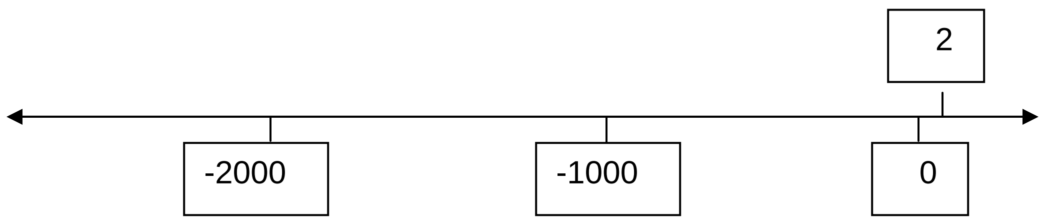
Algebra Placement Test Review

Recognizing the Relative Position between Real Numbers

A. Which number is smaller, 2 or –2000? To really appreciate which number is smaller one must view both numbers plotted on the same number line.



In comparing two numbers the smaller number always plots to the left of the larger number on the number line. This rule says that – 2000 is smaller than 2.

Examples:

1040 < 10,400
- 37 < 37
-1 > -4

Note: < means “less than” and > means “greater than”. Remember to always point the arrow head towards the smaller number.

Put the following numbers in order from smallest to largest:
13, -223, 322, 0, 1330, -2

Answer: -223, -2, 0, 13, 322, 1330

Add, Subtract, Multiply, Divide Real (Signed) Numbers

A. Every number has two characteristics, direction and magnitude. Direction has to do with the sign of the number, either positive (+) or negative (-). When conducting mathematical operations (Add, Subtract, Multiply, or Divide) on numbers the signs of the numbers play a big part in the sign of the answer. Here are some examples:

Addition:	- 3 + 2 = -1	Subtraction:	- 6 – 2 = -8
Multiplication:	(- 3) (4) = - 12	Division:	8 ÷ (- 2) = -4

In doing math operations on numbers you may be asked to add or multiply more than 2 numbers in a problem. You can only add or multiply two numbers at a time and then apply that result to the next number. The following rules apply to all math operations.

B. Adding or Subtracting two numbers:

Rule 1: If the numbers have like signs, add and keep the common sign.

Rule 2: If the numbers have different signs, subtract and use the sign of the larger original number.

Examples: 7 – 4 = 3, - 6 + 2 = - 4, - 8 – 7 = - 15, 9 + 7 = 16

C. Multiplying or dividing two numbers:

Rule 1: If the signs of the two numbers to be divided or multiplied are the same, the result will be positive.

Rule 2: If the signs of the two numbers to be divided or multiplied are different, the result will be negative.

Examples: (7) (- 4) = -28, 6 $\div$ (- 2) = - 3, (- 9) (- 2) = 18, $\frac{-8}{-4} = 2$

D. The only detail to work out now is to understand what to do if there are two signs between two numbers, i.e., 5 – (- 3). Any time there are two signs that are adjacent they can be replaced with one sign as follows:
When two adjacent signs are the same, they can be replaced by a positive (+) sign. When two adjacent signs are different, they can be replaced by a negative (-) sign. The single sign can then be manipulated as per the instructions above.

Examples: -4 + (-5) = -4 –5 = -9 9 – (-5) = 9 + 5 = 14

Absolute Value Concept

A. Recall that every number has two characteristics, magnitude and direction. The sign indicates on which side of zero the number will plot. A positive number will plot to the right and a negative number to the left of zero. The magnitude of a number indicates how far the number will plot from zero. The absolute value of a number is the distance from the plotted location of the number to zero without regard for direction. The absolute value of a number is the magnitude of that number. Two vertical lines, one on either side of the number indicates absolute value. Absolute values are always positive.

