CHAPTER 8

1 Unit Relationships

Goal **Identify relationships between and among linear and square metric units.**

1. Express each area in square centimetres.

a) 8 m^2 = 80 000 cm^2 **c)** 3.5 m^2 = 35 000 cm^2

b) 12 m^2 = 120 000 cm^2 **d)** 0.7 m^2 = 7000 cm^2

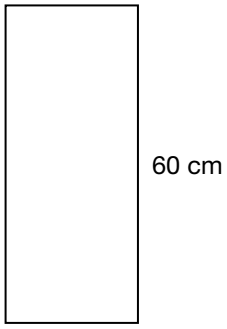
2. Express each area in square metres.

a) 90 000 cm^2 = 9 m^2 **c)** 43 000 cm^2 = 4.3 m^2

b) 660 000 cm^2 = 66 m^2 **d)** 6000 cm^2 = 0.6 m^2

3. Calculate the area of each shape in square centimetres and square metres. Show your work.

a)

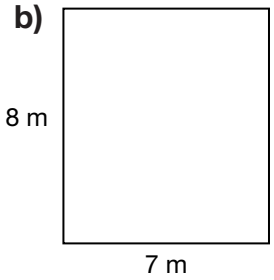


area = length x width
= 60 cm x 25 cm
= 1500 cm^2

area = 1500 cm^2

which is the same as 0.15 m^2

b)



area = length x width
= 8 m x 7 m
= 56 m^2

area = 56 m^2

which is the same as 560 000 cm^2

4. Tina made a paper lantern from a 2 m^2 sheet of paper. She used a 160 cm by 36 cm piece of the paper. What is the area of paper left over?

area = length x width
= 160 cm x 36 cm
= 5760 cm^2, which is the same as 0.576 m^2

area left over = 2 m^2 – 0.576 m^2
= 1.424 m^2

At-Home Help

Lengths in metres and centimetres are related.

1 m = 100 cm

To express a length in metres as centimetres, you multiply by 100.

For example, 16 m is the same as 16 × 100 = 1600 cm.

To express a length in centimetres as metres, you divide by 100.

For example, 240 cm is the same as 240 ÷ 100 = 2.4 m.

Areas in square metres and square centimetres are also related.

1 m^2 = 1 m × 1 m
= 100 cm × 100 cm
= 10 000 cm^2

To express an area in square metres as square centimetres, you multiply by 10 000.

For example, 7 m^2 is the same as 7 × 10 000 = 70 000 cm^2.

To express an area in square centimetres as square metres, you divide by 10 000.

For example, 1300 cm^2 is the same as 1300 ÷ 10 000 = 0.13 m^2.

CHAPTER 8

2

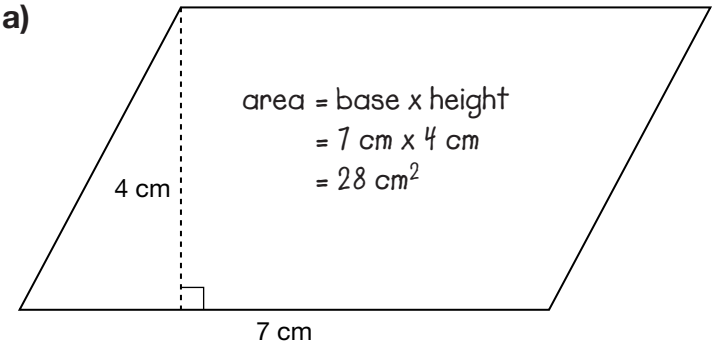
Area Rule for Parallelograms

Goal **Develop and use a rule for calculating the area of a parallelogram.**

You will need a ruler and a protractor.

