Name ______________________________ Period __________ Date ____________

8-12
STUDENT PACKET

MATHLINKS GRADE 8
STUDENT PACKET 12
LINES, ANGLES, AND TRIANGLES

WORD BANK

Word	Definition	Example or Picture
adjacent angles		
complementary angles		
exterior angle of a triangle		
hypotenuse of a right triangle		
legs of a right triangle		
parallel lines		
supplementary angles		
transversal		
vertical angles		

ANGLES AND TRIANGLES

Summary (Ready)

We will establish relationships among angles. We will establish facts about angle sums in triangles. We will solve problems involving angle measures.

Goals (Set)

- Use facts about supplementary, complementary, vertical, and adjacent angles to find angle measures.
- Experimentally verify facts about the angle sum and exterior angle of triangles.
- Write and solve equations involving angle measures.

Warmup (Go)

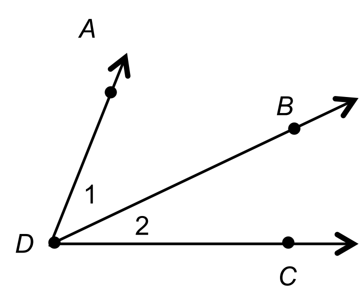
Fill in the blanks with appropriate words or numbers.

1. An acute angle is an angle that measures ________________ 90°.

2. A right angle is an angle that measures ________________ 90°.

3. An obtuse angle is an angle that measures ________________ 90°, but less than 180°.

4. A straight angle is an angle that measures ________.



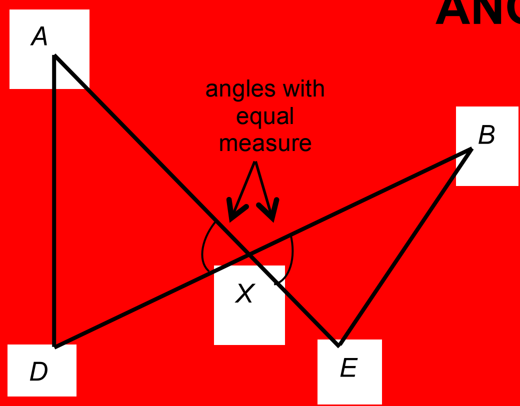
5. Name $\angle 1$ in two different ways. $\angle$________ $\angle$________

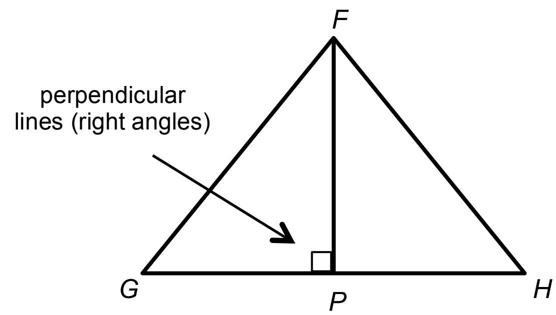
6. Why is it unclear to name $\angle 1$ as $\angle D$?

We will indicate the measure of an angle using absolute value signs. For example, "the measure of angle 1" will be written $|\angle 1|$.

7. If $|\angle ADB| = 42°$ and $|\angle ADC| = 74°$, find $|\angle BDC|$.

ANGLE PAIRS





Use the two diagrams above and the definitions below to name the angle pairs.

1. Adjacent angles are angles that share a common vertex and a common side, and that lie on opposite sides of the common side. ∠_______ and ∠_______ ∠_______ and ∠_______	2. Vertical angles are the opposite angles formed by two lines that intersect at a point. ∠_______ and ∠_______ ∠_______ and ∠_______
3. Complementary angles are two angles with measures whose sum is 90°. ∠_______ and ∠_______ ∠_______ and ∠_______	4. Supplementary angles are two angles with measures whose sum is 180°. ∠_______ and ∠_______ ∠_______ and ∠_______

5. If complementary angles have equal measures, what is the measure of each angle? _____

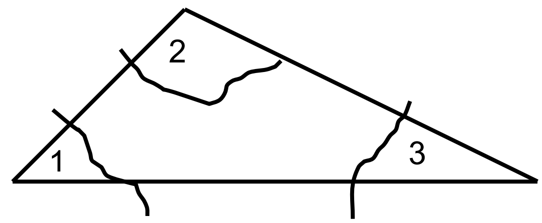
6. If supplementary angles have equal measures, what is the measure of each angle? _____

7. Use a counter example to show that the statement “all adjacent angles have equal measures” is false. Include a diagram.

8. Numbering angles is a simple way to refer to angles when explaining ideas. Number some of the angles in the diagram above. Use those angles to give an example of the statement “vertical angles always have equal measure.”

TEAR IT UP EXPERIMENT

1. Start with **any** triangle.



2. **Tear** off all three angles.

3. Place the "puzzle pieces" together so that the three angles form a straight angle. Sketch your results.

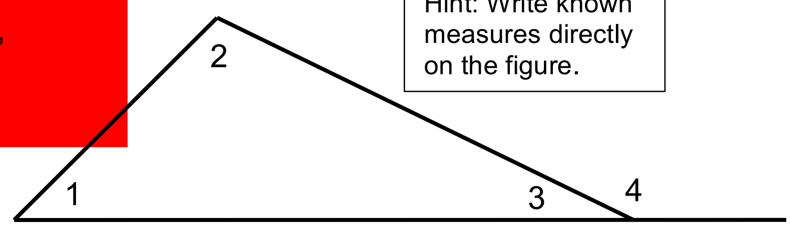
4. Compare your results with the results of your partners. Make a conjecture about the sum of the measures of the angles in a triangle, based on this experiment.

5. If $|\angle 1| = 50°$ and $|\angle 2| = 100°$,

   Find $|\angle 3|$ ________

   Find $|\angle 4|$ _______

Hint: Write known measures directly on the figure.



6. What is the relationship between $|\angle 1|$, $|\angle 2|$, and $|\angle 4|$? Do you think this will always be true? Explain your reasoning.

An <u>exterior angle</u> of a triangle is an angle formed by a side of the triangle and an extension of its adjacent side.

7. Which angle in the triangle above is an exterior angle? _____

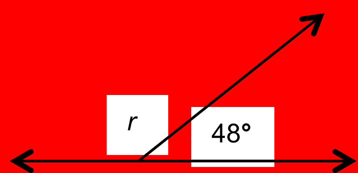
8. Extend sides of the triangle to identify five more exterior angles. Label them $\angle 5$, $\angle 6$, $\angle 7$, $\angle 8$, $\angle 9$.

9. Use appropriate notation to show which exterior angles have equal measures.

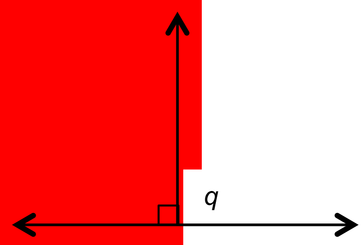
FIND THE MISSING ANGLE MEASURES

Use facts about angles and triangles to find the missing angle measures. Do not use a protractor. Diagrams may not be to scale.

