MACS Bridgewater State College

April 8, 2010

Hands on Geometry: Part 2

Grades 7 & 8

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The materials will be posted at
www.sabinin.info/Conferences.html

Agenda

1. Student work for homework problem
2. Playing with Patty Paper
    a. Symmetry
    b. Transformations
3. Measurement
    a. Area of a Triangle
    b. Surface area of a sphere
    c. 'Volume of a sphere
4. 3-dimensional geometry
    a. Nets
    b. Projections

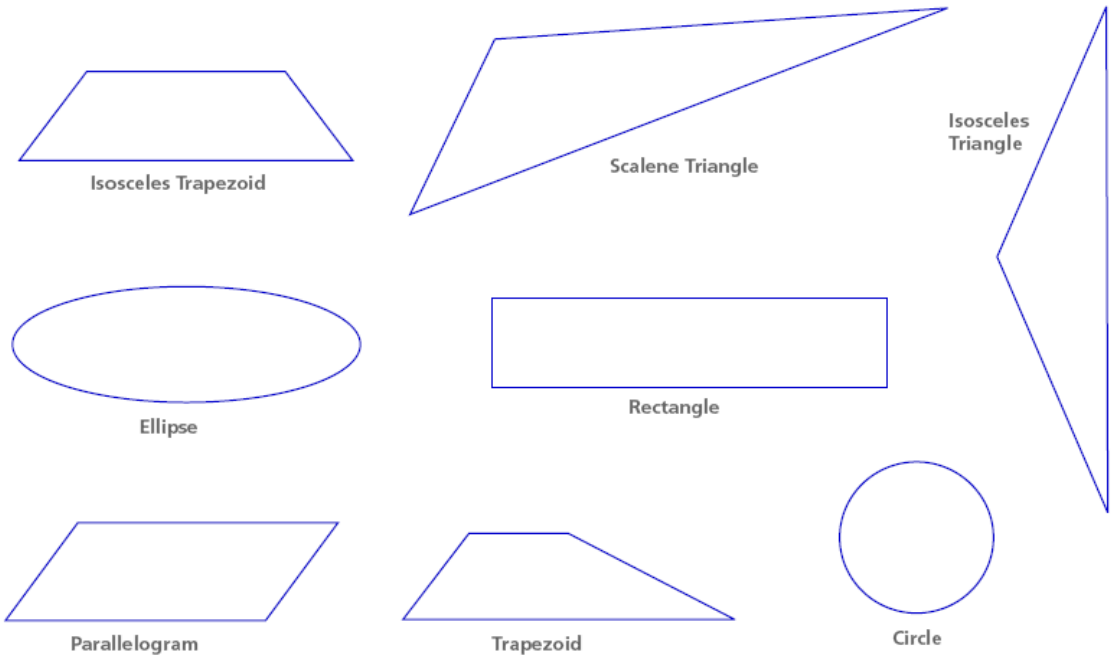
Homework Problem:

Student problem:

In a store we can buy squares for 40¢, circles for 25¢, triangles for 35¢, and rectangles for 45¢. How much would a prism, cube, cylinder, and pyramid cost? List all the possibilities.

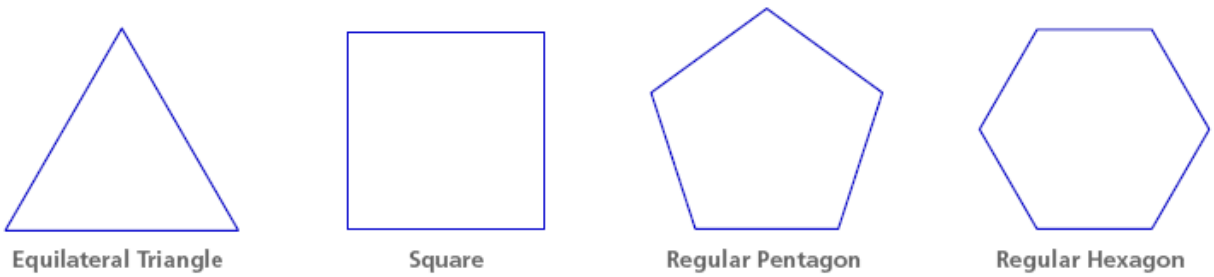
Symmetry

Use patty paper to find all the lines of symmetry you can for the figures below. You can start by tracing the figure on a sheet of patty paper.



Use patty paper to determine if the figures above have rotational symmetry. Determine the angle of rotation where possible.

Use patty paper to find all the lines of symmetry for the regular polygons below. Generalize a rule about the number of lines of symmetry for regular polygons.

