PARAPROFESSIONAL TEST

TUTORIAL

BAKERSFIELD CITY SCHOOL DISTRICT
Education Center – 1300 Baker Street
Bakersfield, CA 93305
Personnel Services

10/03

CONTENTS

TEN TIPS TO IMPROVE TEST PERFORMANCE

1. Read directions carefully and follow them
2. Budget your time wisely
3. Read each question completely
4. Look for key words
5. When in doubt, GUESS
6. Eliminate obvious wrong answers
7. Check other questions for clues
8. Answer easy questions first
9. Don't read too much into a question
10. Mark your answer sheet properly

TEST PREPARATION

Before the test: If you have not been to the test center before, check the directions and visit the location before the day of the test.

Get a good night's sleep. Eat a high energy breakfast and plan to get to the test site at least 15 minutes early.

Bring along your letter/card inviting you to take the test and identification.

Bring along a watch and monitor your own time to stay on pace.

Wear layered clothing so you can adjust to the temperature in the room.

ENGLISH – LANGUAGE ARTS

PROOFREADING/SPELLING

These questions test spelling skills in a proofreading format. You are presented with a passage. Each line of the passage is considered one test question. You are asked to read the passage and indicate how many spelling errors are contained in each line. In some cases, a spelling error will occur because the wrong form of a word that has several correct spellings is used. The different correct spellings of such words have different meanings, for example "no" and "know". Be sure to look for these kinds of errors.

SAMPLE

This section consists of a passage of written material. The lines are numbered in the left margin. You are to read the passage and indicate how many spelling errors are contained in each line by using the following key:

a = The line contains no spelling errors.
b = There is one (1) spelling error in the line.
c = There are two (2) spelling errors in the line.
d = There are three (3) or more spelling errors in the line.

1. The main reason for training is to inprove the work being done by

2. employees in there present jobs and to meet the system and program goals of

3. the agency. It is the responsability of managers to suport and encourage teh

4. use of skills learned in training classes. Training will be done during normal

5. work hours and will be paied for by the employer.

Solutions:

1. The correct choice is **b**. There is one spelling error. The word "improve" is misspelled as "inprove".

2. The correct choice is **b**. The word "there" is not spelled correctly for the use of the word in this sentence. In this case, we need the plural, possessive pronoun "their", so one spelling error is found in this line.

3. The correct choice is **d**. There are three misspelled words in this line: "responsibility", "support" and "the".

4. The correct choice is **a**. The line contains no spelling errors.

5. The correct choice is **b**. This line contains one spelling error. The word "paied" is misspelled and should be "paid".

READING COMPREHENSION

To answer these types of questions you must indicate the most appropriate statement relating to the selection on the basis of whether it: 1) accurately paraphrases portions of the selection; 2) adequately summarizes the selection; or 3) presents an inference that can reasonably be drawn from the selection.

SAMPLE

For the following item, read the paragraph and select the choice which best reflects the content of the passage.

"The major causes of injuries are slips and falls. Tools, parts, and other objects should not be left lying around. Grease droppings, oils, sludge, and especially polymers should be cleaned up as soon as possible. Warning signs, railings and covers can protect against low piping, open tanks and open manholes or hatches. The simple knowledge of proper lifting techniques, such as bending the knees and lifting using the legs, can save many strained or injured backs."

According to the above paragraph, which one of the following is the primary cause of injury?

a. improper lifting techniques
b. grease or polymer burns
c. slips and falls
d. low piping

Solution: To answer this question, evaluate each choice.

Choice **a** lists improper lifting techniques as the primary cause of injury. The paragraph states only that "the simple knowledge of lifting techniques, bending the knees and lifting using the legs, can save many strained or injured backs". Therefore this choice is incorrect.

Choice **b** lists grease or polymer burns as the primary cause of injury. The paragraph states only that "grease droppings, oils, sludge and especially polymers should be cleaned up as soon as possible". Therefore this choice is incorrect.

Choice **c** lists slips and falls as the primary cause of injury. The paragraph states: "The major causes of injuries are slips and falls". **This choice is correct.**

Choice **d** lists low piping as the primary cause of injury. The paragraph states only that "warning signs, railings, and covers can protect against low piping, open tanks and open manholes or hatches". Therefore this choice is incorrect.

MAIN THEME OF A PARAGRAPH

These questions ask you to first read a paragraph and then choose an answer based on the main idea of the paragraph. The correct answer usually restates the main idea using different wording or requires that you draw a conclusion from the contents of the paragraph.

SAMPLE

A successful weight loss program must contain a specific plan designed to achieve healthy weight loss for an individual. An appropriate plan, without necessary determination to carry it out, is useless. Determination, without a well-defined plan, will only achieve partial success.

The MAIN theme of this paragraph is

a. A well-defined plan will assure the success of a weight loss program.
b. A high degree of determination is necessary and sufficient for a highly successful weight loss program.
c. It's impossible to develop a successful weight loss program.
d. Two important ingredients of a successful weight loss program are a well-defined plan and a sincere resolve to implement that plan.

Solution: To answer this question, evaluate each choice.

Choice **a** only contains one of the points: a well-defined plan; therefore, this choice is only partially correct.

Choice **b** also only lists one of the points: determination; therefore, this choice is only partially correct.

Choice **c** is not supported by evidence within the paragraph; therefore, this choice is incorrect.

Choice **d** restates the idea presented in the paragraph. **This choice is correct.**

LOGICAL SEQUENCE OF A PARAGRAPH

Some questions ask you to evaluate a paragraph for a smooth, logical progression of ideas. This is known as logical sequencing. First, it is important to know the structure of a paragraph. The **topic sentence** is the first sentence of a paragraph; it introduces the main theme. The **supporting sentences** give details and develop the main theme; they usually follow the topic sentence. The **closing sentence** wraps up the paragraph by restating the main theme, drawing a conclusion, or presenting a transition to another paragraph.

Some questions to ask when evaluating a paragraph's logical sequence are:

- What is the main theme of the paragraph?
- In what order should the ideas follow?
- Are there ideas that are an extension of the main theme?
- Are there ideas that can't be understood until other things are explained?

SAMPLE

The following paragraph may not be in logical sequence. Read the sentences and select the best order for them.

(1) Shoppers are tired of battling crowds at malls and shopping centers. (2) One drawback is the delay in receiving merchandise, but some Internet vendors offer fast shipping for an additional fee. (3) They also enjoy the convenience of being able to shop 24 hours a day, seven days a week. (4) Holiday shopping on the Internet has grown dramatically in the past few years.

a. **2, 1, 3, 4**
b. **4, 1, 3, 2**
c. **1, 4, 2, 3**
d. **correct as written**

Solution: To answer this question, evaluate each choice.