Examples: $|-4| = 4$ $|13| = 13$ $-|-7| = -7$

Operations with Algebraic Expressions

A. Algebraic terms are monomials that may include one or more variable factors (that may be raised to a power) multiplied by a numerical factor. An example would be:
"$4x^2y$" which means "4 times x times x times y". 4 is a numerical factor. x and y are variable factors. Notice that the terms involve the multiplication of numerical and variable factors. A variable is simply a letter that stands for a number because we do not yet know the value of the number. Other examples of algebraic terms are:

$$7z,\ -32a,\ 14,\ x^4y^6z^3,\ mn,\ 1,\ abcd$$

B. Algebraic expressions occur when Algebraic terms are added or subtracted. An example would be:

$4x^2y – 2x + 3$ This is an expression consisting of 3 terms ($4x^2y$, 2x, and 3).

Other examples: $6x + 4$, $x^2 + 5x – 6$, 3, $9y^2 - 36$, $-8x$

C. Solution of equations often requires the simplification of an algebraic expression. The intent is to manipulate the expression to put it in the simplest form possible. Use of the Distribution Property and gathering like terms can be required.

Using the Distributive Property

A. To evaluate the product of 5 times the sum of 3 and 4 [5(3+4)] you would simply add the 3 and 4 and multiply that sum, 7, by 5 to get 35. Another way to get this answer would be to multiply 5 times 3 (15) and 5 times 4 (20) and the sum of 15 and 20 is 35, which is the same answer. This second process is called distribution. The multiplication by 5 is being distributed over the sum of 3 and 4. You can also distribute over subtraction.
[6 (9-7) = 6(9) – 6(7) = 54 – 42 = 12] or 6(9-7) = 6(2) = 12.

You would never use the distribution in evaluating pure numerical expressions because following the order of operations rules are quicker and easier. However if you want to find the product of 5 and the sum of x and 4 [5(x+4)] you cannot use order of operations procedures because you cannot add x and 4. Now you have to distribute the multiplication of 5 over the sum of x and 4.

$$5(x+4) = 5x + 5(4) = 5x + 20$$

Examples: 3(y-2) = 3y – 3(2) = 3y – 6
-5(a + 3) = -5a + (-5) 3 = -5a + (-15) = -5a - 15
x (y+ 6) = xy + 6x

B. More formally the act of distributing multiplication across addition or subtraction looks like:

A (B + C) = AB + BC or A (B – C) = AB – BC

Examples: 2(x + 4) = (2)x + (2) 4 = 2x + 8

$$\frac{1}{3}(2x – 6) = \left(\frac{1}{3}\right)\left(\frac{2}{1}\right)x - \left(\frac{1}{3}\right)\left(\frac{6}{1}\right) = \frac{2}{3}x-2$$

C. Gathering like terms: Like terms are algebraic terms that have exactly the same variable portion. The terms 3x and -5x are like terms because the variable portion of each terms ix exactly the same (x). The terms 7x and $2x^2$ are not like terms because x is not $x^{2.}$. Similarly, 14x and 8y are not similar terms. Being able to recognize like terms is important because only like terms can be added and subtracted.

Examples: 7x + 2x = 9x
2x + 2y -6x = -4x + 2y
$2x^2 + 9x – 4x + 2 = 2x^2 + 5x + 2$

E. Simplifying Expressions. Below are a few examples.

1. 3(2x – 4) + 8 = 6x – 12 + 8 = 6x – 4

2. 12 – 4(x + 1) = 12 – 4x – 4 = - 4x + 8

3. 2(3 – 2x) + 3y = 6 – 4x +3y = -4x + 3y + 6

F. Evaluating an expression. You cannot solve an expression, but you can evaluate an expression if you are given the values of the variables in the expression. This is often required to check a solution of a problem you have solved.

Example: What is the value of 4x + 2y if x = 3 and y = 4?
4(3) + 2 (4) = 12 + 8 = 20
The value of the expression when x = 3 and y = 4 is 20. Finding the value of an expression requires that the variable values be substituted in place of the variables in the expression and the mathematical operations be accomplished to find the value of the expression. Always put values in parenthesises.

Solving Equations and Formulas

A. Algebraic equations occur when one are more terms are set equal to one or more other terms. Here's an example:

$4x^2 - 2x + 3 = 4x - 27$ In this equation one expression ($4x^2 - 2x + 3$) is set equal to another expression ($4x - 27$). Note that this is an equation consisting of one variable(x). This equation can be solved for x.