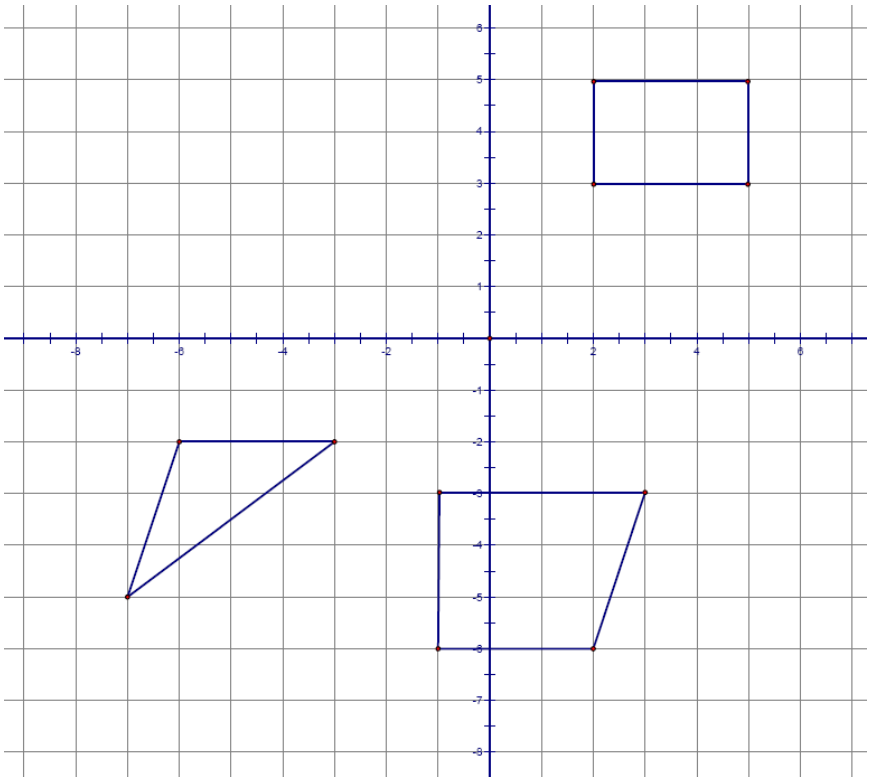


Use patty paper to draw figures with 1, 2, and 4 lines of symmetry. Do any of these figures have rotational symmetry? If so, find the angle of rotation.

Source Unknown

Transformations on Coordinate Plane

Use patty paper to translate each of the figures drawn by 2 units to the left and 1 unit up. Start by carefully tracing the figures onto the patty paper.



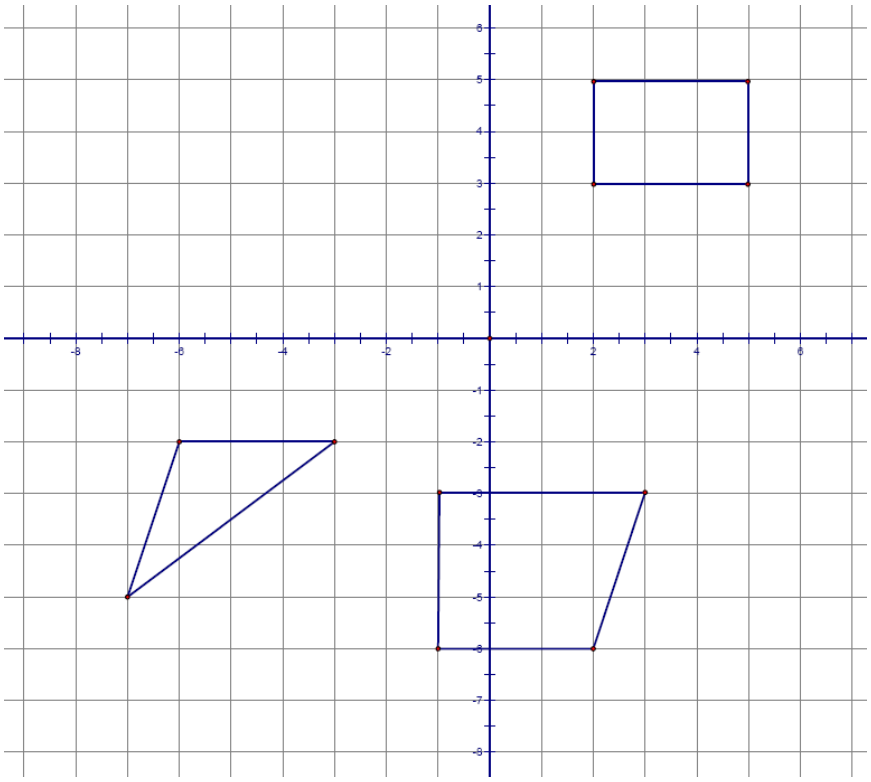
Complete the table below:

Figure	Original Coordinates	Coordinates after translation by 2 units to the left and 1 unit up
Triangle		
Trapezoid		
Rectangle		
Parallelogram	(12,1) (17,1) (11,-2) (16,-2)	
Square		(-6,5) (-3,5) (-6,2) (-3,2)

What can you conclude from this exercise?

Transformations on Coordinate Plane IV

Use patty paper to reflect each of the figures drawn over the vertical axis. Start by carefully tracing the figures onto the patty paper.



Complete the table below:

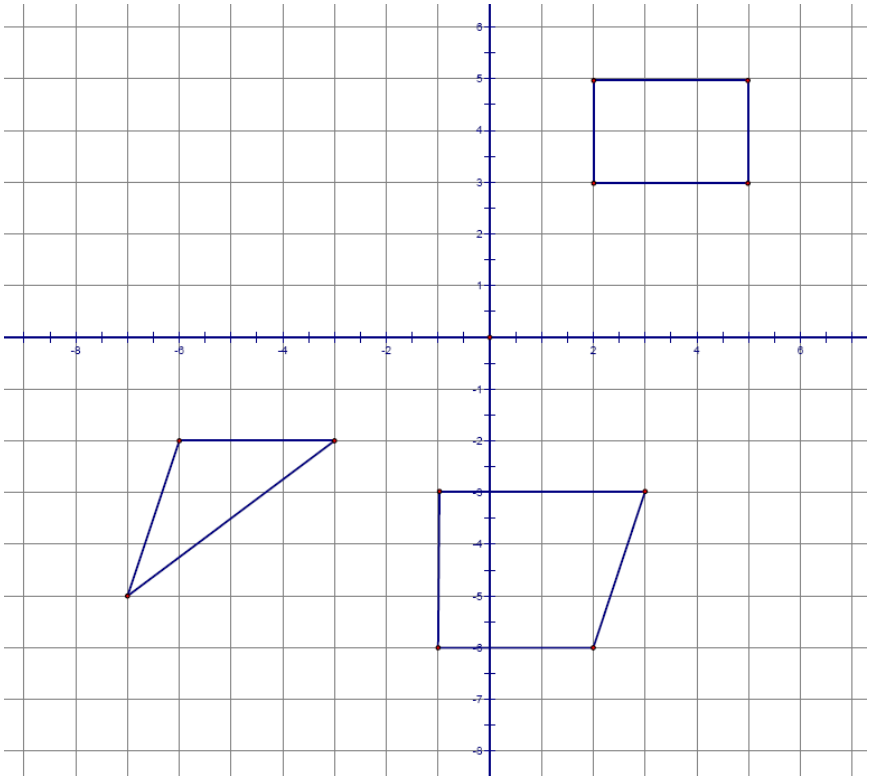
Figure	Original Coordinates	Coordinates after reflecting over the vertical axis.
Triangle		
Trapezoid		
Rectangle		
Parallelogram	(12,1) (17,1) (11,-2) (16,-2)	
Square		(-6,5) (-3,5) (-6,2) (-3,2)

What can you conclude from this exercise?

What do you think would happen to the coordinates if we reflected the figures over the horizontal axis?

Transformations on Coordinate Plane V

Use patty paper to rotate each of the figures by 180 degrees around the origin. Start by carefully tracing the figures onto the patty paper.

