shall submit a written reason for all work absences.* The use of *shall* in contracts signifies a legal requirement.

TRY AND *Try and* is colloquial for *try to.*

Original: *I will try and be there early.*

Revision: *I will try to be there early.*

WHILE Use *while* to mean "during the time that." To avoid confusion, do not substitute *while* for connectives like *and, but*, or *although.*

Original: *John is sales manager, while Joan is in charge of research.*

Revision: *John is sales manager, and Joan is in charge of research.*

Original: *While Joe wants the day off, he has not yet asked for* it.

Revision: *Although Joe wants the day off, he has not yet asked for it.*

WHO, WHOM Use *who* as a subject (where you could substitute "he" or "they"); use *whom* as an object (where you could substitute "him" or "them").

Examples: ***Who** is the leader?* (Compare: ***He** is the leader.*)

*The class is for people **who** will graduate soon.* (*...**they** will graduate...*)

Whom** should we blame?* (*We should blame **him.)

*For **whom** did you order the pizza?* (*You ordered the pizza for **them**.*) *She is the leader **whom** we trust. (We trust **her**...)*

Correct Sentence Combination

For short, choppy sentences

1. Coordination:

and, but, or, nor, yet, for, so

Join complete sentences, clauses, and phrases with coordinators:

example: Doonesbury cartoons satirize contemporary politics. The victims of political corruption pay no attention. They prefer to demand that newspapers not carry the strip.
revision: Doonesbury cartoons laugh at contemporary politicians, **but** the victims of political corruption pay no attention **and** prefer to demand that newspapers not carry the strip.

2. Subordination: http://owl.english.purdue.edu/handouts/general/subordination

after, although, as, as if, because, before, even if, even though, if, if only, rather than, since, that, though, unless, until, when, where, whereas, wherever, whether, which, while

Link two related sentences to each other so that one carries the main idea and the other is no longer a complete sentence (subordination). Use connectors such as the ones listed above to show the relationship.

example: The campus parking problem is getting worse. The university is not building any new garages.
revision: The campus parking problem is getting worse **because** the university is not building any new garages.

example: The US has been overly dependent on foreign oil for many years. Alternate sources of energy are only now being sought.
revision: **Although** the US has been overly dependent on foreign oil for many years, alternate sources are only now being sought.

Notice in these examples that the location of the clause beginning with the dependent marker (the connector word) is flexible. This flexibility can be useful in creating varied rhythmic patterns over the course of a paragraph. See the section below under "For the same pattern or rhythm in a series of sentences."

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1. Relative pronouns

which, who, whoever, whom, that, whose

Embed one sentence inside the other using a clause starting with one of the relative pronouns listed above.

example: Indiana used to be mainly an agricultural state. It has recently attracted more industry.
revision: Indiana, **which** used to be mainly an agricultural state, has recently attracted more industry.

example: One of the cameras was not packed very well. It was damaged during the move.
revision: The camera **that** was not packed very well was damaged during the move.

example: The experiment failed because of Murphy's Law. This law states that if something can go wrong, it will.
revision: The experiment failed because of Murphy's Law, **which** states that if something can go wrong, it will.

example: Doctor Ramirez specializes in sports medicine. She helped my cousin recover from a basketball injury.
revision 1: Doctor Ramirez, **who** specializes in sports medicine, helped my cousin recover from a basketball injury.
revision 2: Doctor Ramirez, **whose** specialty is sports medicine, helped my cousin recover from a basketball injury.

2. Participles

Present participles end in *-ing*, for example: speaking, carrying, wearing, dreaming.

Past participles usually end in *-ed*, *-en*, *-d*, *-n*, or *-t* but can be irregular, for example: worried, eaten, saved, seen, dealt, taught.

For more on participles, see our handout on verbals.

Eliminate a **be** verb (am, is, was, were, are) and substitute a participle.

example: Wei Xie was surprised to get a phone call from his sister. He was happy to hear her voice again.
revision 1: Wei Xie, surprised to get a phone call from his sister, was happy to hear her voice again.
revision 2: Surprised to get a phone call from her, Wei Xie was happy to hear his sister's voice again.