B. Solving an equation means to mathematically manipulate the terms and numbers in the equation until you get the variable you are solving for on one side of the equal sign with a coefficient of positive one. In some cases the answer may be a number. In other cases (formulas) the answer may include one or more variables. There are only two tools used to solve equations. The first tool is the Addition Property of Equality. It says you can add (subtract) the same thing (number or variable) to (from) each side of an equation and you will not change the solution.

Example: $x + 3 = 5$ You can see that x must be 2 to make the equation true. Remember we are trying to get x by itself on one side of equal sign. That means that we must somehow get rid of the 3 on the left side of the equation. Since it is a positive 3 let's subtract 3 from both sides.

$x + 3 - 3 = 5 - 3$

After doing the math operations, this becomes $x = 2$. That $x = 2$ is the solution that we could see above. It is not always possible to see the answer.

D. The second solution tool is the Multiplication Property of Equality. This property says that you can multiply (or divide) both sides of an equation by the same thing (number and/or variable) and you will not change the solution.

Example: $2x = 8$ It can be seen that x must be 4 to make this an equality.

To get x on the left hand side with a coefficient of 1 the 2 must be changed into a 1. The easy way to change any number into a 1 is to divide the number by itself. In this case we will divide both sides by 2.

$$\frac{2}{2}x = \frac{8}{2}$$

$1x = 4$. Therefore the solution is 4.

E. Here's an example requiring both tools to be used in solving the equation.

4x – 3 = 13	It is always appropriate to use the Addition Property first before using the Multiplication Property.
4x – 3 + 3 = 13 + 3	
4x = 16	The Addition Property can no longer be used, but use of the Multiplication Property is now required.
$\frac{4}{4}$ x = $\frac{16}{4}$ or x = 4.	If this answer is plugged back into the original equation 4(4) – 3 = 13 or 16 – 3 = 13 or 13 = 13 an equality is achieved indicating that x = 4 is a correct solution.

F. When equations contain 2 or more variables they are called <u>formulas</u>. You may recognize many formulas from past math classes. Examples are:

3x + 2y = 4	Linear equation
C = 2πr	Circumference of a circle
P = 2L + 2W	Perimeter of a rectangle
I = PRT	Interest calculation

G. Formulas (equations) can be evaluated or solved. Solving equations will be dealt with in the next section. Here is an example of evaluating a formula. Again you must be given values of some variable(s) to find the value of one of the variables in the formula.

Using the formula P = 2L + 2W find the value of P if L = 8 and W = 3.
P = 2(8) + 2(3) = 16 + 6 = 32

H. In solving a formula for one variable the answer often contains one or more variables.
Example:

Solve the formula 2a = 3b + 4c for b.	Use the Add Prop of Eq. first to move the 4c.
2a – 4c = 3b + 4c – 4c	
2a – 4c = 3B	To get b on the right hand side by itself, both sides must be divided by 3.
$\frac{2a-4c}{3}$ = $\frac{3}{3}$ b	
$\frac{2a-4c}{3}$ = b	

