Homework Investigation 1A **Name:**

Lesson 1.02

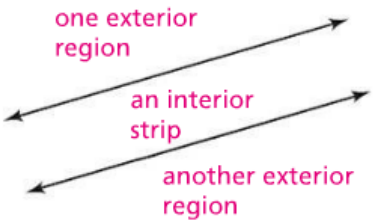
On Your Own

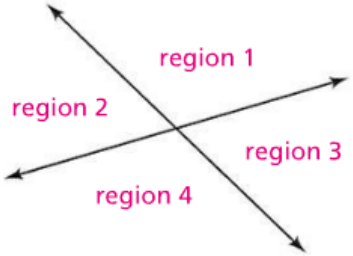
5. Three-dimensional solids can also have symmetry. A *plane of symmetry* of a three-dimensional figure divides it into two identical pieces. If you think of replacing the plane with a mirror, the half of the figure that is reflected in the mirror looks the same as the half that is hidden behind the mirror. Find five different symmetrical objects around your house, such as tissue boxes, cans of soup, and so on. Describe the planes of symmetry of each. You may include drawings of your descriptions.

Remember...
What does the term *infinite* mean?

6. A plane is infinite. Any line in a plane divides the plane into two regions.

Two lines may divide a plane into three or four regions, depending on how you place the lines.





With five lines, what is the maximum number of regions into which you can divide a plane?

7. **Take It Further** Space is infinite. Any plane in space divides space into two regions. Two planes may divide space into three or four regions, depending on how you place the planes. Three planes divide space into as few as four or as many as eight regions. What is the maximum number of regions into which you can divide space with four planes? With five planes?

This is the three-dimensional version of Exercise 6, but it is hard to picture. Experienced mathematicians can puzzle for weeks over the questions asked here.

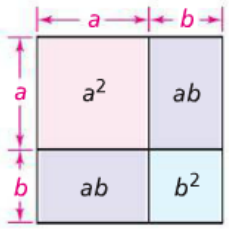
8. **Standardized Test Prep** The Soma Cube is a cube with side length three units. You can construct the cube 240 different ways from six shapes called tetracubes and one shape called a tricube. One of the tetracubes, shown at the right, is a branch or corner piece that is made of four cubes. One cube is hidden in the drawing at the right. (The Soma Cube was invented by Piet Hein. www.piethein.com)

How many planes of symmetry does this tetracube have?

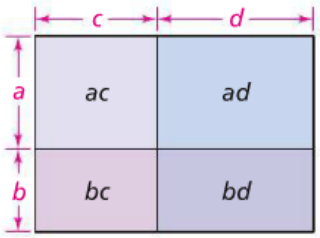
A. 1 **B.** 2 **C.** 3 **D.** 4

Sometimes pictures help you visualize and understand quantities or relationships between quantities.

9. **Write About It** What does each picture below tell you about the multiplication of binomials? Give reasons for each answer.

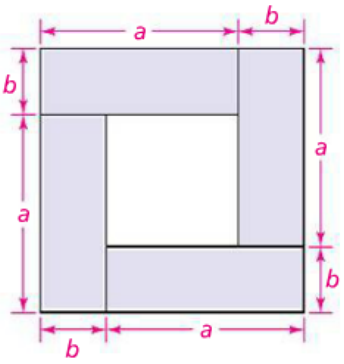


$(a + b)^2 = a^2 + 2ab + b^2$



$(a + b)(c + d) = ac + ad + bc + bd$

10. **Write About It** The first figure above shows $(a + b)^2 = a^2 + 2ab + b^2$. Explain how the figure at the right shows a similar equation involving $(a + b)^2$.



11. Draw a picture that illustrates the equation $d(c + f) = dc + df$.

Maintain Your Skills

12. Make a list of all capital block letters that have lines of symmetry. Draw a three-dimensional representation of each capital letter. What kinds of symmetry do you see?

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Lesson 1.03

On Your Own

4. Read the two recipes below.

Recipe 1: Draw two perpendicular segments that share one endpoint. Make one segment 3 cm long and the other segment 6 cm long. Connect the other two endpoints.

Recipe 2: Draw a right triangle with legs of length 3 cm and 6 cm.

a. Do the two recipes describe the same shape?

b. Draw the shapes that each recipe describes.

5. A quadrilateral has horizontal, vertical, and diagonal lines of symmetry.

a. Draw a quadrilateral that fits this description.

b. Is there only one quadrilateral that fits the description? Explain.

