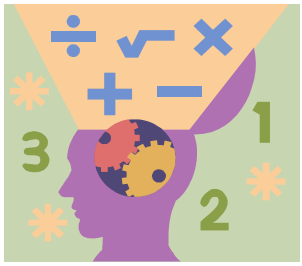
Algebra/Geometry Institute Summer 2010



Faculty Name: **Rod Fullilove**

School: **Drew High School**

Grade Level: **High School Geometry**

1. **Teaching Objective(s)**

Given ten problems on the use of the Pythagorean Theorem, the students will give correct answers with 80% accuracy.

Mississippi Framework objective:

1c Solve real-world or application problems that involve square roots and the Pythagorean Theorem (DOK 3)

2. **Instructional Activities**

Introduction:

To begin the lesson, the Mississippi objective and competency will be stated and written for the students to copy.

Students will be given a sketch of a baseball field with the distances given from home to first base, first base to second base, second base to third base, third base to home, and home to the pitcher's plate. (See attachment # 1)

The following is the scenario that will be given to the students:

The baseball field is a square with bases at each corner. The distances between each base is 90 feet, and from home to the pitcher's plate is 60 feet. Jack was the leadoff batter and got a single to right field. On the first pitch to the next batter, Jack stole 2nd base. On the next pitch, the batter hit a ground ball to the first baseman who stepped on 1st base to record the out. Jack began to run toward 3rd base. The first baseman threw the ball to 3rd and Jack is tagged out as he slid in to the base. How far did the first baseman throw the ball? Could the distance vary or is it always the same? Explain your answer.

Following the introduction, vocabulary to be used in this lesson will be discussed using an activity called "I have, who has?" This will be a pre-lesson vocabulary assessment to determine prior knowledge of these terms . (See attachment # 2)

After the vocabulary activity, for the students who do not have prior knowledge of these terms, the teacher will:

1. define and illustrate the leg of a right triangle, right triangles of various sizes will be drawn on the overhead or chalkboard, and students will be asked to come to the board to identify legs until all legs are labeled.
2. Illustrate examples of whole numbers and their squares. Undo the operation of squaring the number;
   Examples:
   a. $2^2 = 4$ so the square root is the base of the exponential form
   b. $3^2 = 9$ so the square root is the base 3
   c. $5^2 = 25$ so the square root is the base 5

Caution that not all numbers have a whole number as the square root
Examples:
a. The square root of 30 which is 5.477255…
b. The square root of 62 which is 728740078...

3. Draw 5 triangles on the overhead, or board, and place a box in the right angle to identify the angle as a 90° angle.
4. Draw 5 rectangles on the overhead, or board, and ask for 10 volunteers to come to the front and draw one diagonal each in one of the rectangles.
5. Distribute to the entire class, a hand out of different size and shape right triangles with the right angle shown by placing a box in the right angle and an arrow pointing to the side opposite the box. (See attachment #3)

Student activity:
Explain to students that the topic for the lesson is finding the lengths of sides of right triangles.

Each student will be given a picture of a right triangle (See attachment #4) and a ruler. They will be asked to place a box in the angle marked 90°, and to label the hypotenuse with the letter c, using the vocabulary definition. Then ask the students to label one leg of the triangle with the letter a and the other leg with the letter b. Now we have a visual example of a right triangle.

Next, the students will measure and label each leg of the triangle, find the squared number for each of the legs, and find the sum of the two squares (using a calculator, if necessary). The next step is to find the square root of the sum, rounding to the nearest tenth if the square root is not an integer.

The last step will be to measure the length of the hypotenuse (side c) and compare that measurement to the square root of the sum found in the previous step.

At the conclusion of this activity, the definition and illustration of the **Pythagorean Theorem** will be given. (The Pythagorean Theorem explains the relationship between the sides of a right triangle. It says that the length of the triangle's hypotenuse is equal to the sum of the squares of the legs.)

If the two answers match, we have proven the Pythagorean Theorem. If the two answers do not match, we will discuss the possible reasons and implications.