Choice **a** is incorrect because the sentences are not logically ordered: it first presents a supporting sentence (a sentence that is an extension of another idea), then two sentences that don't necessarily relate to the first (but flow with one another), and a closing sentence that is disjointed from the first three sentences.

Choice **b** presents the sentences in a logical order: a topic sentence, 2 supporting sentences, and a closing sentence that could transition to another paragraph. **This choice is correct.**

Choice **c** is incorrect because the sentences are not logically ordered: it presents a topic sentence, then two sentences that relate to the topic and each other, but don't directly develop the topic sentence, and a closing sentence that is disjointed from the first three sentences.

Choice **d** is incorrect because the sentences are not logically ordered: it presents a topic sentence, then one sentence that does not relate to the first (since Internet shopping hasn't been introduced yet), a third sentence that is misplaced, and a closing sentence that is disjointed from the first three sentences.

KEY WORD

In certain multiple choice questions there will be key words that need to be considered when selecting answers. Examples of key words are best, worst, first, only, and never.

SAMPLE

A child has fallen and is bleeding. The first thing you should do is

a. call a doctor
b. apply a bandage to the wound
c. wash the wound
d. apply direct pressure to the wound

Solution: The key word is "first". Although the other steps may be taken, the **first** step is to control the bleeding by applying direct pressure. Choice **d** is therefore correct.

ENGLISH GRAMMAR

These types of questions measure your knowledge of grammar, punctuation, and sentence structure.

SAMPLE

Choose the sentence that represents the best English usage.

a. Of the two runners, Bob is the worst.
b. Of the two runners, Bob is the better.
c. Bob is the worst of the two runners
d. Bob is the best of the two runners.

Solution: To answer this question, evaluate each choice.

Choice **a** is incorrect. The correct way to write the sentence is: Of the two runners, Bob is worse.

Choice **b** is correct.

Choice **c** is incorrect. The correct way to write the sentence is: Bob is the worse of the two runners.

Choice **d** is incorrect. The correct way to write the sentence is: Bob is the better of the two runners.

BASIC WORD MEANINGS

A **prefix** is added to the beginning of a word to give the word a new meaning.

A **suffix** is added to the end of a word to give the word a new meaning.

By becoming familiar with these prefixes and suffixes you can better answer all types of English questions, from vocabulary to reading comprehension.

Prefix	Meaning	Suffix	Meaning
pre-	before	-ette	small
post-	after	-ess	female
un-	not, opposite	-ize	make
in-	not	-ist	a person who
sub-	under	-ian	one who
inter-	between	-ish	having the quality of
mis-	not or bad	-less	without
dis-	not, opposite	-ous	having
trans-	across	-able	is, can be
anti-	against	-ness	having
pro-	in favor of	-or	one who
sub-	under	-ion	act of
super-	above	-en	made of

Understanding the following terminology will help you determine what the question asks for.

Synonyms are words that are the same in meaning.

Antonyms are words that are opposite in meaning.

Verbs are words that show action.

Adverbs are words that modify verbs.

Nouns are words that name a person, place, thing or idea.

Pronouns are words that take the place of one or more nouns.

Adjectives are words that modify or describe a noun or pronoun. It answers the questions: what, which one, how much, and how many?

Conjunctions are words that join together words, phrases, clauses, or sentences.

Prepositions are words that show a relationship between a noun or pronoun and another word in the sentence such as, from, to, between, through, etc.

GENERAL MATH

KEY WORDS AND CONVERTING WORDS TO EQUATIONS

Sometimes math questions use key words to indicate what operation to perform. Becoming familiar with these key words will help you determine what the question is asking for.

OPERATION	OTHER WORDS WHICH INDICATE THE OPERATION
Addition	increased by; more than; combined together; total of; sum; added to. The symbol + means add
Subtraction	decreased by; minus; less; difference between/of; less than; fewer than. The symbol - means subtract
Multiplication	of; times; multiplied by; product of (For example 4 + 4 + 4 equals 4 x 3). The symbols x and • both mean multiply.
Division	per; a; out of; ratio of; quotient of; percent (divide by 100). The symbol ÷ means divide.
Equal	is; are; was; will be; gives; yields; sold for The symbol = means equal.
Per	divided by
Percent	divide by 100 The symbol % means percent.

Here are some examples of words converted to equations.

WORDS	EQUATIONS
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

FRACTIONS

In order to accurately solve fraction problems it is important to distinguish between the numerator and denominator.

Numerator: top number **Denominator:** bottom number

ADDING OR SUBTRACTING FRACTIONS

Adding or subtracting fractions with the same denominator is straightforward.

SAMPLE	$\frac{5}{13} + \frac{6}{13}$
The denominator remains the same, Add the top numbers	$\frac{5+6}{13}$
Answer	$\frac{11}{13}$

If you do not have a common denominator (see simplifying fractions), make one by multiplying the first denominator and the second denominator together.

SAMPLE	$\frac{3}{5} + \frac{2}{7}$
Find the common denominator by multiplying five by seven	$5 \times 7 = 35$
To get new numerators, multiply the numerator by the same number as the denominator was multiplied by	$3 \times 7 = 21$ $2 \times 5 = 10$
Insert the new numbers into the numerator and add the fractions	$\frac{21}{35} + \frac{10}{35}$
Answer	$\frac{31}{35}$

MULTIPLYING FRACTIONS

Multiply the numerator times the numerator and the denominator by the denominator.

SAMPLE	$\frac{1}{4} \times \frac{3}{5}$
	$\frac{1 \times 3}{4 \times 5}$
Answer	$\frac{3}{20}$

Simplify (see *SIMPLIFYING FRACTIONS*) the fraction before and after you multiply.

SAMPLE	$\frac{12}{15} \times \frac{5}{6}$
Simplify $\frac{12}{15}$ *by dividing both numbers by 3*	$\frac{12 \div 3}{15 \div 3} \times \frac{5}{6}$
	$\frac{4}{5} \times \frac{5}{6}$
	$\frac{20}{30}$
Simplify by dividing by 10	$\frac{20 \div 10}{30 \div 10}$
Answer	$\frac{2}{3}$

DIVIDING FRACTIONS

Since division is the opposite of multiplication, first invert (flip over) one fraction and multiply.

SAMPLE	$\frac{1}{5} \div \frac{2}{3}$
Invert $\frac{2}{3}$ *and multiply*	$\frac{1 \times 3}{5 \times 2}$
Answer	$\frac{3}{10}$

SIMPLIFYING FRACTIONS

Try dividing both the numerator and the denominator by each prime number

- Use the rules of divisibility.
- Start with 2: Even numbers (ones that end with 2, 4, 6, 8, or 0) can be divided by two without a remainder.
- Then go to 3: Find the sum of the digits (add the digits together). If the sum can be divided by three then the number is divisible by 3.
- Next try 5: Numbers that end with 5 or 0 are divisible by five.
- Go on to 7, 11, 13, 17, and so on: Unfortunately there is no easy way to determine whether the number will be divisible by these--you just have to try dividing by each. But you can stop trying when the number is less than the divisor.