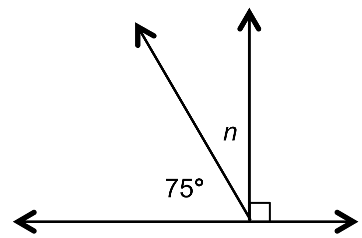
1. $|\angle r|$ = ______



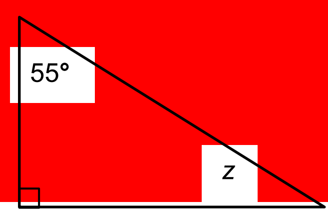
2. $|\angle q|$ = ______



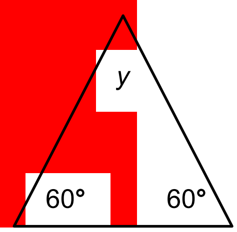
3. $|\angle n|$ = ______



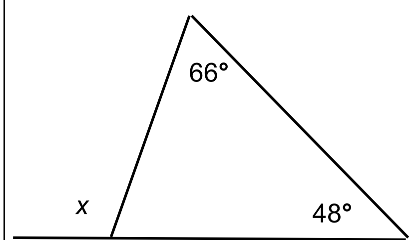
4. $|\angle z|$ = ______



5. $|\angle y|$ = ______

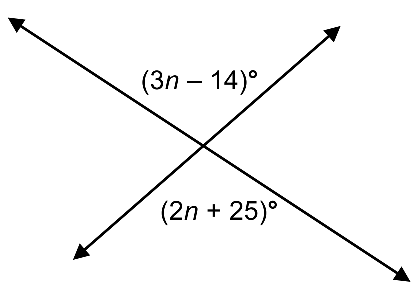


6. $|\angle x|$ = ______

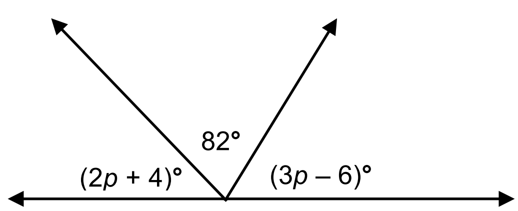


Find the unknown and the measure of each angle in each diagram.

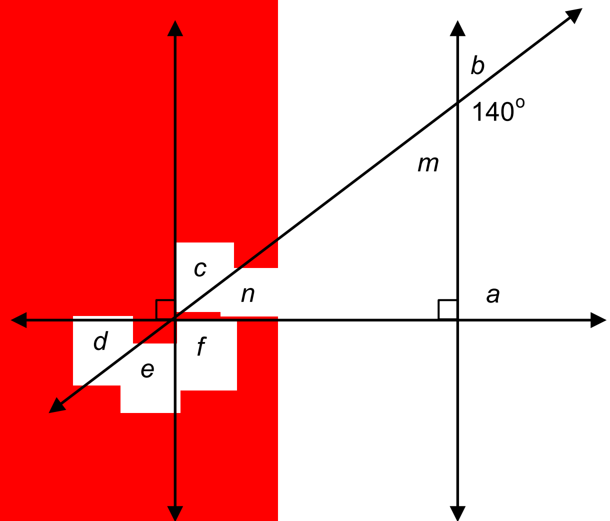
7.



8.



PRACTICE FINDING ANGLE MEASURES



Find the measure of each angle and support each answer with an explanation or calculation.

1. $\lvert\angle m\rvert$ = _______	2. $\lvert\angle n\rvert$ = _______
3. $\lvert\angle a\rvert$ = _______	4. $\lvert\angle b\rvert$ = _______
5. $\lvert\angle c\rvert$ = _______	6. $\lvert\angle d\rvert$ = _______
7. $\lvert\angle e\rvert$ = _______	8. $\lvert\angle f\rvert$ = _______

PARALLEL LINES

Summary (Ready)

We will establish vocabulary and facts related to angles formed when parallel lines are crossed by a third line. We will use properties of parallel lines to solve problems.

Goals (Set)

- Establish facts about angles formed when parallel lines are cut by a transversal.
- Prove angle sum and exterior angle theorems for triangles.
- Solve problems involving angle measures.

Warmup (Go)

Parallel lines are lines in a plane that never intersect each other. If line *m* is parallel to line *n*, we write *m* || *n*.

This diagram contains two parallel lines, *m*, and *n*. We indicate they are parallel with ≫.

The parallel lines are crossed (or cut) by another line *k*, called a transversal.

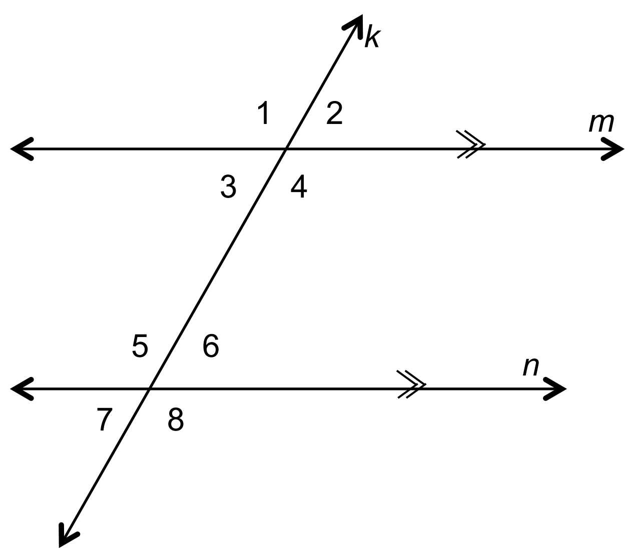
1. Use a protractor to find the measure of each angle formed when these parallel lines are cut by the transversal.

|∠ 1 | = ______ |∠ 2 | = ______

|∠ 3 | = ______ |∠ 4 | = ______

|∠ 5 | = ______ |∠ 6 | = ______

|∠ 7 | = ______ |∠ 8 | = ______



2. What do you notice about the measures of all of the acute angles in this figure?

3. What do you notice about the measures of all of the obtuse angles in this figure?

ABOUT PARALLEL LINES 1

Use the word bank below. Select a word to match each description. Then give one or more examples using the diagram in the warmup.

	Word or Phrase	Description	Example
1.		Lines in a plane that never meet.	
2.		A line that passes through two or more lines.	
3.		If a transversal intersects two parallel lines, these angles appear on the same side of the transversal in the same relative location.	
4.		If parallel lines are cut by a transversal, these angles appear on the opposite sides of the transversal and between the parallel lines.	
5.		If parallel lines are cut by a transversal, these angles appear on the opposite sides of the transversal and outside the parallel lines.	
6.		Two angles with measures whose sum is 180°.	
7.		Opposite angles formed by two lines that intersect at a point.	
8.		Angles that share a common vertex and a common side, and that lie on opposite sides of the common side.	

9. Circle all the angle pairs listed in the word bank that have equal measures if two parallel lines are cut by a transversal.

WORD BANK

adjacent angles	alternate exterior angles	alternate interior angles
corresponding angles	parallel lines	supplementary angles
transversal	vertical angles	

ABOUT PARALLEL LINES 2

If two parallel lines are cut by a transversal, then
- alternate interior angles have equal measure,
- corresponding angles have equal measure,
- alternate exterior angles have equal measure.

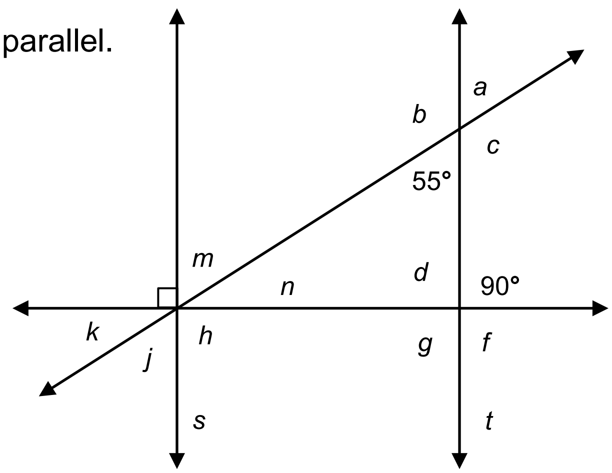
1. Assume lines that appear to be parallel are truly parallel.

   Label the parallel lines using ≫ notation.

   Label the transversal lines *u* and *v*.

2. Find the measures of all labeled angles.

   Write them directly on the diagram.



Name a pair of:

3. acute vertical angles	4. right vertical angles
5. obtuse vertical angles	6. corresponding angles
7. alternate interior angles	8. alternate exterior angles
9. adjacent supplementary angles	10. non-adjacent supplementary angles
11. adjacent complementary angles	12. non-adjacent complementary angles

13. In problems 3-12 above, circle the names of all pairs of angles that always have equal measures.

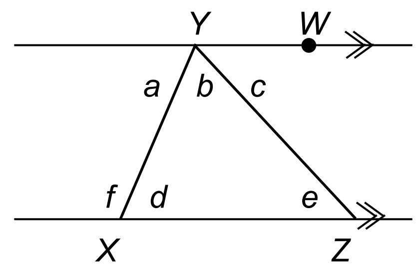
ANGLE SUMS IN TRIANGLES REVISITED

You are given the diagram at the right.

