"Area Activity"

Area of a Parallelogram

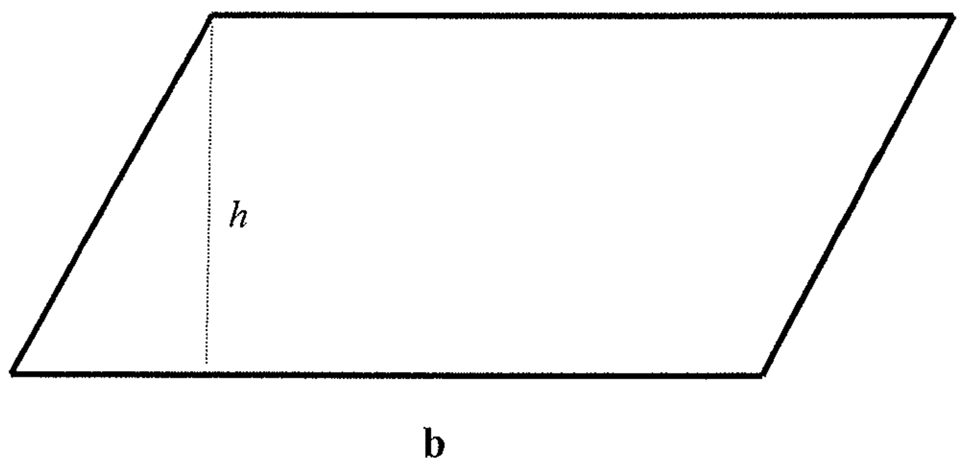
1. The parallelogram below has a base of length b and a height of length h. Cut off the triangle formed on the left side by the dashed line segment "h." Slide the triangle to the right edge of the figure and tape it in place.

What shape is formed? ____________________

What is the length? ______________________

What is the width?_______________________

What is the formula for the area of the figure? _____________________



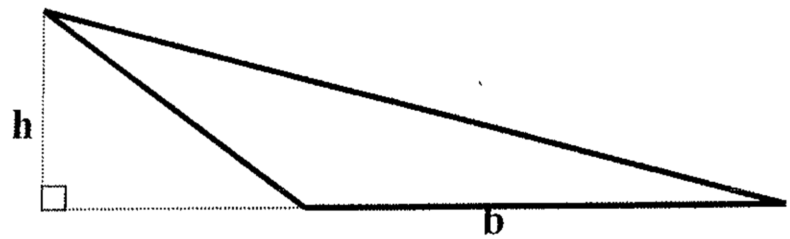
2. How does the area of the new shape compare to the area of the original parallelogram?

3. Using the exploration above, write a formula for the area A of a parallelogram with base b and height h.

4. Use the formula found above to find the area of a parallelogram with base 7 cm and height 4 cm.

Area of a Triangle

1. Use the patty paper to trace the triangle shown below. Using both triangles construct a parallelogram. Tape the patty paper to the page to show the parallelogram you constructed.



How does the base of the triangle compare to the base of the parallelogram?

How does the height of the triangle compare to the height of the parallelogram?

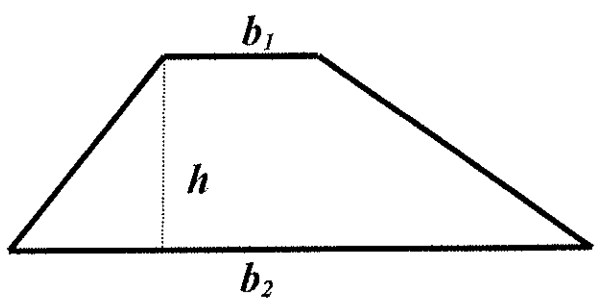
How does the area of the triangle compare to the area of the parallelogram?

2. Using the exploration above and the formula for the area of a parallelogram, write a formula for the area of a triangle with the same base and height.

3. Use the formula found above to find the area of a triangle with base 7.3 cm. and height 6 cm.

Area of a Trapezoid

4. Use the patty paper to trace the trapezoid shown below. Using both trapezoids construct a parallelogram. Tape the patty paper to the page to show the parallelogram you constructed.
   What is the base of the parallelogram? ______ What is the height of the parallelogram? __________
   What is the area of the parallelogram? ____________________



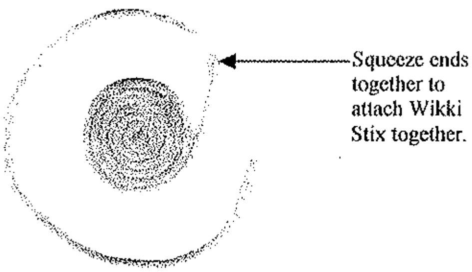
How does the area of your original trapezoid compare to the area of the parallelogram?

