After watching the *Area of a Parallelogram* video, make sense of the mathematics by taking a closer look at the problem situation and solution. Use the questions and comments in bold to help you understand the formula for the area of a parallelogram.

Problem: Volunteers are laying sod around the parking lot of a community skate park. Organizers for the project need to know how much sod is required to cover a parallelogram-shaped area.

What is a parallelogram? A parallelogram is a quadrilateral where both pairs of opposite sides are parallel. The following shapes are all parallelograms. The parallel sides are the same color.
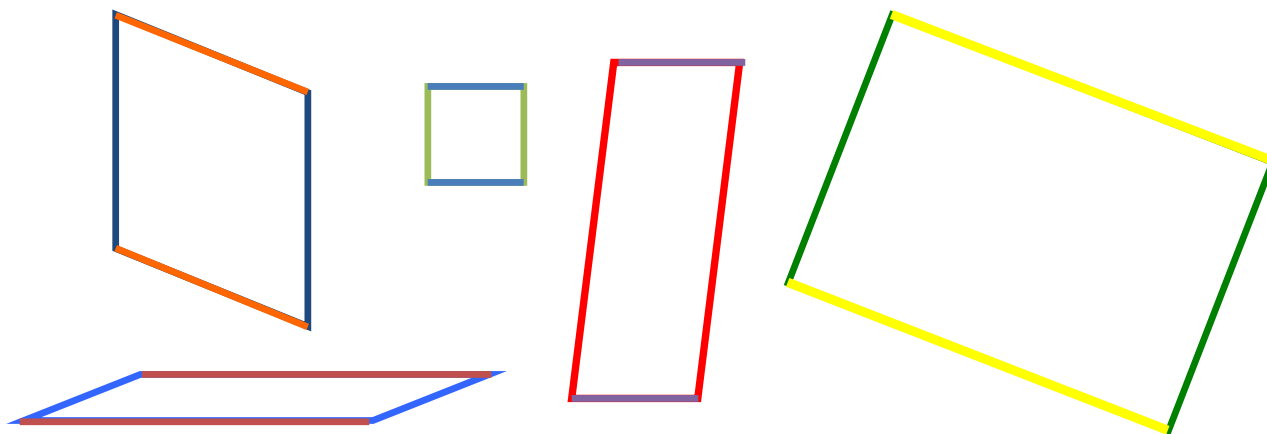
In order to determine how much sod is needed, you need to find the area of the parallelogram-shaped region. What information do you need to calculate the area of a parallelogram? In order to calculate the area of a parallelogram you need to know
- the base of the parallelogram and
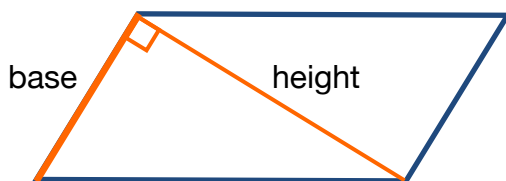- the height of the parallelogram.

How do you know which side of the parallelogram is the base? A parallelogram has four sides and any of the four sides can be the base. A parallelogram does not have to sit on its base.

MakingSense

What is the height of a parallelogram? The height of a parallelogram is the distance from the base to the opposite side. The height is always perpendicular to the base which means the base and height form a right angle. The height can be measured anywhere along the base line even outside the parallelogram.
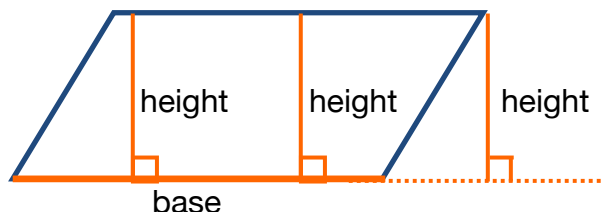
You may also use the base and corresponding height as shown below.

In order to make sense of the formula for area of a parallelogram, consider the formula for area of a rectangle. The area of a rectangle is determined by taking the length times the width (A = l • w). This is the same as taking the base times the height (A = b • h).
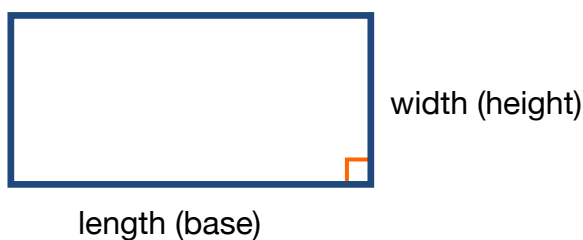
If you cut a parallelogram into two parts along the height, you can rearrange the pieces to form a rectangle.

Compare the rectangle to the original parallelogram. How does the base of the rectangle compare to the base of the parallelogram? They are the same. **How does the height of the rectangle compare to the height of the parallelogram?** They are also the same. **How does the area of the rectangle compare to the area of the parallelogram?** Since the two pieces of the parallelogram were rearranged to form a rectangle and no pieces were discarded, the parallelogram and rectangle have the same area.

How can you determine the area of a parallelogram? You can use the formula, area equals base times height (A = b • h). This formula works for all parallelograms. You can cut any parallelogram into two pieces along the height and arrange the pieces into a rectangle with the same base and height as the parallelogram.

The base of the parallelogram-shaped area at the skate park is 60 feet and the height is 20 feet. Use the formula for area of a parallelogram to determine how many square feet of sod is needed to cover the parallelogram-shaped region.

20 ft.

60 ft.

$A = b \cdot h$
$= 60 \cdot 20$
$= 1200$ sq. ft.
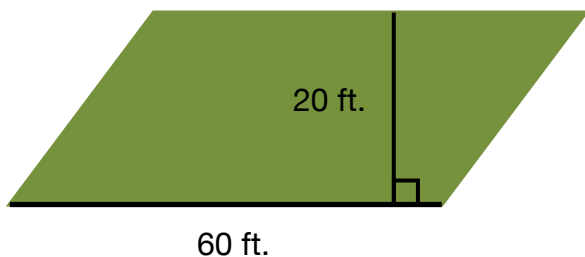
Does the area of the parallelogram change if a different side of the parallelogram is used as the base? Find the area of the parallelogram again using the base and height shown below. The area does not change. It is still 1200 square feet.

40 ft.

30 ft.

$A = b \cdot h$
$= 30 \cdot 40$
$= 1200$ sq. ft.
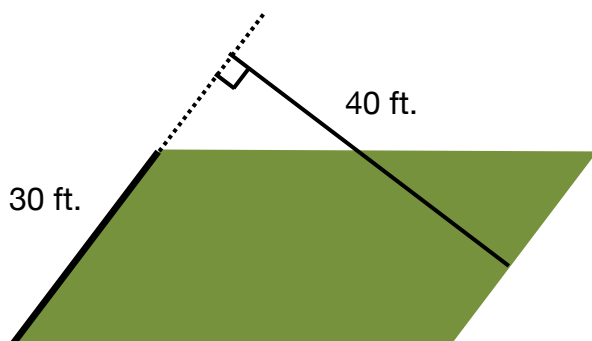
If one roll of sod covers 10 square feet, how many rolls of sod are needed to cover the parallelogram-shaped area. It will take 120 rolls of sod (1200 ÷ 10 = 120).