Geometry Materials

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Problem of the Month

The Wheel Shop

Level A:

You go to a shop that sells tricycles. There are 18 wheels in the Wheel Shop.

How many tricycles are in the shop?

Explain how you know.

Level B:

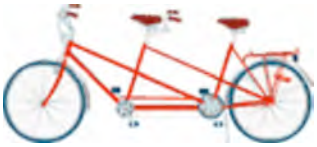
The Wheel Shop sells other kinds of vehicles. There are bicycles and go-carts in a different room of the shop. Each bicycle has only one seat and each go-cart has only one seat. There are a total of 21 seats and 54 wheels in that room.

How many are bicycles and how many are go-carts?

Explain how you figured it out.

Level C:

Three months later some vehicles have sold and new models have been brought into the Wheel Shop. Now, there are a different number of bicycles, tandem bicycles, and tricycles in the shop. There are a total of 135 seats, 118 front handlebars (that steer the bike), and 269 wheels.


How many bicycles, tandem bicycles and tricycles are there in the Wheel Shop?

Level D:

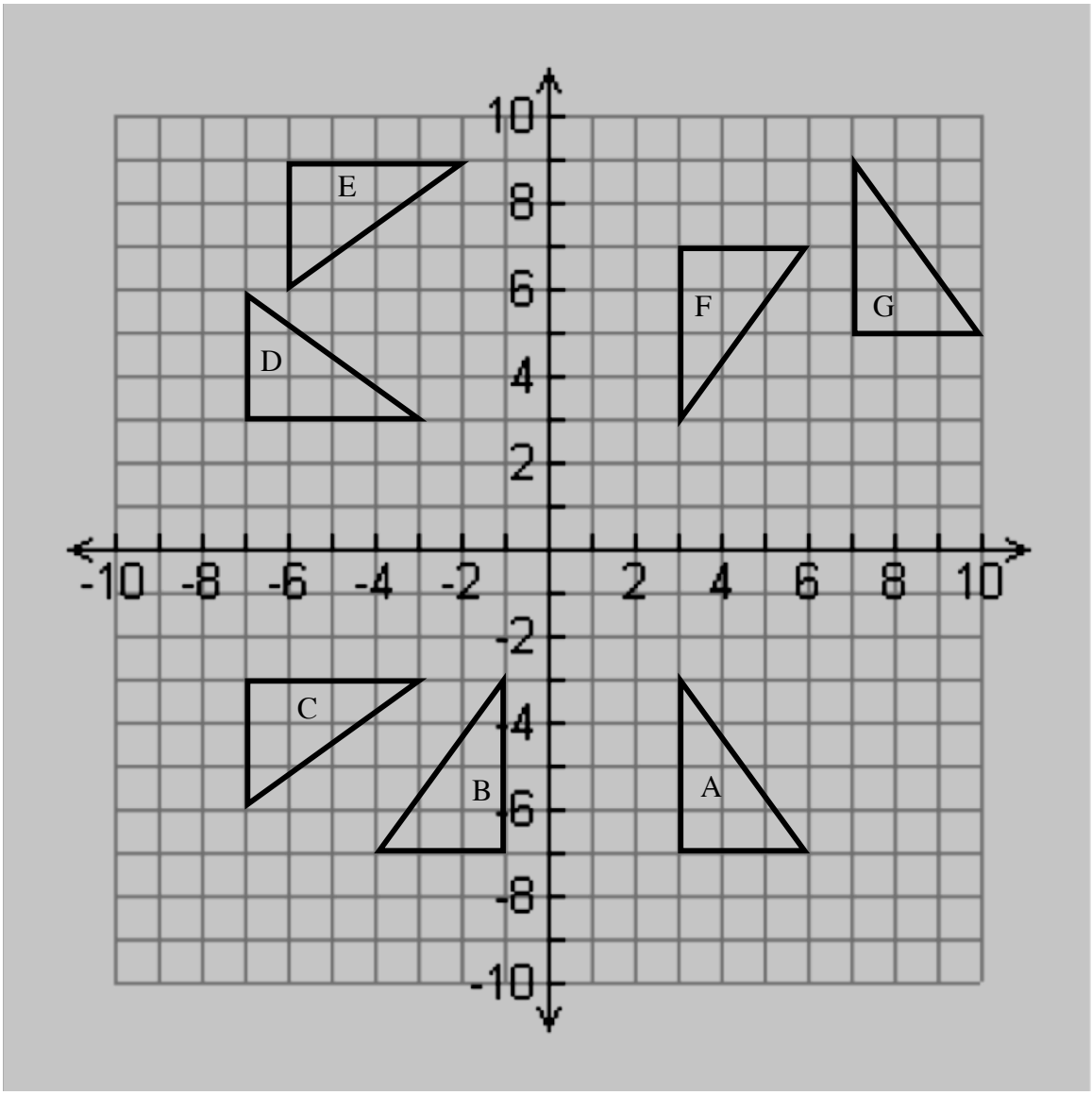
In the back stockroom at the Wheel Shop, the number of seats and horns equaled the number of wheels. The number seats and handlebars equaled the number of horns. Twice the number of wheels is equal to three times number of handlebars. Determine the relationship of horns to seats.

