As we mentioned in 12.1, we typically use squares as our units for area, however we can use any shape that tiles the plane.

Def: The **area** of a region R is the number of a chosen unit which are required to cover the region without overlap.

Example 12.6 - Making Measurements in Nonstandard Units
(square grid) $A_{orange} = 2$ units, $A_{blue} = 6$ units (triangular grid) $A_{orange} = 6$ units, $A_{blue} = 18$ units.

Def: If R and S are two regions in the plane that have the same size and shape, then they are **congruent** ($R \cong S$).

♦ **The Congruence Property of Area**: If two regions are congruent, their areas are the same.
♦ **The Addition Property of Area**: If a region is dissected into nonoverlapping subregions, the area of the full region is the sum of the areas of the subregions.

Example 12.7 - The Pendulum and the Ax: Which has bigger area?

Area of a Rectangle with length l and width w is $A = lw$.

Area of a Parallelogram with base b and height h is $A = bh$.

Example 12.9 - Using the Parallelogram Area Formula to find area and lengths.

Area of a Triangle with base b and height h is $A = \frac{1}{2}bh$.

Example 12.10 - Using the Triangle Area Formula to find area and lengths.

Area of a Trapezoid with bases of length a and b and height h is $A = \frac{1}{2}(a + b)h$.

Example 12.11 - Finding the Areas of Lattice Polygons

Def: The **length of a polygonal curve** is the sum of the lengths of the sides.
Def: The **length of a nonpolygonal curve** is estimated by the lengths of closer and closer polygonal curves.

Def: The **perimeter** of a region is the length of its boundary.

Example 12.13 (modified) - Finding Perimeters (and Area!)
$$\left(A_{green} = 14\,\text{cm}^2, A_{orange} = 12\,\text{cm}^2, A_{red} = 32\,\text{cm}^2, A_{blue} = 24\,\text{cm}^2\right)$$
$$\left(P_{green} = 22\,\text{cm}, P_{orange} = 16\,\text{cm}, P_{red} = 32\,\text{cm}, P_{blue} = 24\,\text{cm}\right)$$

Def: The **circumference of a circle** is the perimeter of the circle.

Circumference of a Circle with radius r and diameter $d = 2r$ is $C = 2\pi r = \pi d$.
Area of a Circle with radius r is $A = \pi r^2$.

Discussion: triangulating figures to calculate area (like 12.2#13), converting units.

Homework 6 (due 3/30/10):

- Section 12.1 #7, 8, 9, 11, 18, 22, 26
- Section 12.2 #6, 8, 13, 14, 16, 17, 23, 53, 54