Rules for Exponents

A. The mathematical manipulation of exponential terms in Algebra requires you to now the following rules.

1. Rule I: $a^r \; a^s = a^{r+s}$

   Example: $x^4 x^3 = x^7$

2. Rule II: $(a^r)^s = a^{r \times s}$

   Example: $(x^2)^5 = x^{10}$

3. Rule III: $(a\,b)^r = a^r \; b^r$

   Example: $(x^2 y)^3 = x^6 y^3$

4. Definition: $a^{-r} = \frac{1}{a^r}$

   Example: $x^{-3} = \frac{1}{x^3}$

5. Rule IV: $\frac{a^r}{a^s} = {}^{r-s}$

   Examples: $\frac{x^8}{x^{-3}} = x^{8-(-3)} = x^{11}$

6. Rule V: $\left(\frac{a}{b}\right)^r = \frac{a^r}{b^r}$

   Examples: $\left(\frac{x^2}{y^5}\right)^3 = \frac{x^6}{y^{15}}$

Multiplying Monomials and Polynomials

A. A monomial is just another name for an Algebraic term.

Examples: $7, 3x, -3x^2y, 21ab^3c^2$

B. A polynomial is two or more terms strung together with addition or subtraction signs.

Examples: $x + 3$, $7y - 6$, $2x + 3y - 4$, $x^2 + 4x + 2$

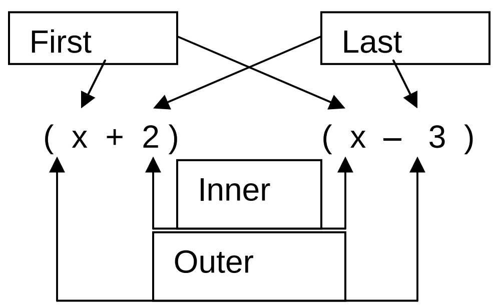
C. Multiplying a polynomial by a monomial requires the use of the Distributive Property.

Example:

$3x(x + 4) = (3x)\ 2x + (3x)\ 4 = (3)(2)(x)(x) + (3)(4)(x) = 6x^2 + 12x$

D. Multiplying a binomial (two term polynomial) by another binomial requires another technique other than the use of the distributive property.

This technique is called FOIL. F stands for first terms, O stands for outer terms, I stands for inner terms, and L stands for last terms.



F is the product of the first terms: $(x)(x) = x^2$
O is the product of the outer terms: $(-3)(x) = -3x$
I is the product of the inner two terms: $(2)(x) = 2x$
L is the product of the last two terms: $(2)(-3) = -6$

$(x + 2)(x - 3) = x^2 - 3x + 2x - 6 = x^2 - x - 6$

Note: The O and the I products generally generate like terms and must be Combined as indicated in above example ($-3x + 2x = -x$).

Special Products

A. The first special product is the Perfect Square Trinomial

$(a + b)^2 = aa + ab + ab + bb$ or $a^2 + 2ab + b^2$.

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

B. The second special product is the Difference of Two Squares. Any numerical factor and variable factor must be a perfect square.

Example: $(a + b)(a – b) = aa – ab + ab + bb = a^2 - b^2$

Note: $a^2 - b^2$ is the difference of the two squares, a^2 and b^2.

Factoring

A. In this Algebra review, up to now, we have learned how to mathematically manipulate Algebraic terms and expressions to get an answer. We have been learning how to use some unique building tools to fabricate (build) a result. Factoring involves the opposite technique—how to break down an expression into its basic building blocks. We are going to learn the solution techniques to find the values of X that are solutions for the equation $2x^2 + 10x + 12 = 0$.

B. Factoring using the Greatest Common Factor (GCF). This is basically using the Distribution Property in reverse. When required to factor an expression or use factoring to solve an equation it is imperative to always first see if a GCF can be factored out. In looking at the expression 3x + 9, is there a number or variable that is common to each term? Yes, 3 is common to both terms. If 3 is divided (or factored) out of both terms the result is 3(x + 3)

Example: Factor the GCF out of $8y^3 - 12y^2$

The technique is to find the largest number, if any, that will divide evenly into each term and the largest power of a variable term, if any, that is common to each term. Inspection of each term will show that 4 is the largest number that is common to each term. Further inspection will show that y^2 is the highest power of y that is common to each term.

$$8y^3 - 12y^2 = 4y^2(2y – 3)$$

The results can be checked by applying the distributive property in which you should return to the original polynomial.

C. Factor by Grouping: Typically if you are asked to factor an expression with 4 terms that cannot be combined, it is a good idea to see if the expression can be factored by grouping. For the expression ax + 3a + 2x + 6 look at the first two terms to see if they contain a GCF. The GCF would be a. Now look at the last two terms. In this case 2 is the GCF. If A is factored out of the 1^{st} two terns and 2 is factored out of the last two terms, the expression would be a(x + 3) + 2(x + 3). Now instead of having 4 terms the expression has 2 terms, and there is a GCF for these terms. That GCF is (x + 3). If x + 3 is factored out of both terms, the result is (x + 3)(a + 2).

