

# Popcorn, Get Your Popcorn Up Here!

## Problem

To learn the principle of Archimedes' Screw

## Background

One of the first people to use a screw to lift was the ancient Greek scientist Archimedes. He invented a screw pump that could raise water from a lower level up to a higher level, making it flow against the force of gravity. Even though Archimedean screws were first built more than two thousand years ago, they are still used today. African farmers use them to irrigate their crops by lifting the water from the river into raised irrigation canals. The pumps are usually powered either by animals or by hand.

## Teacher Prep

Cut the bottom off each bottle. Near the top of each bottle, cut a triangular hole. See diagram 1

## Procedure

1. Measure the diameter of the 2-liter bottle.
2. Using the compass, measure and draw seven circles that are 2 mm smaller than the diameter of the bottle. Mark the center of each circle.
3. Using scissors, carefully cut out each circle.
4. Using the ruler, draw a line from the center of the circle to the edge (radius).
5. Cut from the edge to the center, being careful not to cut through the middle point.
6. Separate the edges of the cut and use a hole punch to make a hole at the center mark of the circle. See diagram 2.
7. To join the circles, place two circles on top of each other so that the slits line up. Glue the right edge of the slit on the bottom circle to the slit that is on the left edge of the top circle.
8. Continue this pattern until all seven have been joined to create the screw.
9. Slide the dowel through the holes of all seven circles.
10. Stretch the circles along the dowel.
11. Glue the slits at the top and the bottom of the screw firmly to the dowel. See diagram 3.
12. Push a small tack through the cap of the bottle. It may be necessary to use a hammer.
13. Screw the cap onto the bottle.
14. Place the completed screw into the bottle.
15. To hold the screw in place, press the end of the dowel firmly into the tack. It may be necessary to use a hammer to tap it into place. See diagram 4.
16. Place the bowls at two different elevations.
17. Put the popcorn in the lower bowl.
18. Place the end of the screw that has the cap into the bowl of popcorn.
19. Begin to twist the dowel and watch the popcorn as it rises up to the top of the pop bottle. When it reaches the top it should fall into the bowl that you placed at a higher elevation. See diagram 5.
20. Enjoy the popcorn.

## Conclusion

1. Explain how the screw raised the popcorn.
2. Why would this type of device be used today?
3. Research Archimedes and write a brief paragraph about his life.

## Materials

one 1/4" wooden dowel  
glue  
2 empty two-liter bottles with caps  
tag board  
scissors  
compass  
small tack  
popped popcorn  
metric ruler  
hole punch  
hammer  
two bowls

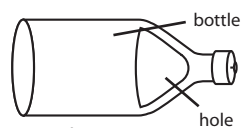


Diagram 1

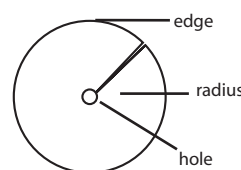


Diagram 2

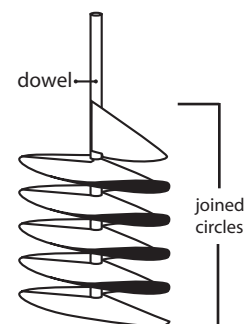


Diagram 3

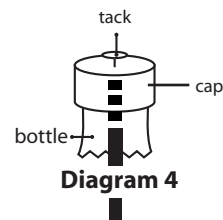


Diagram 4

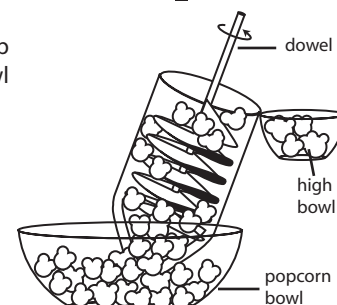


Diagram 5