SAMPLE	**Simplify** $\frac{26}{65}$	
Twenty-six can be divided by two without a remainder (because its even), but 65 can't	26 ÷ 2 =13 65 ÷ 2 = 32.5	YES NO
The digits do not add up to three	2 + 6= 8 ÷ 3 6 + 5= 11 ÷ 3	NO NO
Sixty-five can be divided by five without a remainder, but 26 can't	65 ÷ 5 = 13 26 ÷ 5 = 5.2	YES NO
Try 7	26 ÷ 7 = 3.7 65 ÷ 7 = 9.3	NO NO
Try 11	26 ÷ 11 = 2.4 65 ÷ 11 = 5.9	NO NO
Try 13- and it works!!!	26 ÷ 13 = 2 65 ÷ 13 = 5	YES YES
Answer	$\frac{2}{5}$	

WRITING A DECIMAL AS A FRACTION

SAMPLES

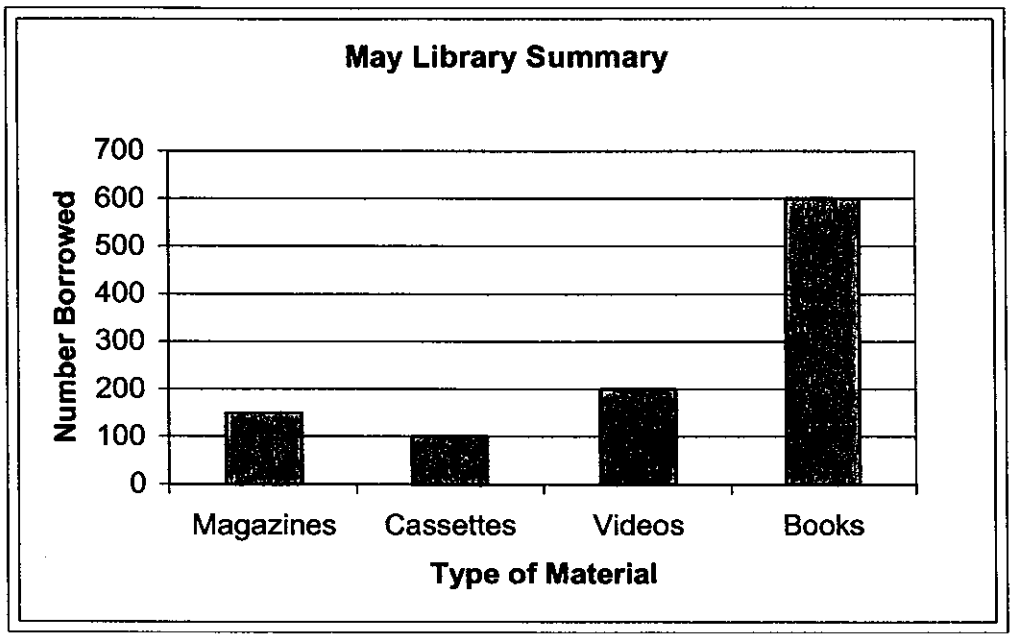
	Decimal	**Fraction**	**Final Answer**
For a number in the tenths place, remove the decimal, divide by ten, and simplify	**.5**	$\frac{5}{10}$	$\frac{1}{2}$
For a number in the hundredths place, remove the decimal, divide by 100, and simplify	**.05**	$\frac{5}{100}$	$\frac{1}{20}$
For a number in the thousandths place, remove the decimal, divide by 1,000, and simplify	**.005**	$\frac{5}{1,000}$	$\frac{1}{200}$

READING TABLES AND CHARTS

Some questions test the ability to understand, interpret and use information in tables and charts. Often answering these questions depends on looking in the correct places for information. It is important to know that the horizontal row at the bottom is the x-axis and the vertical column on the left side is the y axis.

SAMPLES

Use this chart to answer the following questions.



According to the May Library Summary, what was the number of videos borrowed in May?

a. 100
b. 150
c. 200
d. 300

Solution: This question just requires you to extract information from the chart.

- Begin by determining what information the question asks for.
- Look for the number borrowed (on the left vertical column / y axis) for videos (a type of material found on the horizontal row at the bottom / x axis).
- Find the videos column and then look to the left and read the number that lines up with the top of the videos column.

Choice **a** is the number of cassettes borrowed in May; therefore, this choice is incorrect.

Choice **b** is the number of magazines that was borrowed in May; therefore, this choice is incorrect.

Choice **c** is correct because the top of the bar meets the line for 200.

Choice **d** does not correspond to any of the numbers on the chart; therefore, this choice is incorrect.

According to the May Library Summary, what percent of the total number of items borrowed were cassettes and videos?

a. 9.52 %
b. 19.05 %
c. 28.57 %
d. 35.00 %

Solution: This question requires you to extract information from the chart and then calculate a percentage.

- Begin by determining what information the question asks for: cassettes plus videos compared to the total number of materials borrowed.
- Add up all of the columns to obtain the total (150 + 100 + 200 + 600 = 1,050).
- Find the cassettes and videos numbers (100 + 200 = 300).
- Divide the number of cassettes and videos by the total and multiply by 100 (300 ÷1,050 = .2857 x 100 = 28.57%).

Choice **a** is only the percentage of cassettes borrowed in May; therefore, this choice is incorrect.

Choice **b** is only the percentage of videos borrowed in May; therefore, this choice is incorrect.

Choice **c** is correct because the number of cassettes and videos (300) divided by the total (1,050), and multiplied by 100 is equal to 28.57.

Choice **d** is the answer if in the last step, 1,050 is divided by 300 and then multiplied by 10; therefore this choice is incorrect.

STATISTICS

Find the average (also known as the mean) by dividing the sum of the data and dividing that by the number of data elements.

SAMPLE	**What is the average of 79, 67, 81, 99, 88, and 72?**
The six data elements	79, 67, 81, 99, 88, and 72
Add the numbers	79 + 67 + 81 + 99 + 88 + 72 = 486
Divide by the number of data elements	486 ÷ 6
Answer	**81**

EXPONENTS

An exponent is a superscript, or small number written at the top right corner of a number, variable, or parenthesis (for example: 3^4). This tells you to multiply 1 by the number as many times as the exponent says.