$ax + 3a + 2x + 6 = (x + 3)(a + 2)$

G. Factoring Trinomials. Trinomials of the form $ax^2 + bx + c$ (a, b, c are real numbers) can be factored. If a is 1, the factoring process is easier. To factor $ax^2 + bx + c$, you are looking for an answer that is in the form $(x + m)(x + n)$. The product mn must equal c and the algebraic sum of m and n must equal b.

Example: $x^2 + 2x – 8 = (x + 4)(x – 2) = xx – 2x + 4x – 8 =$
After FOILing we see that $x^2 + 2x – 8$ a = 1, b = 2, and c = -8. Also m = 4 and n = -2. From above mn = c or (4)(-2) = -8 and m-n = b or (4) + (-2) = 2

Example: Factor $x^2 + 10x + 16$.
First of all look at the factors of c (16). They are: (1, 16), (2, 8), and (4,4). Each set of factors when multiplied gives you 16 (c)., but the algebraic sum of only one set of factors gives you 10 and that is (2, 8).

So the factorization of $x^2 + 10x + 16 = (x + 2)(x + 8)$ If you FOIL this answer you will get the trinomial you started out with.

I. Factorization of a polynomial $ax^2 + bx + c$ where a does not equal 1. This factorization is much more difficult that when a= 1. The most often used factorization technique for this type problem is trial and error. Basically you look at the factor of a and the factors of c and test different combinations to get the answer.

Example: Factor $2x^2 + 7x + 6$. The factor of a (2) are (1,2) and the factors of c (6) are (1,6) and (2,3). You must use the coefficient of x^2 to be 2, and using the factors of 2 and 3 will probably get you closer to 7 than using the factors of 1 and 6. Remember you must multiply either 1 or 6 by 2 and then add. Using the 2 and 3 factors the possibilities are: $(2x + 2)(x + 3)$ or $(2x + 3)(x + 2)$. If you foil these two products you will see that the second set of factors is the answer. $2x^2 + 7x + 6 = (2x + 3)(x + 2)$

K. Factorization of the Difference of Two Squares. If you are asked to factor $x^2 - y^2$ the answer is $(x + y)(x – y)$. Look again at 8b above.

Example: Factor $16a^4 - 81b^4 = (4a^2 + 9b^2)(4a^2 - 9b^2)$, but you are not done because $4a^2 - 9b^2$ can still be factored.
The final answer is $(4a^2 + 9b^2)(2a + 3b)(2a – 3b)$.

Remember when factoring the difference of 2 squares-always check to see if the factoring results in the difference of another 2 squares.

Note: You cannot factor $a^2 + b^2$. There are no binomials that you can multiply and get a product of $a^2 + b^2$.

Solving Trinomials

A. Ever since we have been talking about factorization we have factored expressions. You have not seen an equal sign since it was briefly mentioned at the beginning of 9 above. Now we want to briefly explain how to solve trinomials. If you multiply two factors and the product is zero, then either one or both of the factors must be zero. If (p)(q) =0 then either p or q or both must be zero.

a. Trinomial solution process: The process involves factoring the trinomial and setting each factor equal to zero. Solve each equation for the variable and check the answer by substituting it into the original equation. It you get an equality the answer is a good solution.

Example: Solve $x^2 + x - 6 = 0$

$(x - 2)(x + 3) = 0$

$x - 2 = 0$, so $x = 2$ is a possible solution

and $x + 3 = 0$, so $x = -3$ is a possible solution

$x^2 + x - 6 = 0$	$x^2 + x - 6 = 0$
$2^2 + 2 - 6 = 0$	$(-3)^2 + (-3) - 6 = 0$
$4 + 2 - 6 = 0$	$9 - 3 - 6 = 0$
$6 - 6 = 0$	$6 - 6 = 0$
$0 = 0$	$0 = 0$ both are equalities so both answers are good solutions.

