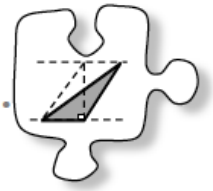
Name:_____ Period:_____ Date:_____

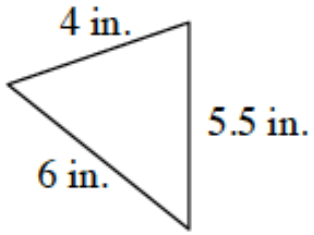
2.2.4 How can I find the height?



Heights and Areas

In Lesson 2.2.2, you learned that triangles with the same base and height must have the same area. But what if multiple dimensions of a shape are labeled? How can you determine which dimension is the height?

2-90. Candice missed the lesson about finding the area of the triangle. Not knowing where to start, she drew a triangle and measured its sides, as shown below. After drawing her triangle, Candice said, "*Well, I've measured all of the sides. I must be ready to find the area!*"

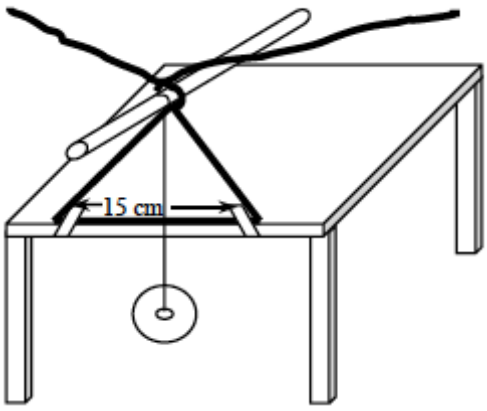


If you think she is correct, write a description of how to use the side lengths to find the area. If you think she needs to measure anything else, copy the figure on your paper and add a line segment to represent a measurement she needs.

2-91 HEIGHT LAB

What is the height of a triangle? Is it like standing at the highest point and looking straight down? Or is it like walking up a side of the triangle? Today your team will build triangles with string and consider different ways height can be seen for triangles of various shapes.

Use the materials given to you by your teacher to make a triangle like the one in the diagram below.



Student jobs:

- Hold the pencil (or pen) with the weight.
- Make sure that the weight hangs freely.
- Draw accurate sketches.
- Obtain and return materials as directed by the teacher.

i. Tie one end of the short string to the weight and the other to the end of a pencil (or pen).

ii. Tape a 15 cm section of the long string along the edge of a desk or table. Be sure to leave long ends of string hanging off each side.

iii. Bring the loose ends of string up from the table and cross them as shown in the diagram. Then put the pencil with the weight over the crossing of the string. Cross the strings again on top of the pencil.

Name:_____ Period:_____ Date:_____

Now, with your team, build and sketch triangles that meet the three conditions below. To organize your work, assign each team member one of the jobs described at right.

a. The height of the triangle is inside the triangle. Sketch:

b. The height of the triangle is a side of the triangle. Sketch:

c. The height of the triangle is outside of the triangle. Sketch:

2-92. How can you find the height of a triangle if it is not a right triangle?

a. On the Lesson 2.2.4 Resource Page there are four triangles labeled (1) through (4). Assume you know the length of the side labeled "base." For each triangle, draw in the height that would enable you to find the area of the triangle. Note: You do **not** need to find the area.

b. Find the triangles for part (b) at the bottom of the same resource page. These triangles are all congruent. For each triangle, choose a base and highlight it with a color and then draw in its respective base with another color. Repeat this process with a new base and height for the other two triangles. (Hint: not all heights will be inside the triangle).

c. Using a ruler, measure and record the length of each base and height in the data table. Then calculate the area of the triangles (look at the Math Notes at the end of this packet). What do you notice about the areas?

Name:_____ Period:_____ Date:_____

2-93. AREA TOOLKIT

Over the past several days, you have explored how to find the areas of triangles, parallelograms, and trapezoids. Obtain the Lesson 2.2.4B Resource Page from your teacher. Today you will start a new page of your Geometry Toolkit, called the Area Toolkit. Keep this Toolkit in a safe place. You will want it for reference in class and when doing homework.

At this time, describe what you know about finding the areas of triangles, rectangles, parallelograms, and trapezoids. Be sure to include an example for each shape.