Level E:

The repair department of the bicycle shop repairs three things: flat tires, bent handle bars and ripped seats. Today in the repair department, 25% of the bikes had flat tires only, 5% had bent handlebars only, and 10% had ripped seats only. Just 1/12th of the bikes had all three repairs to do: flat tires, bent handlebars and ripped seats. No bikes were completely fixed and there are a total of 101 repairs to be made. How many bikes are in the repair department? How many bikes need two repairs? If less than half of all the bikes have a ripped seat, what is the range of bikes that need both the tires and handlebars repaired without needing to fix the seat?

Rigid Motion
MAC Assessment Task

Kyra enjoys making puzzles using rigid motion transformations. She drew right triangles on the coordinates axes below and labeled the triangles A through G.



Kyra writes the following clues:

1. Triangle A is reflected over the x-axis. Name the resulting triangle. _____

2. Write a single transformation that maps triangle A onto triangle D.

_____

3. Triangle A maps onto triangle C through a rotation about the origin.

   What is the angle of rotation? _____

   What other angle of rotation can be used? _____

4. Find a two-step transformation that maps triangle A onto triangle E.

_____

_____

5. Kyra draws the right triangle H with vertices (-4,1), (-1,1), (-1,4). Explain why triangle A cannot be mapped to triangle H using a rigid motion transformation.

_____

_____

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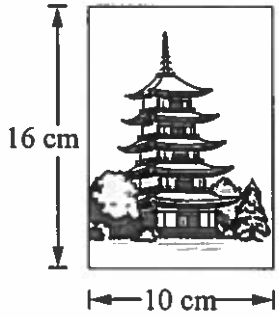
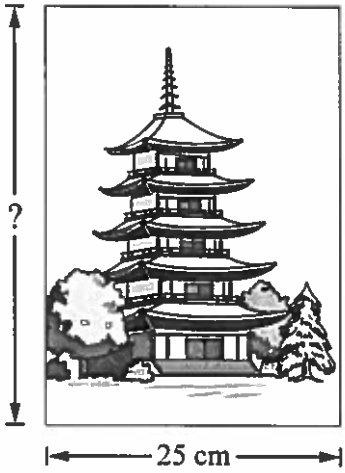
The Poster

This problem gives you the chance to:
- calculate sizes in an enlargement

Photograph



Poster



1. A photograph is enlarged to make a poster.
The photograph is 10 cm wide and 16 cm high.
The poster is 25 cm wide. How high is the poster? _____
Explain your reasoning.