Elementary Algebra Review

The Elementary Algebra Section of the Accuplacer Computerized Placement Test consists of twelve multiple choice questions, which include the following operations:

Computation (add, subtract, multiply and divide) of:
Integers, rational numbers (positive and negative), absolute values, monomials, and polynomials

Evaluation of algebraic formulas

Factoring polynomials

Simplifying rational roots, exponents, and algebraic fractions

Solving equations, inequalities, and word problems

Solving systems of linear equation and quadratic equations

Linear equations

Translating written phrases into algebraic expressions or equations

Answers to all questions are in a multiple choice format, and you must answer one question before going to the next. Calculators are not permitted, but scrap paper will be provided and must be turned in at the end of the testing session. There is no time limit. Work through these sample questions Answers are included at the end of this section.

1) On a recent Tuesday in Fairbanks, Alaska, the temperature at 6:00 p.m. was 8° F. By midnight the temperature had fallen 23°, and by 6:00a.m. the following day the temperature had dropped another 4°. By 3:00 p.m., the temperature had risen 24°. What was the temperature at 3:00 p.m. on Wednesday?

   a) 35°
   b) -19°
   c) 5°
   d) -5°

2) Multiply: (x-5)(x-2)

   a) x^2 -7x – 10
   b) x^2 -7x + 10
   c) x^2 +7x -10
   d) 2x-10

2) A rectangular table is 11 feet longer than it is wide. If the perimeter is 42 feet, what is the width?

   a) 462 feet
   b) 53 feet
   c) 31 feet
   d) 5 feet

4) Simplify: $2x + \sqrt{4x^2} + \sqrt{12x^4}$

a) $18x^3$

b) $2x + \sqrt{4x^2} + \sqrt{12x^4}$

c) $4x + 2\sqrt{3x^4}$

d) $4x + 2x^2\sqrt{3}$

5) If x = -2, then $x^2 + 2x + 3$ is equal to:

a) 3
b) -5
c) 11
d) 5

6) The sum of twice a number and 7 is 37. Find the number.

a) 30
b) 7
c) 23
d) 15

7) (3, -2) is the solution for which linear equation?

a) 3x -2y = 13
b) 2x + y = 3
c) 5x + 3y = -7
d) 4x + 7y = -5

8) List these numbers from least to greatest: -5, 2, -2, 0, 4, -1

a) 0, -1, -2, 2, 4, -5
b) -5, 4, 2, -2, -1, 0
c) -5, -2, -1, 0, 2, 4
d) -1, -2, -5, 0, 2, 4

9) Simplify: (2 – 4) (6 – 8) (11 – 9)

a) 4
b) -4
c) 8
d) -256

10) Which binomial is a factor of: $x^2 - 13x + 36$?

a) $(x + 4)$
b) $(x - 4)$
c) $(x - 13)$
d) $(x + 13)$

11) $\frac{x^2 + 4x + 3}{x^2y} \div \frac{x^2 + 2x + 1}{xy^2}$

a) $\frac{2x + 3}{xy}$

b) $\frac{y(x + 3)}{x(y + 1)}$

c) xy

d) $\frac{xy}{2x + 3}$

12) Simplify: $2x - 3(x-2)$

a) $-x + 6$
b) $x + 6$
c) -1
d) $3x - 5$

13) Solve: $x^2 - 5x = 24$

a) -2 or -5
b) 5 or 2
c) 8 and -3
d) -8 and 3

14) Solve: $\sqrt{x} - 2 = 5$

a) 7
b) 9
c) 3
d) 49

15) Solve: $4y^2 - 16 = 0$

a) 4 or -4
b) 0
c) 2 or -2
d) 11 or -11

Elementary Algebra Answers and Solutions

1) Answer: c Solution: The temperature dropped from the starting point, so you must subtract from the original temperature of 8°. 8 – 23 = -15 then -15 – 4 = -19. Then the temperature rose by 24 degrees, so you add 24. -19 + 24 = 5°

2) Answer: b Solution: You may be familiar with the acronym FOIL, which stands for first, outer, inner, and last. You multiply each of the numbers (letters) by the other numbers (letters.) First terms, $x * x = x^2$ outside terms, (-2) * (x) = -2x inside terms, (-5) * x = -5x last terms (-5)(-2) = 10. Then combine any like terms:
-2x + (-5x) = -7x
$x^2 - 7x + 10$