After discussing, exploring, and computing lengths of sides of a right triangle, students will practice their comprehension using the following group activities:

Attachment #5 Matching Exercise
Attachment #6 Squares and Square Roots
Attachment #7 Pythagorean Practice

Evaluation

For the first 5 exercises use your ruler to measure all sides of the labeled triangle. Using your calculator to help with squaring and square roots, identify each triangle as a right triangle R or not a right triangle (NR).
For the second 5 exercises, use the Pythagorean Theorem to find the length of the hypotenuse, rounded to the nearest tenth.

Attachments:

#1 Diagram of a baseball field
#2 I Have- Who Has vocabulary activity
#3 Diagram of a right triangle showing hypotenuse opposite right angle
#4 Diagram of a large right triangle
#5 Matching exercise
#6 Squares and Square roots
#7 Pythagorean Practice
#8 Evaluation

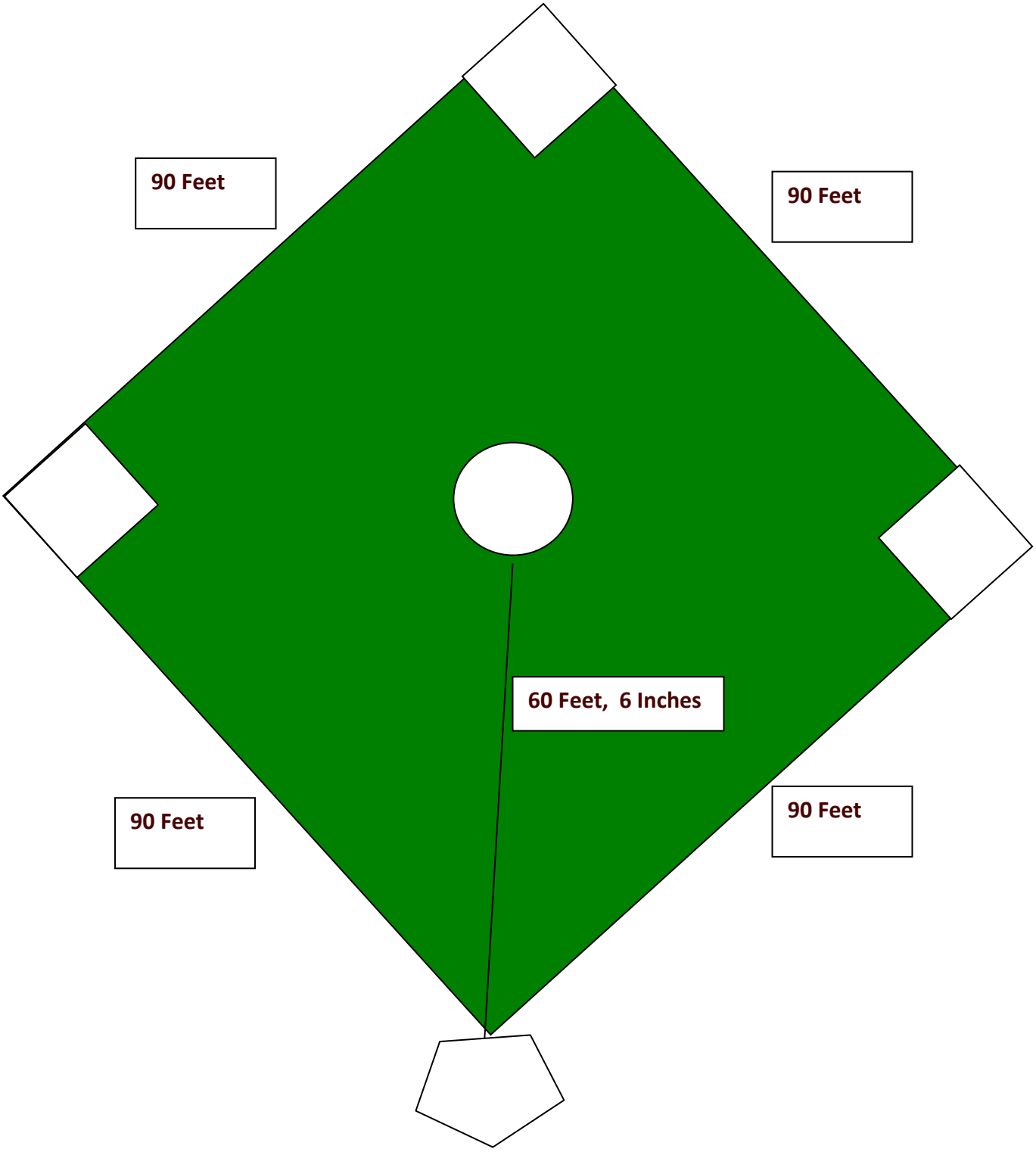
Materials:

Geometry textbook Prentice Hall
Handouts (attachments)
Ruler
Calculator
Pencil
Colored markers

Bibliography:

Kalin, Robert and Corbitt, Mary Kay (1993). Geometry. 311-315. Prentice Hall.

Attachment #1



ANSWER KEY

ATTACHMENT #1

Use $a^2 + b^2 = c^2$ to solve this problem.

The angles at each base are 90°. If t he throw is made from 1st base to 3rd base, this will be the hypotenuse © for the right triangle formed by the distance from home to first base (90 feet) represented by a and the distance from home to 3rd base (90 feet) represented by b. This is an isosceles right triangle.

So, substituting 90 feet for a and 90 feet for b, we have $90^2 + 90^2 = c^2$.

$90^2 = 8100$ $8100 + 8100 = c^2$.

$16200 = c^2$

$\sqrt{16200} = c$

127.9 is the correct answer for c rounded to the nearest tenth.

I HAVE-WHO HAS

Attachment # 2

The teacher will begin the activity by asking the first question:

Question: Who has the length of one side of a triangle?

Answer: I have a LEG.
Question: Who has the square root of 25?

Answer: I have 5
Question: Who has a triangle with 90°?

Answer: I have a right triangle
Question: Who has the other length of a side of a right triangle?

Answer: I have the other LEG
Question: who has the length from one corner of a rectangle to the opposite corner?

Answer: I have a diagonal
Question: who has the side opposite the right angle in a right triangle?

Answer: I have the hypotenuse
Question: who has the name of the sixth century Greek mathematician?

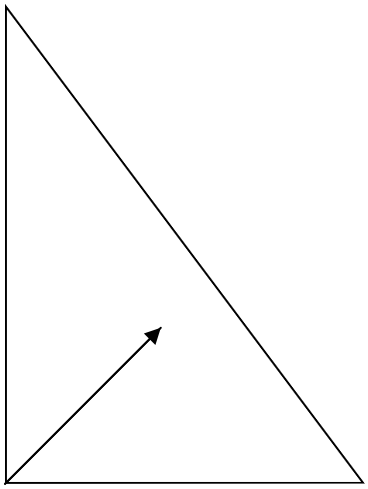
Answer: I have Pythagoras
Question: Who has the square of one leg of a right triangle?

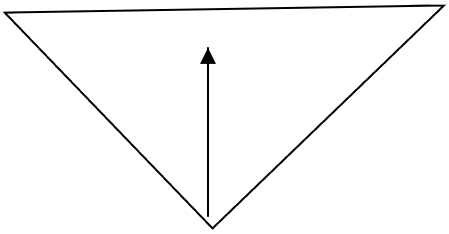
Answer: I have a^2
Question: Who has the square of the other side of a right triangle?

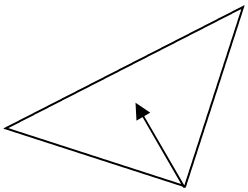
Answer I have b^2
Question: Who has $a^2 + b^2 = c^2$?