2. On the poster, the building is 30 cm tall.
How tall is it on the photograph? _____
Explain your work.

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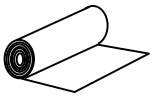
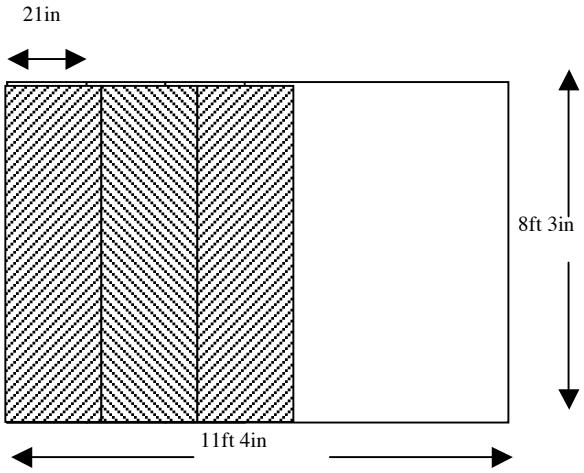
Wallpaper

This problem gives you the chance to:
• solve a real life problem working with lengths and widths

Martina is going to wallpaper a wall in her bedroom.
The wall is 11 feet 4 inches wide and 8 feet 3 inches high.





A roll of wallpaper is 21 inches wide and 30 feet long.
Whole strips of wallpaper are cut from the roll, then glued vertically onto the wall.

1. How many whole strips of wallpaper can Martina cut from one roll of paper? _____
   Show how you figured it out.

2. How many whole strips of wallpaper does Martina need to paper her wall? _____
   Show how you figured it out.

3. How many rolls of wallpaper will Martina need? _____

4. Maria wondered whether to cover two walls with the wallpaper.
   If the two walls are both the same size will Martina need twice as many rolls of wallpaper?

   _____

   Explain how you figured this out.

   _____

   _____

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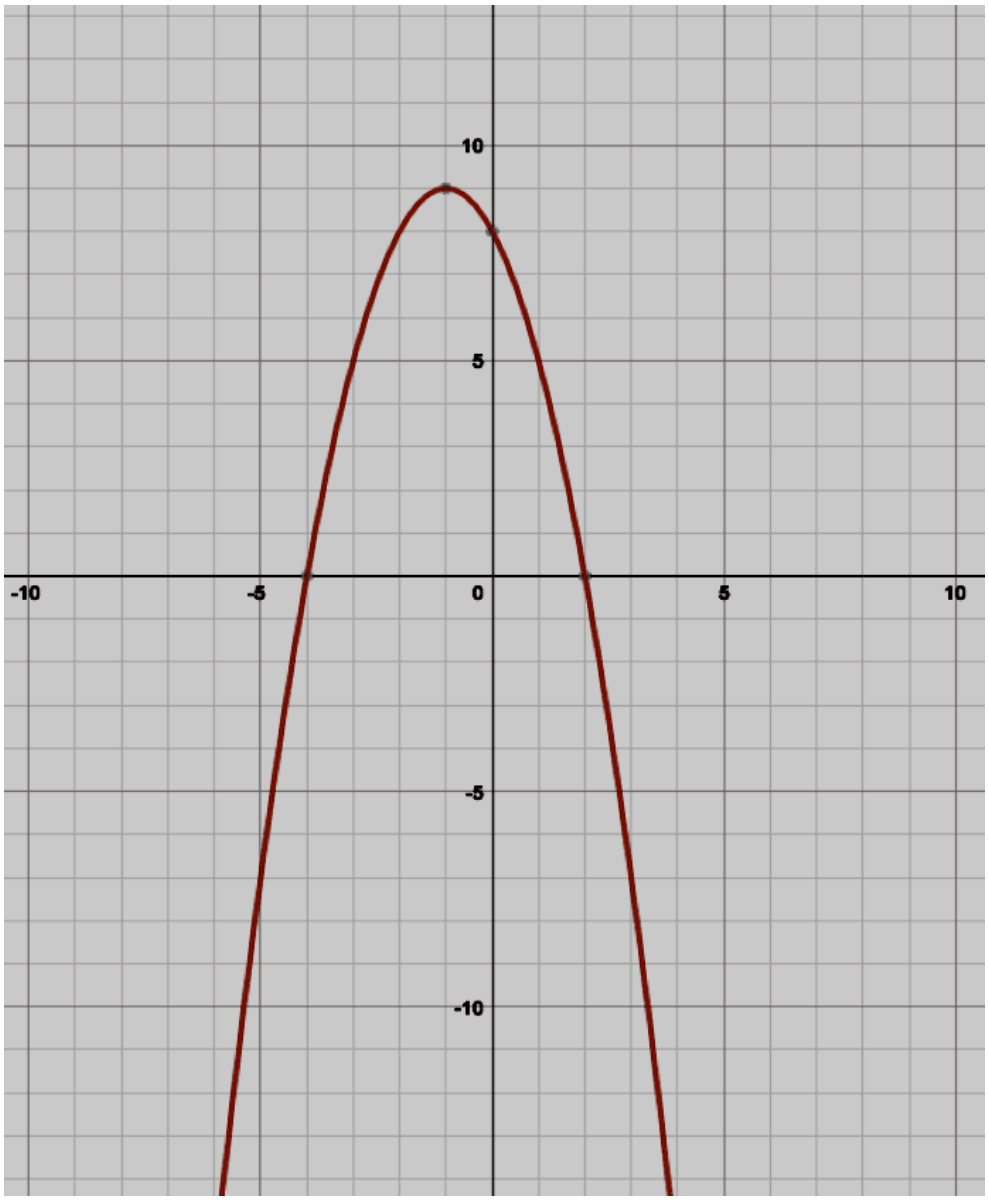
Consuelo's Graph