SAMPLE	**Simplify 3^4**
Multiply one by three multiplied by itself four times	1 (3 × 3 × 3 × 3)
	1 (81)
Answer	**81**

SAMPLE	**Simplify -3^4**
The location of the negative sign is not contained by parenthesis, so the sign will be attached at the end	-3^4
Simplify the exponent first	1 (3 × 3 × 3 × 3)
	1 (81)
	81
Add the negative at the end	- 81
Answer	**- 81**

SAMPLE	**Simplify $(-3)^4$**
The location of the negative sign is contained in the parenthesis	$(-3)^4$
Instead of carrying down the negative sign, each three is made negative	1 (-3 × -3 × -3 × -3)
	1 (81)
	81
Answer	**81**

When multiplying exponents, add the superscripts

SAMPLE	**Simplify $x^{16}x^2$**
Add the superscripts 16 and 2	x^{16+2}
Answer	$\mathbf{x^{18}}$

When dividing exponents, subtract the superscripts

SAMPLE	**Simplify** $\frac{x^6}{x^2}$
Subtract the superscripts ^{6} *and* ^{2}	x^{6-2}
Answer	x^4

When raising a product to a power, multiply exponents

SAMPLE	**Simplify** $(x^2x)^3$
Multiply the exponent on each variable in parenthesis by the exponent outside of the parenthesis	$x^{2\times3}x^{1\times3}$
Add the superscripts	x^6x^3
Answer	x^9

SOME OTHER TIPS ON EXPONENTS

- Anything to the zero power equals one

  SAMPLE $1002^0 = 1$

- Zero to any power except zero is always zero

  SAMPLE $0^{1,250} = 0$; but $0^0 = 1$

- For any number raised to the first power, simply remove the exponent

  SAMPLE $1002^1 = 1002$

- Ten to any power can be simplified by placing the number of zeros the exponent says after a one

  SAMPLE $10^3 = 1{,}000$

PRE-ALGEBRA AND ALGEBRA

SPECIAL NOTATION FOR MULTIPLICATION AND DIVISION WITH VARIABLES

Here are some examples of special notations and what they mean:

2b means 2 x b

2(a + 5) means twice the sum of a number (a) and five

bc means b x c

4bc means 4 x b x c

d/5 means d ÷ 5

ALGEBRA WORD PROBLEMS

In algebra you solve problems by essentially making two groups, one for each side of an equation. An unknown number or value is represented by a letter (for example: x).

BASIC STEPS

1) Define the variable
2) Translate the problem into an equation and plug in known values
3) Solve the equation
4) Go back to the problem and plug in the new value to obtain the answer

SAMPLE	**A car dealership has 15 new cars and 12 used cars. How many cars do they have?**
Define the unknown variable	Let x = Total Cars
Translate the problem into an equation and plug known values in	15 + 12 = x
Solve the equation	27 = x
Answer	**There are 27 Total Cars.**

CONSECUTIVE INTEGER WORD PROBLEMS

SAMPLE	**Two consecutive numbers have a sum of 71. What are the numbers?**
Define the unknown variables: Since two numbers are unknown, in order to solve it you must use only one variable (such as x) in the equation.	Let x = The First Consecutive Number Let x + 1 = The Second Consecutive Number
Translate the problem into an equation and plug known values in	x + (x + 1) = 71
Solve the equation	x + (x + 1) = 71
Remove parenthesis	2x + 1 = 71
Subtract 1 from each side	-1 + 2x + 1 = 71 -1 2x = 70
Divide both sides by 2	$\frac{2x}{2} = \frac{70}{2}$ x = 35
Go back to the problem and plug in new values	35 = The First Consecutive Number 35 + 1 = The Second Consecutive Number
Answer	**35 & 36**

Other tips for consecutive number word problems:

- When solving for negative consecutive numbers, ignore the negative sign and do not do anything differently. Keep the x positive and when you have obtained your answer, add the negative sign.
- When solving for even or odd consecutive numbers, add a space to the equation. For example: The next consecutive number after 15 can be found by adding 1 to it. The next even/odd number can be found by adding 2.

SAMPLE	**Two consecutive ODD numbers have a sum of 40. What are the numbers?**
Define the unknown variable	Let x = The 1st Consecutive Odd Number Let x + 2 = The 2nd Consecutive Odd Number
Translate the problem into an equation and plug known values in	x + (x + 2) = 40
Solve the equation	x + (x + 2) = 40
Remove parenthesis	2x + 2 = 40
Subtract 2 from each side	-2 + 2x + 2 = 40 -2
	2x = 38
Divide both sides by 2	$\frac{2x}{2} = \frac{38}{2}$ x = 19
Go back to the problem and plug in new values	19 = The 1st Consecutive Odd Number 21 = The 2nd Consecutive Odd Number
Answer	**19 & 21**

ORDER OF OPERATIONS

1. **Parenthesis and Brackets** from the inside out.
2. **Exponents** of numbers or parenthesis.
3. **Multiplication and Division** in the order they appear.
4. **Addition and Subtraction** in the order they appear.

SAMPLE	**Simplify the following expression: $2 + (3 - 1)3^2$**
Simplify parenthesis & brackets from the inside out (subtract 1 from 3)	$2 + (3 - 1)\ 3^2 =$ $2 + (2)\ 3^2$
Simplify exponents (3^2 becomes 9)	$2 + (2)\ 3^2 =$ $2 + (2)\ 9$
Simplify multiplication and division (multiply 2 and 9)	$2 + (2)\ 9 =$ $2 + 18$
Simplify addition and subtraction (combine like terms)	$2 + 18 =$ 20
Answer	**20**

SIMPLIFYING EXPRESSIONS

1. **Combine like terms**
2. **Simplify multiplication**
3. **Distribute a number or sign in to parenthesis**
4. **Use the FOIL Method to multiply two or more parenthesis**
5. **Simplify Exponents of a number**

1. Combine like terms

Combine or add up all of the like terms.

Examples of like terms:

2x, 45x, x, 0x, -26x, -xbecause they are all x with a coefficient

15, -2, 27, 9043, 0.6 because they are all constants

$3y^2$, y^2, $-y^2$, $26y^2$ because they are all y^2 with a coefficient

For comparison, below are a few examples of unlike terms:

17x, 17z because they are different letter variables

15y, $19y^2$, $31y^5$ because they are different powers or exponents

19x, 14xy because they both have the letter y but the second term has another variable in it

SAMPLE	**5x + 7x**
Add like terms	5x + 7x = 12x
Answer	**12x**

SAMPLE	**14a + 7 + 21a**
Organize like terms together	14a + 21a + 7
Add like terms	14a + 21a + 7 = 35a + 7
Answer	**35a + 7**

2. Simplify multiplication

Same Variables

When multiplying same letter variables, keep the letter and add exponents.

