

# ENGINEERING CHALLENGE: STRONG SHAPES

*Explore the structural nature of different shapes and apply it to different designs in this engineering activity.*

## MATERIALS NEEDED

- Colored Paper Sheet (normal weight – not cardstock)
- Tape
- A number of hardback books or a cookie sheet or tray
- Small weights of known value, or items to use as weights with a scale to measure



## WHAT TO DO

- Fold pieces of paper into at least three different shapes of tube. Circular, triangular and square are three good ones to start with, but you can do more if you want a larger amount of data.
- Make four tubes of each shape you have chosen
- Secure the seams on each tube with tape
- Stand four same-shaped tubes on end and arrange in a manner to support a book or tray on top of all of them
- Add additional books or weights to the tray until the tubes crumple or collapse. Record the amount of weight you added before the tubes failed.
- Repeat this process with remaining shapes one shape at a time, keeping the support setup arrangement the same. Record the maximum weight each shape holds before it collapses. Which shape was the strongest? Which was the weakest? Compare the data and discuss why you think certain shapes can hold more weight than others.

## OPEN EXPLORATION

Using your knowledge about the strength of different shapes, create your own experiment with the following paper design challenges:

- A table at least 5 inches high that can hold two pounds of weight
- A bridge with a minimum height of 4 inches and a minimum span of 8 inches that can support five pounds of weight
- A sandal with a 1 inch thick sole that someone can step into without crushing