Secondary Math 3 Unit 1 Notes

Unit 1.1: Numeracy

1. Order of Operations:

a) $(3+1)^3 - 10 \div 2$

b) $4(6+2) - 6 - 1$

c) $4 - (5 \cdot 2) \div (2+3)$

d) $\frac{9}{2 \cdot (-1) - 1^3}$

e) $(2-1)^2 + -6 - \left(\frac{4-(-2)}{3} - 5\right)$

f) $-4 \cdot 3 + (|2| + (-2)^2)$

2. Solving Equations:

a) $2(-6x+4) - 8x = 168$

b) $-5(1+7b) = -5 - 5b$

c) $-2(7+5n) = 28 + 4n$

d) $\frac{3x+5}{4} = \frac{4x}{5}$

e) $-2(2+v) = 31 + 3v$

f) $\frac{4(x+3)}{2(x+1)} = 3$

3. Fractions Rules:

Add or subtract	
Multiply	
Divide	

a) $\frac{2}{5}+\frac{3}{10}$

b) $\frac{5}{12}-\frac{1}{18}$

c) $\frac{12}{25}+\frac{13}{10}$

d) $\frac{15}{6}\cdot\frac{3}{10}$

e) $\frac{5}{2}\cdot\frac{24}{25}$

f) $\frac{2}{5}\div\frac{3}{10}$

g) $\frac{12}{15}\div\frac{3}{10}$

h) $\frac{\frac{2}{5}}{\frac{14}{15}}$

i) $\frac{\frac{2}{5}}{2}$

4. Exponent Rules:

Property	Rule	Example
Zero Property		• $a^0 =$ • $12^0 =$
Negative Exponent Property		• $\left(\frac{1}{a}\right)^{-1} =$ • $(2a)^{-2} =$ • $2a^{-3} =$
Product of Powers Property		• $a^4 \cdot a^3 =$ • $5a^2 \cdot 2a^9 =$
Quotient of Powers Property		• $\frac{a^7}{a^2} =$ • $\frac{6a^{10}}{2a^{-1}} =$
Power of a Power Property		• $(a^3)^2 =$ • $(2x^2)^5 =$

Simplify: Your answer should contain only positive exponents.