3) Answer: d Solution: Begin by defining the unknown. Let x = the width, and let x + 11 = the length. The perimeter of a polygon is the sum off all its sides. For a rectangle this would mean adding the length twice and the width twice and adding those numbers together. The formula is $P = 2l + 2w$. Since the perimeter is given in the problem, you can substitute in the formula the parts that you know, and solve for the parts that you need to know. 42 = 2(x + 11) + 2(x). Next multiply the 2's by the other numbers/letters in the parentheses:
42 = 2x + 22 + 2x.
Then combine the like terms: 42 = 4x + 22.
Subtract 22 from each side of the equation: 42-22 = 4x + 22 – 22
leaving 20 = 4x
Then divide both sides of the equation by 4 to isolate x: 5 = x.
The width is 5 feet and the length is 11 feet longer or 16 feet.

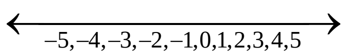
4) Answer: d Solution: Begin by taking the square roots of any perfect squares under the radicals. The square root of 4 is 2 and the square root of x^2 is x, so the middle term becomes 2x. The number 12 can be broken down into 4 * 3. The square root of 4 is 2 and the square root of x^4 is x^2. The square root of 3 is not a perfect square, so leave it under the radical. Now you have $2x + 2x + 2x^2\sqrt{3}$. Combine the like terms 2x + 2x, which leaves $4x + 2x^2\sqrt{3}$.

5) Answer: a Solution: Given that x = -2, substitute that number in the equation for each x. $(-2)^2 + 2(-2) + 3$. Remember that a negative number multiplied by another negative number results in a positive product, so (-2)(-2) = 4 for the first term. The second term is a positive number multiplied by a negative number which results in a negative product, so 2(-2) = -4. After multiplying, the remaining equation is 4 – 4 + 3. After subtracting 4 from 4, this leaves only 3.

6) Answer: d Read all word problems carefully, and think about the meaning of the words. Twice means multiplied by 2, and sum is the answer to an addition problem. The terms *is* and *results in* usually represent the equal symbol. As in question number 3, begin by assigning a variable to the unknown. Let x = the number. Twice the number would be written as 2x. Add the number 7 to the 2x and write the 37 on the other side of the equals symbol. 2x + 7 = 37 Now that you have the equation, you are ready to solve for x. Subtract 7 from both sides of the equation: 2x + 7 – 7 = 37 – 7. This leaves 2x = 30. Next divide both sides of the equation to get x by itself. x = 15. To check your answer, plug 15 into your original equation. The result should be a true statement. 2(15) + 7 = 37. 37 = 37 is a true statement.

7) Answer: a Solution: The solution sets for linear equations are written in the form (x,y). To determine the correct solution to the linear equation, substitute each combination of x and y into the equation and solve to see if it results in a true statement. 3(3) – 2(-2) = 13
9 + 4 = 13 13 = 13 is a true statement

8) Answer: c It might help to draw a number line on your scrap paper and/or think of the absolute value of the numbers decreasing as they approach zero.



9) Answer: c In solving problems with several steps, begin by completing the operations inside the parentheses first. (2 - 4) results in (-2), (6 – 8) results in -2, and (11-9) results in 2. Now there is only multiplication remaining (-2)(-2)(2). After multiplying the contents of the first two parentheses, the result is 4 since multiplying two negatives results in a positive answer. Multiply that 4 by 2 and the result is 8.

10) Answer: b Solution: The answer choices for this question are binomials, one of which is a factor of the trinomial in the original question. First factor the binomial by figuring the square root of the first term and the factors of the last term. The square root of x^2 is x and the factors of 36 are: (1 and 36) or (-1 and -36) or (2 and 18) or (-2 and -18) or (3 and 12) or (-3 and -12) or (4 and 9) or (-4 and -9). Think about which of these factors would add together to get the middle term (-13 in this problem.) -4 and -9 is the correct combination. The factored form of the trinomial is written in two sets of parentheses, with the square root of the first term in the first position of each. The second term in each are the factors with the chosen signs. (x – 4)(x – 9). To check the product, use the FOIL method explained in the answer to question #2. Before choosing an answer from the four choices, be certain that you have used the correct sign.

