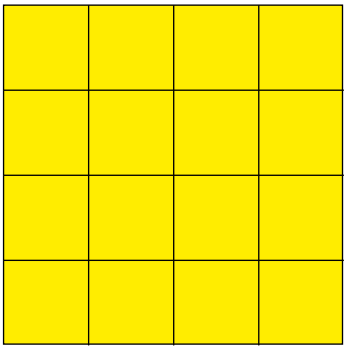
MathsBites by Clifford the Dog

Perimeter and area

Given some basic linear dimensions, familiar shapes can be constructed and corresponding measures of boundary (perimeter) and interior region (area) calculated. For these shapes, one can investigate whether the perimeter of a given shape is less than, equal to, or greater than its area.

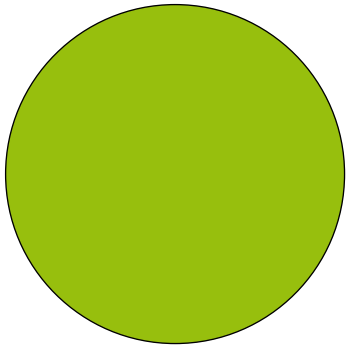


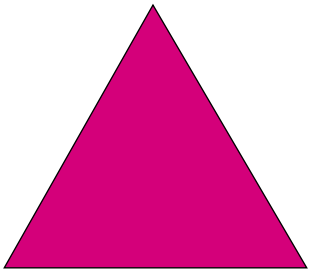
What is the side length of a square that has equal perimeter and area?

If we let l stand for the side length, then the perimeter is $4l$ and the area is l^2 For these to have the same magnitude $4l = l^2$, so either $l = 0$, in which case the square does not exist, or $l = 4$.

Suppose a rectangle has a fixed perimeter of 40cm. For what values of the width is the perimeter less than, equal to or greater than the area? What are the possible combinations of whole number values of width and length for a rectangle to have perimeter equal to its area?

What is the diameter of a circle that has equal perimeter (circumference) and area? What are the dimensions of an ellipse for which the perimeter is *approximately* equal to its area? There are no simple exact formulas for the perimeter of an ellipse, see: http://www.mathsisfun.com/geometry/ellipse-perimeter.html; http://home.att.net/~numericana/answer/ellipse.htm#elliptic; and http://mathworld.wolfram.com/Ellipse.html for background material.

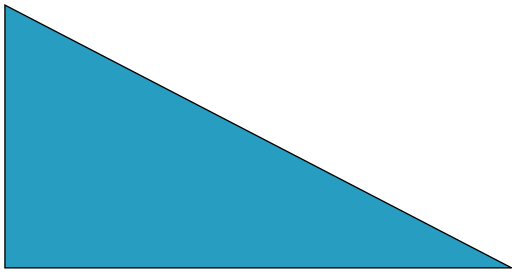




What is the side length of an equilateral triangle that has equal perimeter and area?

What are the possible whole number base and altitude lengths for a right angled triangle that has equal perimeter and area?

See: http://www2.edc.org/mathproblems/problems/printProblems/ekPerimArea2.pdf for a solution.



What relationships of a similar kind are there for other geometric shapes? Technology can be used to assist in the construction and variation of shapes and analysis of the relationship between perimeter and area using a combination of numerical, graphical and algebraic approaches.