a) $2r^2 \cdot 2^r$

b) $3k^2 \cdot k^{-3}$

c) $(2b^5)^2$

d) $\frac{2x^{-4} \cdot x^{-2}}{(x^{-4} \cdot x^3)^2}$

e) $\frac{(k^{-1})^2 \cdot (2k^{-4})^0}{4k \cdot k^4}$

f) $\frac{2y^{\frac{3}{4}}}{2y}$

5. Radicals. Simplify each radical.

a) $\sqrt{720}$

b) $\sqrt{256x^4}$

c) $\sqrt[3]{16x^6}$

d) $\sqrt[4]{8x^{18}}$

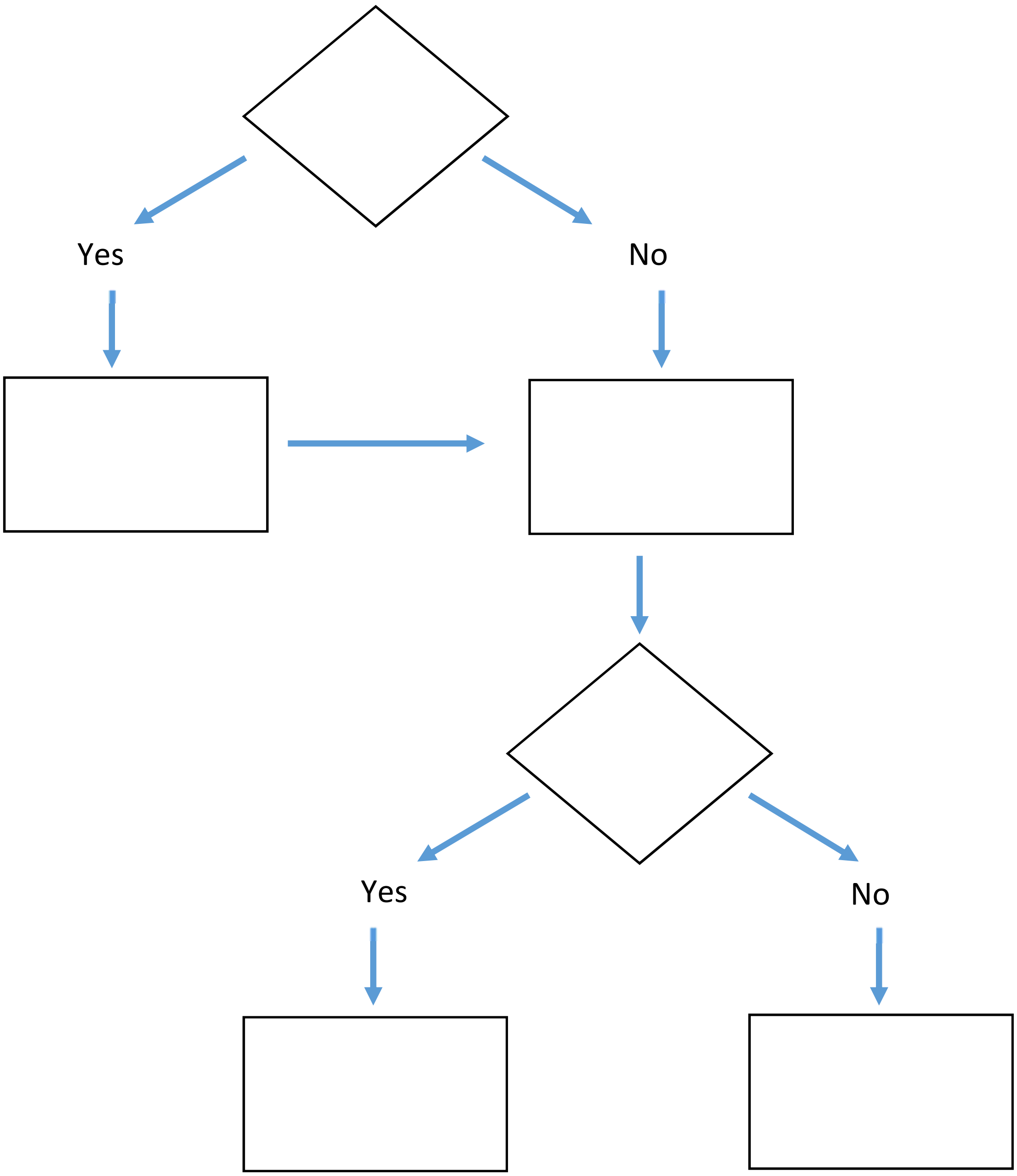
e) $\sqrt{600}$

f) $\sqrt[3]{216x^7}$

Unit 1.2: Factoring

FACTORING polynomials involves breaking up a polynomial into simpler terms (the factors) such that when the terms are multiplied together they equal the original polynomial. Factoring helps solve complex equations so they are easier to work with.

Factoring Steps



1. The first step in factoring is to check to see if any of the terms have anything in common. This is called the **GREATEST COMMON FACTOR.** (Note: If the leading coefficient is negative, you will factor out a negative as well.)

a) $8xy + 4xy^2$

b) $-14x^2y^2z + 21xy^2z^2$

c) $8x - x^2$

d) $6x^2 - 2x + 4$

2. Factoring Trinomials when the leading coefficient is 1:

a) $n^2 - 7n + 6$

b) $m^2 - m - 56$

c) $r^2 - 16r + 64$

d) $v^2 + 9v + 20$

e) $x^2 - 15x + 50$

f) $n^2 + 11n + 30$

3. If you are given 4 terms and you are asked to factor it, you may consider factoring by grouping. Factoring by grouping creates smaller groups within the problem.

Steps to factoring by grouping:
i. Group the first two terms together and the last two together. ii. Factor the GCF from each of the two groups. Notice that what is left inside the parenthesis is a perfect match. This is now the GCF of the two remaining terms. iii. Factor the "match" out of the two remaining terms. Your polynomial is now factored!

a) $4x^2 + 20x - 3xy - 15y$

b) $3x^3 - 6x^2 + 15x - 30$

c) $x^2 + ab - ax - bx$

d) $x^3 + 2x^2 - 9x - 18$

4. Factoring Trinomials when the leading coefficient is not 1:

Steps
i. Find two numbers that multiply to $a \cdot c$ (the outside) and add to b (the middle). ii. Split the middle term into two pieces using the numbers from part (i). iii. Factor by Grouping

a) $5b^2 + 16b + 3$

b) $3n^2 - 20n + 12$

c) $6p^2 + 13p - 15$

d) $8x^2 - 15x - 2$

e) $6r^2 + 7r - 90$

5. **Difference of Squares**: If your polynomial has two terms that are both perfect squares separated by a subtraction sign: $a^2 - b^2$ then it will always factor out to be: $(a - b)(a + b)$.

