5.1 Area of a Parallelogram

You will need
- centimetre square dot paper
- a calculator
- a geoboard and elastic bands

GOAL
Develop and apply the formula for the area of a parallelogram.

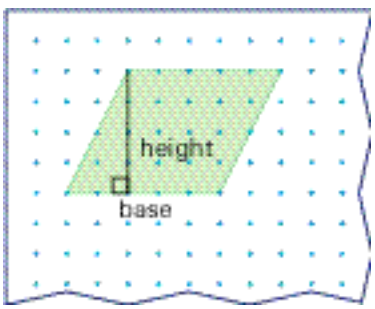
Learn about the Math

Sandra and Ravi are designing a logo for a new amusement park called Adventurepark. They start with a 5-by-4 rectangle and make it into a parallelogram. They wonder what the **formula** for the area of a parallelogram is.

formula
a rule represented by symbols, numbers, or letters, often in the form of an equation; for example, Area of a rectangle = base × height

? What formula can you use to calculate the area of the parallelogram?

A. Draw Sandra and Ravi's parallelogram on centimetre square dot paper. (You can use any side as the base.) Draw a vertical line from the top to the bottom to make a right triangle. This line is the height. Label the height and the base.

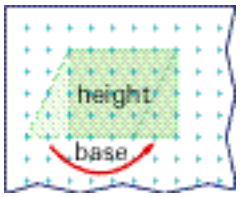


Communication Tip

- The little square in the diagram means that the height and the base form a right angle (90°). The height is always perpendicular to the base. Any side can be a base.
- Units of area always have a small, raised "2" written after them, as follows: 12 m^2. This indicates that two dimensions, length and width, are involved.

NEL

B. Cut out the triangle from the logo. Move the triangle to the right side of the parallelogram to form a rectangle. What is the area of the rectangle? What is the area of the parallelogram?

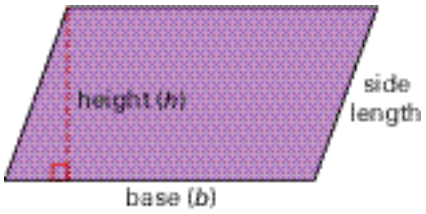


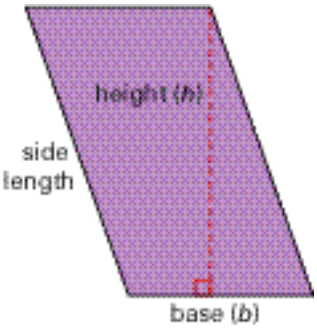
Reflecting

1. How can cutting and then moving the right triangle help you develop the formula for a parallelogram?

2. When calculating the area of a parallelogram, why don't you multiply the two side lengths?

3. What is the formula for the area of a parallelogram with base b and height h?



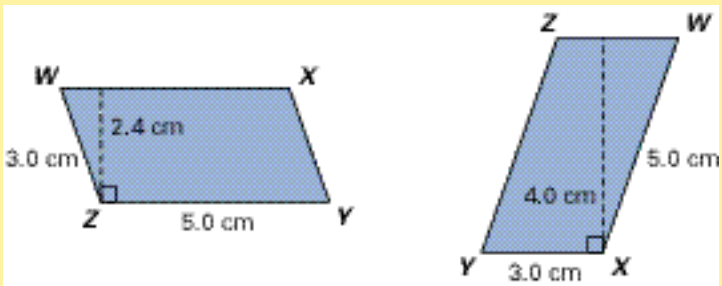


4. Why would you use a formula to calculate the area of a parallelogram instead of counting squares?

Work with the Math

Example: Calculating the area of a parallelogram

What is the area of parallelogram $WXYZ$?



Solution A

$A = b \times h$
$= 5.0 \text{ cm} \times 2.4 \text{ cm}$
$= 12.0 \text{ cm}^2$

The formula for the area of a parallelogram is A = base × height.
If side ZY is the base, then the height is 2.4 cm.
Use these values in the formula and multiply.
The area of the parallelogram is 12 cm².

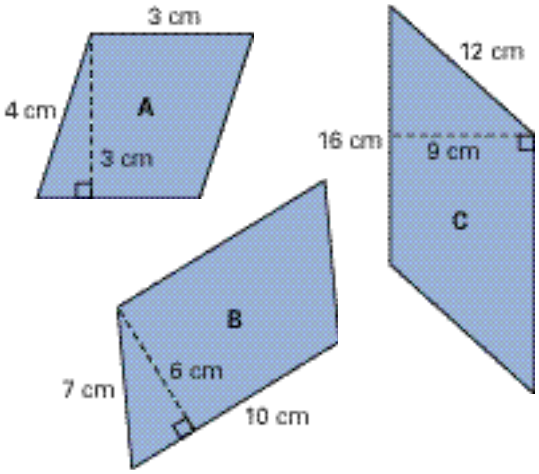
Solution B

$A = b \times h$
$= 3.0 \text{ cm} \times 4.0 \text{ cm}$
$= 12.0 \text{ cm}^2$

Look at the shape a different way. (Turn it.)
If side YX is the base, then the height is 4.0 cm.
The area of the parallelogram is 12 cm².