SAMPLE	**a × a**
Neither a has a visible exponent, so their exponents are both 1	$a^1 \times a^1$
Add the exponents	$a^{1+1} = a^2$
Answer	**a^2**

SAMPLE	**a × a^4**
The first a doesn't have a visible exponent, so its exponent is 1	$a^1 \times a^4$
Add the exponents	$a^{1+4} = a^5$
Answer	**a^5**

Different Variables

SAMPLE	**y^5 × a^2**
The terms cannot be multiplied by simply adding the exponents because each multiplier is a different letter	$y^5 \times a^2$
Answer	**y^5a^2**

SAMPLE	**a^2 × a^3y^2**
Add the exponents of a^2 and a^3	$a^5 \times y^2$
Answer	**a^5y^2**

3. Distribute a number or sign in to parenthesis

SAMPLE	**6 (2 + 4a)**
Remove parentheses and multiply each term by six	(6 × 2) + (6 × 4a)
Answer	**12 + 24a**

4. Use the FOIL Method to multiply two or more parenthesis

First - Multiply the first term in each parenthesis.

Outer - Multiply the outer term in each parenthesis.

Inner - Multiply the inner term in each parenthesis.

Last - Multiply the last term in each parenthesis.

SAMPLE	**(3 + 7x) (6 + 2x)**
Multiply the first term	(3 + 7x) (6 + 2x) = 6 × 3 = 18 18
Multiply the outer terms	(3 + 7x) (6 + 2x) = 3 × 2x = 6x 18 + 6x
Multiply the inner terms	(3 + 7x) (6 + 2x) = 7x × 6 = 42x 18 + 6x + 42x
Multiply the last terms	(3 + 7x) (6 + 2x) = 7x × 2x = $14x^2$ 18 + 6x + 42x + $14x^2$
Combine like terms	18 + 6x + 42x + $14x^2$ = 18 + 48x + $14x^2$
Answer	**18 + 48x + $14x^2$**

5. Simplify Exponents of a number.

See the EXPONENTS section for a review

PRIME FACTORIZATION

A **prime number** is a positive integer greater than one that can only be divided by itself and one.
Some examples are 2,3,5,7,11,13, 17, and 19.

A **composite number** is a positive integer greater than one that has more than one divisor other than one and itself.
Some examples are 4,6,9,15, and 21.

One is neither a prime nor a composite number.

WAYS TO OBTAIN THE PRIME FACTOR

- Repeatedly divide by prime numbers.
- Choose any pair of factors and split these factors until all the factors are prime.
- Work backwards from the answers, seeing which one is BOTH only prime numbers, *and* produces the correct product

SAMPLE	**What is the prime factorization for 68?**
Divide by 2 (a prime number)	$68 \div 2 = 34$
The correct way to represent prime factorization	2×34
Divide 34 by 2 and you are left with 17 (a prime number)	$34 \div 2 = 17$
Answer	**$2 \times 2 \times 17$**

GREATEST COMMON FACTOR (GCF/GCD)

The **greatest common factor** is the largest integer that is a common factor of all the given integers.

FIND THE GCF BY:

- Finding the prime factorization of each integer.
- The GCF is the product of all prime factors common to every number.

SAMPLE	**What is the greatest common factor of 8 and 44?**
Find the prime factorization of each integer	$8 = 2 \times 2 \times 2 \times 1$ $44 = 2 \times 2 \times 11 \times 1$
List the common prime factors	8: $2 \times 2 \times 1$ 44: $2 \times 2 \times 1$
Multiply the common prime factors	$2 \times 2 \times 1 = 4$
Answer	**4**

LEAST COMMON DENOMINATOR (LCD/LCM)

The **least common denominator** (multiple) is the smallest integer that is a common multiple (denominator) of the given integers.

FIND THE LCD BY:

- Finding the prime factorization of each integer.
- Take the greatest power on **each** prime and multiply them to obtain the LCD.

SAMPLE	**What is the least common denominator of 12, 50, and 90?**
Find the prime factorization of each integer	$12 = 2 \times 2 \times 3 \times 1$ $50 = 2 \times 5 \times 5 \times 1$ $90 = 2 \times 3 \times 3 \times 5 \times 1$
List the prime factors with the greatest power of all the given integers	12: 2^2 50: 5^2 90: 3^2
Multiply the prime factors	$2^2 \times 5^2 \times 3^2$
Answer	**900**

FACTORING

Factoring is writing a math expression as a product of factors. For example: writing 14 as (2)(7), where 2 and 7 are factors of 14. Factoring can also be done with trinomial and polynomial expressions.

- FIRST--always factor as much as you can! Often all terms in an expression have a common factor, first group the like terms and then find the greatest common factor and extract it (this is like the distributive law in reverse).

SAMPLE	**Factor 5x + 7x**
x is a factor of both 5x and 7x, extract x and add the contents of the parentheses	x(5 + 7)
Answer	**12x**

SAMPLE	**Factor 14a + 7 + 21a**
Organize like terms	14a + 21a + 7
Since a is a factor of both 14a and 21a, extract a and add the content of the parentheses	a(14 + 21) + 7
Answer	**35a + 7**

TRINOMIALS

- FIRST--always factor as much as you can! Often all terms in an expression have a common factor, first group the like terms and then find the greatest common factor and extract it (this is like the distributive law in reverse).
- Next Reverse the FOIL method to get the factored form:
  1. Set up a product of two expressions, where parentheses hold each of the two expressions.
  2. Find the factors that go in the first positions.
  3. Determine the sign for each expression by looking at the signs before the second and third terms in the trinomial:
     - two negative signs: the signs in each expression are opposite with the larger number being negative
     - two positive signs: the signs are both positive
     - negative then a positive: the signs are both negative
     - positive and negative: the signs are opposite and the larger number is positive
  4. Find the factors that go in the last positions.
- Check your work

SAMPLE	**Factor the trinomial: $x^2 - 4x - 32$**
Reverse the FOIL method to get the factored form	$x^2 - 4x - 32$
Since x multiplied by itself equals x^2, place one x in each parenthesis	(x +/- __) (x +/- __)
Since the signs on the2nd and 3rd trinomial terms are both negative, the signs of the second term in each factor must be opposite	(x – __) (x + __)
What two numbers multiplied by one another would equal 32?	*Possibilities: 32 and 1 16 and 2 8 and 4*
Since the signs on the2nd and 3rd trinomial terms are both negative, the larger multiple will have a negative sign	*Possibilities: -32 and 1 -16 and 2 - 8 and 4*
Out of the possibilities, which pair added to one another equals -4?	*- 8 and 4*
Plug these into the equation	(x - 8)(x + 4)
Check your work by using FOIL on the two factors	$x^2 - 8x + 4x - 32$
Simplify	$x^2 - 4x - 32$
Answer	**(x - 8)(x + 4)**