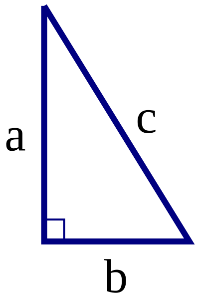
a) $z^2 - 9$

b) $2y^2 - 32$

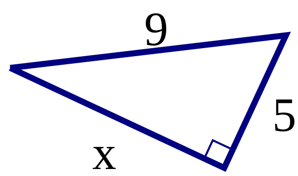
c) $4g^2 - 64$

Unit 1.3: Right Triangle Trigonometry

1. Remember: If you know two sides of a right triangle and you are trying to find the third, you can use the ______________________.



1a)



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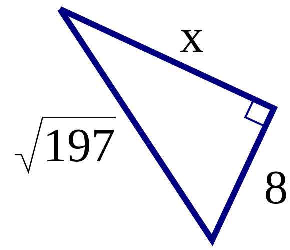
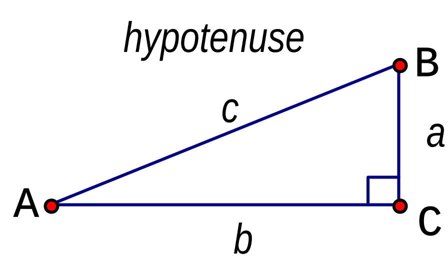


*BE SURE TO SIMPLIFY ALL RADICALS.

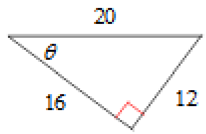
Trigonometry means triangle measurement. Trig involves <u>ratios</u> that compare two sides of a right triangle. The three ratios that we will be using are **SINE, COSINE,** and **TANGENT.**

LET'S DEFINE SINE, COSINE, AND TANGENT:		
Words	Symbols	Models
sine of ∠A =	sin A = sin B =	
cosine of ∠A =	cos A = cos B =	
tangent of ∠A =	tan A = tan B =	

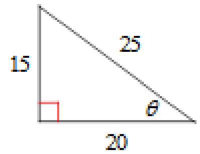
You **MUST** be careful and recognize what the question is asking for! Sometimes it will ask you to find missing angles/sides. BUT … if the question only requests that you give the trig ratio – your answer will be a fraction. Quick. Easy. Don't over complicate it!!

2. Find each trig ratio:

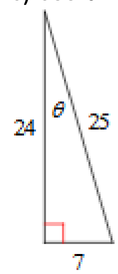
a) tan θ



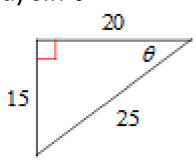
b) sin θ



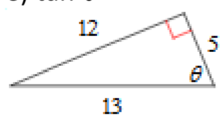
c) cos θ



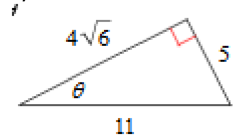
d) sin θ



e) tan θ

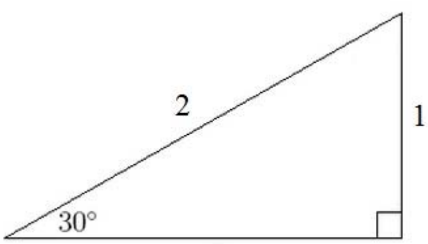


f) cos θ

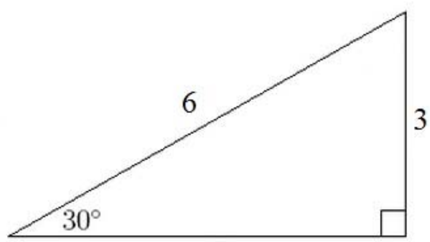


Find each trig ratio:

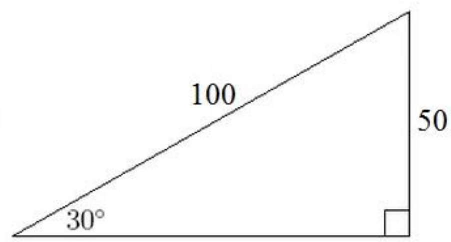
a) sin30



b) sin30



c) sin30



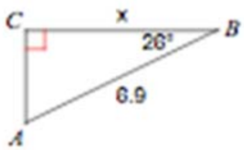
(not drawn to scale)

What do you notice?