Assessment Task

Melissa helps Consuelo work on a math problem involving a parabola. They examine the graph below.



1. What are the coordinates of the vertex point? _____

2. List the zeros of the parabola. _____
   Explain how you know the zeros.

3. Write a function of the parabola. _____

Melissa writes the following function, $y = -2x - 1$

4. Draw a graph of Melissa's function on the same coordinate axes.

5. Consuelo wants to find where the line and parabola intersect. Determine the points of intersection of the two functions.

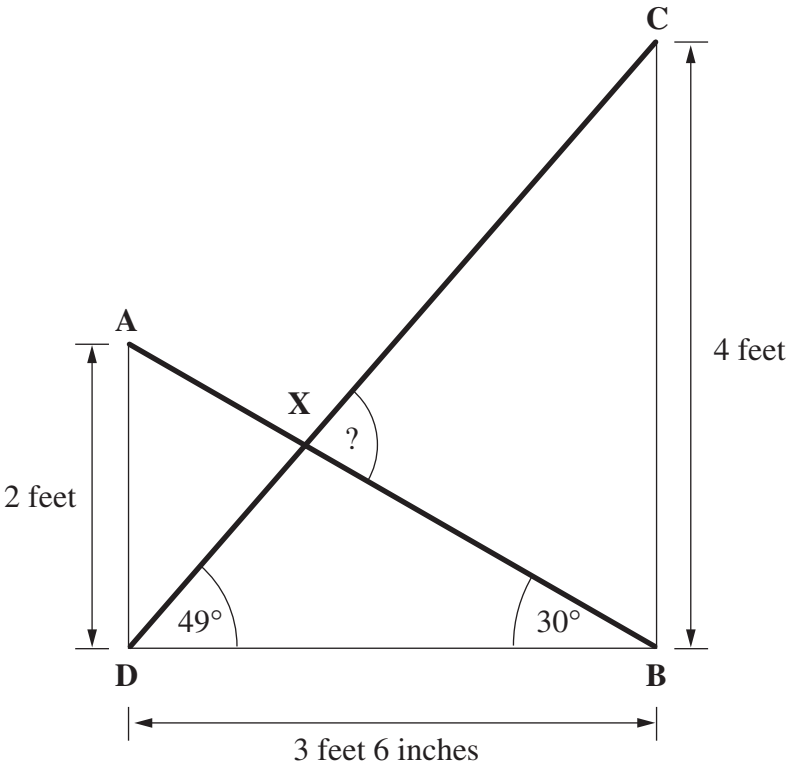
   _____

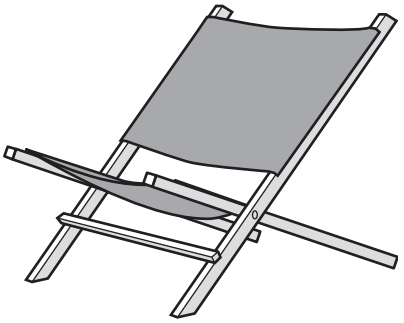
   Show how you figured it out.