Parallel lines (||) are indicated with ≫.

Transversals form Δ XYZ

This is a proof of two important facts about the angle measures in triangles. Explain why each statement below is true.



	Statements	Explain why the statement is true.
1.	$\overleftrightarrow{WY} \parallel \overleftrightarrow{XZ}$	
2.	$\lvert\angle a\rvert + \lvert\angle b\rvert + \lvert\angle c\rvert = 180°$	
3.	$\lvert\angle a\rvert = \lvert\angle d\rvert$	
4.	$\lvert\angle c\rvert = \lvert\angle e\rvert$	
5.	$\lvert\angle b\rvert + \lvert\angle d\rvert + \lvert\angle e\rvert = 180°$	
6.	$\lvert\angle f\rvert + \lvert\angle d\rvert = 180°$	
7.	$\lvert\angle b\rvert + \lvert\angle d\rvert + \lvert\angle e\rvert = \lvert\angle f\rvert + \lvert\angle d\rvert$	
8.	$\lvert\angle b\rvert + \lvert\angle e\rvert = \lvert\angle f\rvert$	

Two Important Facts About Angles in Triangles

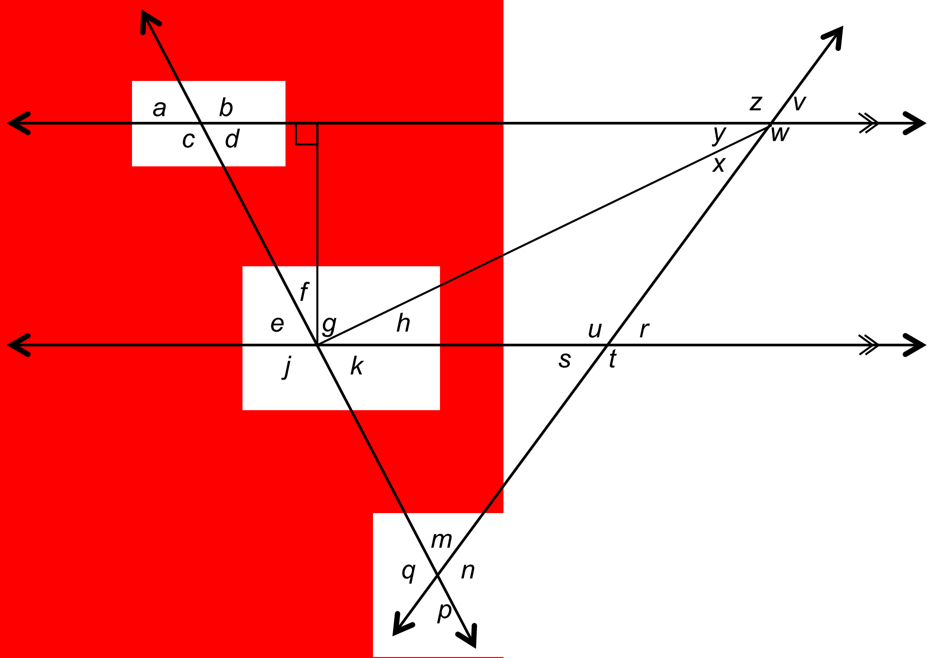
(A) The sum of the measures of the interior angles of a triangle equals 180°.

(B) The measure of an exterior angle of a triangle is equal to the sum of the measures of the two nonadjacent interior angles.

9. Which line in the proof above establishes statement (A)? ________

10. Which line in the proof above establishes statement (B)? ________

BIG PUZZLE



Find the measures of all the angles in the figure above. Three are already given to you.

1. $|\angle a|$ = ___
2. $|\angle b|$ = ___
3. $\boxed{|\angle c| = 130°}$
4. $|\angle d|$ = ___
5. $|\angle e|$ = ___
6. $|\angle f|$ = ___
7. $|\angle g|$ = ___
8. $|\angle h|$ = ___
9. $|\angle j|$ = ___
10. $|\angle k|$ = ___
11. $|\angle m|$ = ___
12. $|\angle n|$ = ___
13. $|\angle p|$ = ___
14. $|\angle q|$ = ___
15. $|\angle r|$ = ___
16. $|\angle s|$ = ___
17. $|\angle t|$ = ___
18. $|\angle u|$ = ___
19. $|\angle v|$ = ___
20. $|\angle w|$ = ___
21. $|\angle x|$ = ___
22. $\boxed{|\angle y| = 40°}$
23. $\boxed{|\angle z| = 120°}$

24. Explain how you found $|\angle p|$.

CONVERSE OF A STATEMENT

The converse of a statement is created by interchanging the hypothesis and the conclusion. In other words, the converse of the statement “if A then B” is the statement “if B then A.”

Determine if each statement is true. If it is false, give a counterexample.

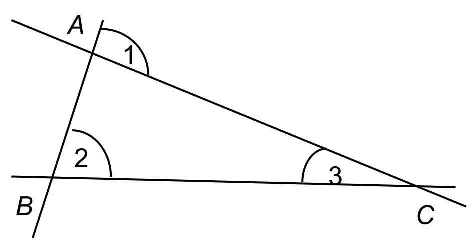
________1a. If n is an even integer, then $n+1$ is an odd integer. (Statement)
________1b. If $n+1$ is an odd integer, then n is an even integer. (Converse)

________2a. If n is divisible by 9, then n is divisible by 3. (Statement)
________2b. If n is divisible by 3, then n is divisible by 9. (Converse)

________3a. If three angles are interior angles of a triangle, then the sum of their measures is 180°. (Statement)
________3b. If the sum of the measures of three angles equals 180°, then the angles are interior angles of a triangle. (Converse)

4. Is the converse of a true statement always true? ____

5. Refer to the figure at the right. Antonio said, “Angles 1 and 2 are congruent.” Archie said, “That doesn’t make sense.” Do you agree with Archie? Support your answer using facts about the angles in ΔABC.



6. Write the converse of the statement: If two parallel lines are cut by a transversal, then the corresponding angles have equal measure. Is the converse true or false?

7. Chuy said, “If two lines are cut by a transversal and corresponding angles are congruent, then the two lines can’t intersect.” Why is Chuy correct?

THE PYTHAGOREAN THEOREM

Summary (Ready)	Goals (Set)
We will explore the relationship among the side lengths of right triangles and then understand a proof of the Pythagorean Theorem. Then we will use this theorem to solve problems.	• Explore the Pythagorean Theorem numerically, algebraically, and geometrically. • Understand a proof of the Pythagorean Theorem. • Use the Pythagorean Theorem and its converse to solve problems. • Apply the Pythagorean Theorem to find distances in the coordinate plane.

