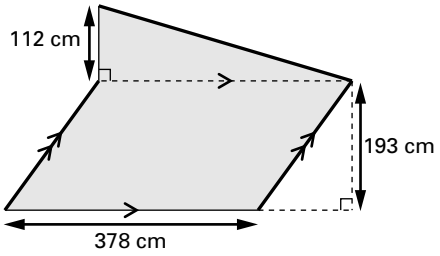
5A Solving Area Problems (page 1)

GOAL Estimate and calculate area, and convert units to solve problems.

You will need
- a calculator

Learn about the Math

Kaitlyn is painting this design on a stage for a drama festival. The stage is a trapezoid with parallel sides with lengths 6.50 m and 7.60 m. The parallel sides are 6.00 m apart.



? About what area of the stage is not covered by Kaitlyn's design?

Example: Estimating areas and the difference between the areas

Estimate the area of the stage and the area of Kaitlyn's design.
Express both in the same unit, and estimate the difference.

Kaitlyn's Solution

Area of a parallelogram
$= b \times h$
$= 378 \text{ cm} \times 193 \text{ cm}$ is about $400 \text{ cm} \times 200 \text{ cm}$
$= 80\,000 \text{ cm}^2$

First I estimated the area of Kaitlyn's design. I rounded measurements of the parallelogram part of the design and estimated the area.

The area of the parallelogram is about 80 000 cm^2.

Area of a triangle
$= b \times h \div 2$
$= 378 \text{ cm} \times 112 \text{ cm} \div 2$ is about $400 \text{ cm} \times 100 \text{ cm} \div 2$
$= 20\,000 \text{ cm}^2$

I rounded measurements of the triangle part of the design and estimated the area.

Since the opposite sides of a parallelogram are equal, the base of the triangle is 378 cm.

The area of the triangle is about 20 000 cm^2.

$20\,000 \text{ cm}^2 + 80\,000 \text{ cm}^2$
$= 100\,000 \text{ cm}^2$

The total area of the design is about 100 000 cm^2.

Area of a trapezoid
$= (a + b) \times h \div 2$
$= (6.50 \text{ m} + 7.60 \text{ m}) \times 6.00 \text{ m} \div 2$ is about $7 \text{ m} \times 6 \text{ m} = 42 \text{ m}^2$

Then I estimated the area of the stage. I figured out that 7 m is about halfway between 6.50 m and 7.60 m.

The area of the stage is about 42 m^2.

$1 \text{ m}^2 = 100 \text{ cm} \times 100 \text{ cm}$
$= 10\,000 \text{ cm}^2$

1 m = 100 cm and $1 \text{ m}^2 = 1 \text{ m} \times 1 \text{ m}$.

$100\,000 \text{ cm}^2$
$= (100\,000 \div 10\,000) \text{ m}^2$
$= 10 \text{ m}^2$

To express the estimated area of Kaitlyn's design in square metres, I divided its estimated area by 10 000.

$42 \text{ m}^2 - 10 \text{ m}^2 = 32 \text{ m}^2$

I subtracted my estimate for the area of Kaitlyn's design from my estimate for the area of the stage. The area of the stage that is not covered by Kaitlyn's design is about 32 m^2.

Solving Area Problems (page 2)

Reflecting

1. Explain Kaitlyn's strategy for estimating the area of the stage.

2. Calculate the area of the stage that is not covered by Kaitlyn's design to the nearest hundredth of a square metre. Explain how to use Kaitlyn's estimate to determine whether your calculations are reasonable.

3. Why do you think Kaitlyn converted the area of the design to square metres instead of converting the area of the stage to square centimetres?

4. Why might you want to calculate or estimate area in real life? How could you research the information you would need?

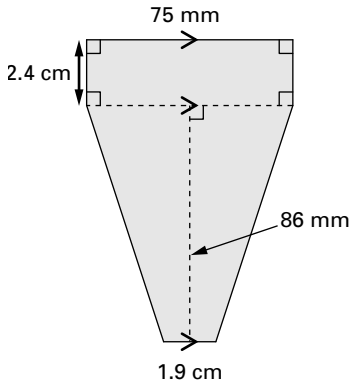
A Checking

5. Express each area in square centimetres.

a) 6 m^2 **b)** 4.75 m^2

6. a) Estimate the area in square millimetres. Explain your strategy.

b) Calculate the area in square millimetres. Use your estimate to check.



B Practising

7. Express each area in square metres.

a) 552 000 cm^2 **b)** 9307 cm^2

8. Ryan has 2.00 m^2 of material. He wants a rectangular piece 88 cm by 73 cm and a triangular piece with a base of 42 cm and a height of 1.05 m to make a costume.

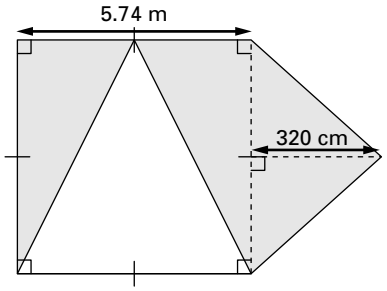
a) How many square centimetres will be left?

b) Express the number of square centimetres left as square metres to the nearest hundredth.

Solving Area Problems (page 3)

9. a) Estimate the area of the shaded part in square metres.

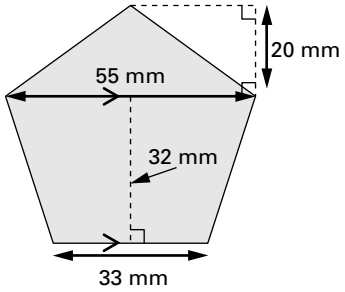
b) Calculate the area of the shaded part in square centimetres.
Explain how your estimate shows whether your calculation is reasonable.



10. Choose a situation such as building a skateboard or painting a porch. Research information you would need. Write a few sentences to report on what you researched and why you would need the information. Use math language.

C Extending

11. Estimate, and then calculate the area of this regular pentagon.



12. A stage prop consists of a trapezoid and a triangle. The trapezoid has parallel sides 2.50 m and 3.50 m long that are 1.00 m apart. The base of the triangle is 164 cm and its height is 94 cm. What is the ratio of the area of the trapezoid to the area of the triangle?