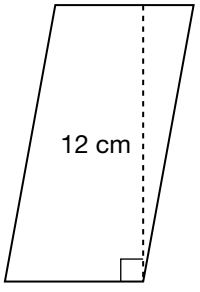
1. Calculate the area of each parallelogram. Show your work.

a)



area = base x height
= 7 cm x 4 cm
= 28 cm^2

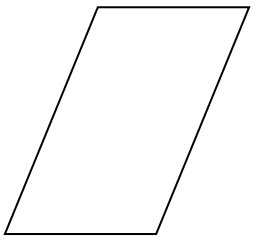
b)



area = base x height
= 6 cm x 12 cm
= 72 cm^2

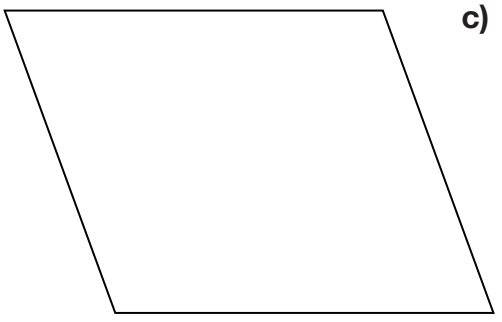
2. Anand drew three parallelograms. Measure the dimensions and calculate the area of each parallelogram. Show your work.

a)



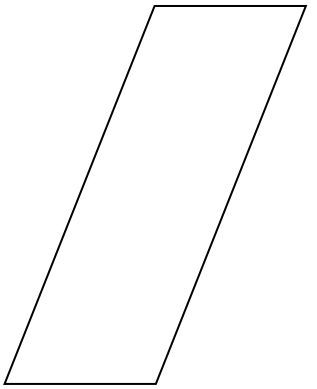
area = base x height
= 2 cm x 3 cm
= 6 cm^2

b)



area = base x height
= 5 cm x 4 cm
= 20 cm^2

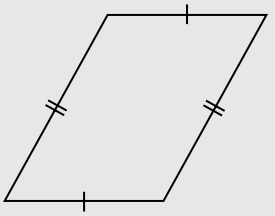
c)



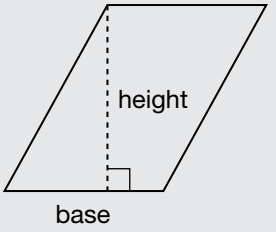
area = base x height
= 2 cm x 5 cm
= 10 cm^2

At-Home Help

A **parallelogram** is a four-sided shape that has two pairs of parallel sides.



To determine the area of a parallelogram, draw a line that is perpendicular to the base. **Perpendicular** means forms a 90° angle. This perpendicular line is the **height** of the parallelogram.



The general rule for the area of a parallelogram is
area = base × height

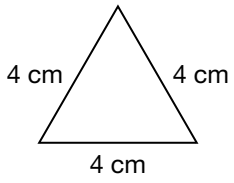
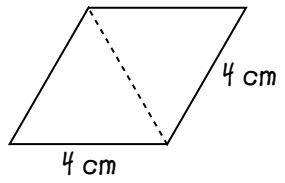
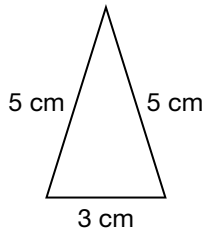
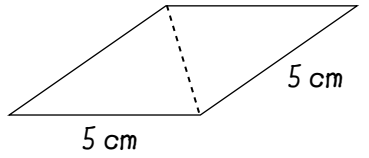
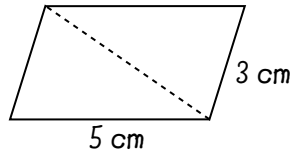
CHAPTER 8

3 Geometric Relationships

Goal **Identify relationships between triangles and parallelograms.**

You will need a ruler.

1. Complete the chart by sketching parallelograms made up of two congruent triangles.

Type of triangle	Sketch of parallelograms
equilateral 	
isosceles 	 

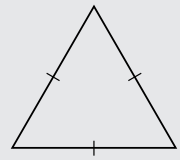
2. How is the area of a triangle related to the area of a parallelogram? Explain.

Suggested answer:
Each parallelogram is made up of two identical triangles.
So the area of one triangle is equal to half the area of the parallelogram.