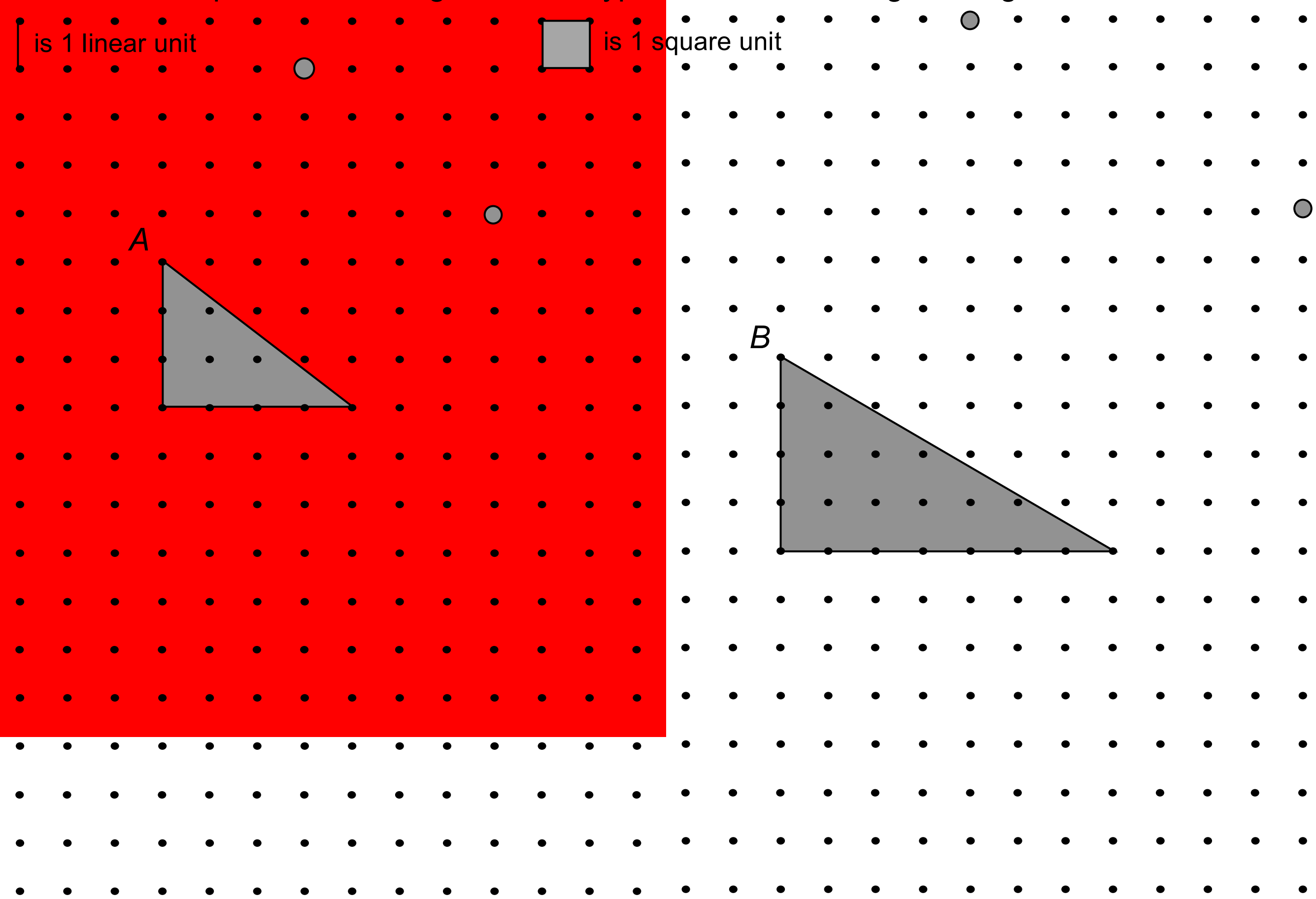
Warmup (Go)

Simplify each expression.

1. $a + a$	2. $a \bullet a$
3. $ab + ab$	4. $ab \bullet ab$
5. $\frac{1}{2}a + \frac{1}{2}a$	6. $\left(\frac{a}{2}\right)\left(\frac{a}{2}\right)$
7. $\frac{1}{2}ab + \frac{1}{2}ab$	8. $\frac{ab}{2} + \frac{ab}{2}$

TWO RIGHT TRIANGLES

1. Draw the squares on the legs and the hypotenuse of each right triangle below.

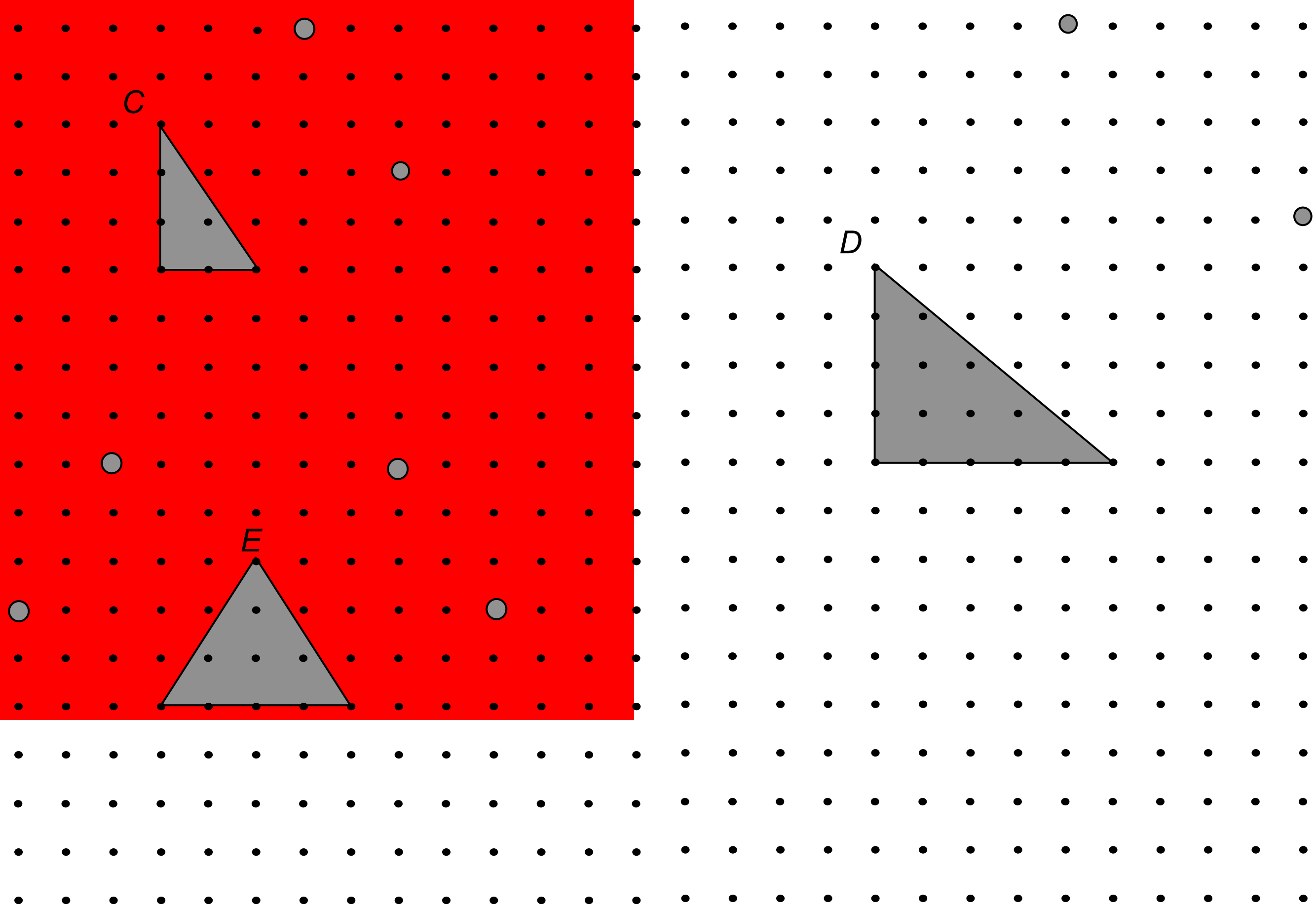


		Triangle *A*	Triangle *B*
2.	Length of the shorter leg		
3.	Length of the longer leg		
4.	Area of the square on the shorter leg		
5.	Area of the square on the longer leg		
6.	Area of the square on the hypotenuse		
7.	Length of the hypotenuse		

8. Write a conjecture about the relationship between the area of the square on the hypotenuse and the area of the squares of the legs of a right triangle.