3. Prepositions

about, above, across, after, against, along, among, around, as, behind, below, beneath, beside, between, by, despite, down, during, except, for, from, in, inside, near, next to, of, off, on, out, over, past, to, under, until, up, with

Turn a clause into a prepositional phrase (a phrase beginning with a preposition, such as the ones listed above).

example 1: The university has been facing pressure to cut its budget. It has eliminated funding for important programs. (two independent clauses)
example 2: The university, which has been facing pressure to cut its budget, has eliminated funding for important programs. (subject, relative clause, predicate)
example 3: Because it has been facing pressure to cut its budget, the university has eliminated funding for important programs. (dependent clause, independent clause)
revised: **Under** pressure to cut its budget, the university has eliminated funding for important programs. (prepositional phrase, independent clause: the most concise version of the four)

For the same pattern or rhythm in a series of sentences

1. Dependent markers

See the list of dependent markers above under "Subordination."

Put clauses and phrases with dependent markers at the beginning of some sentences instead of starting each sentence with the subject. In this example the structure and content of the sentences remains the same, but some elements are moved around to vary the rhythm.

example: The room fell silent when the TV newscaster reported the story of the earthquake. We all stopped what we were doing. The pictures of the quake shocked us. We could see that large sections of the city had been completely destroyed.
revised: When the TV newscaster reported the story of the earthquake, the room fell silent. We all stopped what we were doing. The pictures of the quake shocked us because we could see that large sections of the city had been completely destroyed.

2. Transitional words and phrases

accordingly, after all, afterward, also, although, and, but, consequently, despite, earlier, even though, for example, for instance, however, in conclusion, in contrast, in fact, in the meantime, in the same way, indeed, just as... so, meanwhile, moreover, nevertheless, not only... but also, now, on the contrary, on the other hand, on the whole, otherwise, regardless, shortly, similarly, specifically, still, that is, then, therefore, though, thus, yet

Vary the rhythm by adding transitional words at the beginning of some sentences.

example: Fast food corporations are producing and advertising bigger items and high-fat combination meals. The American population faces a growing epidemic of obesity.
revised: Fast food corporations are producing and advertising bigger items and high-fat combination meals. Meanwhile, the American population faces a growing epidemic of obesity.

Vary the rhythm by alternating short and long sentences.

example: They visited Canada and Alaska last summer to find some native American art. In Anchorage stores they found some excellent examples of soapstone carvings. But they couldn't find a dealer selling any of the woven wall hangings they wanted.
revised: They visited Canada and Alaska last summer to find some native American art, such as soapstone carvings and wall hangings. Anchorage stores had many soapstone items available. Still, they were disappointed to learn that wall hangings, which they had especially wanted, were difficult to find.

Part 3

Ability to Assist

Ability to Assist

Instructional Aide Worker Qualities

Purpose of Classification:

Works with children and/or adults to provide intervention and/or instructional or supervisory services to foster emotional and educational development. Follows program plan as developed by supervisor. Incumbents in this classification may perform their work in classrooms or in homes.

Distinguishing Characteristics:

This is a specialized classification and not part of a series.

Example of Duties:

- Administers assessment tests to children and/or adults used in development of individualized program plans for physical, mental and/or educational activities.

- Arranges times to visit client at home; initiates activities of individualized program plan.

- Collects data and maintains documentation on child's progress regarding each area of training such as cognitive, physical and recognition.

- Plans and prepares lesson plans for group activities and gathers necessary materials and supplies required; employs various teaching methods to promote learning and implement activities.

- Participates in monthly meetings between parents and program coordinator.

- Assists in teaching parents how to work with their children in order to foster educational and emotional development; assists classroom teacher with special projects or activities.

- Assists with teacher directed activities by operating audiovisual equipment, distributing classroom materials or monitoring activities of children.

- Assists adult or parents of child in completing necessary forms for participation in programs.

- Maintains classroom which includes cleaning tables and chalkboards and sweeping floors.

Knowledge, Skills and Abilities:

- Skill in developing activities to enhance child development.

- Skill in working with children

- Ability to effectively communicate.

Minimum Qualifications:

- One year instructional aide or related experience; OR

- Any equivalent combination of experience, training and/or education approved by Human Resources.