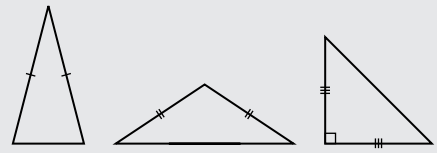
At-Home Help

Congruent means identical in shape and size.

An **equilateral triangle** has all sides of equal length.

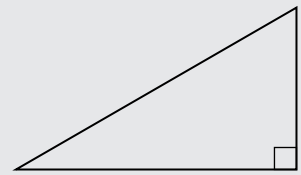


An **isosceles triangle** has two sides of equal length.



A **scalene triangle** has all sides of different lengths.

A **right-angled triangle** has one right angle. A **right angle** measures 90°.



CHAPTER 8

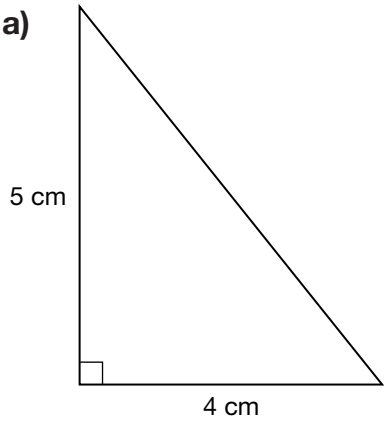
4 Area Rule for Triangles

Goal **Develop and use a rule for calculating the area of a triangle.**

You will need a ruler and a protractor.

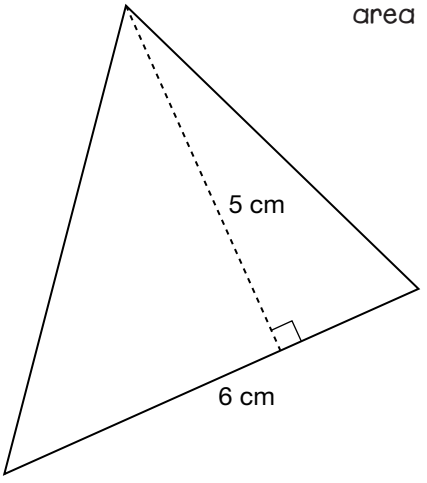
1. Calculate the area of each triangle. Show your work.

a)



area = (base x height) ÷ 2
= (4 cm x 5 cm) ÷ 2
= 20 cm^2 ÷ 2
= 10 cm^2

b)

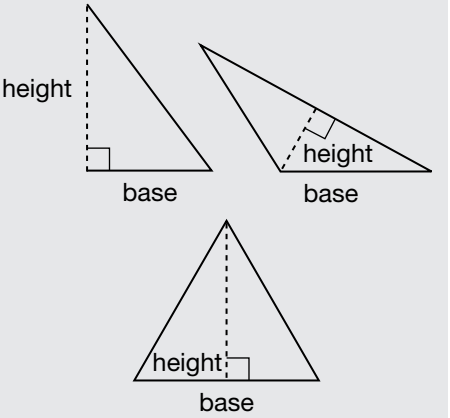


area = (base x height) ÷ 2
= (6 cm x 5 cm) ÷ 2
= 30 cm^2 ÷ 2
= 15 cm^2

At-Home Help

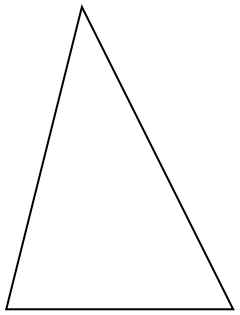
To determine the area of a triangle, draw a line perpendicular to the base and through the vertex across from it. This perpendicular line is the **height** of the triangle.

To calculate the area of a triangle, multiply the base by the height and divide by 2.



