Key Concepts

Lesson 14-1

Area of Parallelograms

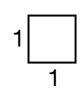
Objective Teach students the formula for finding the area of a parallelogram, justify that the formula is true, and use the formula to find the areas of parallelograms.

Note to the Teacher *In this lesson your students will learn to compute the area of a parallelogram. Begin by reminding them that a parallelogram is a four-sided figure (a quadrilateral) in which the two pairs of opposite sides are parallel. Point out that a rectangle is a special type of parallelogram. Ask your students how they would decide if a parallelogram is a rectangle. (A parallelogram is a rectangle if its angles all measure 90°.)*

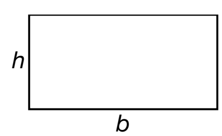
Rectangles

Begin your discussion of the area of parallelograms by reviewing the area of a rectangle.

The basic unit of area is the area of a square of side length 1.

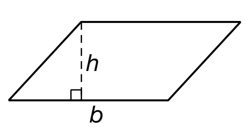


The area of this square is 1. By seeing how many such "unit squares" fit into a rectangle of base length b and height h, we can see that the area of the rectangle below is $b \cdot h$.



Parallelograms

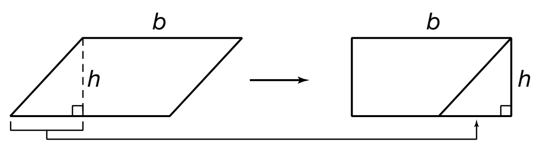
The area of a parallelogram of height h (the height is the shortest distance from the base to the side opposite the base) and base length b is also $b \cdot h$.



Why Are the Area Formulas for Rectangles and Parallelograms the Same?

Point out to your students that the formulas for the area of a rectangle and the area of a parallelogram are the same. Ask them why they think this is true.

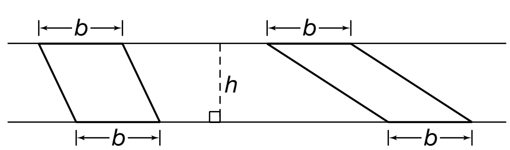
In order to guide this discussion, have your students carefully draw a parallelogram like the one on the left below. (The use of grid paper makes it easier to achieve a true parallelogram.) Have them cut the right triangle (formed by the height line) off the end of the parallelogram and tape it on the other end as shown in the figure on the right below.



The result is a rectangle of height *h* and base length *b*. Therefore the area of the resulting rectangle is equal to $b \cdot h$. Since this rectangle was constructed using both parts of the original parallelogram, the area of the parallelogram is also $b \cdot h$.

Parallelograms of Equal Area

See if your students can find different parallelograms that have the same area. To guide them in this task, draw two parallel lines of distance *h* from each other. Then mark two congruent line segments of length *b*, one on each of the lines. By connecting each endpoint of one of these segments to an endpoint of the other segment, students will produce a parallelogram of height *h* and base length *b*. The parallelogram therefore has area $b \cdot h$. Since this is true no matter where the line segments were placed on the lines, one can produce many different parallelograms this way, all having the same area.



Using the Area Formula $A = b \cdot h$

Finally, ask your students to do calculations like those shown in the following examples.

Example 1 **Find the area of a parallelogram having height 4 and base length 12.**

Solution The area A is the base b times the height h: $A = b \cdot h$.

$$A = 12 \cdot 4$$
$$= 48$$

Example 2 **Find the area of a parallelogram having height 2.5 and base length 3.4.**

Solution $A = 2.5 \cdot 3.4$

$$= 8.5$$

Example 3 **Find the area of a parallelogram having height $\frac{2}{7}$ and base length 3.**

Solution $A = 3 \cdot \frac{2}{7}$

$$= \frac{6}{7}$$

End of Lesson