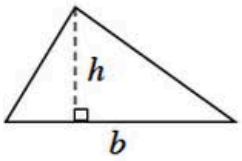
METHODS AND MEANINGS

MATH NOTES

Areas of a Triangle, Parallelogram, and Trapezoid

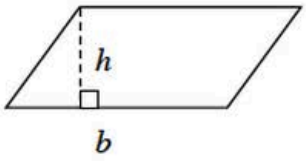
The area of a triangle is half the area of a rectangle with the same base and height. If the base of the triangle is length b and the height length h, then the area of the triangle is:

$$A = \tfrac{1}{2}bh.$$



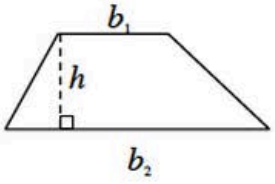
The area of a parallelogram is equal to a rectangle with the same base and height. If the base of the parallelogram is length b and the height length h, then the area of the parallelogram is:

$$A = bh.$$



Finally, the area of a trapezoid is found by averaging the two bases and multiplying by the height. If the trapezoid has bases b_1 and b_2 and height h, then the area is:

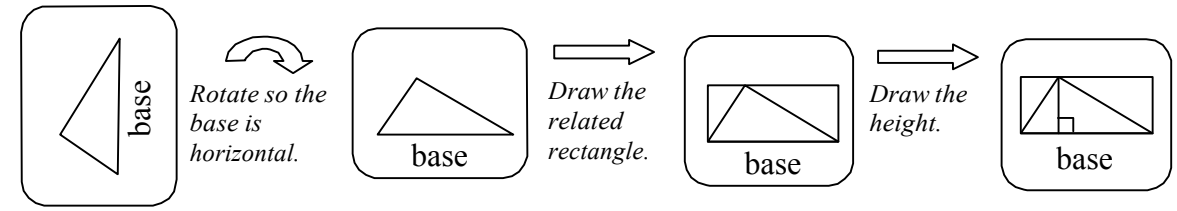
$$A = \tfrac{1}{2}(b_1 + b_2)h.$$



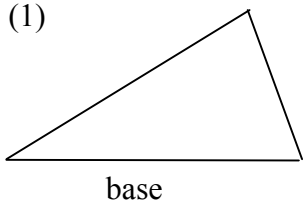
Name: _____ Period:_____ Date:_____

Resource Page 2.2.4 Height

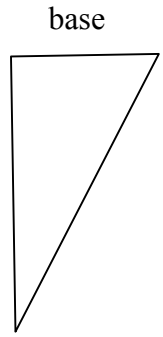
2-92, part (a)



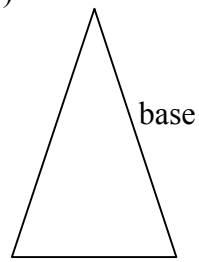
(1)



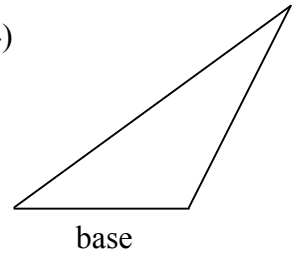
(2)



(3)

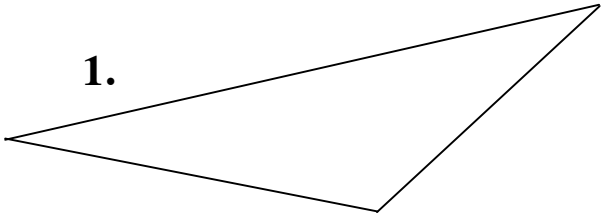


(4)

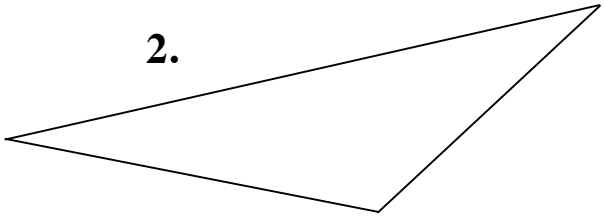


2-92, part (b)

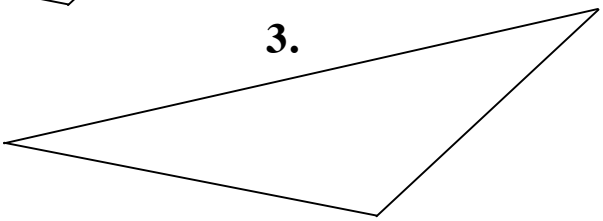
1.



2.



3.



Triangle:	**Base Color and Length (cm)**	**Height Color and Length (cm)**	**Area (cm^2)**
1			
2			
3			