TWO MORE RIGHT TRIANGLES

1. Draw the squares on the legs and the hypotenuse of each right triangle below.



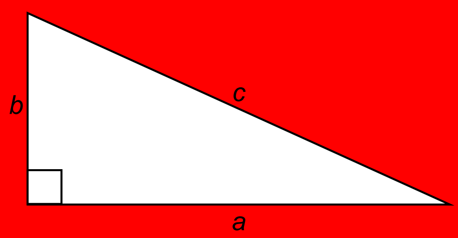
2. Find the area of each square on the triangles' legs and hypotenuse and fill in the blanks for the area equations.	3. Find the length of the legs and hypotenuse of each triangle and fill in the blanks for the side length equations.
Triangle *C*	Triangle *D*
Area equation: (______) + (______) = (______)	Area equation: (______) + (______) = (______)
Side length equation: $(\_\_\_\_\_\_)^2 + (\_\_\_\_\_\_)^2 = (\_\_\_\_\_\_)$	Side length equation: $(\_\_\_\_\_\_)^2 + (\_\_\_\_\_\_)^2 = (\_\_\_\_\_\_)$

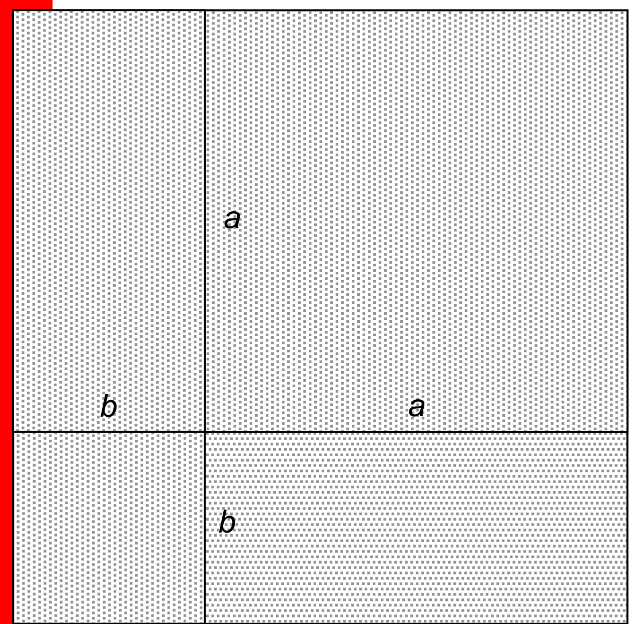
4. Draw squares on the sides of triangle *E*, find the areas of the squares, and demonstrate that the relationship in problems 2 and 3 does NOT hold for this triangle (which is NOT a right triangle).

PROOF: PART 1

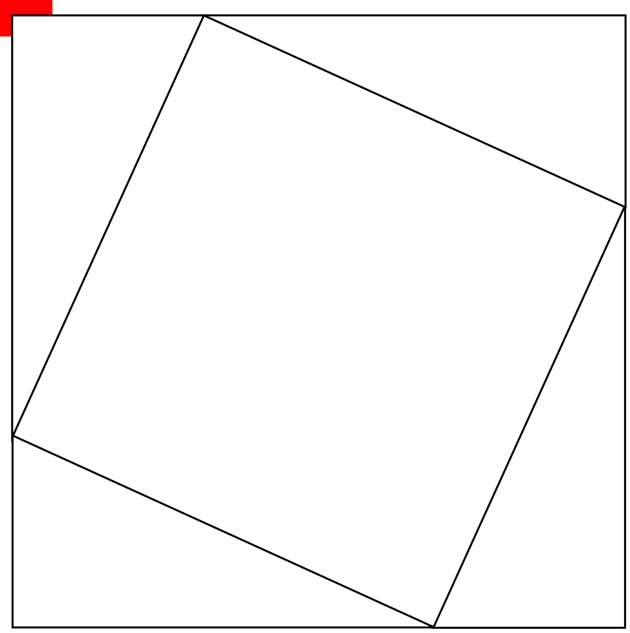
Your teacher will give you a copy of these squares to write on and cut out for this activity. You may also record measurements here.

Here is a right triangle with side lengths *a*, *b*, and *c*:





The two large squares have the same area. They were constructed using lengths *a*, *b*, and *c.*

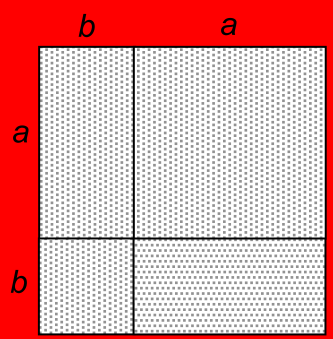


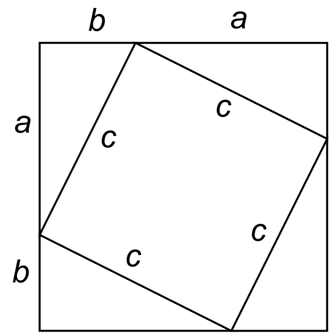
1. Label some right angles and some lengths on several segments of both large squares.

2. For both large squares, write the area inside of each polygonal piece.

3. Cut out both large squares. Then cut them apart along the interior lines.

A PROOF: PART 2



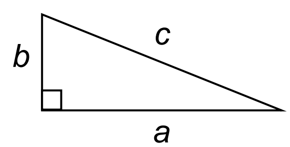


1. Write the areas inside the polygonal pieces in the two square figures above (use the information from the pieces previously cut.)

2. Write an equation that equates the sum of the areas of the shaded polygons with the sum of the areas of the unshaded polygons.

3. Simplify the equation.

4. Use words to state the meaning of this equation as it refers to the legs and the hypotenuse of the original triangle.



5. This relationship is called the ____.

THE PYTHAGOREAN THEOREM AND ITS CONVERSE

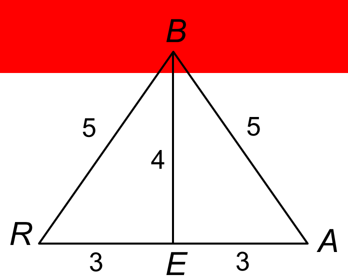
Pythagorean Theorem: For a right triangle, the sum of the squares of the lengths of the two legs is equal to the square of the length of the hypotenuse.

Converse of the Pythagorean Theorem: If the sum of the squares of the lengths of two sides of a triangle is equal to the square of the length of the third side, then the triangle is a right triangle.

1. Show why a triangle with side lengths of 4, 5, and 8 is not a right triangle.

2. In a right triangle, the legs measure 8 inches and 15 inches. Find the hypotenuse.

3. Is $\overline{BE}$ perpendicular to $\overline{AR}$? Explain with words and numbers.



4. The Pythagorean Theorem is applied in problem(s) _____________ above.

5. The converse of the Pythagorean Theorem is applied in problem(s) _____________ above.

6. To use the Pythagorean Theorem, what information do you need to know?

   What will you find out?

7. To use the converse of the Pythagorean Theorem, what information do you need to know?

   What will you find out?

PYTHAGOREAN TRIPLES

A Pythagorean triple consists of three positive integers a, b, and c, such that $a^2 + b^2 = c^2$.

1. Look for side length patterns:

a. A right triangle has legs of lengths 5 units and 12 units. What is the length of its hypotenuse?

b. Are these three integers a Pythagorean triple? Explain.

c. A right triangle has legs of lengths 10 units and 24 units. What is the length of its hypotenuse?

d. Are these three integers a Pythagorean triple? Explain.

e. How are the triples in these two triangles related?

f. Propose another Pythagorean triple based on this problem. Check your conjecture.

2. Look for side length patterns:

a. A triangle has side lengths of 3 units, 4 units, and 5 units. Is this a right triangle?

b. Are these three integers a Pythagorean triple? Explain.

c. A triangle has side lengths of 15 units, 20 units, and 25 units. Is this a right triangle?

d. Are these three integers a Pythagorean triple? Explain.

e. How are the triples in these two triangles related?

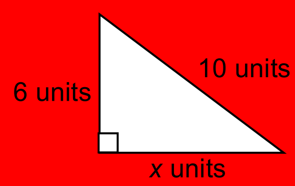
f. Propose another Pythagorean triple based on this problem. Check your conjecture.

3. The Pythagorean Theorem is applied in problem(s) ______________ above.
The converse of the Pythagorean Theorem is applied in problem(s) ______________ above.

FIND THE MISSING LENGTH

Find the missing length in each right triangle. Leave the result in square root form if the result is not equivalent to a whole number.