5. Using the exploration above write a formula for the area of a trapezoid with bases b_1 and b_2 and height h

6. Use the formula above to find the area of a trapezoid with bases 5.4 mm and 7.6 mm and height 3 mm.

Area of a Circle with Wikki Stix

1.) Coil 5 Wikki Stix in a spiral to create a solid circle as shown in the picture. *The **area** of your finished circle is 5 Wikki Stix.*



2.) Measure the radius of your circle to the nearest tenth of a centimeter:

r = _______________

Find the circumference of your circle using the formula $C = 2\pi r$.

3.) Starting at the point on the circumference where the last Wikki Stick ended, use scissors to cut a radius as shown in the picture:

4.) Spread the Wikki Stix into straight lines as shown in the picture:

When all the Wikki Stix have been pulled straight, a triangle is formed. *The **area** of this triangle is 5 Wikki Stix.* Therefore, the area of the triangle is equal to the area of the circle:

Area of circle = Area of triangle = ½**bh**

So, Area of circle = ½**bh** where **b** = base of the triangle, **h** = height of the triangle

5.) The base of the triangle corresponds to what part of the circle?

____

The height of the triangle corresponds to what part of the circle?

____

6.) Make appropriate substitutions into the formula for area of a triangle to derive a formula for the area of a circle:

$$A = \frac{1}{2} \cdot \mathbf{b} \cdot \mathbf{h}$$
$$A = \frac{1}{2} \cdot \_\_\_\_\_ \cdot \_\_\_\_\_$$

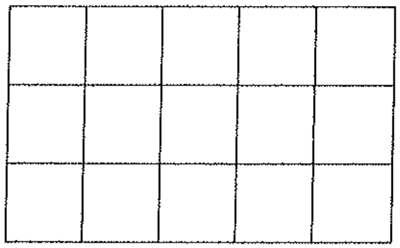
7.) Find the area of your original Wikki Stix circle using the formula you derived in #6 and the radius from #2.

8.) Measure the base and height of your Wikki Stix triangle. **b** = __________ **h** = __________

9.) Find the area of your Wikki Stix triangle using the formula A = ½bh.

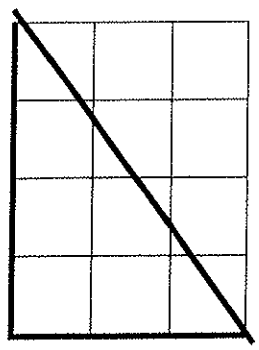
10.) Compare the areas in #7 and #9. Were they close? What factors might account for any differences?

Volume of Prisms and Cylinders



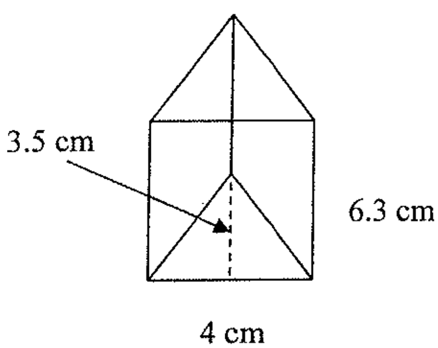
length	width	height	volume

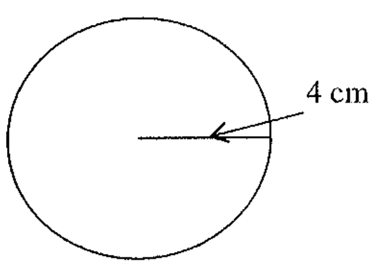
1. Label the length and width of this rectangle (in units).
2. What is the area of this rectangle (in square units)? ______________
3. Cover the rectangle with one layer of cubes.
4. What is the volume of the rectangular prism you have just built (in cubes)? _______
5. Record the length, width, height and volume of this prism in the chart.
6. Add another layer of cubes to build a rectangular prism with a height of 2 units. Record the length, width, height, and volume.
7. Add a third layer and record the information in the chart.
8. Use reasoning to find the volume if the height is 4, and again if the height is 5. Record the information for both of these prisms in your chart.
9. Based on your reasoning, write a formula for finding the volume of a rectangular prism.
10. Use the volume formula and show steps to find the volume if the height is 8 1/3 units.



1. What is the area of the triangle indicated in the drawing above? _______________
2. If we could place a layer of cubes on the triangle, it would build a triangular prism. What would be the volume of this triangular prism? Make a chart similar to the one on the previous page to record this information.
3. If we placed a second layer of cubes on the triangle, what would the volume be? Record.
4. If we place a third layer of cubes on the triangle, what would the volume be? Record.
5. Use reasoning to find the volume if the height is 4, and again if the height is 5. Record.
6. Based on your reasoning, write a formula for finding the volume of a triangular prism.

