Unit 1 Review

Function Notation

A function is a mathematical relation so that every _____ in the _______ corresponds with one ______ in the ________. To evaluate a function, f(x), substitute the ___________ for every x and calculate.

Example: Evaluate f(-3) for f(x) = 100(2)^x.

Transformations

Transformations are function rules that applied to ____________________________ to create a new shape.

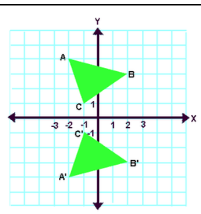
Certain transformation preserve rigid motion and produce congruent figures: ________________________, ____________________, and _____________________, or any combination of these.

Other transformations do not preserve rigid motion, so they do not produce congruent figures.

__________________ produce similar figures, while ____________________________ are not congruent or similar.

To prove if a transformation preserves rigid motion, you can use the distance formula:

Rules for transformations:

Transform-ation	Reflection Over the x-axis	Reflection Over the y-axis	Reflection Over the y=x line	Rotation of 90^0 Clockwise	Rotation of 90^0 Counter-clockwise	Rotation of 180^0	Trans-lation
Written Description	Shape flips over the x-axis (flips over the horizontal axis)						
Picture							
Function Rule	f(x, y) → (x, -y)						

To determine the coordinates for a dilation, __________________ each point times the scale factor of the dilation.

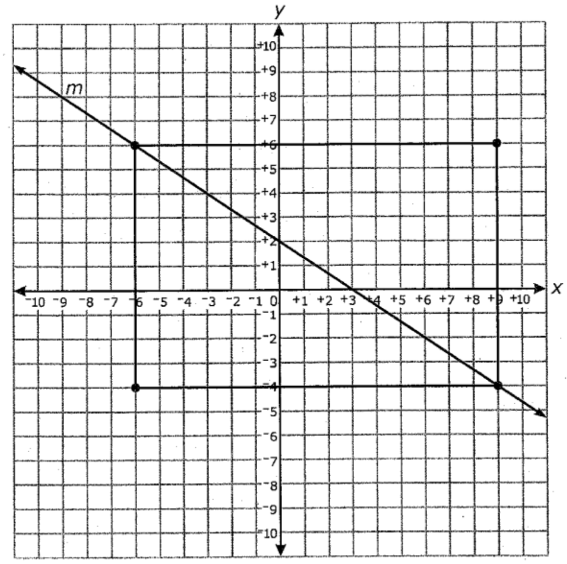
Concept Questions:

1. Why do rotations, reflections, and translations preserve congruence while dilations do not?

2. Why do adding and subtracting translate points, while multiplying dilates points?

Unit 1 Review Problems

1. Which transformation will carry the rectangle shown below onto itself?



A a reflection over line *m*

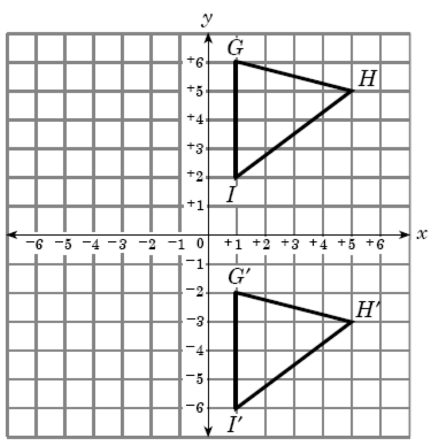
B a reflection over the line $y = 1$

C a rotation 90° counterclockwise about the origin

D a rotation 270° counterclockwise about the origin

2.

$\triangle G'H'I'$ is the image of $\triangle GHI$ after a transformation.



Which describes the transformation shown?