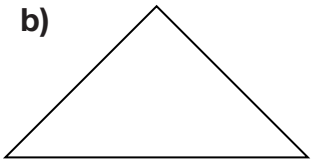
2. Measure each triangle and calculate the area.

a)



area = (base x height) ÷ 2
= (3 cm x 4 cm) ÷ 2
= 12 cm^2 ÷ 2
= 6 cm^2

b)



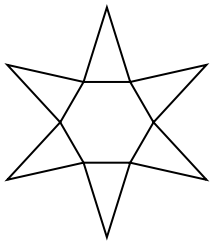
area = (base x height) ÷ 2
= (4 cm x 2 cm) ÷ 2
= 8 cm^2 ÷ 2
= 4 cm^2

CHAPTER 8
5

Solve Problems Using Open Sentences

Goal **Use open sentences to solve problems.**

1. Penelope made a fabric flower using triangles. Each petal has a base of 5 cm and a height of 8 cm.



She wants to make another flower with twice the area. What base and height could she use for the new petals? Write an open sentence to solve the problem. Show your work.

Suggested answer:

area of one original petal
= base x height ÷ 2
= 5 cm x 8 cm ÷ 2
= 20 cm^2

area of one new petal
= 20 cm^2 x 2
= 40 cm^2

possible base of triangle = 10 cm
(10 cm x □) ÷ 2 = 40 cm^2
I know that 80 ÷ 2 = 40 and 10 x 8 = 80.
So the height is 8 cm.

The possible dimensions of the triangle is a base of 10 cm with a height of 8 cm.

2. Matt's house has a basement room with an area of 92 m^2. Matt's parents are planning to build a bathroom in the room. The area of the room will then be 88 m^2. List two possible sets of whole number dimensions and shapes for the bathroom. Write an open sentence to solve the problem. Show your work.

Suggested answer: area of bathroom = 92 m^2 − 88 m^2
= 4 m^2

The bathroom could be a square or a rectangle.
area = length x width
4 m^2 = □ x □
4 m^2 = 2 m x 2 m
4 m^2 = 1 m x 4 m

Possible dimensions of the bathroom are a 2 m by 2 m square or a 1 m by 4 m rectangle.

At-Home Help

To solve a problem involving area, use the problem-solving model.

Understand the Problem
- Draw a sketch to help you visualize the problem. Label any dimensions you are given on the sketch.
- Determine what you are asked to find.

Make a Plan
- Use mathematical relationships that can help you solve the problem. For example, to find the area of a parallelogram, use area = base × height.
- Write an open sentence if possible. For example, □ × 8 = 96 is an open sentence.

Carry Out the Plan
- You can guess, estimate, or use number facts to solve the open sentence. For example, from the 8 times table, 12 × 8 = 96. So the missing number in the open sentence above is 12.

Look Back
- Check that your answer makes sense with the information in the problem.
- Remember to include the appropriate units in your answer.

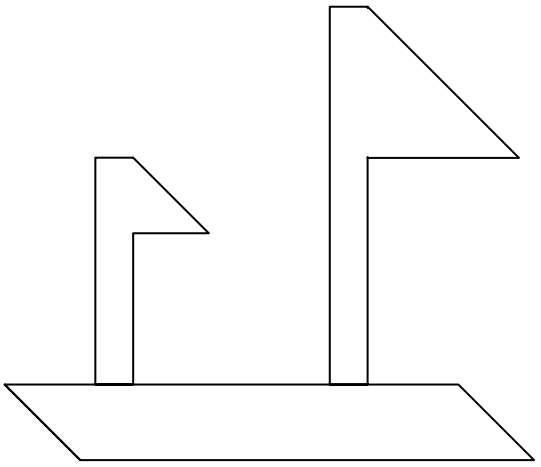
CHAPTER 8

6 Areas of Polygons

Goal **Calculate the area of polygons by breaking them into simpler shapes.**

You will need a ruler.

