5.5 Exploring the Area and Perimeter of a Trapezoid

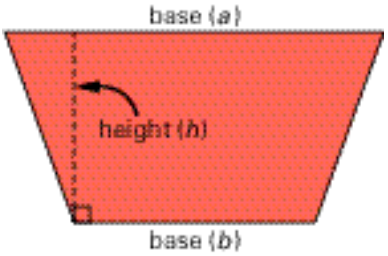
You will need
- a 24 cm piece of string
- tape
- a ruler

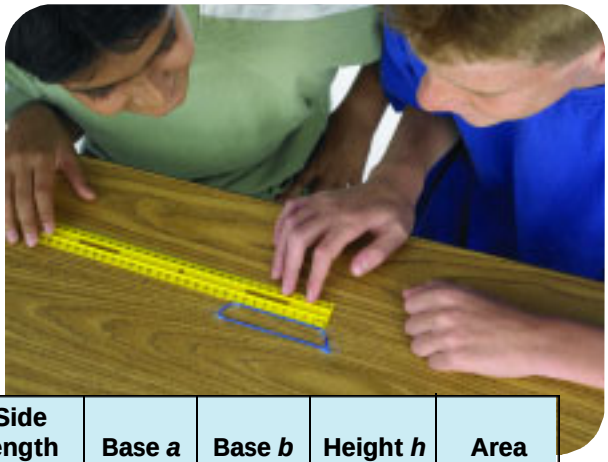
GOAL
Explore the relationship between the area and the perimeter of a trapezoid.

Explore the Math

Brooke is planning a flower garden in the shape of an **isosceles trapezoid**. It will have a perimeter of 24 m. Brooke wants the garden to have the greatest possible area.

isosceles trapezoid
a trapezoid where the non-parallel sides have equal lengths

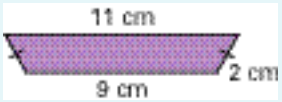




? What dimensions will give the garden the greatest area?

A. Use tape to help you arrange a 24 cm piece of string into different isosceles trapezoids. Let 1 cm represent 1 m.

B. Copy the table and add more rows.

Perimeter (cm)	Sketch of possible trapezoid	Side length (cm)	Side length (cm)	Base *a* (cm)	Base *b* (cm)	Height *h* (cm)	Area (cm^2)
24		2	2	9	11	1.5	15

C. Continue the table for more possible trapezoids. Determine which dimensions give the greatest area.

D. Suppose that the perimeter of Brooke's garden will be 32 m. Create a new table to show possible trapezoids. Determine which dimensions give the greatest area.

Reflecting

1. What happens to the area of the garden as its height increases?
2. What happens to the area of the garden as its sides and its height become closer to the same measurement?
3. Which trapezoid has the greatest area?

Mental Math

USING A STAIRCASE TO CONVERT LENGTHS

You can use a metric staircase to convert lengths from one unit to another.

To convert 1.59 km to metres, the number of metres must be *greater than* 1.59.

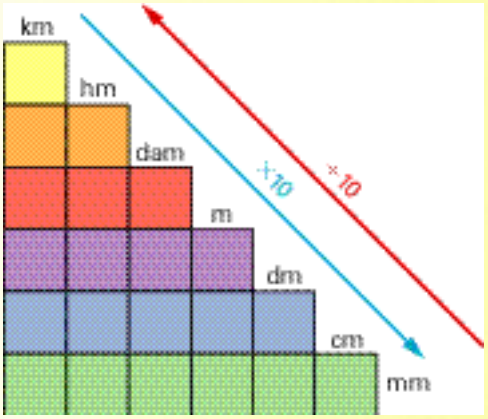
You go down three steps and multiply 1.59 by 10 three times.

1.59 km = 15.9 hm = 159 dam = 1590 m
× 10 × 10 × 10

To convert 1590 m to kilometres, the number of kilometres must be *less than* 1590.

You go up three steps and divide 1590 by 10 three times.

1590 m = 159 dam = 15.9 hm = 1.59 km
÷ 10 ÷ 10 ÷ 10



1. How can you use mental math to multiply numbers by 10?
2. How can you use mental math to divide numbers by 10?
3. Convert each length.
   - **a)** 2.75 km to metres
   - **b)** 8.6 m to millimetres
   - **c)** 14 dam to centimetres
   - **d)** 1.788 km to decametres
   - **e)** 19 245 mm to metres
   - **f)** 455.5 m to kilometres
   - **g)** 0.5 mm to centimetres
   - **h)** 0.15 cm to decimetres