A reflection over x-axis

B reflection over y-axis

C $(x', y') = (x - 8, y)$

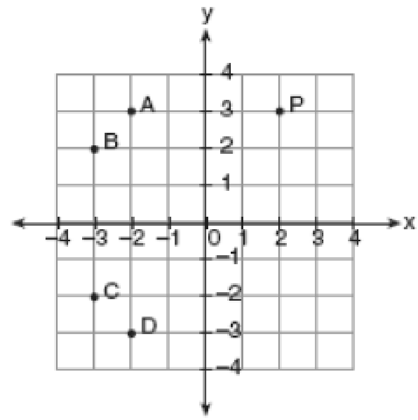
D $(x', y') = (x, y - 8)$

3. The image of point A after a dilation of 3 is $(6,15)$. What was the original location of point A?

[A] (18,45) [B] (3,12)

[C] (9,18) [D] (2,5)

4. In the accompanying graph, if point P has coordinates (a,b), which point has coordinates $(-b,a)$?



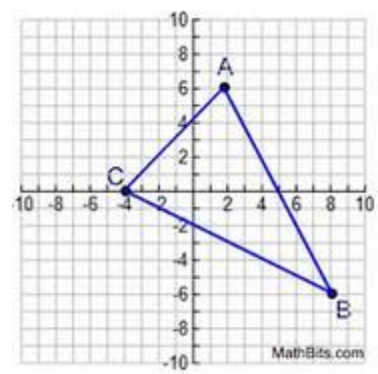
[A] B [B] A [C] D [D] C

5. What are the coordinates of the point (2, -3) after is it reflected over the x-axis and rotated 90^0 counterclockwise?

[A] (-3, 2) [B] (2, 3)

[C] (-2, 3) [D] (-2, -3)

6.



If the triangle above is reflected over the x-axis and dilated by a scale factor of 3, what is the length of the new image AC? Round to the nearest tenth.

A) 2.8 units B) 8.5 units

C) 18.2 units D) 25.5 units

Unit 2 Review

Polynomial Operations

Multiplying: ________________ terms times EVERY other term

To distribute __________________, write the polynomial in parentheses and _____________.

Adding or subtracting: _____________________________________.

Remember, you can NOT operate with ________________ in the calculator!

Example 1: $(2x – 3)^3$

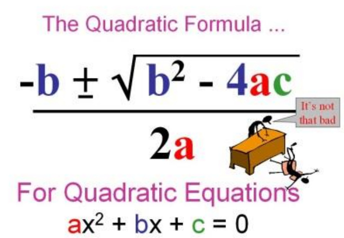
Factoring/Dividing

GCF	$x^2 + bx + c$	$ax^2 + bx + c$	Perfect Squares	
$10x^2 – 5x$	$x^2 – 9x – 22$	$3x^2 – 13x – 10$	$x^2 – 49$	$5x^3 + 500x$

Quadratic Formula

You MUST use the quadratic formula for ______________solutions or _____________ solutions in radical form.

Example: Solve $3x^2 + 9x = -11$



Completing the Square

To complete the square and rewrite quadratics, use _________ to find the correct c.

Then, ________________ the parentheses and _____________________ the parentheses.

Finally, ________________ and _________________.

Example: Complete the square to find the vertex of $y = x^2 – 12x – 15$. Then, solve the equation.

Solving Equations/Systems

Solutions to all equations and systems are the ______________________________ on the graph.

If you graph both sides of an equation (or both equations in a system) in the calculator, use:

______________________, ______________________ to find the solution. (Don't forget to adjust your window range if necessary.)

Real-World Quadratics

x-intercept: Where __________________ = 0

y-intercept: ________________ value, where _____ = 0

Maximum/minimum value: The ______________ or _____________ y-coordinate (output)

Example: A rocket is launched and follows the function $h(t) = -16t^2 + 500t + 30$ for its first 10 seconds.

a) From what height is the rocket launched?

b) What is the highest height the rocket reaches?

c) When does the rocket hit the ground?

Concept Questions:

1. Why is a parabola shaped like a U, and why does it have a line of symmetry through the vertex?

2. What is the easiest way to solve quadratics? Explain.

3. Why is $x^2 - 49$ not equal to $(x - 7)(x - 7)$?

Unit 2 Practice Problems

1.

The equation $2x^2 - 5x = {}^-12$ is rewritten in the form of $2(x - p)^2 + q = 0$. What is the value of q?

A $\frac{167}{16}$

B $\frac{71}{8}$

C $\frac{25}{8}$

D $\frac{25}{16}$

2. Solve: $8x^2 + 3x = -7$

A $\frac{{}^-3 \pm i\sqrt{215}}{16}$

B $\frac{3 \pm i\sqrt{215}}{16}$

C $\frac{{}^-3 \pm \sqrt{233}}{16}$

D $\frac{3 \pm \sqrt{233}}{16}$

3.