1. Justin drew a boat using different polygons. Calculate the area of the shape. Show your work.



Suggested answer:

area of small sail = (base x height) ÷ 2
= (1 cm x 1 cm) ÷ 2
= 1 cm^2 ÷ 2
= 0.5 cm^2

area of large sail = (base x height) ÷ 2
= (2 cm x 2 cm) ÷ 2
= 4 cm^2 ÷ 2
= 2 cm^2

area of small mast = length x width
= 3 cm x 0.5 cm
= 1.5 cm^2

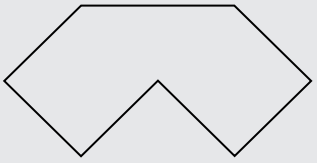
area of large mast = length x width
= 5 cm x 0.5 cm
= 2.5 cm^2

area of bottom of boat = base x height
= 6 cm x 1 cm
= 6 cm^2

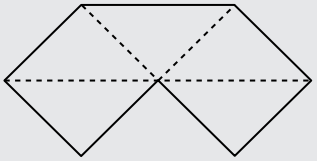
total area = 0.5 cm^2 + 2 cm^2 + 1.5 cm^2 + 2.5 cm^2 + 6 cm^2
= 12.5 cm^2

At-Home Help

The area of a complex shape can sometimes be determined by dividing it into several smaller parts. The total area is equal to the sum of the areas of the smaller parts.



For example, to determine the area of the shape above, divide it into five triangles.



area of triangle = (base $\times$ height) ÷ 2
= (2 cm $\times$ 1 cm) ÷ 2
= 1 cm^2

total area = 5 $\times$ area of triangle
= 5 $\times$ 1 cm^2
= 5 cm^2

Test Yourself Page 1

Circle the correct answer.
You will need a ruler.

1. Which measurement is the same as 13 m^2?

A. 1300 cm^2 **C.** 130 000 cm^2

B. 13 000 cm^2 **D.** 1 300 000 cm^2

2. Which measurement is the same as 20 000 cm^2?

A. 0.2 m^2 **C.** 20 m^2

B. 2 m^2 **D.** 200 m^2

3. Which statement is *not* correct?

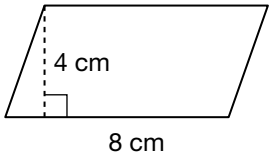
A. 80 000 cm^2 is the same as 8 m^2.

B. 0.1 m^2 is the same as 10 000 cm^2.

C. 2500 cm^2 is the same as 0.25 m^2.

D. 31 m^2 is the same as 310 000 cm^2.

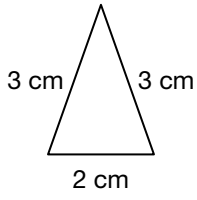
4. What is the area of the parallelogram in square centimetres?

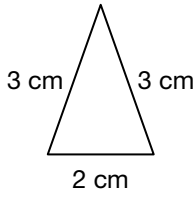


A. 12 cm^2 **C.** 32 cm^2

B. 16 cm^2 **D.** 36 cm^2

5. How many different parallelograms can you make using these triangles?





A. 1 **C.** 3

B. 2 **D.** 4

Test Yourself Page 2

6. Which area relationship is *not* true?

A. Two congruent triangles can be used to form a parallelogram. The area of one triangle is half the area of the parallelogram.

B. A parallelogram can be used to form a rectangle if it is cut along its height. The area of the parallelogram is equal to the area of the rectangle.

C. The area of a rectangle is equal to the length times the width.

D. Two congruent triangles can be used to form a parallelogram. The area of one triangle is double the area of the parallelogram.

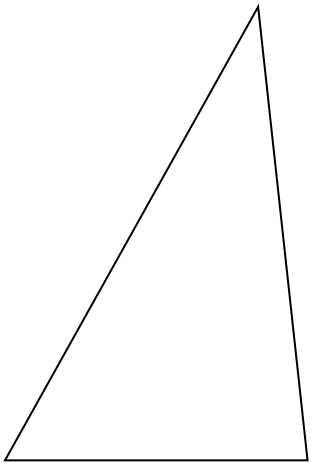
7. What is the area of the triangle?

A. 10 cm^2

B. 12 cm^2

C. 20 cm^2

D. 24 cm^2



8. Nadia designed a logo using different polygons. What is the area of the logo?

A. 14 cm^2

B. 15 cm^2

C. 22 cm^2

D. 36 cm^2