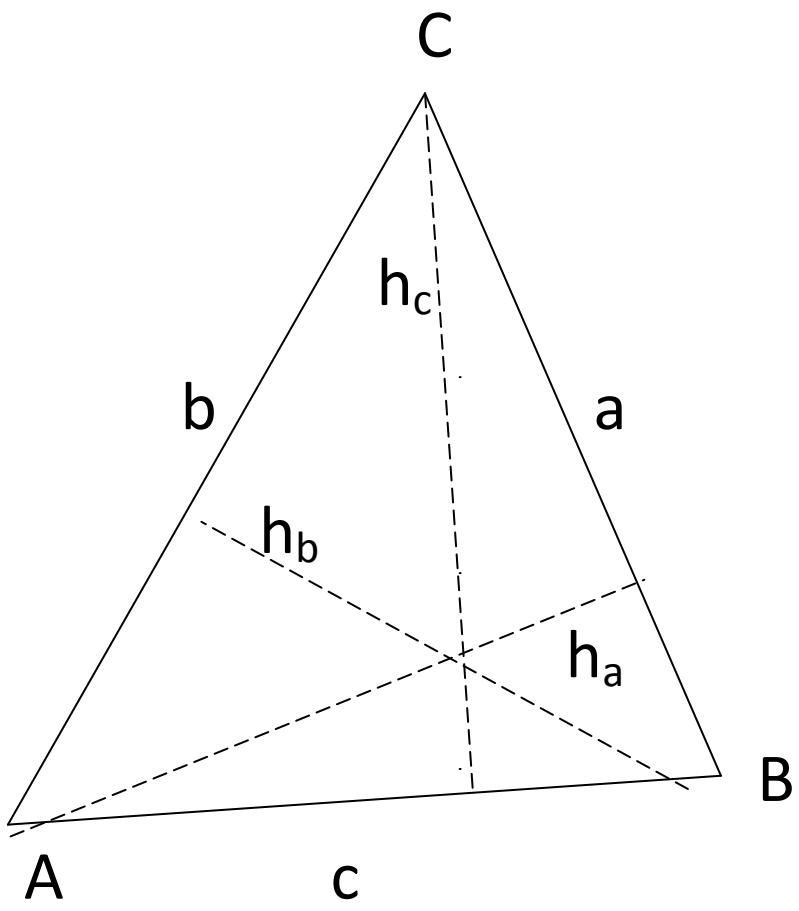


Complete the table below:

Figure	Original Coordinates	Coordinates after rotation about the origin
Triangle		
Trapezoid		
Rectangle		
Parallelogram	(12,1) (17,1) (11,-2) (16,-2)	
Square		(-6,5) (-3,5) (-6,2) (-3,2)

What can you conclude from this exercise?

Area of a Triangle

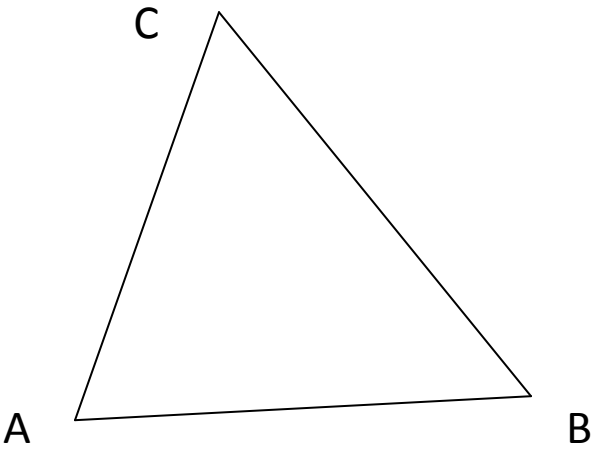


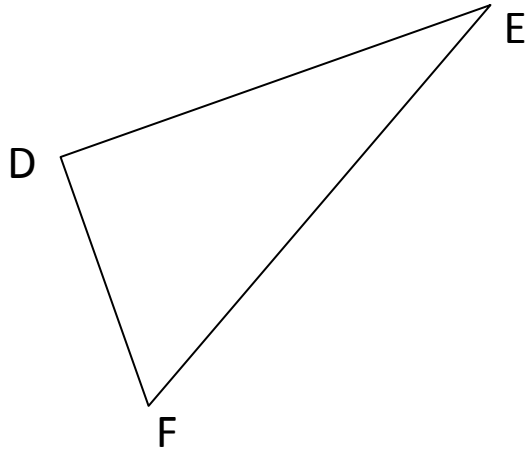
$A_{\triangle ABC} = ½\ a^* h_a$

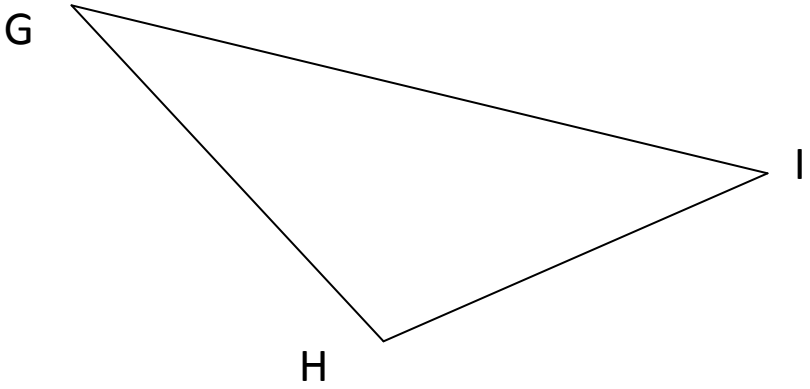
$A_{\triangle ABC} = ½\ b^* h_b$

$A_{\triangle ABC} = ½\ c^* h_c$

Construct all the altitudes on each triangle, label them, and write the formula for the area of each triangle in three different ways.