What value of h is needed to complete the square for the equation $x^2 + 10x - 8 = (x - h)^2 - 33$?

A ${}^-25$

B ${}^-5$

C 5

D 25

4. Which equation has exactly one real solution?

A $4x^2 - 12x - 9 = 0$

B $4x^2 + 12x + 9 = 0$

C $4x^2 - 6x - 9 = 0$

D $4x^2 + 6x + 9 = 0$

5.

The graph of the function $f(x) = x^3$ will be shifted down 2 units and to the right 3 units. Which is the function that corresponds to the resulting graph?

A $g(x) = (x + 3)^3 + 2$

B $g(x) = (x + 3)^3 - 2$

C $g(x) = (x - 3)^3 + 2$

D $g(x) = (x - 3)^3 - 2$

6.

The number of bacteria in a culture can be modeled by the function $N(t) = 28t^2 - 30t + 160$, where t is the temperature, in degrees Celsius, the culture is being kept. A scientist wants to have fewer than 200 bacteria in a culture in order to test a medicine effectively. What is the ***approximate*** domain of temperatures that will keep the number of bacteria under 200?

A ${}^-1.01°C < t < 2.03°C$

B ${}^-0.90°C < t < 1.97°C$

C ${}^-0.86°C < t < 1.93°C$

D ${}^-0.77°C < t < 1.85°C$

7.

The heights of two different projectiles after they are launched are modeled by $f(x)$ and $g(x)$. The function $f(x)$ is defined as $f(x) = {}^-16x^2 + 42x + 12$. The table contains the values for the quadratic function g.

x	$g(x)$
0	9
1	33
2	25

What is the ***approximate*** difference in the maximum heights achieved by the two projectiles?

A 0.2 feet

B 3.0 feet

C 5.4 feet

D 5.6 feet

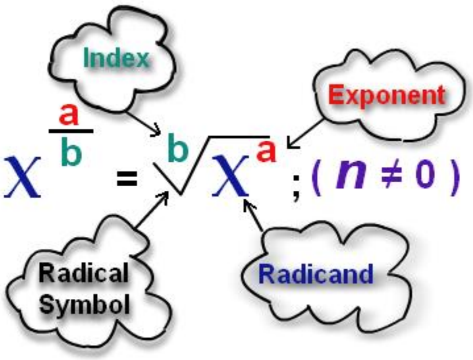
Unit 3 Review

Simplifying Radicals

To simplify a number or expression under a square root, determine the ________________________________ of the radicand under the radical, write the expression by _________________ the two radicals, and take the ______________________ of the perfect square. For example:

$\sqrt{72} = \sqrt{36} \cdot \sqrt{2} = 6\sqrt{2}$ Examples: $\sqrt{150}$ $\sqrt{60x^8}$

Rational Exponents (with fractions)



The numerator of the exponent is the ____________________ of the radicand.

The denominator of the exponent is the ____________.

Radical Equations

To solve a radical equation (with a variable inside a __________________), first use inverse operations to get the ________________ by itself.

Then, __________________ both sides to pull the variable out of the radical.

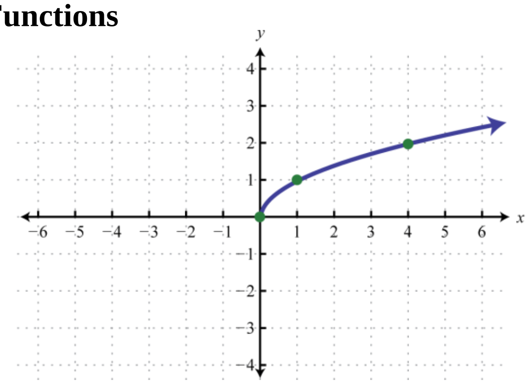
Finally, __________________ to get the variable by itself, if necessary.