This description is intended to be generic in nature. It is not intended to determine specific duties and responsibilities of any particular position. Essential functions and overtime eligibility may vary based on the specific tasks assigned to the position.

Discipline Philosophy/Behavior Guidelines

The traditional school is based on the assumption that learning best takes place in a structured and disciplined atmosphere. The best form of discipline is self-discipline. It is hoped that in the school society each student will develop a strong sense of self-discipline. Self-discipline frees an individual from external constraints that control and direct him or her.

To help each child develop self-discipline, the school will emphasize obedience to authority as well as independence. In adult society, not everyone is self-disciplined; therefore laws and regulations have been established to protect the rights of individuals. Students should understand that, at times, what seems best for the group takes precedence over what seems best for the individual. Students should understand that rules are necessary when people live together, and that rules should be respected. When self-control is not evident, external control will become necessary.

The school needs the support of the parents if this is to work effectively.

A. Parent/Guardian Responsibilities.

1. To teach the child self-discipline and respect for authority.
2. To see that the child attends school regularly and on time.
3. To see that the child is prepared and has the necessary materials.
4. To familiarize the child with the discipline policy and regulations.
5. To provide the school with a current telephone number through which he/she can be reached during the school day.
6. To come to the school to get the child when necessary.
7. To be available for conferences when necessary.
8. To cooperate with the school for the benefit of the child.
9. To encourage the student to report to the proper person (teacher, principal, etc.) any problems that develop, rather than resorting to hitting, etc.

B. Student Responsibilities.

1. To be aware of and follow system-wide policy and regulations and school guidelines for acceptable behavior.
2. To refrain from disruptive behavior, which may interfere with a teacher's right to teach and a student's right to learn.
3. To refrain from: physical force, verbal abuse, threats, blackmail.
4. To seek clarification from school personnel concerning the appropriateness of any action or behavior.
5. To attend classes regularly and punctually with necessary materials and preparation.
6. To follow policy and regulations for every event considered part of the school program regardless of the time or place.
7. To report problems that develop (instead of hitting, name-calling, etc.) to resolve a problem.

C. Prohibited Behaviors Could Result in Exclusion from School

USD 259 Board Policy P5113 states the following:
The principal or designee may suspend or propose to expel a pupil from school for any of the following reasons:

a) Willful violation of any published regulation for pupil conduct adopted or approved by the BOE or developed and promulgated by an individual school.
b) Conduct which substantially disrupts, impedes, or interferes with the operation of any public school.
c) Conduct which substantial impinges upon or invades the rights of others.
d) Conduct which has resulted in the conviction of the pupil for any offense specified in Chapter 21 of the Kansas Statutes Annotated or any criminal statute of the United States.
e) Disobedience of an order of a teacher, peace officer, school security officer, or any school authority when such disobedience can reasonable be anticipated to result in disorder, disruption, or interference with the operation of any public school or substantial and material impingement upon or invasion of the rights of others.

f) Any student who brings or is found to be in possession of a dangerous weapon, or who places a person in fear of bodily harm with a dangerous weapon or a weapon on school premises before, during, or after school or at any school sponsored activity (See BOE policies 1462, Assault and Battery of Staff, Policy 1465, Pupil Behavior-Alcohol, Drugs, Drug Paraphernalia and/or Other Controlled Substances, and Policy 1466 Possession or Use of Weapons. Copies of these policies may be obtained from school).

D. Recommended Course of Action for Teachers

The teacher will:

1. Discuss the matter with the student and unless the seriousness of the offense merits immediate action, warn the student that continued misbehavior will result in the loss of certain privileges.
2. Proceed, as appropriate, with any of the following corrective actions if misbehavior continues:
3. Isolate within the classroom.
4. Have the child write a letter to parent concerning misbehavior.
5. Have the child call parent at home or work to explain misbehavior.
6. Detain child after school, provided adequate prior arrangements have been made with a parent/guardian.
7. Any other acceptable action as adopted by the school staff: loss of playtime, not allowed to participate in group activities, etc.
8. Withhold privileges. (No student may be denied the right to participate in any part of the instructional program or to have a lunch period).
9. Isolate outside of the classroom in a location away from the classroom and under supervision for a maximum of one hour. Records are to be kept of all times that students are outside of the classroom for disciplinary reasons.
10. Contact parent by telephone/letter for input and cooperation when necessary.
11. Consult with the principal concerning misbehavior.
12. Refer child to the principal for further corrective action.