POLYNOMIALS

There is no shortcut to factoring polynomials. First memorize some special types of polynomials, and then practice. Here are some extremely useful polynomial identities:

Perfect squares

$a^2 + 2ab + b^2 = (a + b)^2$
$a^2 - 2ab + b^2 = (a - b)^2$

Difference of squares

$a^2 - b^2 = (a + b)(a - b)$

Others

$(a + b) \times c = ac + bc$
$(a - b) \times c = ac - bc$
$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$
$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

STRATEGIES

- FIRST--always factor as much as you can! Often all terms in an expression have a common factor, first group the like terms and then find the greatest common factor and extract it (this is like the distributive law in reverse).
- Look for perfect squares:
  $a^2 + 2ab + b^2 = (a + b)^2$
  $a^2 - 2ab + b^2 = (a - b)^2$
- Look for the difference of squares:
  $a^2 - b^2 = (a + b)(a - b)$
- Factor by trial and error
- Reverse the FOIL method to get the factored form:
  1. Set up a product of two expressions, where parentheses hold each of the two expressions.
  2. Find the factors that go in the first positions.
  3. Find the factors that go in the last positions.
- Check your work

SAMPLE	**Factor $a^2 - 81$**
Since $9^2 = 81$, this looks like a difference of squares	$(a + 9)(a - 9)$
Check your work by using FOIL	$a^2 + 9a - 9a - 81$
The positive and negative 9a cancel each other out	$a^2 - 81$
Answer	**$(a + 9)(a - 9)$**

SAMPLE	**Factor $3x^2 + 9x + 6$**
Factor out 3	$3(x^2 + 3x + 2)$
Factor by trial and error, since the second and third term in the parentheses are positive, the signs in each factor must be positive	$3(x + \_\_)(x + \_\_)$
What two numbers multiplied by one another would equal 2 and added to one another would equal 3? How about 2 and 1?	$3(x + 2)(x + 1)$
Check your work by using FOIL on the two factors in parentheses	$3\ (x^2 + 2x + 1x + 2)$
Simplify	$3(x^2 + 3x + 2)$
Distribute the 3	$3x^2 + 9x + 6$
Answer	**$3(x + 2)(x + 1)$**

SAMPLE ALGEBRA PROBLEMS

SAMPLE	**Name the like terms in 7s + 9y + y**
Answer	**9y, y**

SAMPLE	**Explain why 7a + 8z - 9x is in simplest form.**
Answer	**It has no like terms and no parentheses.**

SAMPLE	**Explain why 6 + 2(x - 4) is not in simplest form.**
Answer	**The two has not been distributed to the terms in the parentheses, and then simplified by combining like terms.**

SAMPLE	**Simplify r + 3(s + 7r)**
Distribute the 3 to the contents of the parenthesis	r + 3(s) + 3(7r) = r + 3s + 21r
Organize like terms	1r + 21r + 3s
Combine like terms	1r + 21r + 3s = 22r + 3s
Answer	**22r + 3s**

SAMPLE	**Simplify 8 + (-7)**
Adding a negative number is the same as subtracting that number	8 - 7
Answer	**1**

SAMPLE	**If 14 = j - (-20), what is the value of j?**
	14 = j - (-20)
Subtracting a negative number is the same as adding a positive number	14 = j + 20
Subtract 20 from both sides	-20 + 14 = j + 20 - 20
Answer	**-6 = j**

SAMPLE	**How is the product 3 x 3 x 3 expressed in exponential notation?**
Set up the equation	$3^1 \times 3^1 \times 3^1$
When multiplying, add the exponents	3^{1+1+1}
Answer	**3^3**

SAMPLE	**What is the value of $3t^5$ if t = 2?**
Replace t with 2	$3(2^5)$
Simplify exponents	3(2 x 2 x 2 x 2 x 2)
	3(32)
Answer	**96**

SAMPLE	**Simplify 2(a + 5)**
Distribute the 2 to parenthesis	2(a) + 2(5)
Answer	**2a + 10**

SAMPLE	**Simplify $(-4a^5b)(8a^2)$**
Multiply like terms beginning with -4 and 8	$-32\ (a^5b)(a^2)$
Multiply a^5 and a^2	$-32\ (a^7)(b)$
Answer	**$-32a^7b$**

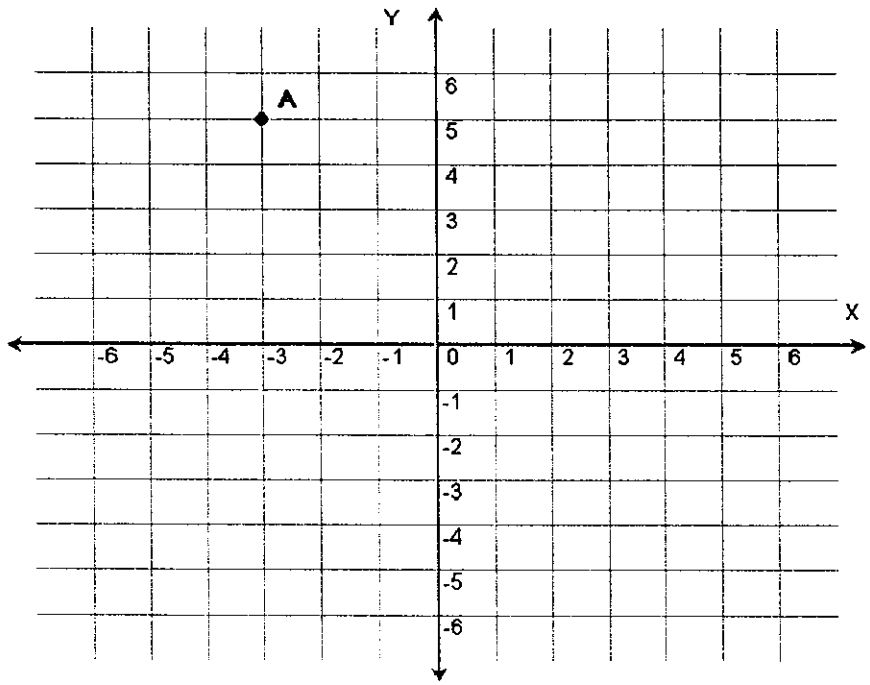
SAMPLE	**Solve** $\frac{10}{y} = \frac{7}{y+3}$
Cross multiply	10(y + 3) = 7y
Solve for y, begin by distributing the 10	10y + 30 = 7y
Combine like terms, begin by subtracting 10y from both sides	-10y + 10y + 30 = 7y – 10y
	30 = -3y
Divide both sides by -3	$\frac{30}{-3} = \frac{-3y}{-3}$
Answer	**-10 = y**

THE COORDINATE SYSTEM

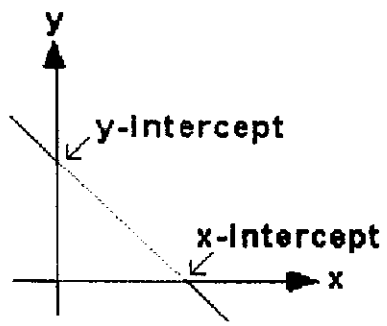
GRID GRAPHS

The location of any point on a grid can be indicated by an **ordered pair** of numbers (X,Y) where X represents the number of units on the horizontal line stemming away from zero (called the x-axis), and Y represents the number of units on the vertical line stemming away from zero (called the y-axis). The X is always listed first, and the Y is always listed second in an ordered pair.