Example: $5\sqrt{3x + 2} + 19 = 99$

Radical Functions

$f(x) = \sqrt{x}$

x	$f(x)$
0	0
1	1
4	2
9	3

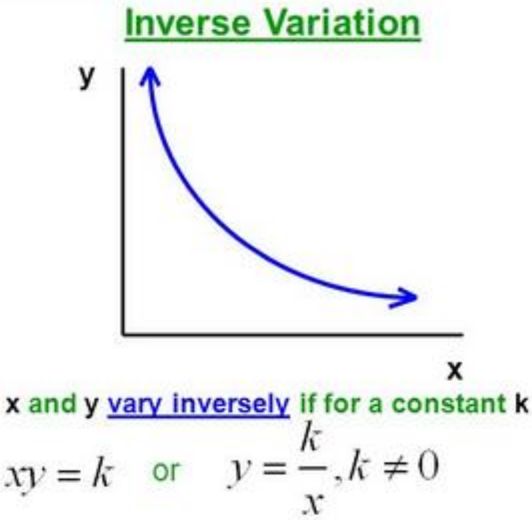


Domain - ___________ Range - ___________

x-intercept - _________ y-intercept - __________

minimum point - _________

Inverse Variation



Inverse variation results when two variables are _______________ to equal a constant, *k*.

The relationship is that as one variable ________________, the other variable ___________________.

Concept Questions:

1. Why are the domain and range of the parent radical function non-negative numbers?

2. Using rational exponents, explain why a square root and an exponent of 2 are inverse operations.

3. What are the main differences between direct and inverse variation?

Unit 3 Practice Problems

1. Simplify:

$$\left(x^{\frac{3}{4}}\right)^3$$

A $x^{\frac{27}{64}}$

B $x^{\frac{9}{4}}$

C $x^{\frac{9}{12}}$

D $x^{\frac{15}{4}}$

2. Solve: $3x - 7\sqrt{x} + 2 = 0$

A $x = \frac{1}{9},\ x = 4$

B $x = \frac{1}{3},\ x = 4$

C $x = \frac{1}{9},\ x = \frac{^-1}{3}$

D $x = \frac{1}{3},\ x = \frac{1}{9}$

3. The equation $s = 2\sqrt{5x}$ can be used to estimate the speed, s, of a car in miles per hour, given the length in feet, x, of the tire marks it leaves on the ground. A car traveling 90 miles per hour came to a sudden stop. According to the equation, how long would the tire marks be for this car?

A 355 feet

B 380 feet

C 405 feet

D 430 feet

4. The volume, V, of a certain gas varies inversely with the amount of pressure, P, placed on it. The volume of this gas is 175 cm^3 when 3.2 kg/cm^2 of pressure is placed on it. What amount of pressure must be placed on 400 cm^3 of this gas?

A 1.31 kg/cm^2

B 1.40 kg/cm^2

C 2.86 kg/cm^2

D 7.31 kg/cm^2

5. Which expression is equivalent to $\left(\dfrac{16x^{\frac{1}{6}}y^{-2}}{x^{\frac{-1}{6}}y^{6}}\right)^{\frac{3}{2}}$?

A $24x^{\frac{9}{2}}y^{\frac{9}{2}}$

B $\dfrac{24x^{\frac{3}{4}}}{y^{9}}$

C $\dfrac{64}{x^{\frac{1}{2}}y^{8}}$

D $\dfrac{64x^{\frac{1}{2}}}{y^{12}}$

Unit 4 Review

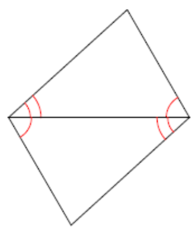
Triangle Congruence

Two triangles are congruent when all _________ and all ___________ are congruent.

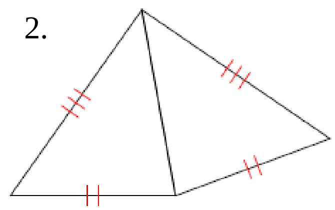
We can prove that two triangles are congruent if we know that certain parts of the triangles are congruent by proving congruence postulates: _________ , _______, ________, ________, ________ (for right triangles)

Examples:

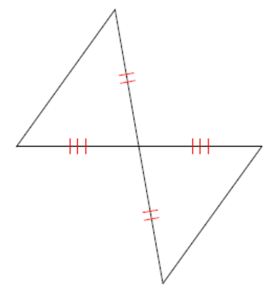
1.