Solve without using the Pythagorean theorem:

The three sides of a right triangle are 6cm, 8cm, and 10cm. Find the length of the altitude to the hypotenuse.

Challenge for the Math Soul:

Points M, N, and P are midpoints of sides AB, BC, and CA respectively. If the area of triangle ABC is 42 sq.cm, find the areas of:

a) triangle ABP
b) triangle AMP
c) quadrilateral PMNC

Surface Area of the Sphere

Choose a sphere from the ones available in the classroom. Write down everything you know and can find out about your sphere.

How would you describe the surface area of that sphere in words?

Put your sphere in a bag and tie it tight letting out as much air as possible. Now, cover the whole sphere with duct-tape. Make sure that you cannot see the sphere at all. If you see pockets of air, cut a little hole in the plastic and let the air out.

When you have finished making the duct-tape skin for the sphere, cut the skin off without cutting through the sphere. BE CAREFUL! To find the surface area, you need to find out how much area the duct-tape skin covers. Draw some circles with the same radius as your sphere. How many of these circles will the duct-tape skin cover?

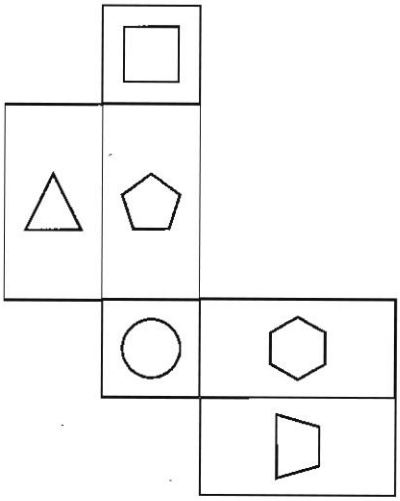
Use what you know about the area of the circle to write a formula for the surface area of the sphere.

Know Your Nets 5

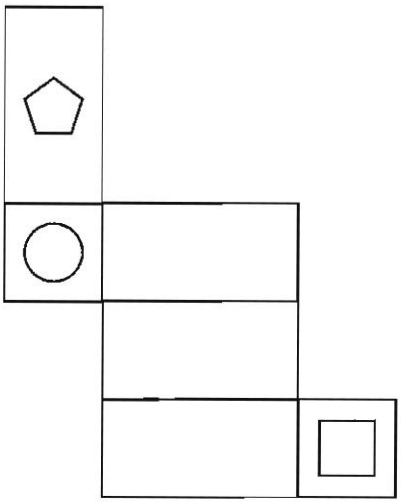
Net A and Net B can be folded to form rectangular prisms.

1. Draw the missing shapes on the faces of Net B to make it identical to Net A.

Net A



Net B



2. When the nets are folded, what shape is opposite the hexagon? _____

3. How did you figure it out? _____

_____

_____

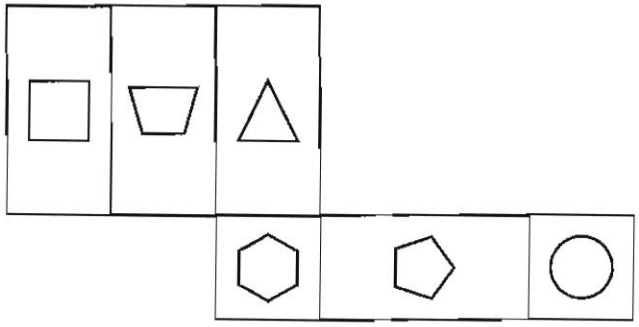
Source: Groundworks, Reasoning with Geometry. Wright Group/McGraw Hill.

Know Your Nets 6

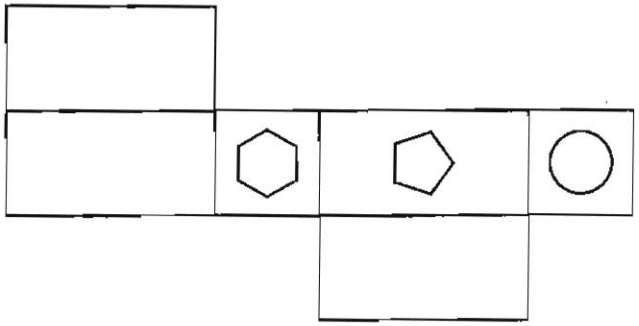
Net A and Net B can be folded to form rectangular prisms.

