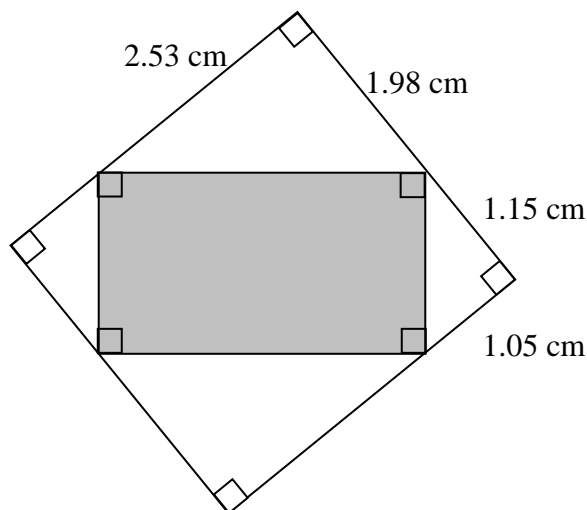


### Example

The shaded rectangle in the diagram shown below is formed from the hypotenuses of four right triangles. The left and right triangles are congruent, and the top and bottom triangles are congruent. The measurements shown are exact.



**a. Estimate the area of the shaded rectangle.**

To estimate the area of the shaded rectangle, estimate the area of the larger rectangle and then subtract the areas of the right triangles.

The width of the larger rectangle can be estimated as  $2\text{ cm} + 1\text{ cm}$  or  $3\text{ cm}$ . The height of the larger rectangle can be estimated as  $2.5\text{ cm} + 1\text{ cm}$  or  $3.5\text{ cm}$ . Therefore, the area of the larger rectangle can be estimated as  $(3.5\text{ cm})(3\text{ cm})$  or  $10.5\text{ cm}^2$ .

The area of the two larger right triangles together can be estimated as  $2(0.5)(2.5\text{ cm})(2\text{ cm})$  or  $5\text{ cm}^2$ . The area of the two smaller right triangles together can be estimated as  $2(0.5)(1\text{ cm})(1\text{ cm})$  or  $1\text{ cm}^2$ . Therefore the sum of the areas of all 4 right triangles can be estimated as  $5\text{ cm}^2 + 1\text{ cm}^2$  or  $6\text{ cm}^2$ .

Subtracting the estimate of the areas of the right triangles from the area of the larger rectangles yields:  $10.5\text{ cm}^2 - 6\text{ cm}^2$  or  $4.5\text{ cm}^2$ . Therefore an estimate of the area of the shaded rectangle is  $4.5\text{ cm}^2$ .

**b. Find the exact area of the shaded square to the nearest tenth.**

The steps followed in part a can be repeated using exact numbers. Let's look at two methods: rounding at the end and rounding to the nearest tenth in each step.

The area of the larger rectangle:  
 $(2.53\text{ cm} + 1.05\text{ cm})(1.98\text{ cm} + 1.15\text{ cm}) = 11.2054\text{ cm}^2$       or 11.2

The area of the larger right triangles:  
 $(2.53\text{ cm})(1.98\text{ cm}) = 5.0094\text{ cm}^2$       or 5.0

The area of the smaller right triangle:

$$(1.05 \text{ cm})(1.15 \text{ cm}) = 1.2075 \text{ cm}^2$$

or 1.2

The sum of the areas of the right triangles:

$$5.0094 \text{ cm}^2 + 1.2075 \text{ cm}^2 = 6.2169 \text{ cm}^2$$

or  $5.0 + 1.2 = 6.2$

The difference between the area of the larger rectangle  
and the areas of the right triangles:

$$11.2054 \text{ cm}^2 - 6.2169 \text{ cm}^2 = 4.9885 \text{ cm}^2$$

or  $11.2 - 6.2 = 5.0$

We had estimated that the solution would be close to  $4.5 \text{ cm}^2$ , and our answer,  $4.9885 \text{ cm}^2$  is fairly close to the estimate. If we round at each step, the answer is also very close, but it is not an exact answer.