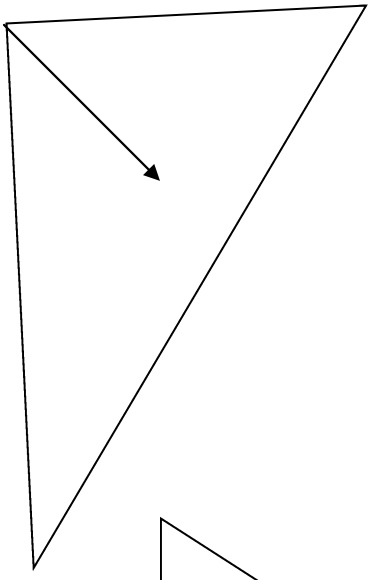
Teacher Answer: I have the Pythagorean Theorem

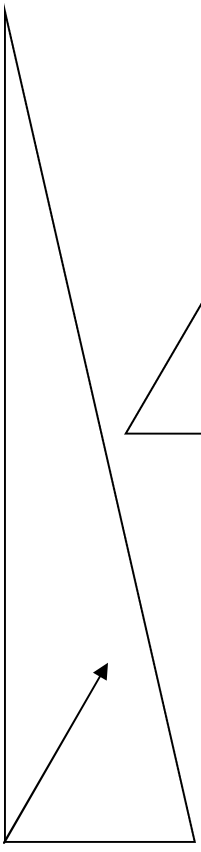
Attachment #3

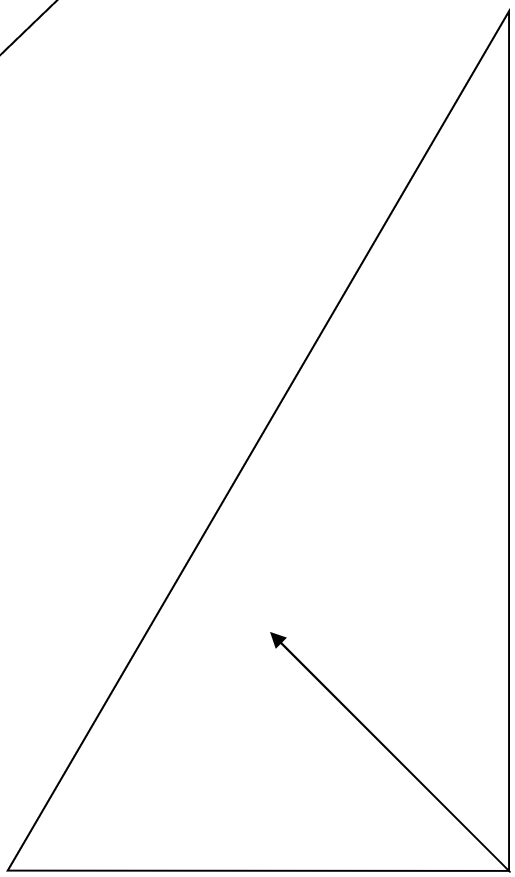


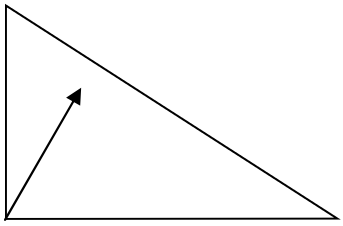




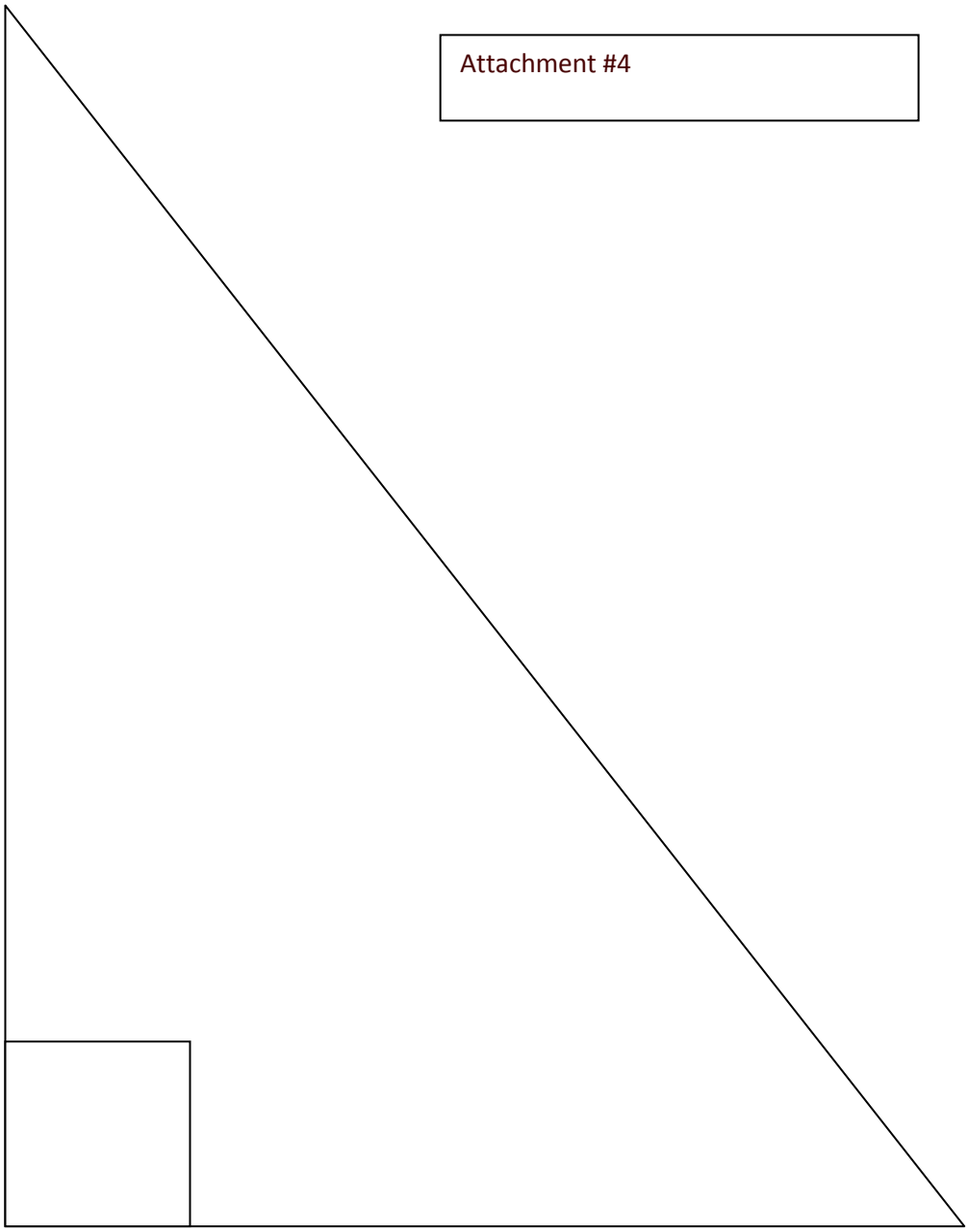








Attachment #4



MATCHING WITH PYTHAGORAS Attachment *#5*

Determine the letter for the correct answer from the list below and place it beside the matching statement.

___ 1. The sides 3,4,5 are called a Pythagorean _____ .

_2. A triangle with sides of 7,11, and 13 _____ form a right triangle.

_3. To undo a number being squared, you take_____.

_4. A right angle is exactly _____ degrees.

_5. If b = 8, and c = 17, what is the length of leg a? _6. The two sides of a triangle that form a right angle. _7. The longest side of a right triangle. _B. If a = b, and b = 12, what is the length of leg c? _9. If a = 24, and c = 25, what is the length of leg b?

_10. A triangle with sides 9,40, and 41 _____form a right triangle.

_11. The only type of triangle that the Pythagorean Theorem works with.

Choices for “Matching With Pythagoras” Attachment #5

a. Right Triangle
b. Hypotenuse
c. Triple
d. Does
e. Square Root
f. √200
g. 15
h. Does
i. 90
j. 7
k. Legs