7. Use your formula to find the volume of the triangular prism shown below:





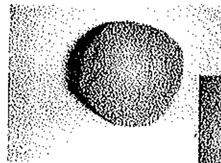
If we could cover this circle exactly with cubes we would build a cylinder that is one unit tall. What would be the volume of the cylinder?

What would the volume be if we built the cylinder two layers tall?_______ three layers?______

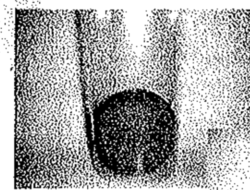
Write a formula for the volume of a cylinder. Use the formula to find the volume of a cylinder that is 12.3 cm tall and has a radius of 8 cm.

Volume of Spheres

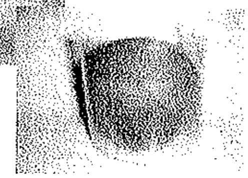
(1)



(2)



(3)



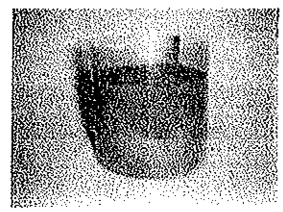
1. Use modeling dough to make a sphere.

2. Wrap a transparency strip around the sphere creating a cylinder. Trim the transparency strip so that the height of the cylinder is even with the top of the sphere. (This can be done by marking the transparency with a marker and laying it flat to cut.)

   Tape the cylinder snugly around the sphere.

3. How does the diameter of the sphere compare to the height of the cylinder?

(4)



4. Flatten the sphere so that it fits snugly (smash it into the edge) in the bottom of the cylinder. Notice that the "sphere" is now a cylinder. The volume of the sphere is equal to the volume of this play dough cylinder.

5. Measure the height of the plastic cylinder. ____________

   Measure the height of the modeling dough cylinder. ________

   The height of the modeling dough cylinder is approximately what fractional part of the height of the plastic cylinder? $\frac{2}{3}$

6. If h represents the height of the plastic cylinder, how can we represent the height of the modeling dough cylinder? $\frac{2}{3}h$

   If $V_{\text{plastic cylinder}} = \pi r^2 h$ then $V_{\text{modeling dough cylinder}} = \pi r^2 \cdot \frac{2}{3}h$

7. Since the modeling dough cylinder has the same volume as the original sphere (see #4), we can use the same formula. Therefore,

   $V_{\text{sphere}} = \pi r^2 \frac{2}{3}\cancel{h}(2r)$

8. In #3 you found that the height of the plastic cylinder is equal to the diameter of the sphere. Represent h in terms of the radius (r) of the sphere and substitute this for h in the formula for the volume of the sphere and simplify:

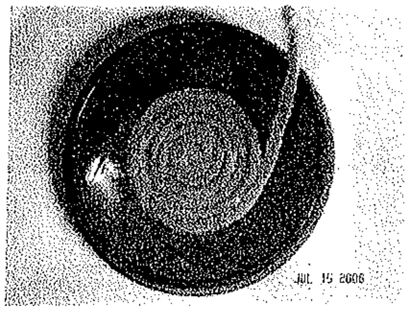
   $V_{\text{sphere}} =$ ____________

9. After the class discussion, revise your formula for the volume of the sphere if needed.

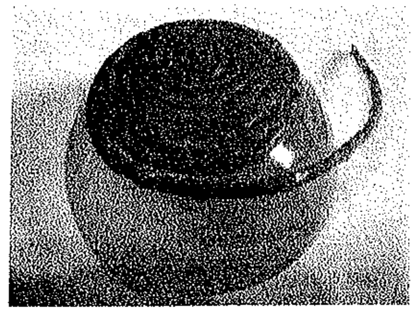
10. Use the formula from #9 to calculate the volume of a sphere that has a radius of 4 cm.

Surface Area of a Sphere with Wikki Stix

1.) Coil Wikki Stix to completely cover the circular lid to the hemisphere. See picture below:



2.) Coil Wikki Stix to completely cover the hemisphere. See picture below:



3.) Remove the Wikki Stix from both the circular lid and the hemisphere. Count how many were used to cover each shape. Complete the following:

The area of the circle is _______ Wikki Stix.

The surface area of the hemisphere is _________ Wikki Stix.

4.) Compare your results with other groups. Based on this data, the surface area of a sphere with the same diameter as the hemisphere and circle above is approximately ___________ Wikki Stix.

5.) Use the exploration above to complete the following:

$A_{sphere} =$ _______ $\times$ A_{circle}

6.) The formula to find the area of a circle is $A = \pi r^2$. Use this formula and your answer to #5 to write a formula to find the surface area of a sphere:

$A_{sphere} =$ _______________

7.) Measure the radius of the circular lid to the nearest tenth of a centimeter and use the formula you wrote in #5 to find the surface area of a sphere with the same radius.