Lesson 2: Properties of Area

Classwork

Exploratory Challenge/Exercises 1–4

1. Two congruent triangles are shown below.



* 1. Calculate the area of each triangle.
	2. Circle the transformations that, if applied to the first triangle, would always result in a new triangle with the same area:

 Translation Rotation Dilation Reflection

* 1. Explain your answer to part (b).
	2. Calculate the area of the shaded figure below.
	3. Explain how you determined the area of the figure.
1. Two triangles $△ABC$ and $△DEF$ are shown below. The two triangles overlap forming $△DGC$.



* 1. The base of figure $ABGEF$ is comprised of segments of the following lengths: $AD=4$,$ DC=3$, and $CF=2.$ Calculate the area of the figure $ABGEF.$
	2. Explain how you determined the area of the figure.
1. A rectangle with dimensions $21.6×12$ has a right triangle with a base $9.6$ and a height of $7.2$ cut out of the rectangle.
	1. Find the area of the shaded region.
	2. Explain how you determined the area of the shaded region.

Lesson Summary

Set (description): A *set* is a well-defined collection of objects. These objects are called elements or members of the set.

**Subset:**  A set $A$ is a *subset* of a set $B$ if every element of $A$ is also an element of $B$. The notation $A⊆B$ indicates that the set $A$ is a subset of set $B$.

**Union:**  The *union* of $A$ and $B$ is the set of all objects that are either elements of $A$ or of $B$, or of both. The union is denoted $A∪B$.

**Intersection:** The *intersection* of $A$ and $B$ is the set of all objects that are elements of $A$ and also elements of $B$. The intersection is denoted $A∩B$.

Problem Set

1. Two squares with side length $5$ meet at a vertex and together with segment $AB$ form a triangle with base $6$ as shown. Find the area of the shaded region.
2. If two $2×2$ square regions $S\_{1}$ and $S\_{2}$ meet at midpoints of sides as shown, find the area of the square region, $S\_{1}∪S\_{2}$.
3. The figure shown is composed of a semicircle and a non-overlapping equilateral triangle, and contains a hole that is also composed of a semicircle and a non-overlapping equilateral triangle. If the radius of the larger semicircle is $8$, and the radius of the smaller semicircle is $\frac{1}{3}$ that of the larger semicircle, find the area of the figure.
4. Two square regions $A$ and $B$ each have area 8. One vertex of square $B$ is the center point of square$ A$. Can you find the area of $A∪B$ and $A∩ B$ without any further information? What are the possible areas?
5. Four congruent right triangles with leg lengths $a$ and $b$ and hypotenuse length $c$ are used to enclose the green region in Figure 1 with a square and then are rearranged inside the square leaving the green region in Figure 2.
	1. Use Property 4 to explain why the green region in Figure 1 has the same area as the green region in Figure 2.
	2. Show that the green region in Figure 1 is a square and compute its area.
	3. Show that the green region in Figure 2 is the union of two non-overlapping squares and compute its area.
	4. How does this prove the Pythagorean theorem?