1.



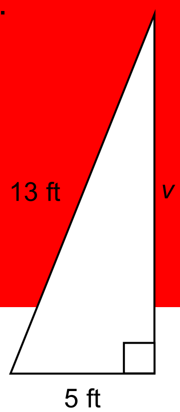
$x^2 + (\_\_\_\_\_)^2 = (\_\_\_\_\_)^2$

$x^2 + \_\_\_\_\_ = \_\_\_\_\_$

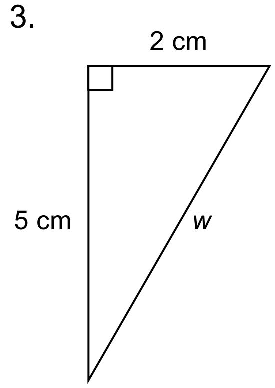
$x^2 = \_\_\_\_\_$

$x = \_\_\_\_\_$

2.



3.



4. To get from home to work every day, Samos drives 7 miles east on Avenue A, and then drives north on Avenue B. He knows that the straight-line distance from his home to his place of work is about 25 miles. How many miles does he drive north on Avenue B?

   a. Draw a sketch:

   b. Write an appropriate formula and substitute with numbers:

   c. Answer the question in words:

FIND THE MISSING LENGTH (Continued)

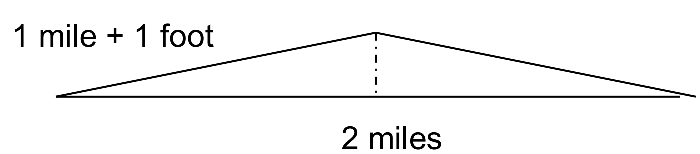
For each problem, sketch and label a diagram, and then find the missing length.

5. Find the diagonal of a rectangle whose sides are 15 mm and 20 mm long.

6. Find the diagonal of a square whose side is 10 cm long.

7. Find the height of an isosceles triangle with equal sides that each measure 12 inches and a base that is 18 inches long.

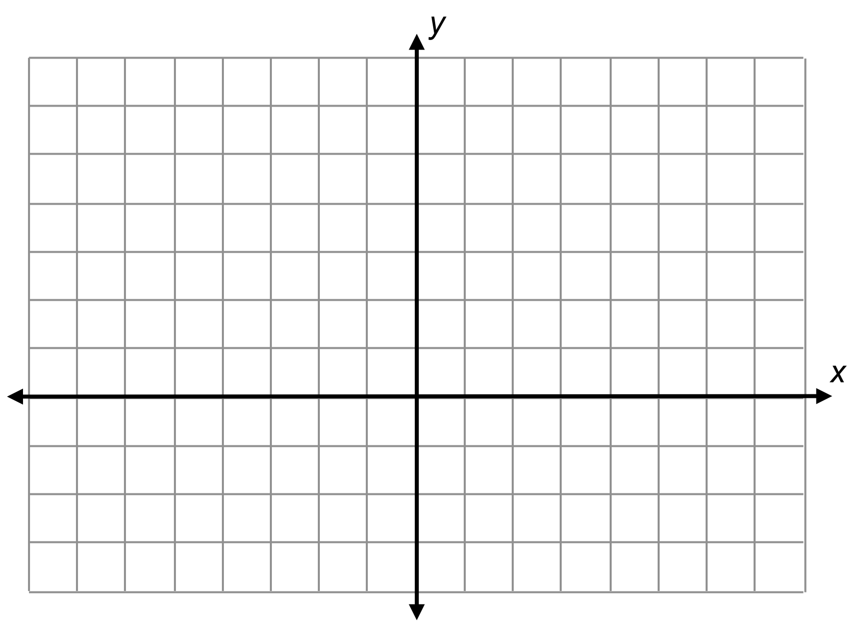
8. A stretch of railroad track two miles long is made up of two one-mile tracks. The rails were laid down end to end in winter. They were secured at the endpoints, but not in the middle. In the summer each rail expanded one foot in length and the tracks jutted upwards in the middle. How high above the ground was the rail in the middle?



FINDING DISTANCES

Use the grid below as needed. Write non-integer values in square root form AND as a decimal number rounded to the nearest tenth.

1. Find the length of each side of ΔABC: $A(2,6)$, $B(2,2)$, $C(5,2)$ $\|AB\|$: ____________ $\|BC\|$: ____________ $\|AC\|$: ____________	2. Find the length of each side of ΔDEF: $D(-2,6)$, $E(-6,6)$, $F(-6,4)$ $\|ED\|$: ____________ $\|EF\|$: ____________ $\|FD\|$: ____________
3. Find the length the diagonal $\overline{KM}$ of rectangle *JKLM*: $J(-3,0)$, $K(7,0)$, $L(7,-3)$, $M(-3,-3)$ $\|KM\|$: ____________ Notation reminder: We denote a line segment from point K to point M as $\overline{KM}$. We denote the length of $\overline{KM}$ as $\|KM\|$.	4. Find $\left\|BD\right\|$ for *B* and *D* as in problems 1 and 2. $\|DB\|$: ____________



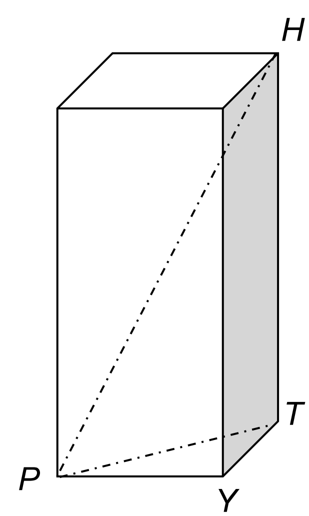
THE DIAGONAL OF A RECTANGULAR PRISM

The rectangular prism pictured below (not necessarily drawn to scale) has the given dimensions:

$|PY| = 4\text{cm}$ $|YT| = 3\text{cm}$ $|TH| = 12\text{cm}$

1. The diagonal of the BASE of the prism is line segment _______.
   - Use a colored pencil to draw a triangle that includes this diagonal as the hypotenuse.
   - Mark the right angle on the prism, and sketch and label the triangle below.
   - Find the length of the diagonal of the prism's base.

2. The diagonal of the prism is line segment _______.
   - Use a different colored pencil to draw a triangle that includes this diagonal as the hypotenuse.
   - Mark the right angle on the prism, and sketch and label the triangle below.
   - Find the length of the diagonal of the prism.



SKILL BUILDERS, VOCABULARY AND REVIEW

SKILL BUILDER 1

Solve each proportion using any method.

1. $\frac{3}{8} = \frac{x}{24}$	2. $\frac{12}{x} = \frac{3}{7}$
3. $\frac{x}{5} = \frac{10}{20}$	4. $\frac{9}{2} = \frac{3}{x}$

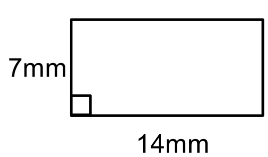
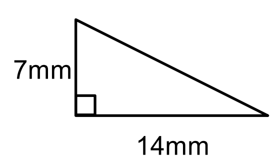
Solve for x.

5. $\frac{1}{4}x - 4 = -6$	6. $\frac{3}{4}x + \frac{1}{2} - x = \frac{1}{2}(x - \frac{1}{4})$

The formulas for finding the circumference and area of a circle are below.
For each equation, solve for π.

7. $C = \pi d$	8. $A = \pi r^2$

Find the area of each figure.

9.  $A =$ __________	10.  $A =$ __________

SKILL BUILDER 2

Draw the following lines on the coordinate axes below. Then fill in the table.