A Checking

5. Copy and complete the table, based on the parallelograms shown.



Parallelogram	Base (cm)	Height (cm)
A		
B		
C		

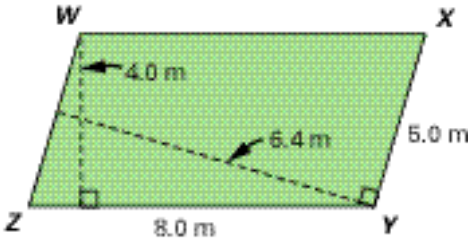
6. Create three parallelograms on a geoboard.

a) Use an elastic band to show the height of each parallelogram. Record your results on centimetre square dot paper.

b) Count the squares to describe the area of each parallelogram.

c) Use a formula to calculate the area of each parallelogram.

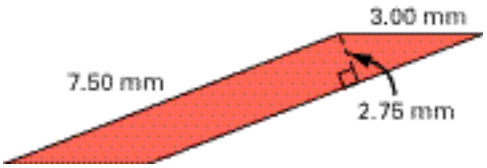
7. Calculate the area of parallelogram *WXYZ* in two different ways. Show your work.



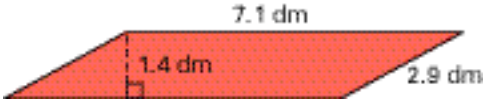
B Practising

8. Calculate the area of each parallelogram to the nearest tenth.

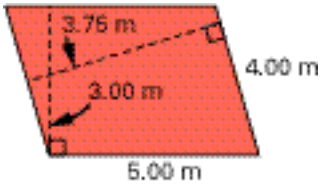
a)



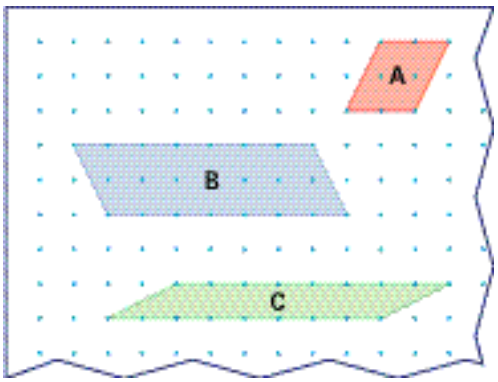
b)



c)



9. a) Draw the following parallelograms on centimetre square dot paper. For each parallelogram, label a base and the corresponding height.



b) Calculate the area of each parallelogram.

10. Draw an example of a parallelogram in which both the base and the height are the sides. Explain your thinking.

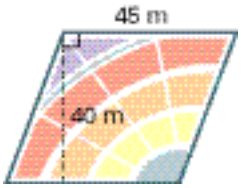
11. Draw possible base and height combinations for three different parallelograms, each with an area of 36 cm^2.

12. Copy and complete the table.

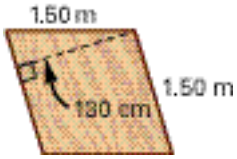
	Base	Height	Area of parallelogram
a)	4 m	■ m	28 m²
b)	20 cm	11 cm	■ cm²
c)	■ cm	9 cm	63 cm²
d)	1.7 dm	2.6 dm	■ dm²
e)	0.6 m	■ m	4.2 m²
f)	27.5 mm	32.6 mm	■ mm²

13. Calculate for each parallelogram.

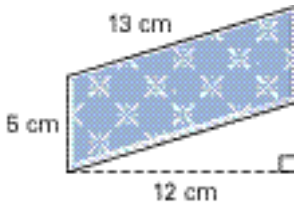
a) the area of the auditorium



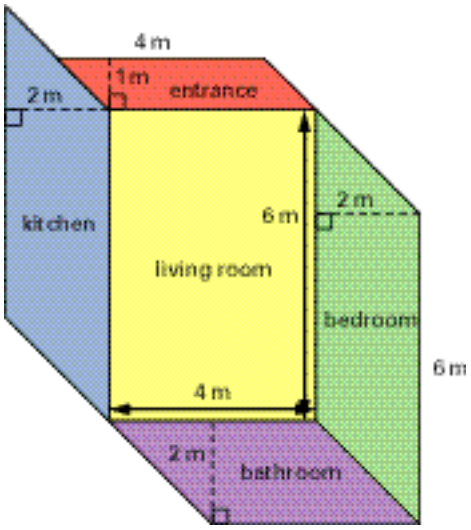
c) the area and perimeter of the table top



b) the area and perimeter of the wall tile



14. Calculate each floor area in this apartment. Each room is a parallelogram.



C Extending

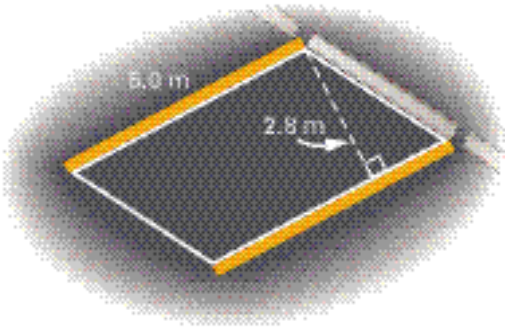
15. Draw a parallelogram, and label it A. Now draw three more parallelograms, as described below.

a) a parallelogram that is half the area of A

b) a parallelogram that is twice the area of A

c) a parallelogram that is three-quarters the area of A

16. Adventurepark will need a parking lot for staff vehicles. The parking spaces will be angled in a row. Each parking space will be a parallelogram with a base of 5.0 m and a height of 2.8 m. The cost to pave each parking space is $21.50.



Copy and complete the following table. Show your calculations.

Number of parking spaces	Area (m²)	Total cost ($)
1		
5		
10		
50		