11) Answer: b Solution: This problem involves factoring trinomials, as explained in the answer to question #10. To factor the numerator of the both fractions, take the square root of the first term, and figure out the factors of the last term. For the first fraction, the square root of x^2 is x and would be written in the first position in both parentheses. The factors of 3 are: 1 and 3. {Note, we do not need to consider the negative factors since there are no negative numbers in this problem.} (x + 1)(x + 3) is now the numerator of the first fraction, and the denominator remains the same. For the second fraction, the square root of x^2 is x, and the factors of 1 are: 1 and 1. (x + 1)(x + 1) is the numerator for the second fraction. Remember that division of fractions is done by multiplying by the reciprocal of the second fraction. Rewrite the problem as a multiplication problem keeping the first fraction the same and writing xy^2 as the numerator of the second fraction and (x + 1)(x + 1) as the denominator of the second fraction. You may cancel any like terms from numerators to denominators. {Note: You may only cancel in multiplication, never in addition or subtraction. You may only cancel from numerators to denominators, never from numerators to numerators or denominators to denominators.}

$$\frac{(x + 3)(x + 1)}{x^2y} * \frac{xy^2}{(x + 1)(x + 1)}$$

The terms (x + 1) can be divided to leave 1 on the numerator in the first fraction and the in the denominator of the second fraction. The *x* terms can be divided leaving x in the denominator of the first fraction and 1 in the numerator of the second fraction. The *y* terms can be divided leaving 1 in the denominator of the first fraction and y in the numerator of the second fraction. The result is $\frac{y(x + 3)}{X(y + 1)}$

12) Answer: a Solution: This problem involves several operations and cannot be solved, only simplified. Since a number beside the parentheses indicates multiplication, begin by multiplying the negative 3 by both terms inside the parentheses. This results in 2x – 3x + 6. Then combine like terms: 2x – 3x = -1x, which is usually written as –x.

13) Answer: c Solution: To solve, subtract 24 from both sides of the equation to get: $x^2 - 5x - 24 = 0$ Factor the trinomial following the steps explained in the solutions to questions 10 and 11. The factors of -24 are (-1 and 24) or (-24 and 1) or (2 and -12) or (-2 and 12) or (4 and -6) or (-4 and 6) or (-3 and 8) or (-8 and 3). Of these choices, adding -8 and 3 results in the middle term (-5). To check this problem, substitute the possible answers in the equation and determine which set results in true statements. $(8)^2 - 5(8) = 24$; $64 - 40 = 24$; $24 = 24$ is a true statement. $(-3)^2 - 5(-3) = 24$; $9 + 15 = 24$; $24 = 24$ is true.

14) Answer: d Solution: To solve this problem, first add 2 to both sides of the equation leaving $\sqrt{x}$ = 7. Then square both sides $(\sqrt{x})^2 = (7)^2$
This results in x = 49.

15) Answer c Solution: This problem may be solved by factoring or by isolating the variable and taking the square root of both sides. To solve by factoring, first divide everything by 4, leaving $y^2 - 4 = 0$. This type of the equation is the difference of two squares and is factored by writing the square root of the first term in the first position of the parentheses and writing the square root of the second term in the second position of both parentheses. Write one as an addition and the other as a subtraction. $(y – 2)(y + 2) = 0$. Since the product of these is equal to zero, they may be solved separately. y - 2 = 0; add 2 to both sides, and y = 2. y + 2 = 0; subtract 2 from both sides and y = -2.

Another method of solving is to isolate the variable and take the square root of both sides. First add 16 to both sides, resulting in $4y^2 = 16$. Then divide both sides by 4, leaving $y^2 = 4$. Take the square root of both sides to determine the final answer. The square root of y^2 is y and the square root of 4 is either negative or positive 2. (Sometimes written as ±2)