Sine, cosine, and tangent of angle measures all have a specific value that is given by the ratio of the side lengths of the triangle. Each angle measure has a unique ratio, so we can use this information to find missing sides and angles of right triangles.

3. Use trig to find the missing sides of each triangle:

a)



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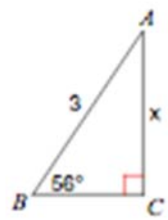

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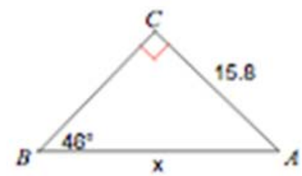

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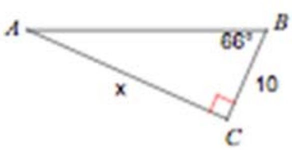

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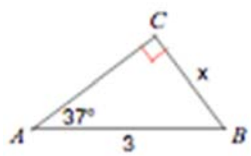

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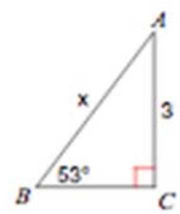
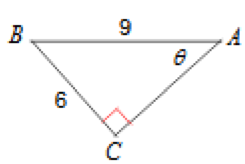


4. Use Sine, Cosine and Tangent to find the missing angle indicated.

a)



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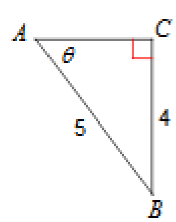

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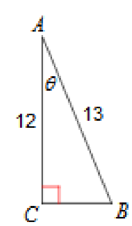

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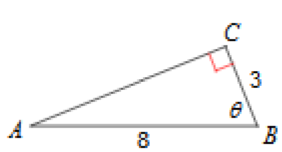

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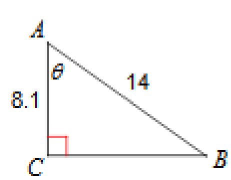

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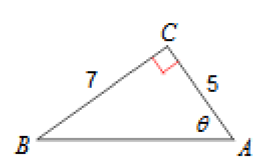
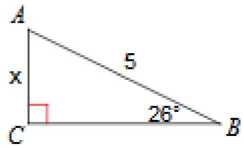
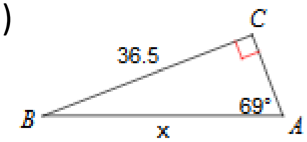
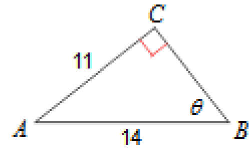
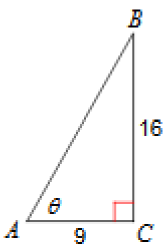


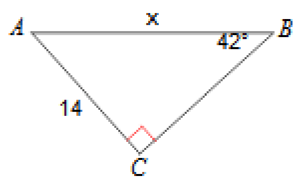
5. Find the missing piece of information? Either a side (x) or an angle (θ)

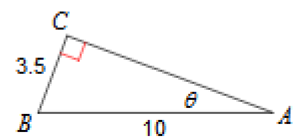
a) 

b) 

c) 

d) 

e) 

f) 

Unit 1.4: Solving a Quadratic Equation using the Quadratic Formula.

What happens when you can't factor a quadratic? Another algebraic method we can use to solve quadratic equations is using the quadratic formula. When the quadratic is in standard form, (Meaning: ________________________________), you locate a, b, c and plug the values into the following formula:

YOU NEED TO MEMORIZE THIS!!	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Let's Practice! Use this formula to solve the following equation: $x^2 + 4x - 9 = 0$

Step 1: Identify the following: a= ____________ b=____________ c=____________

Step 2: Plug these values into the Quadratic Formula

Step 3: Simplify the radical (solve for x).

ERROR ALERT! Simplifying the radical is the place where most mistakes are made. Be Careful!

Example 1: Solve each equation using the quadratic formula

a) $x^2 + x - 11 = 0$

b) $x^2 + 11x + 18 = 3$

c) $4x^2 + 10x + 6 = 0$

d) $3x^2 - 8 = 0$

e) $x^2 - 4x + 10 = 0$

f) $2x^2 - 6x + 5 = 0$

g) $2x^2 = -10$

h) $5x^2 = 8 - 5n$

Example 2:

a. Is it possible for a quadratic graph to have 1 real solution? If yes, sketch an example of that graph:

NOTE

b. Is it possible for a quadratic graph to have 0 real solutions? If yes, sketch an example of that graph:

NOTE