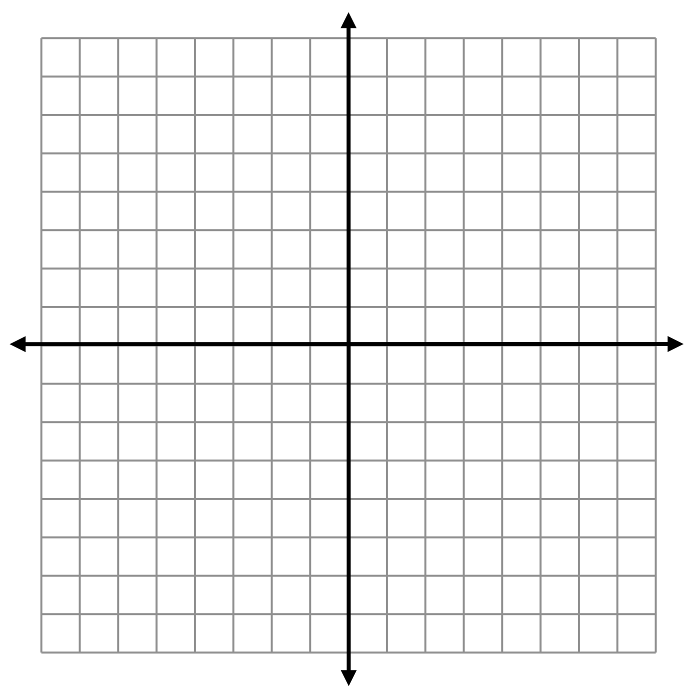
One point on the line	slope	*y*-intercept	*x*-intercept	equation of the line in slope-intercept form
1. (1, 1)		-3		A.
2. (4, -3)		3		B.
3.				C. $y = -3x + 4$
4.				D. $y = -\frac{1}{3}x - 4$

Use letters A-D to answer problems 5-8.

5. Which is the only line above with a positive slope?

6. Of the lines with a negative slope, which is the flattest?

7. Which is the steepest?



8. Write an equation of a line that is parallel to line A.

SKILL BUILDER 3

Write each expression in exponent form.

1. $5^3 \cdot 5^2$	2. $(5^3)^2$	3. $x^3 \cdot x^2$	4. $(x^3)^2$
5. $7^9 \cdot 7^{-9}$	6. $7^{-4} \cdot 7^{-9}$	7. $\dfrac{9^2}{9^3}$	8. $(9^3)^{-5}$

Compute.

9. -6^2	10. $(-6)^{-2}$	11. $(-6)^2$
12. $5^3 + 5^2$	13. $\left(\left(\dfrac{1}{2}\right)^3\right)^2$	14. $\left(\dfrac{1}{3}\right)^3 \bullet \left(\dfrac{1}{2}\right)^2$

15. $\sqrt{37}$ is between the consecutive integers _____ and _____.

 An approximation for $\sqrt{37}$ as a mixed number is __________.

16. Simplify $\left(\sqrt{\dfrac{20}{5}}\right)^2 + \sqrt{\dfrac{4}{81}}$

17. Write both numbers below in scientific notation. Then circle the larger number and write how many times larger it is than the other number.

 12×10^{-8} → _______________

 0.36×10^{-3} → _______________

SKILL BUILDER 4

Simplify each numerical expression. Leave in square root form if necessary.

1. $6^2 + 8^2$	2. $\sqrt{16} + \sqrt{9}$
3. $\sqrt{16+9}$	4. $\sqrt{25+4}$
5. $\sqrt{3^2+4^2}$	6. $\sqrt{5^2+12^2}$

Solve each for the positive value of *x*. Leave non-integer values in square root form.

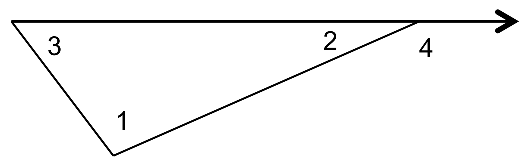
7. $x^2 = 49$	8. $x + 3 = 5$
9. $x + 3^2 = 5^2$	10. $x^2 + 3^2 = 5^2$
11. $x + 8^2 = 10^2$	12. $x^2 + 8^2 = 100$

SKILL BUILDER 5

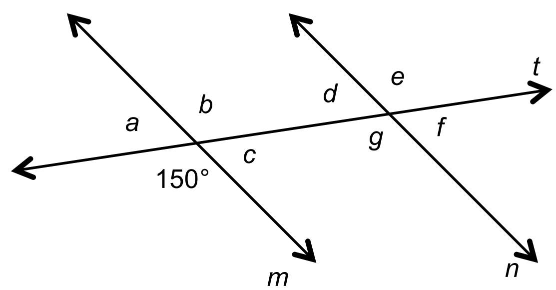
1. Solve the following system of equations using any method.

$$\begin{cases} y = -2x - 2 \\ -2x + 3y = 10 \end{cases}$$

2. If $|\angle 1| = 96°$, and $|\angle 2| = 32°$, then $|\angle 3|$ = _____, and $|\angle 4|$ = _____



Lines *m* and *n* are parallel, and line *t* is a transversal. Find the following.



3. $|\angle a|$ = _____
4. $|\angle b|$ = _____
5. $|\angle c|$ = _____
6. $|\angle d|$ = _____
7. $|\angle e|$ = _____
8. $|\angle f|$ = _____
9. $|\angle g|$ = _____

Choose from the word bank below a term (or terms) to describe each pair of angles. Write ALL of the letters that apply.

10. $\angle a$ and $\angle b$ → __________
11. $\angle c$ and $\angle f$ → __________
12. $\angle a$ and $\angle c$ → __________
13. $\angle c$ and $\angle d$ → __________
14. $\angle a$ and $\angle d$ → __________
15. $\angle d$ and $\angle f$ → __________
16. $\angle b$ and $\angle g$ → __________
17. $\angle c$ and $\angle g$ → __________

WORD BANK

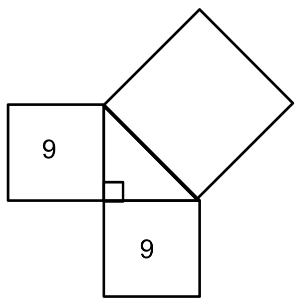
A. adjacent angles	B. alternate exterior angles	C. alternate interior angles
D. complementary angles	E. corresponding angles	F. supplementary angles
	G. vertical angles	

SKILL BUILDER 6

1. The Pythagorean Theorem only applies to ___________ triangles, with two shorter sides that are called _______, and a longest side that is called the _____________.

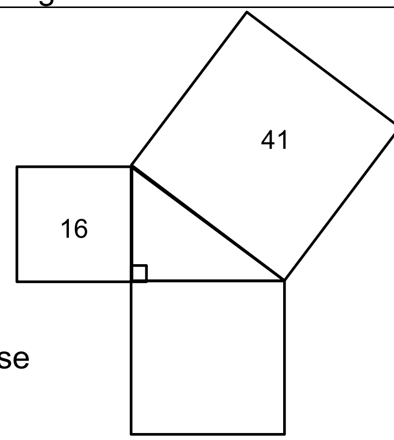
For each of the following, the areas of two squares are given in square units. Find the area of the third square (write it inside the square). Then find the side lengths asked for.

2.



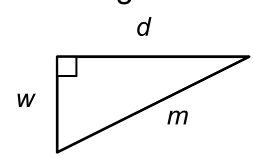
The length of each leg is __________.

3.



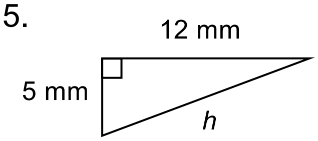
The length of the hypotenuse is _________.

4. For the following triangle, write an equation that relates the given side lengths according to the Pythagorean Theorem.

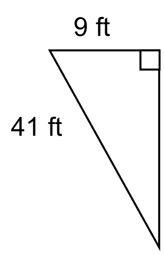


Find the missing length for each right triangle using the Pythagorean Theorem.

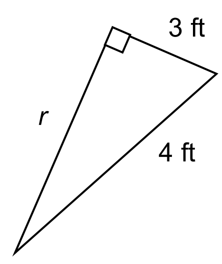
5.



6.



7.

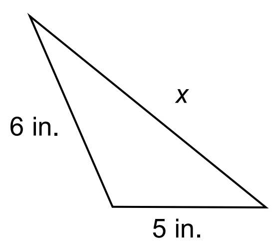


SKILL BUILDER 7

Determine whether each set of three numbers is a Pythagorean triple. That is, could the numbers be the lengths of three sides of a right triangle?