The numbers in an ordered pair are called **coordinates**.
For example if the x-coordinate is -3 and the y-coordinate is 5, the ordered pair for the point would be (-3,5).



SLOPE COORDINATES



The **x-intercept** is the point where a line crosses the x-axis. It is found by setting y = 0 and solving the resulting equation.

The **y-intercept** is the point where a line crosses the y-axis. It is found by setting x = 0 and solving the resulting equation.

SAMPLE	**What are the coordinates of the x-intercept of the line 4y – x = 5?**
Set up the equation	4y – x = 5
Set y = 0 and solve for x	4 (0) – x = 5
	-x = 5
Multiply both sides by -1	(-1)-x = (-1) 5 x = - 5
Answer	**(- 5, 0)**

GEOMETRY

BASICS

- The angles of any four sided figure always add up to 360°
- Two lines are **perpendicular** (⊥) when they meet at a 90° angle
- Two lines are **parallel** (||) when they never intersect
- **Bisect** means to cut in half

SQUARES

- Each of the 4 sides are always equal in length
- Each of the 4 angles is always equal to 90°
- The area (A) of a square is found by squaring the measurement of one side
  - $A = s^2$
- Find the perimeter by adding up the length of all the sides
  - Perimeter = 4s

RECTANGLES

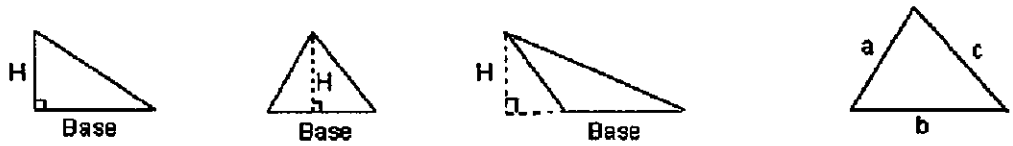
- Opposite sides are always equal
- Each of the 4 angles is always equal to 90°
- The area of a rectangle is found by multiplying the rectangle's length by its width
  - A = lw
- Find the perimeter by multiplying the length by two and the width by two and adding those products
  - Perimeter = 2l + 2w

CIRCLES

- There are 360° in a circle
- Radius = distance from the center to any point on the edge of the circle (*r*)
- Diameter = straight line distance from one point on the circle to another, passing through the center point (*d*)
- Pi = 3.14 (π)
- The area of a circle is found by multiplying Pi by the radius squared
  - $A = \pi r^2$
- Circumference is the distance around the outside of the circle, find it by multiplying two by Pi by the radius
  - Circumference = $2 \pi r$

TRIANGLES

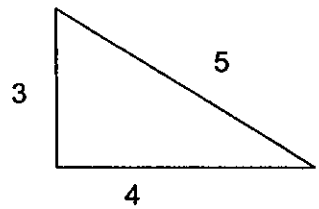
- Each of the 3 angles will always add up to 180°
- On right triangles two sides intersect to form a 90° angle
- The area of a triangle is found by multiplying the triangle's base by its height and dividing the product in half
  - A=½ bh
- Find the perimeter by adding up the length of all the sides



- A hypotenuse is the side of a right triangle that is opposite the right (90°) angle. By using the Pythagorean theorem one can find the length of an unknown side of a right triangle.
  - The Pythagorean Theorem is: $a^2 + b^2 = c^2$, where c equals the hypotenuse.

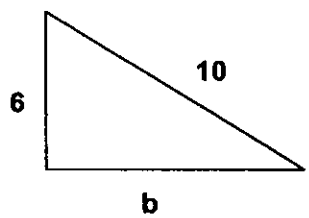
SAMPLE

In the right triangle below, the length of side a = 3, the length of side b = 4 and the hypotenuse (side c), has a length of 5. Using the Pythagorean Theorem ($a^2 + b^2 = c^2$), we see that $3^2 + 4^2 = 5^2$.



SAMPLE

Determine the length of side b, given that side a = 6 and side c = 10



Use the Pythagorean Theorem	$a^2 + b^2 = c^2$
Plug in known values	$6^2 + b^2 = 10^2$
Combine like terms (subtract 6^2 from both sides)	$b^2 = 10^2 - 6^2$
Simplify exponents $(1 \times 10 \times 10) - (1 \times 6 \times 6)$	$b^2 = 100 - 36$
	$b^2 = 64$
Obtain the square root of 16 ($b^2 = 8^2$)	$\sqrt{b^2} = \sqrt{64}$
Answer	**b = 8**

MATH DEFINITIONS

Use the following glossary to review math definitions and concepts.

MATH GLOSSARY

A

Acute Angle — An angle that is less than a right angle (90°).

Angle — A figure formed when two rays meet at their endpoints. The common endpoint is the vertex.

Area — The number of square units inside of a shape or needed to cover the surface.

Average — A number that is the sum of the terms in a group, divided by the number of terms in that group. An average is also referred to as a mean.

B

Base — In 10^3, the base is 10. The base is used as a factor as many times as given by the exponent (3). That is $10^3 = 10 \times 10 \times 10$.

Bisect — To divide something in two.

C

Circle Graph — A type of statistical graph used to compare parts of a whole.

Circumference — Distance around a circle.

Coefficient — Any of the factors of a product considered in relation to a specific factor.

Common Multiple — A number that is a multiple of two or more numbers.

Composite Number — A positive integer greater than one that has more than one divisor other than one and itself.

Congruent — Congruent figures match or fit exactly and have the same size and shape.

Consecutive — "In order," usually from smallest to largest.

Constant — A number that is assumed not to change value.

Coordinate of a Point — A number associated with the point on a number line.

D

Decimal — A number with one or more places to the right of the decimal point.

Degree — A unit of measure for an angle.

Denominator — The number below the fraction bar in a fraction.

D

Diameter — Any line segment that passes through the center of the circle connecting two points on the circle.