Garden Chair

This problem gives you the chance to:

- use a drawing to calculate lengths and angles





Dan is designing a garden chair. The diagram above shows a side view of the chair when it is set up for use. $\overline{AB}$ and $\overline{CD}$ represent two lengths of wood hinged together at X. $\overline{BD}$ is horizontal. A is vertically above D, and C is vertically above B.

1. Calculate the angle between the two lengths of wood, $\angle BXC$. _____

2. Use the Pythagorean theorem to calculate the length of $\overline{CD}$. _____
Show your work.

3. Show that triangles AXD and BXC are similar.

_____

_____

_____

_____

4. Use the fact that triangles AXD and BXC are similar to calculate $\overline{CX}$,
the distance from the top of the seat to the hinge.
Show how you figured it out. _____

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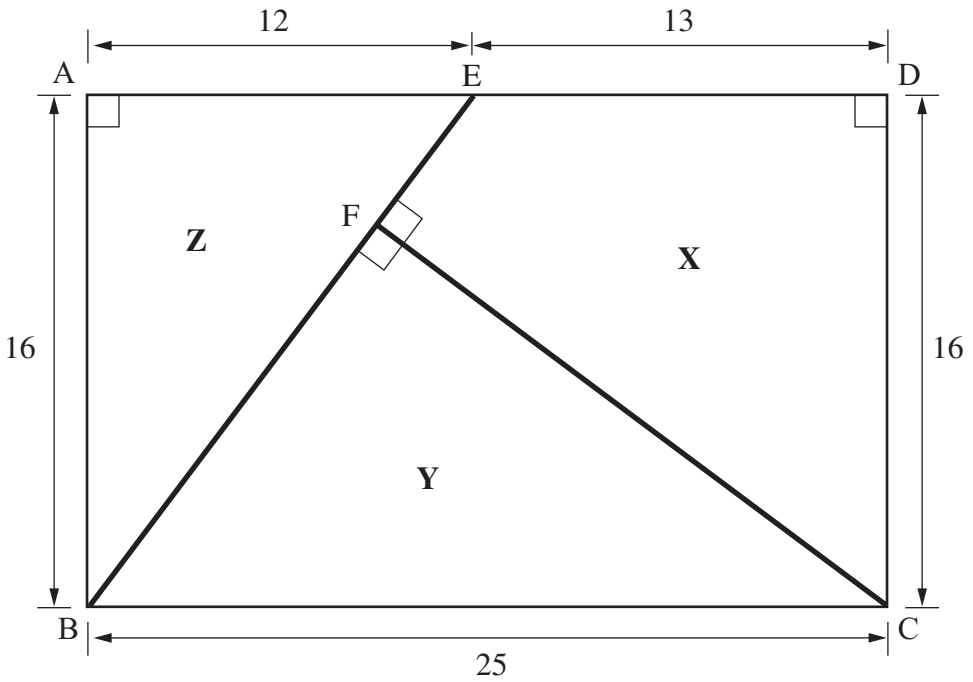
Rectangle and Square

This problem gives you the chance to:

- solve a problem using similarity and the Pythagorean theorem

A rectangle 25 centimeters long and 16 centimeters wide is divided into two right triangles and a quadrilateral, as shown below. The two triangles Y and Z are similar.



1. Calculate the lengths of the sides of the two triangles Y and Z, and the sides of the quadrilateral X.

BE = _____ cm BF = _____ cm

FE = _____ cm FC = _____ cm

2. Draw a diagram to show how the two triangles and the quadrilateral can be rearranged to make a square.

What is the length of each side of the square? _____ cm
Explain your reasoning.

_____

_____

_____

_____

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