2.



3.



Similar Triangles

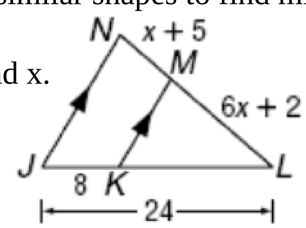
ANY shapes are similar if their sides are ________________________.

If you divide the length of the corresponding sides, the ratios should be ______________. The ratio is called the ______________________.

Triangles are similar if _________________________ are equal. This is the _____ similarity postulate.

You can use similar shapes to find missing lengths of sides.

Example: Find x.



Other Geometric Theorems

The <u>midsegment</u> of a triangle is _____________ and __________________ the opposite side.

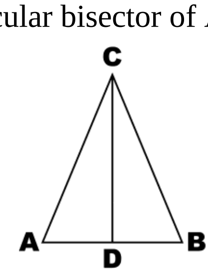
Side-Splitter Theorem - Any segment in a triangle ______________ to a side divides the sides into proportional parts.

All angles in a triangle add to __________, and isosceles triangles have ______ equal angles and sides.

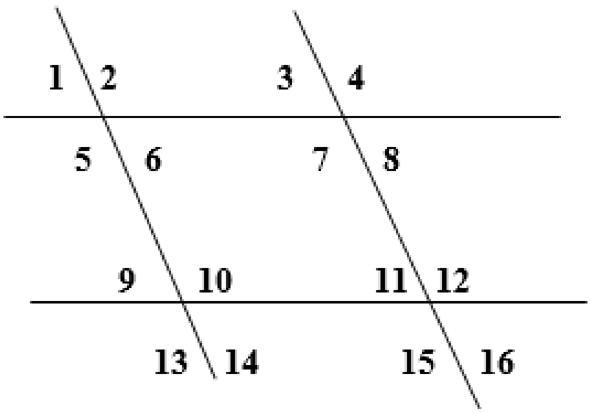
We need to know these theorems, but we also need to be able to PROVE these theorems.

Given: CD is the perpendicular bisector of AB.

Prove: ΔABC is isosceles.



Theorems about angles:



Equal Angles		Supplementary Angles	
Vertical Angles		**Linear Pair**	
Corresponding Angles		**Consecutive Interior Angles**	
Alternate Interior Angles			
Alternate Exterior Angles			

Concept Questions:

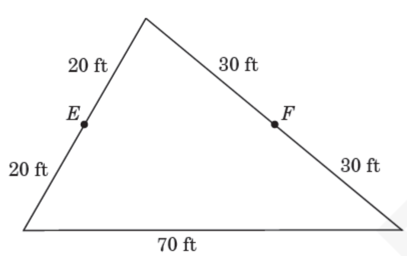
1. What are the similarities and differences between similar and congruent triangles?

2. In your own words, what does it mean to “prove” that two triangles are congruent using one of the congruence postulates?

3. What is the scale factor of the similar triangles created by the midsegment of a triangle? How do you know?

Two More Sample Problems!

How long is $\overline{EF}$?



A 20 ft

B 25 ft

C 30 ft

D 35 ft

According to the map, the road connecting the cities of Oakton (O) and Ridgeton (R) intersects the road connecting Maple View (M) and Pineville (P).

If the roads intersect in the town of Forest Grove (F) in the diagram, which statement is *always* true?

A $MP = RO$

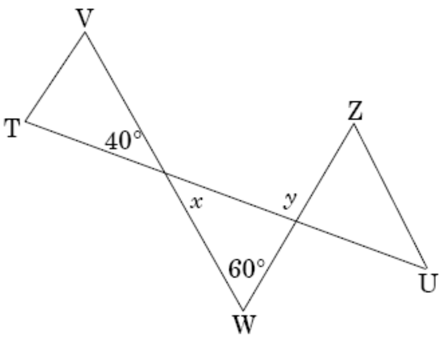
B $\overline{PF} \perp \overline{OF}$

C $\angle OFP \cong \angle RFM$

D $\angle RFP \cong \angle MFR$

Unit 4 Practice Problems

1. In the drawing, what is the measure of angle y?



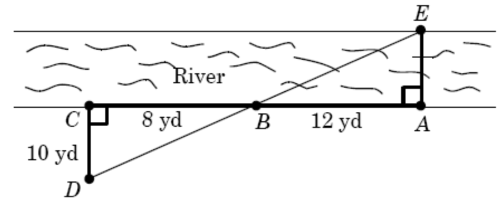
A 40°

B 60°

C 80°

D 100°

2. Jill wants to measure the width of a river. She marks distances as shown in the diagram.



Using this information, what is the ***approximate*** width of the river?