1. 12, 16, 20	2. 7, 24, 25	3. 4, 6, 8

4. Latonya said the missing side length of this triangle is $\sqrt{61}$ inches. Is the work she showed to justify this claim correct? Explain.



$$5^2 + 6^2 = x^2$$
$$25 + 36 = x^2$$
$$61 = x^2$$
$$\sqrt{61} = x$$

5. A square has a perimeter of 20 cm. Find the length of its diagonal rounded to the nearest tenth.

6. Find the height of an equilateral triangle whose side is 8 ft. Round your answer to the nearest tenth.

7. Challenge: A gift box in the shape of a cube has a side length of 10 inches. Find the length of the diagonal, rounded to the nearest tenth of an inch.

FOCUS ON VOCABULARY

Match the words to the clues.

Words

_______ 1. alternate interior angles

_______ 2. converse of the Pythagorean Theorem

_______ 3. corresponding angles

_______ 4. hypotenuse

_______ 5. legs

_______ 6. obtuse angle

_______ 7. parallel lines

_______ 8. Pythagorean Theorem

_______ 9. Pythagorean triple

______ 10. right triangle

______ 11. straight angle

______ 12. transversal

Clues

a. If *a* and *b* are legs of a right triangle and *c* is the hypotenuse, then $a^2 + b^2 = c^2$.

b. 3, 4, 5 is an example of this

c. The side of right triangle opposite the right angle. The longest side in a right triangle.

d. If the sum of the squares of the lengths of two sides of a triangle is equal to the square of the length of the third side, then the triangle is a right triangle.

e. A triangle that has a right angle.

f. Two sides of the triangle adjacent to the right angle.

g. Lines in a plane that never meet.

h. If two lines are cut by a transversal, these angles appear on the same side of the transversal in the same relative location.

i. If two lines are cut by a transversal, these angles appear on the opposite sides of the transversal and between the parallel lines

j. An angle that measures 180°.

k. An angle that measures more than 90° and less than 180°.

l. A line that crosses two or more lines in a plane.

SELECTED RESPONSE

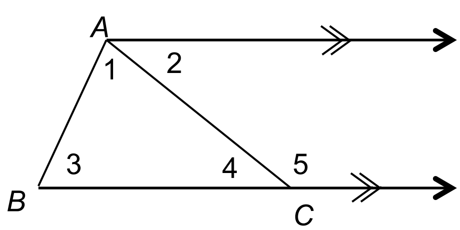


Figure 1

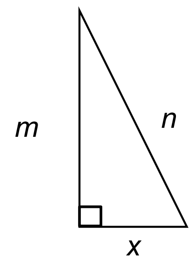


Figure 2

Show your work on a separate sheet of paper and choose the best answer.

1. Choose all correct statements about figure 1.

   A. $\angle 1$ and $\angle 2$ are adjacent angles

   B. $\angle 4$ and $\angle 5$ are vertical angles

   C. $\angle 4$ and $\angle 5$ are supplementary angles

   D. $\angle 1$ and $\angle 2$ are supplementary angles

   E. $\angle 2$ and $\angle 4$ are alternate interior angles

   F. $\angle 2$ and $\angle 3$ are corresponding angles

   G. $\angle 2$ is an exterior angle of ΔABC

   H. $\angle 5$ is an exterior angle of $\Delta\ ABC$

   I. $\angle 1 + \angle 3 = \angle 5$

   J. $\angle 3 + \angle 4 = \angle 2$

   K. $\angle 1 + \angle 3 + \angle 4 = 180°$

   L. $\angle 3 + \angle 4 + \angle 5 = 180°$

---

2. Choose all correct statements about figure 2. Let m = 15 cm and n = 17 cm.

   A. n is a hypotenuse

   B. m and x are legs

   C. $m^2 + x^2 = n^2$

   D. $n^2 - x^2 = m^2$

   E. $x = 64$

   F. $x = 8$

   G. $x = \sqrt{8}$

   H. x can be found using the converse of the Pythagorean Theorem

---

KNOWLEDGE CHECK

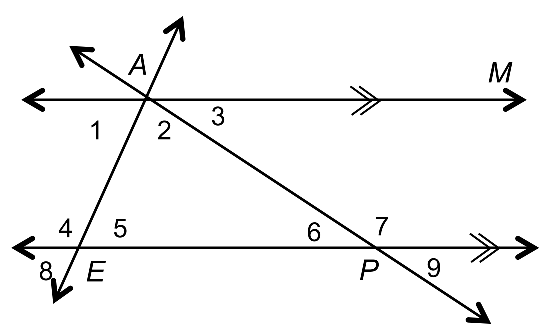
Show your work on a separate sheet of paper and write your answers on this page.

12.1 Angles and Triangles and **12.2 Parallel Lines**

Use ALL of the words from the word bank that apply to each problem about the diagram below.

WORD BANK

a. adjacent angles	b. alternate exterior angles	c. alternate interior angles
d. corresponding angles	e. exterior angle of a triangle	f. parallel lines
g. supplementary angles	h. transversal	i. vertical angles



1. line *AM* and line *EP*
2. line *AP*
3. $\angle 4$ and $\angle 5$
4. $\angle 5$ and $\angle 8$
5. $\angle 2$ and $\angle 3$
6. $\angle 1$ and $\angle 8$
7. $\angle 1$ and $\angle 5$
8. $\angle 3$ and $\angle 9$
9. $\angle 7$ in relation to ΔAEP

12.3 The Pythagorean Theorem

10. A right triangle has legs of 5 mm and 12 mm. Find the length of its hypotenuse.

11. Could a right triangle have side lengths 24, 25, and 7 units?

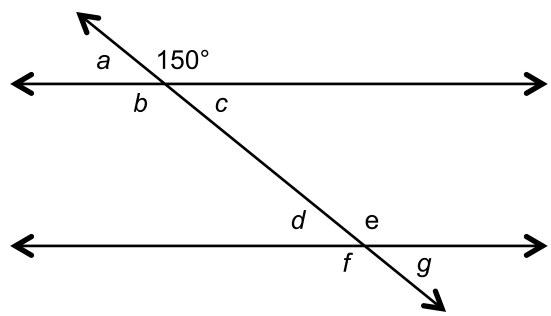
12. Find the height of an isosceles triangle with equal sides that each measure 5 m and a third side that measures 6 m (use the long side as the base).

13. In which problem above did you apply the converse of the Pythagorean Theorem?

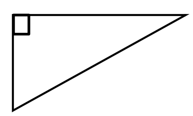
HOME SCHOOL CONNECTION

1. Draw a picture and explain how you know the sum of the measures of the interior angles of a triangle is 180°.

2. Find the missing angles measures in the diagram. Assume that lines that appear parallel are parallel.



3. Draw squares on the sides of each of the sides of this triangle below and explain how they are related.



4. Determine whether a triangle with side lengths 30 m, 40 m, and 50 m is a right triangle. See if you can figure it out without substituting values into the Pythagorean Theorem.

Parent (or Guardian) Signature ___________________________

COMMON CORE STATE STANDARDS – MATHEMATICS

STANDARDS FOR MATHEMATICAL CONTENT	
8.EE.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ ~~and $x^3 = p$~~, where p is a positive rational number. Evaluate square roots of small perfect squares ~~and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational~~.
8.G.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, ~~and the angle-angle criterion for similarity of triangles.~~ *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*
8.G.6	Explain a proof of the Pythagorean Theorem and its converse.
8.G.7	Apply the Pythagorean Theorem to determine the unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
8.G.8	Apply the Pythagorean to find the distance between two points in a coordinate system.

STANDARDS FOR MATHEMATICAL PRACTICE	
MP1	Make sense of problems and persevere in solving them.
MP2	Reason abstractly and quantitatively.
MP3	Construct viable arguments and critique the reasoning of others.
MP7	Look for and make use of structure.

9 7 8 1 6 1 4 4 5 2 2 0 1