## The Shoe Design Challenge (Area and Perimeter of Irregular Objects)

Perimeter is the distance around a 2-dimensional figure. Area is the amount of space it takes to cover a 2-dimensional figure.

A shoe is an excellent irregular object to study. Shoes have all sorts of designs and shapes, many for function, some just for style.

For instance, look at the following examples:


Each shoe has a different amount of area and a different perimeter for its tread. Searching Google images for "shoe soles" shows a huge variety of shapes/designs

We can also estimate the area and perimeter of shoe soles.

1. Trace the bottom of your shoe on a piece of $1 / 2$ inch graph paper (if you have a big foot, try fitting it diagonally)
2. Estimate of the area of your shoe sole by:
a) count all the full squares inside the area. Full =
b) count every partial square your shoe enters

Partial $=$
c) Use this formula to find the area of your shoe...it will be in ${ }^{2}$

$$
\text { Area }=0.25 \cdot\left(\text { Full }+\frac{\text { Partial }}{2}\right) \quad \text { Area }=\quad i n^{2}
$$


3. Try to estimate of the perimeter of your shoe (remember, the graph paper is $1 / 2$ inch squares)

Perimeter= in
4. How would your Area \& Perimeter be different if you used smaller graph paper?
5. Suppose you need to design a shoe. What types of shoes are there?
6. What are the top 5 features you'd chose for a shoe?
7. On a piece of graph paper, design a shoe (draw it 2d from the side, top, bottom, front, \& back). Use some of the top 5 features. Be sure to use colored pencils to add color.
8. Now, build your shoe using cardboard \& paper