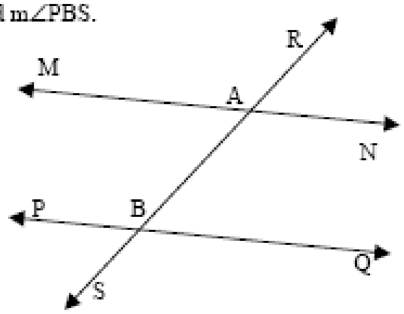
A 6.6 yards

B 10 yards

C 12.8 yards

D 15 yards

3. In the diagram, transversal $\overleftrightarrow{RS}$ intersects parallel lines $\overleftrightarrow{MN}$ and $\overleftrightarrow{PQ}$ at A and B respectively. If $m\angle RAN = (3x + 24)°$ and $m\angle RBQ = (7x - 16)°$, find $m\angle PBS$.



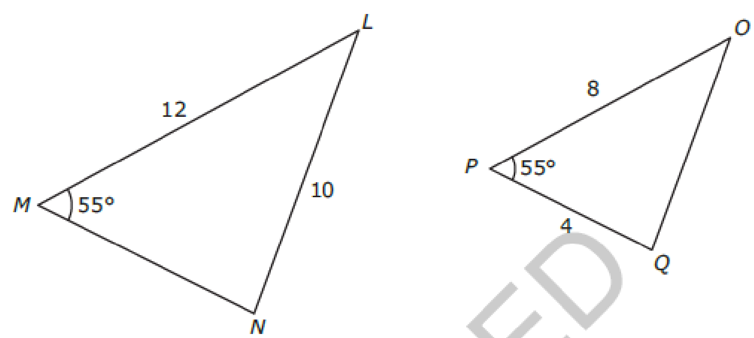
A 180°

B 126°

C 54°

D 10°

4. Triangles *LMN* and *OPQ* are shown below.



What additional information is sufficient to show that ΔLMN can be transformed and mapped onto $\triangle OPQ$?

A $OQ = 6$

B $MN = 9$

C $\angle LMN \cong \angle QOP$

D $\angle NLM \cong \angle QOP$

5. What is the measure of each base angle of an isosceles triangle if its vertex angle measures 56° and its two congruent sides measure 7 units each?

A 56°

B 62°

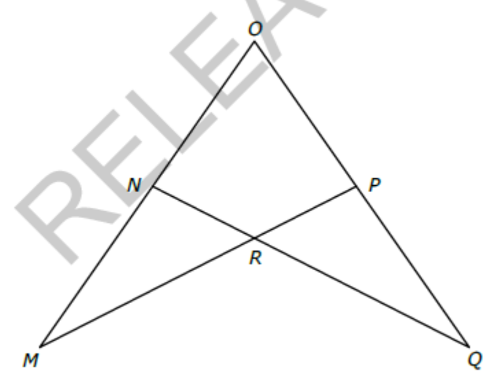
C 70°

D 124°

6. In the picture below, what postulate proves $\Delta MPO \cong \Delta QNO$?

A) SSS B) SAS C) ASA D) AAS

In the diagram of $\triangle OMP$ and $\triangle OQN$, $\angle M \cong \angle Q$ and $\overline{MO} \cong \overline{QO}$.



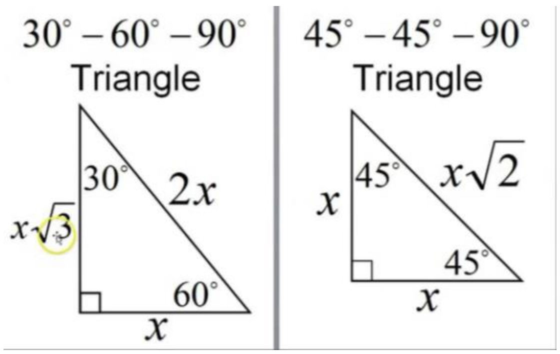
Unit 5 Review

Pythagorean Theorem

$Leg^2 + Leg^2 = Hypotenuse^2$

Don’t forget to ___________________________ if necessary for your answer.