6. What three-dimensional solid has a circle as every cross section?

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Maintain Your Skills

The exercises below use commands from Turtle Geometry. Turtle Geometry is a computer language that moves a cursor (the turtle) forward or backward. The programmer tells the cursor how many steps to move and in what direction. The command *FD 2* means "move forward 2 steps." *RT 90* means "turn to the right 90°." *Repeat 6* means "repeat the given command 6 times."

Follow the commands below. Use a computer or a pencil and protractor to trace out a path.

7. FD 2 RT 90, FD 2 RT 90, FD 2 RT 90, FD 2 RT 90

8. Repeat 6 [FD 2 RT 45]

9. Repeat 6 [FD 2 RT 60]

10. Repeat 8 [FD 2 RT 45]

11. Repeat 8 [FD 2 RT 30]

12. Repeat 12 [FD 2 RT 30]

13. **Standardized Test Prep** Amina entered the following commands into her Turtle Geometry program.

RT 30 FD 20, RT 60 FD 30, RT 60 FD 20, RT 120 FD 50, RT 120 FD 20

Which figure did the program draw for her?

A. an irregular pentagon

B. an open figure

C. a triangle

D. an isosceles trapezoid

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Lesson 1.04

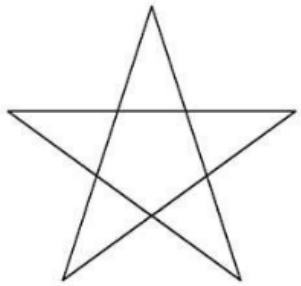
On Your Own

5. Write directions that describe how to draw your initials. Use precise language. Some letters are complicated to draw, so take advantage of any geometry terms that will make your directions more clear.

6. Write careful directions that describe how to walk from the door of your math classroom to the main office of your school.

Homework Investigation 1A **Name:**

7. Write directions that describe how to draw the figure at the right. Then have three classmates draw the figure following your directions. If any of the three pictures differs from the figure at the right, explain what you think caused the difference.



8. **Standardized Test Prep** Enrique has a system he uses to draw regular polygons inscribed in a circle.

   Step 1 He draws a large circle. Then he draws a line tangent to the circle.

   Step 2 For a polygon with m congruent sides, he divides 360° by $2m$ to get y.

   Step 3 He then draws an angle with measure $y°$ such that the following statements are true.

   - The point of tangency is the vertex of the angle.
   - The tangent line is one side of the angle.
   - The other side of the angle passes through the circle.

   Step 4 Next, he draws a line segment from the point of tangency to the point where the other side of the angle intersects the circle.

   Step 5 Finally, he uses a compass to construct $(m - 1)$ segments with endpoints on the circle such that the following are true:

   - The $(m - 1)$ segments are congruent to the first segment.
   - The m segments form a regular polygon.

If Enrique wants to draw a regular nonagon, or nine-sided polygon, inscribed in a circle, what number of degrees will he use for his angle with the tangent?

A. 10° **B.** 20° **C.** 40° **D.** 80°

9. Carefully read and follow the recipe below.

   Step 1 Draw a circle. Label the center of the circle point A.

   Step 2 Draw a radius of the circle. Label its endpoint on the circle point B.

   Step 3 Draw a segment that is tangent to the circle at B. The segment should be longer than the diameter of the circle.

   Step 4 Draw a second radius of the circle that is perpendicular to $\overline{AB}$. Label the point where it touches the circle point D.

   Step 5 Draw a segment that is tangent to the circle at D. The segment should intersect the other tangent segment.

   Step 6 Label the intersection of the two tangent segments point C.

   a. What kind of quadrilateral is $ABCD$?

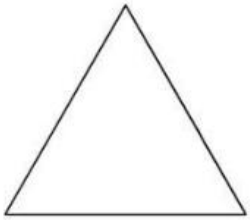
   b. Make a conjecture. In a circle, what is the measure of the angle formed by a radius and a line that is tangent to the circle at the endpoint of the radius?

Homework Investigation 1A **Name:**

Maintain Your Skills

Write directions that describe how to draw each figure.

10.



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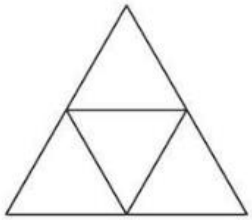

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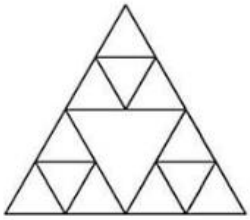
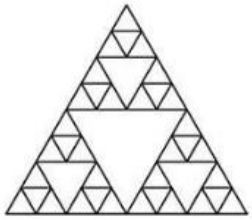


13.



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