1. Draw the missing shapes on the faces of Net B to make it identical to Net A.

Net A



Net B



2. When the nets are folded, what shape is opposite the trapezoid? _____

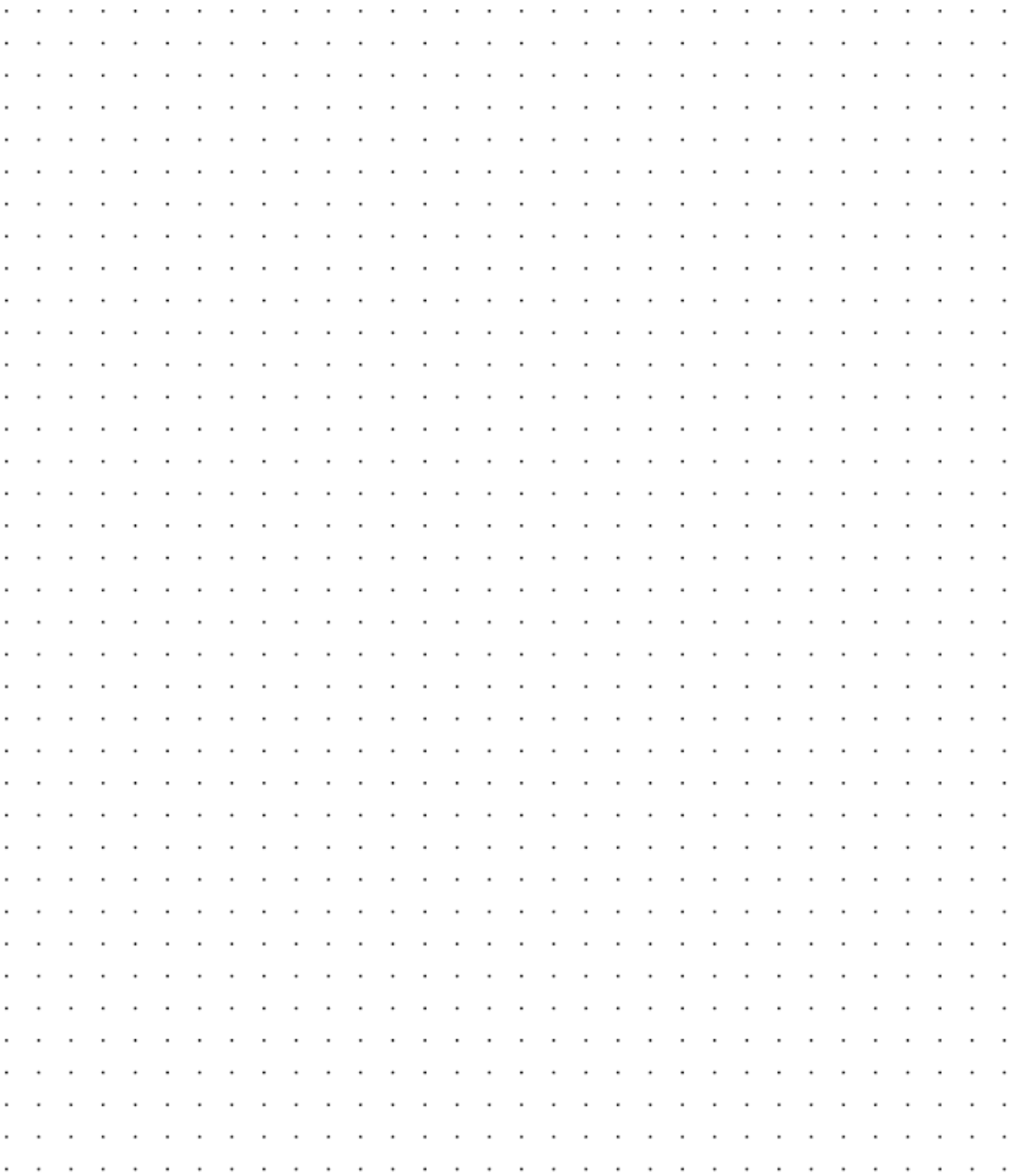
3. How did you figure it out? _____

_____

Source: Groundworks, Reasoning with Geometry. Wright Group/McGraw Hill.