Special Right Triangles (45-45-90 and 30-60-90)



The altitude of an equilateral triangle forms two _____________.

The diagonal of a square forms two _______________________.

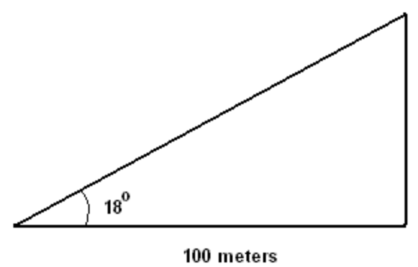
Trigonometric Ratios (MAKE SURE YOU ARE IN DEGREE MODE IN YOUR CALCULATOR!!!)

Sin = ------------------------ Cos = -------------------------- Tan = ---------------------------

The three trigonometric ratios apply to the ______________. The side lengths can be any size, but the ratios will hold for that ____________________.

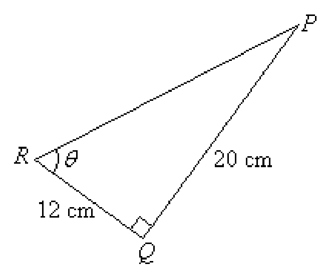
To set up problems to solve for the length of a side:

1. Determine the _________________ you are working with
2. Determine the appropriate __________________________
3. Solve to isolate the variable



To set up problems to solve for an angle measure:

1. Determine the _________________ you are working with
2. Determine the appropriate __________________________
3. Use the _______________ trig ratio (sin^{-1}, cos^{-1}, tan^{-1})



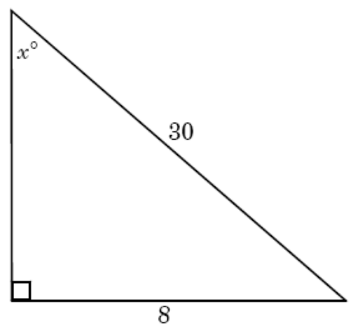
Concept Questions:

1. Why do trig ratios hold for angles when the side lengths can be any length?

2. How do special right triangle rules relate to the Pythagorean Theorem?

Unit 5 Review Problems

1. A right triangle is shown below.



What is the ***approximate*** value of x?

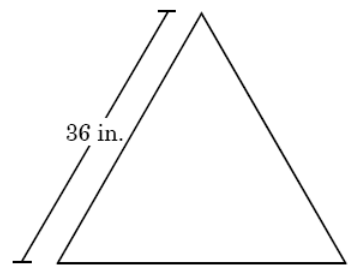
A 14.9

B 15.5

C 74.5

D 75.1

2. A sign is shaped like an equilateral triangle.



If one side of the sign is 36 inches, what is the ***approximate*** area of the sign?

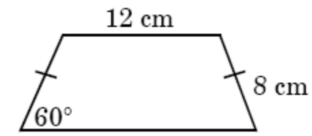
A 1,296 in.^{2}

B 648 in.^{2}

C 561 in.^{2}

D 108 in.^{2}

3. What is the ***approximate*** area of the trapezoid?



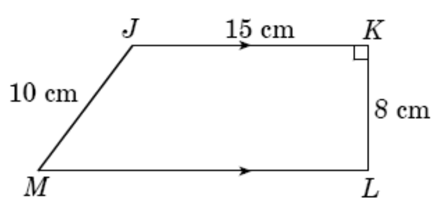
A 83 cm^2

B 110 cm^2

C 128 cm^2

D 192 cm^2

4. In $JKLM$, $\overline{JK} \perp \overline{KL}$ and $\overline{JK} \parallel \overline{ML}$.



What is the area of the trapezoid?

A 120 sq cm

B 144 sq cm

C 164 sq cm

D 168 sq cm

5. A radio transmission tower is 170 feet tall. How long should a guy wire be if it is to be attached 15 feet from the top and is to make an angle of 27° with the ground? Give your answer to the nearest tenth of a foot.