Attachment #5

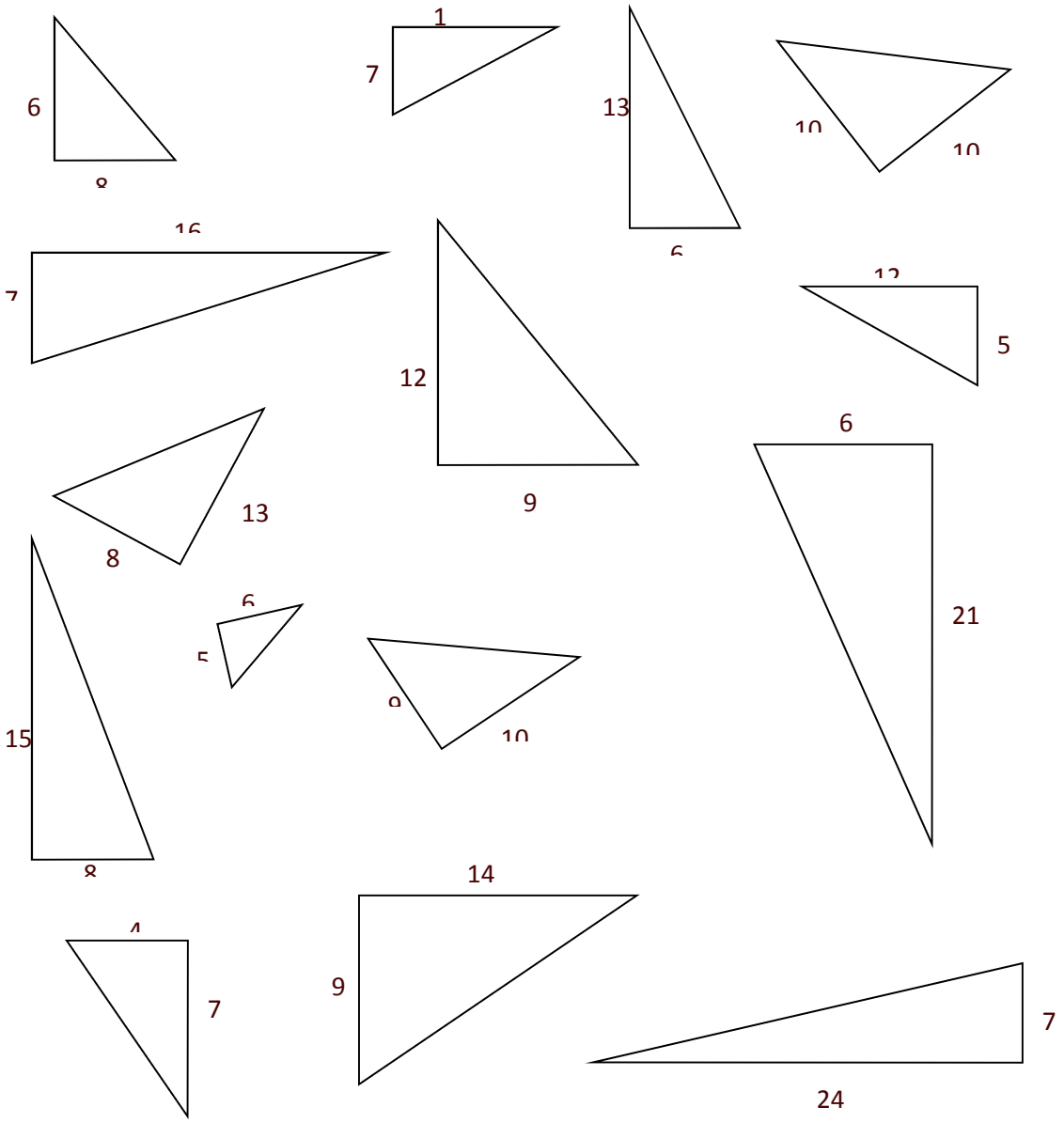
Matching With Pythagoras
Answer Key

1. C
2. H
3. E
4. I
5. G
6. K
7. B
8. F
9. J
10. D
11. a

Pythagorean Theorem Attachment #6

Squares and Square Roots

For each of the following right triangles, find the hypotenuse. Find your answer in the answer box. You may use an answer from the answer only box once.



