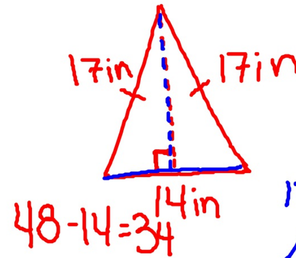
8.6 Maximizing Areas, Part 2

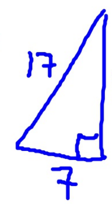
Objective: To find the maximum area for a shape with a given perimeter.

Example 1:

1. The perimeter of an isosceles triangle is 48 inches. What is the area of the triangle if the base is 14in. ?



$48-14=34$



$a^2+b^2=c^2$

$7^2+h^2=17^2$

$49+h^2=289$

$-49 \quad -49$

$h^2=240$

$h\approx 15.5in$

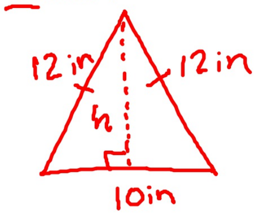
$A=\frac{1}{2}bh$

$A=\frac{1}{2}(14)(15.5)$

$\boxed{A=108.5in^2}$

Example 2:

2. The perimeter of an isosceles triangle is 34 inches. What is the area of the triangle if the base is 10in. ?



$5^2+h^2=12^2$

$25+h^2=144$

$-25 \quad -25$

$h^2=119$

$h\approx 10.9$

$A=\frac{1}{2}bh$

$A=\frac{1}{2}(10)(10.9)$

$A=54.5in^2$

Theorem 8.1 ***The Regular Polygon Theorem***

Of all the polygons having a given perimeter and a given number of sides, the regular polygon has the greatest area.

For Discussion

Suppose for now that Theorem 8.1 is true, even though you have not seen it proven. Also suppose that for a given perimeter, a regular polygon with more sides encloses more area than a polygon with fewer sides. Propose an answer to the following area-maximization problem.

1. For all shapes with the same perimeter, which has the greatest area?

$P=24in$