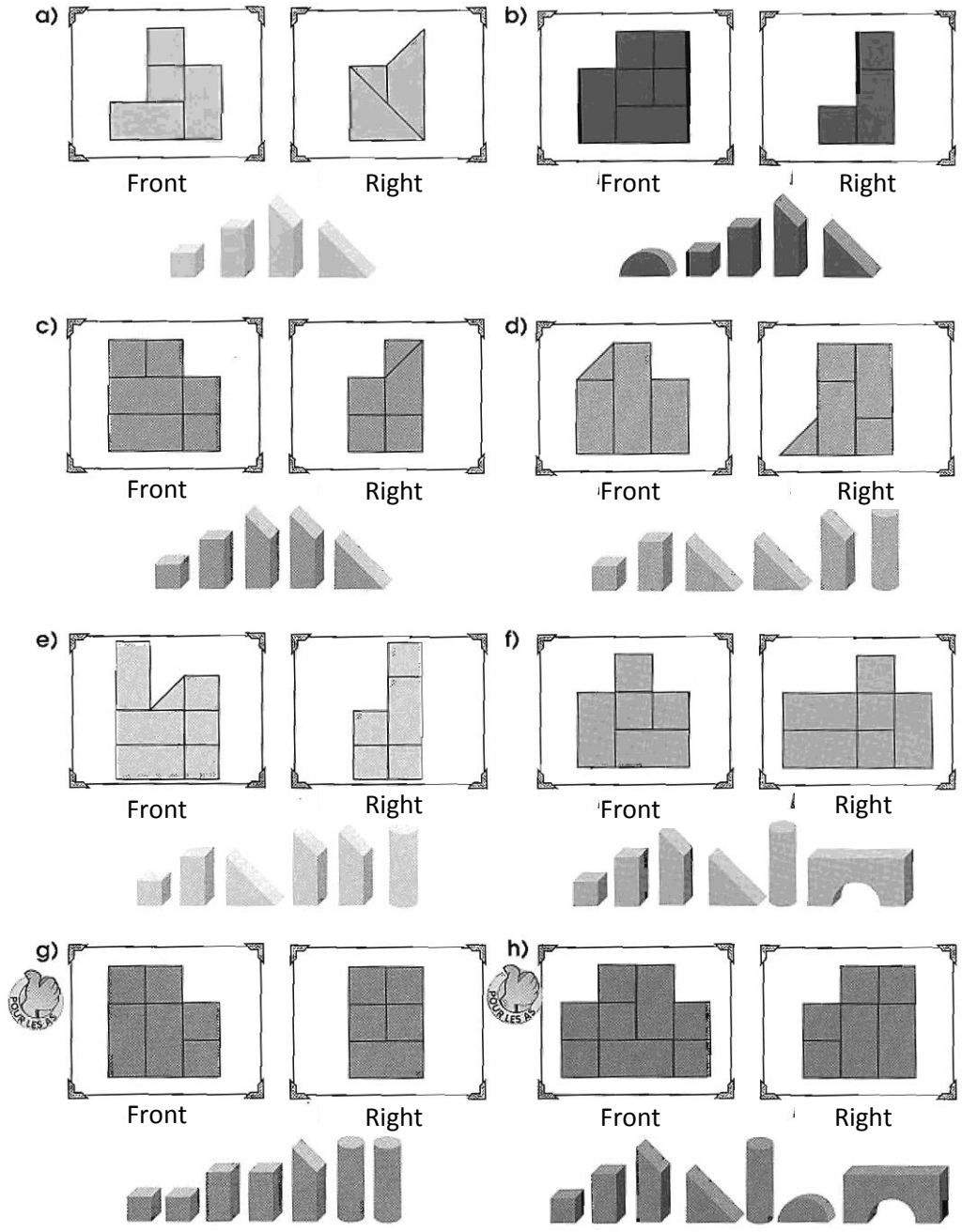
Projections

Choose a geoblock from the set provided. Stand it on the table and draw all possible projections. Do the same for other types of geoblocks in the set. Make sure that your drawings are to scale (assume the side of the cube is 1 unit).



Rebuilding from Projections I

Geoblock castles were built using the pieces given. They were photographed from two angles (from the front and from the right) and then knocked down. It is your job to rebuild the castles based on the photos.