Attachment #6

Pythagorean Theorem
Squares and square Roots

Choices for the square roots:

1. 13
2. 25
3. 17.5
4. 16.6
5. 10
6. 15.3
7. 17
8. 7.07
9. 8.06
10. 14.1
11. 13.5
12. 7.81
13. 21.8
14. 14.3
15. 15

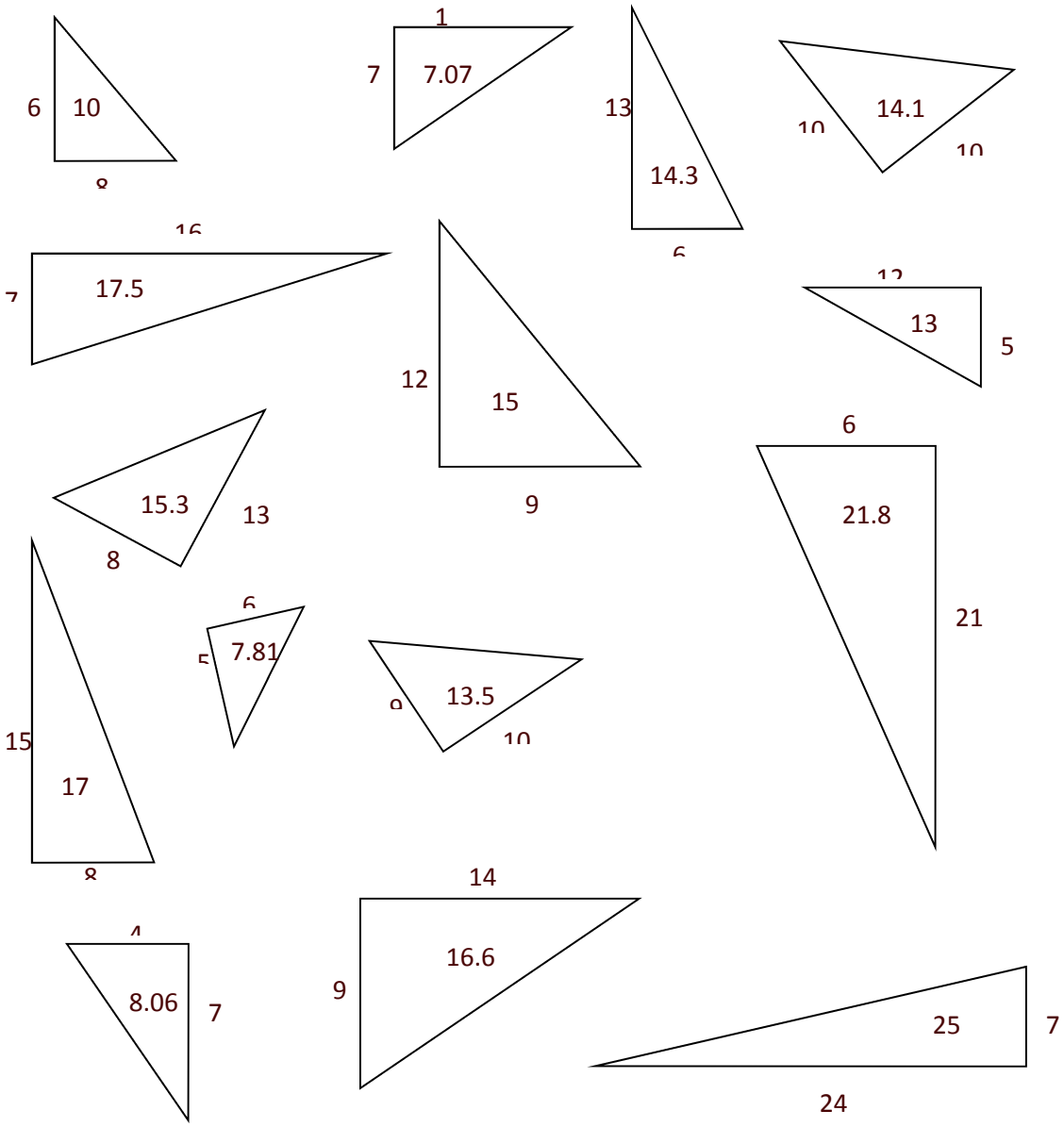
Pythagorean Theorem

Squares and Square Roots

Answer Key

Attachment

For each of the following right triangles, find the hypotenuse. Find your answer in the answer box. You may use an answer from the answer only box once.