Reading Charts

http://curry.edschool.virginia.edu/go/readquest/strat/home.html

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ABC Brainstorm

[instructions | print chart]

brainstorming activity, using letters of the alphabet

Carousel Brainstorming

[instructions]

brainstorm similar to graffiti strategy

Clock Buddies

[instructions | print chart]

a quick partnering system

Column Notes

[instructions]

a learning guide arranged in columns

Comparison-Contrast Charts

[instructions | print chart]

often found in graphic organizer form, a chart for comparing two concepts by looking at the ways they are similar and how they are different

Concept of Definition Map

[instructions | print map]

a visually organized word chart for expanding the concept of meaning and enriching one's understanding of an unfamiliar term

Graphic Organizers

[instructions]

visual organization of information, whether for levels of information, sequence or ordering, or relationships; often called concept maps, webs, clusters, or pictorial organizers

History Frames/Story Maps

[instructions | print history frame | print story map | print story pyramid | print character/plot chart | print cross-disciplinary applications]

based on the story maps that many students already use in English and Language Arts, the history frame is a graphic organizer that looks at key actors, time & place of events, problem or goal, key events, outcome, and larger relevance

Inquiry Chart

[instructions | print chart]

a variation of column notes and learning guides, inquiry charts are used specifically to generate questions whose answers will come from combing through a variety of sources

K - W - L

[instructions | print K-W-L chart | print modified K-W-L chart]

a three-column chart for approaching new content and actively engaging in it; contains components for before, during, and after reading activity

Opinion-Proof

[instructions | print chart]

a two-column chart where students seek to provide support or evidence from the content to bolster an opinion they have put forward

Power Thinking

[instructions]

an alternative system of outlining, power thinking involves assigning "Power" levels to information according to whether it is a main idea, subtopic, or detail

Problem-Solution Chart

[instructions | print chart]

a two-column chart that is especially helpful for looking at cause and effect; its components invite students to consider consequences, causes, and solutions of problems

Question-Answer Relationships

[instructions | print chart | print QAR concept map]

an strategy for understanding different levels of questions, from simple recall to more complex, and for recognizing the nature of given questions so that it is better understood what kind of answer is called for

Questioning the Author

[instructions]

a protocol of questions for examining how clearly an author has communicated his or her ideas

RAFT Papers

[instructions | print blank form]

a framework for approaching writing that can be especially good for encouraging expressions of empathy and understanding of another's perspective

Reciprocal Teaching

[instructions]

a constructed activity for students to collaborate in understanding a selection of content (can also be done individually); students take on roles as Summarizer, Questioner, Clarifier, or Predictor

Selective Underlining/Highlighting

[instructions]

emphasis on the word "*selective*"; a means for students to read for key ideas, essential vocabulary, cause and effect, etc.

Semantic Feature Analysis

[instructions]

an attribute analysis tool; students can compare different ideas, concepts, people, events, etc. against a cross-referenced set of criteria

Story Maps

same as history frames; see above

Summarizing

[instructions | print Sum It Up sheet | print Sum It Up directions]

a strategy for developing coherent but brief expressions of larger ideas by focusing on key words and main ideas; included are suggestions for various ways to teach summarizing, including an activity called Sum It Up

Thesis-Proof

[instructions | print chart | print pro/con chart]

a variation of two-column charts where students use key ideas in their content to support a thesis; excellent for pre-writing

Think-Pair-Share

[instructions]

a cooperative and structured discussion strategy

Three-Minute Pause

[instructions | print overhead master]

a structured pause; a comprehension check

3 - 2 - 1

[instructions | print 3-2-1 master]

good quick strategy for summarizing and questioning

Venn Diagrams

[instructions | Venn Diagram for 2 | Venn Diagram for 3 | Venn Diagram w/Summary | Venn Variations]

the most common charts for looking at similarities and differences

Word Map

[instructions | print map v.1 | print map v.2]

a vocabulary strategy for visually mapping associations of meaning for a new term

Basic Elements of a Lesson Plan

A **Lesson Plan** is a simply worded script or written teacher aid, used by novice and experienced teachers alike, providing a well-organized set of learning experiences to students. It helps teachers to gather resources and to visualize procedures that will be used in the lesson. It may be a single lesson that fits into a unit or a series of lessons that cover a subject in the curriculum. It should be written so that a substitute teacher can follow it or it may be used in a team teaching context.