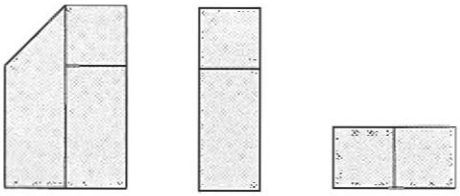


Translated from Defi Mathematique, Michel and Robert Lyons

Rebuilding from Projections II

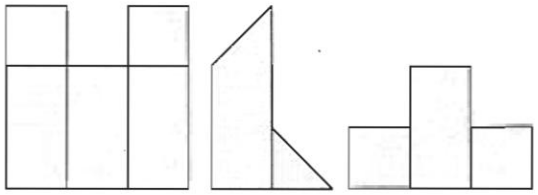
Each of the constructions below were built using 3 geoblocks. Find the geoblocks that were used and rebuild the constructions.

a)



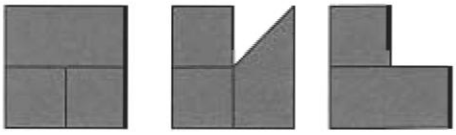
Front Right Top

b)



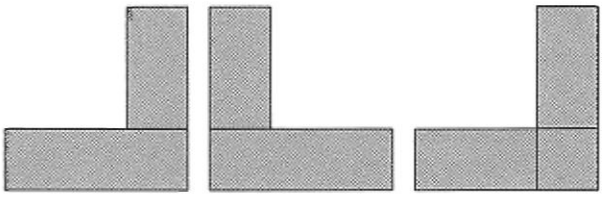
Front Right Top

c)



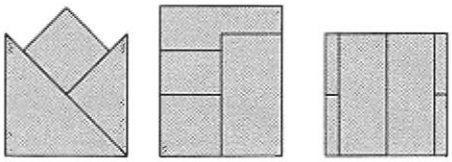
Front Right Top

d)



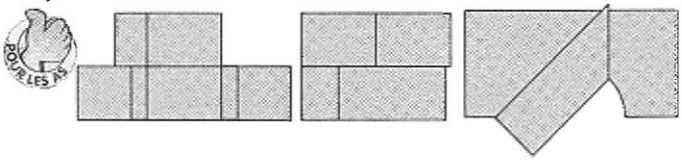
Front Right Top

e)



Front Right Top

f)

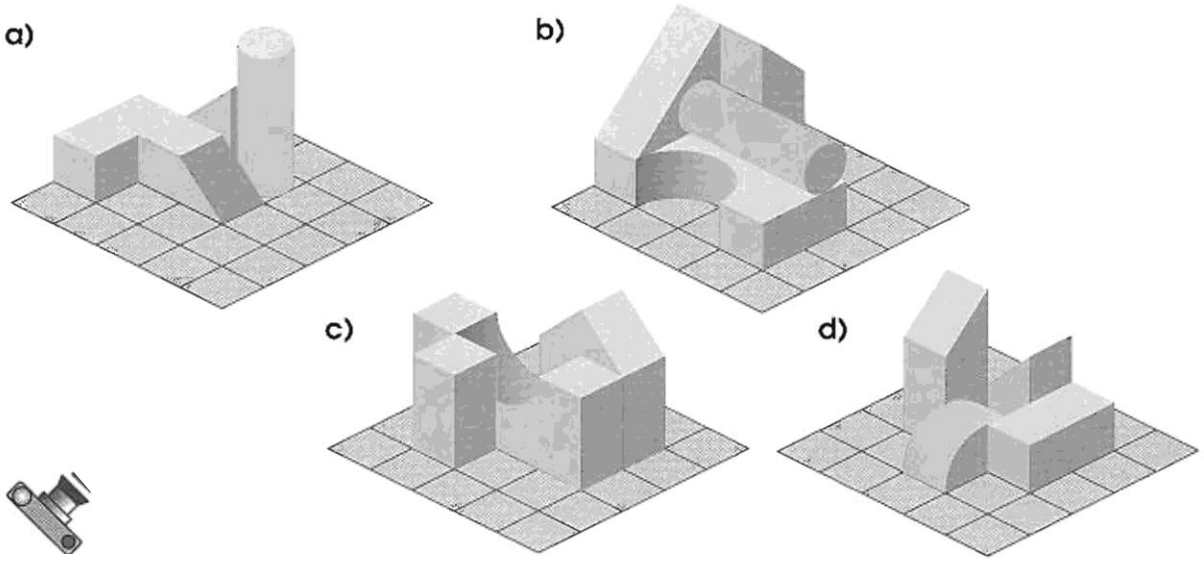


Front Right Top

Translated from Defi Mathematique, Michel and Robert Lyons

Rebuilding from Projections III

Before breaking down these constructions, you realized that you may want to rebuild them in the future. Draw their 3 projections (front, right, and top).



Front

Translated from Defi Mathematique, Michel and Robert Lyons