Attachment #7

Pythagorean Theorem
Practice Exercises

Using c as the measure of the hypotenuse, find the measure for each missing side or hypotenuse. Round to the nearest tenth.

1. a = 3, b = 4, c = _____
2. a = 6, c = 10, b = _____
3. b = 12, c = 13,. A = _____
4. a = 6, c = 12, b = _____
5. a = 8, b = 6, c = _____
6. a= 5, c = 13, b = _____
7. b = 0.8, c = 1.0, a = _____
8. a = 11, b = 4, c = _____
9. a = √12, b = 6, c = _____
10. b = 11, c = √289, a = _____
11. a = 19, b = √39, c = _____
12. a = √6, b = √19, c = _____

Attachment #7

Pythagorean Theorem
Practice Exercises
Answer Key

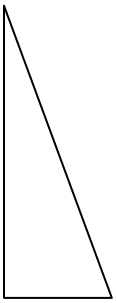
1. 25
2. 8
3. 5
4. 10.4
5. 10
6. 12
7. .6
8. 11.7
9. 6.9
10. 11.7
11. 20
12. 5

Attachment #8

Evaluation
Pythagorean Theorem

For the first 5 exercises use your ruler to measure all sides of the triangle. Using your calculator to help with squaring and square roots, identify each triangle as a right triangle R or not a right triangle NR.

1.



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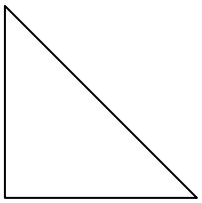

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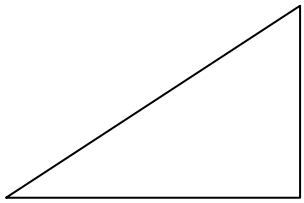

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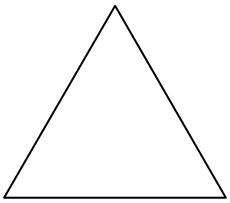

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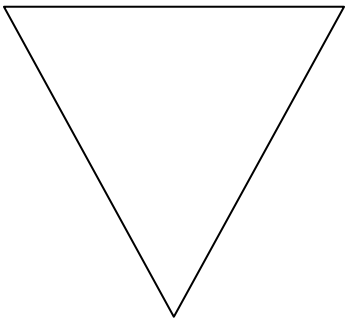
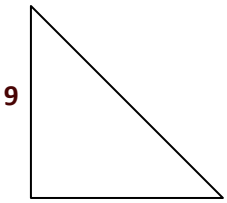


For the second 5 exercises each triangle is a right triangle. Use the Pythagorean Theorem to find the length of the hypotenuse rounded to the nearest tenth.

6.



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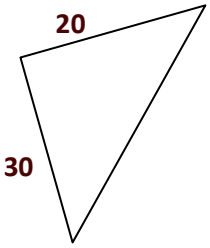

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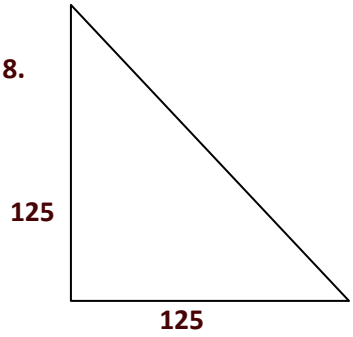

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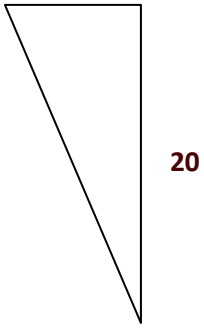

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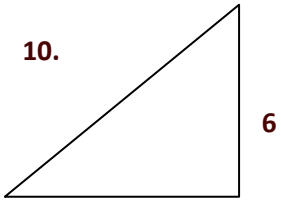

Attachment #8

Evaluation
Pythagorean Theorem
Answer Key

1. R
2. R
3. R
4. NR
5. R
6. 18.4
7. 36.1
8. 176.8
9. 23.3
10. 10