The arrangement and format of the traditional components of an effective lesson plan vary to some degree by author. There are, however, common elements of a plan that cut across the variety of sources and variations in terminologies. A number of authors considered 4 sections as follows: Preliminary Information, Lesson Approach, Lesson Development, and Lesson Summary (Richarson, 1981; Alessi, 1979). Within each of these categories are the more familiar Objectives, Introduction, Procedures, Materials and Evaluation sections that are typically associated with lesson planning. The broader 4 section categories are used below as this structure tends to encompass all the sub-categories quite well.

Preliminary Information:

This section contains the **subject** and **title of the lesson**. It may also identify the appropriate placement of the topic within the framework of the larger unit topic by providing a **description** or **outcome statement**. This feature is used to identify the plan and give the reader a brief overview of its purpose. The section also includes the **student grade level** and any unique characteristics of the student population. The **name of the teacher** and **address of school** should also be identified in this section.

Lesson Approach or Preparation:

This section specifies the lesson **objectives** or educational purpose of the plan. Often referred to as "behavioral objectives", these are **educational objectives** which state very precisely what the learner will be able to do after successfully completing the learning experience. Objectives are embedded within long-term goals of the curriculum. Educational objectives may be used as an organizational framework for selecting and sequencing learning experiences, and they may be used to help teachers chart the progress made by the group or by individuals. (Eby, 1994)

Behavioral objectives are written to specify the conditions under which the learning will take place, the action or behavior and the criteria for success (ex. after practice-writing the spelling words five times each, the student will write the words when dictated by the teacher, spelling 18 or the 20 words correctly). Some authors argue that a single lesson plan should contain only one objective (Richardson, 1981); while others recommend listing 3 or 4 in sequence (Eby, 1994; Weiler, 1994). Some authors distinguish behavioral objectives (those achieved in the course of instruction) from terminal objectives (what students should be able to do after a particular sequence of instruction) (Alessi, 1979). Objectives should be written so that they can be understood by both students and the teacher.

A second component of this section is the **Introduction**. Some authors use this category to briefly describe the lesson, linking it with previous lessons, and setting the stage for what will follow (Richardson, 1981). Other authors use the introduction to acquaint the students with lesson objectives (Eby, 1994; Williams, 1994). By orienting then, students will understand how the lesson relates to them and their previous experiences, and they learn what will be expected of them. The introduction is meant to focus the attention of students and motivate them to continue with the tasks that follow. The introduction in this interpretation is used as a "grabber" (Ridley, 1995).

Another use of the introduction Component is to identify any instructional **techniques**, **materials**, and **resources** needed to implement the lesson.

Lesson Development/ Content/ Teaching-Learning Activities/ Procedures:

Using a variety of headings, this category describes the educational experiences and sequence of steps involved with implementing the lesson. This section involves a presentation of the subject matter by the teacher and activities and tasks to be carried out by the students. Included in this section may be any or all the following sub-sections: instructional method or technique, motivation (see "grabber" above), a brief statement of purpose, teacher modeling or demonstration, connection with previous learning, class discussion, a check for understanding, guided practice or activity either individually or in groups, independent practice or activity, and closure (Eby, 1994). Descriptions of activities should also include an awareness and understanding of why students are doing certain activities, and how these activities facilitate long-term retention of knowledge, awareness and skill development in students. Some plans may also suggest the amount of time needed to carry out certain activities or tasks (Weiler, 1994).

Lesson Summary and Evaluation:

The **summary** component is used to review the information covered, draw conclusions and evolve generalizations by emphasizing the major concepts that were presented in the lesson. **Evaluation** of students involves a description of the way teachers have planned in advance to determine whether the objectives were reached and whether students learned what they should have (Eby, 1994; Williams, 1994). Assessment should measure student mastery of skills and knowledge relative to the state objectives. The method of evaluation will vary with the subject matter. Finally, this section may include a list of **references** and **suggested readings**.