A) 374.5 ft B) 190.8 ft C) 341.4 ft D) 174.0 ft

6.

A building 220 feet tall casts a 60 foot long shadow. If a person looks down from the top of the building, what is the measure of the angle between the end of the shadow and the vertical side of the building (to the nearest degree)? (Assume the person's eyes are level with the top of the building.)

A) 75° B) 74° C) 16° D) 15°

Unit 6 Review

Probability Concepts

Probability - A value between _____ and _____ that determines the likelihood of a specific event occurring

Experimental Probability - The actual probability that occurs from an experiment or ____________________

Theoretical Probability - The ________________ probability based on the mathematical likelihood of an event occurring

The more _____________ that occur for a given experiment, the closer the experimental probability will be to the theoretical probability.

Probability Terms

Independent Events - Events whose outcomes are ______________________ by other or previous events

Dependent Events - Events whose likelihood ___________________ by other events

Mutually Exclusive - Events or outcomes that cannot ________________________

Conditional Probability - When the likelihood of an event is ________________ on another event occurring

(represented as $B \mid A$, or _________________________)

Probability Formulas

Addition Rule (Mutually Exclusive Events) - When two events, A and B, are mutually exclusive, the probability that A or B will occur is the sum of the probability of each event. $P(A \text{ or } B) = P(A) + P(B)$

Addition Rule (Non-Mutually Exclusive Events) - When two events, A and B, are non-mutually exclusive, the probability that A or B will occur is: $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

Multiplication Rule (Independent Events) - When two events, A and B, are independent, the probability of both occurring is: $P(A \text{ and } B) = P(A) \cdot P(B)$

Multiplication Rule (Dependent Events) - When two events, A and B, are dependent, the probability of both occurring is: $P(A \text{ and } B) = P(A) \cdot P(B|A)$

Concept Questions:

1. What are the differences between the addition and multiplication rules, and when would each apply?

2 Why does experimental probability get closer to theoretical probability as the number of events increases?

Unit 6 Review Problems

1. Which of the following are likely to be dependent events?

- A. the weather and the number of books on your shelf
- B. the color of your car and its gas mileage
- C. the weight of your car and its gas mileage
- D. the size of your house and the size of your shoes

2.

If I flip a fair coin 10 times, which of the following is true?

- A. The number of heads will equal the number of tails.
- B. The probability of all heads is greater than the probability of all tails.
- C. The probability of HHHHHHHHHH = the probability of HTHTHTHTHT.
- D. The probability of HHHHHHHHHH < the probability of HTHTHTHTHT.

Use this table for problems #3 - 5.

Favorite Movie Genre	Male	Female	Total
Action	52	16	68
Romantic Comedy	14	74	88
Total	66	90	

3. How many total people were surveyed?

A) 66 B) 90 C) 156 D) 312

4. What is the probability that a person likes action movies?

A) ¼ B) 1/3 C) 17/39 D) 22/39

5. What is the probability that a person is female, given that she likes romantic comedies?

A) 7/44 B) 8/45 C) 37/44 D) 37/45

6. Mrs. Allison is preparing a cookies and milk party for her third grade class. There are 12 students that drink only whole milk, 8 students that drink only almond milk, 7 students that drink only skim milk, and 3 students drink only soy milk. What is the probability that a student from Mrs. Allison's class drinks only almond or soy milk?

A) 3/30 B) 4/15 C) 1/3 D) 11/30

7. **Melissa collects data on her college graduating class. She finds that out of her classmates, 60% are brunettes, 20% have blue eyes, and 5% are brunettes and have blue eyes. What is the probability that one of Melissa's classmates will have brunette hair or blue eyes, but not both?**

A) 12% B) 75% C) 80% D) 85%

8. Two urns each contain blue and black marbles. Urn I contains 7 blue marbles and 5 black marbles. Urn II contains 5 blue marbles and 5 black marbles. A marble is drawn from each urn. What is the probability that both marbles are black?

- A. $\frac{5}{24}$
- B. $\frac{11}{12}$
- C. $\frac{5}{12}$
- D. $\frac{5}{11}$