Difference — The answer in subtraction.

Distributive Property — For any numbers a, b, and c, $a(b + c) = ab + ac$ and $(b + c)a = ba + ca$.

Divisible — A number is divisible by another number if the remainder is 0 after dividing.

E

Equation — An expression with a variable and an equal sign.

Equivalent — Fractions that name the same number. 1/2, 2/4, and 3/6 are equivalent fractions.

Estimate — An approximate rather than an exact answer.

Evaluate — To find the value of an expression by replacing variables with numbers.

Even number — A number that ends in 0,2,4,6 or 8.

Exponent — In 10^3, the exponent is 3. The exponent tells how many times the base, 10 is used as a factor. $10^3 = 10 \times 10 \times 10$.

F

Factor — Numbers or symbols that when multiplied together form a product or that divide another number or symbol.

Formula — An equation that states a rule for the relationship between certain quantities.

Fraction — A number that shows part of a whole unit. Example: 1/2

G

Graph — A drawing used to show information.

Greater Than (>) — The symbol used to compare two numbers or equations when the greater number is on the left.

Greater Than (≥) — The symbol used to compare two numbers or equations when the greater or equal number is on the left.

Greatest Common Factor (GCF) — The largest integer that is a common factor of all the given integers.

Grid — Parallel and perpendicular line segments on which points are plotted.

H

Hundredth — One of 100 equal parts. In the decimal 0.86, the digit 6 is in the hundredths' place.

I

Integer — All numbers but fractions.

L

Least Common Denominator (LCD) — The smallest integer that is a common multiple (denominator) of the given integers.

Less Than (<) — The symbol used to compare two numbers when the lesser number is on the left.

Less Than (≤) — The symbol used to compare two numbers when the lesser or equal number is on the left.

Line — A set of points that go on and on in both directions.

Line Graph — A graph that connects points to show how data changes over time.

Line Plot — A graph that shows data along a number line. Each x represents one number in the data set.

Line Segment — Part of a line. It has two endpoints.

M

Mean — A number that is the sum of the terms in a group, divided by the number of terms in that group. The mean is also known as the average.

Median — The middle number in a set of data when the data are arranged in order from least to greatest.

Mixed Number — A number containing a whole number part and a fraction part, such as 2½.

Mode — The number or numbers that occur most often in a collection of data.

Multiple — The product of a whole number and any other whole number.

Multiplication — An operation between two or more numbers, called factors, to find a product. For example, 5 + 5 + 5 is the same as 5 x 3.

N

Negative Number — Any number less than zero.

Number Line — A line that shows numbers in order.

Numerator — The number above the fraction bar in a fraction.

O

Odd Number — A number that ends in 1,3,5,7, or 9.

Ordered Pair — A pair of numbers that give the location of points on a coordinate grid.

P

Parentheses ( ) — Grouping symbols. They can show which operation should be done first or multiplication in equations such as 2(3 + 4) = 2 x 7.

Percent — A ratio with a denominator of 100. For example 5% and 5/100 name the same number.

Perimeter — The distance around the outside of a figure.

Perpendicular Lines — Lines that intersect to form right angles.

Pi (•) — The ratio of the circumference of a circle to the diameter of a circle. • •= 3.14.

Plot — To locate and mark the point named by an ordered pair on a grid.

Point — An exact location. Points are usually named with capital letters.

Positive Number — Any number greater than zero.

Prime Number — A positive integer greater than one that can only be divided by itself and one.

Probability — The chance that an event will happen.

Product — The answer in multiplication.

Property of One for Division — Any number divided by 1 is that number. Any number except 0 divided by itself is 1.

Property of One for Multiplication — The product of any number and 1 is that number.

Q

Quotient — The answer in division.

R

Radius — Any line segment that connects the center of a circle to a point on the circle.

Range — The difference between the greatest number and the least number in a set of data.

Ray — Part of a line. It has one endpoint and continues on and on in one direction.

R

Rectangle — A quadrilateral with both pairs of opposite sides parallel. There are four right angles.

Remainder — The number left over when division is complete.

Right Angle — An angle that equals 90°.

Rounding — Expressing a number to the nearest ten, hundred, thousand, and so on.

Rules of negative and positive when multiplying or dividing — If there are an even amount of negative signs, the answer is positive. If there are an odd amount of negative signs, the answer is negative.

S

Simplest form — A fraction in which the only common factor of the numerator and denominator is one.

Subtraction — To take away one number from another.

Sum — The answer in addition.

T

Tenths — One or more of ten equal parts of a whole. In the decimal 0.86, the digit 8 is in the tenth's place.

Triangle — A polygon with 3 sides and 3 points of intersection.

V

Variable — A symbol that stands for a number.

Vertex — The point where two rays meet.

Volume — The amount of space inside a solid shape.

X

x-axis — The horizontal axis in a coordinate grid.

x-coordinate — The first number in an ordered pair.

x-intercept — The point where the line crosses the x-axis (when y=0 in an equation).

Y

y-axis — The vertical axis in a coordinate grid.

y-coordinate — The second number in an ordered pair.

Y

y-intercept The point where the line crosses the y-axis (when x=0 in an equation).

Z

Zero Property of Division Zero divided by any number except zero is zero. You cannot divide a number by zero.

Zero Property of Multiplication The product of any number and zero is zero.

ABILITY TO ASSIST

To study for questions related to the ability to assist in instruction, it is important to think about the role of a Paraeducator / Instructional Aide and to answer questions based on this role. Paraeducators / Instructional Aides should have knowledge of basic child guidance and development characteristics and principles and appropriate ways to manage student behavior.

Paraeducators / Instructional Aides also need to:

- Follow instructions provided by the teacher (verbal and written).
- Be positive when interacting with students, parents, and school personnel.
- Communicate and be respectful while interacting with students and families from diverse cultures.
- Keep student information confidential (personal information, test results, medical history, etc.).
- Tutor students (individually and in small groups).
- Watch and help students in other learning environments (library, computer lab).
- Score teacher-developed tests and file information accurately.

SAMPLE

When communicating with parents from a different culture, it is most important to

a. do all of the talking so they feel more comfortable
b. be respectful of the differences between your culture and theirs
c. realize that their level of communication is not as refined as yours
d. point out your cultural differences at the beginning of the conversation

Solution: To answer this question, evaluate each choice.

Choice **a** is incorrect. Successful communication involves both speaking and listening.

Choice **b** is correct. Being respectful of cultural differences encourages open communication.

Choice **c** is incorrect. Being from another culture doesn't mean that their level of communication is better or worse than yours.

Choice **d** is incorrect. Pointing out cultural differences may create a negative communication environment. It is best to focus on similarities between both of you, such as concern for their child