

Geometry Puzzles

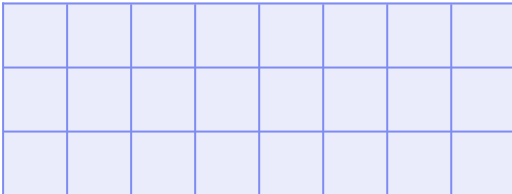
A GUIDE

Count the squares, walk the fence, and meet the amazing shape that shrinks without getting shorter.

Area is just counting squares

Imagine a chocolate bar made of little squares. If you want to know how big it is, you could count every square one by one. That number is called the area, and we measure it in square units.

But counting one by one is slow. Here is the shortcut: count how many squares are in one row, then count how many rows there are. Multiply them, and you have counted every square at once.



Worked example A chocolate bar has 3 rows with 8 squares in each row. What is its area?

1. Each row holds 8 squares.
2. There are 3 rows, so multiply: $3 \times 8 = 24$.
3. That counts every single square exactly once.

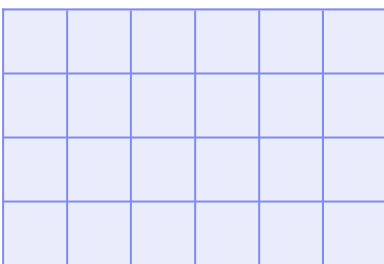
Answer: 24 square units

Perimeter means walking the fence

Now forget the inside of the shape. Pretend you are an ant walking all the way around the edge, like a farmer checking a fence. The total distance you walk is called the perimeter.

For a rectangle the walk is easy: across the top, down one side, back along the bottom, and up the other side. The top and bottom match, and the two sides match. So you can add one width and one height, then double it.

Keep the two ideas separate in your head. Area lives inside the shape and counts squares. Perimeter lives on the edge and counts steps.



Worked example A rectangle is 4 units tall and 6 units wide. How far does an ant walk to go all the way around?

1. Walk across the top: 6 units.
2. Walk down the side: 4 units.
3. That is half the trip, so add them and double: $(6 + 4) \times 2 = 20$.

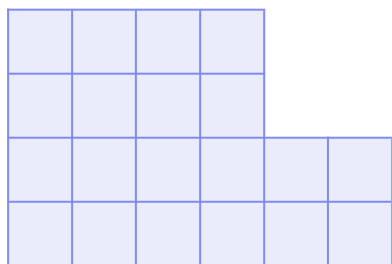
Answer: 20 units

The corner-bite surprise

Here comes the puzzle that fools almost everyone. Take that 4 by 6 rectangle and bite a 2 by 2 square out of one corner. The shape is clearly smaller now, so the fence around it must be shorter too, right?

Wrong! Watch the ant's walk. Where the corner used to be, the ant now turns in, walks along the bite, and comes back out. The two new edges it walks are exactly as long as the two old edges it lost. The fence just got dented in, not shortened.

So the area shrinks, but the perimeter stays exactly the same. Any bite taken out of a corner works this way. That is the secret weapon for a whole family of puzzles.



Worked example A 4 by 6 rectangle has a 2 by 2 square bitten out of one corner. What are the new area and the new perimeter?

1. The full rectangle had area $4 \times 6 = 24$ square units.
2. The bite removed $2 \times 2 = 4$ squares, so the area is $24 - 4 = 20$.
3. The old perimeter was $(4 + 6) \times 2 = 20$ units.
4. The bite swaps two old edges for two new edges of the same total length, so the perimeter does not change.

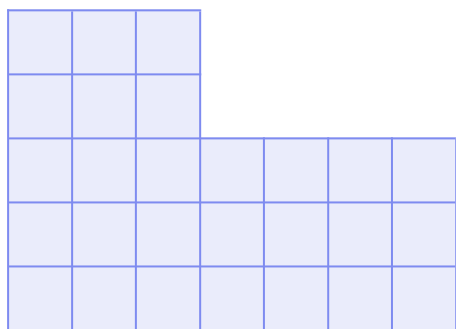
Answer: Area = 20 square units, perimeter = 20 units (unchanged!)

Building with L-shapes

An L-shape is what you get after a corner bite. To find its area, you have two great moves, and they always agree. Move one: take the whole rectangle and subtract the missing bite.

Move two: slice the L into two rectangles with one straight cut, find each area, and add. Pick whichever slice looks easier. Checking your answer both ways is how puzzle champions catch their own mistakes.

And remember the surprise from before: the L-shape's perimeter is the same as the full rectangle it came from. So you often do not need to measure the L at all. Just rebuild the rectangle in your head.



Worked example An L-shape is a 5 by 7 rectangle with a 2 by 4 piece missing from one corner. What is its area?

1. The full rectangle would have area $5 \times 7 = 35$ square units.
2. The missing corner piece is $2 \times 4 = 8$ square units.
3. Subtract the bite: $35 - 8 = 27$.
4. Check with a slice: a 3 by 7 strip (21) plus a 2 by 3 strip (6) also makes 27.

Answer: 27 square units

Remember

- ★ Area lives inside (count squares); perimeter lives on the edge (count steps).
- ★ A corner bite dents the fence inward but never makes it shorter.

★ To find an L-shape's area, either subtract the bite from the full rectangle or slice the L into two rectangles — both give the same answer.

★ Two shapes with the same perimeter can have very different areas, so never guess one from the other.

Now you try

- 1) A rectangle is 3 units tall and 5 units wide. What is its area in square units?

Answer: _____

- 2) A rectangle is 4 units tall and 7 units wide. What is its perimeter in units?

Answer: _____

- 3) A rectangle has an area of 24 square units and is 4 units tall. How many units wide is it?

Answer: _____

- 4) A square garden has a perimeter of 20 units. How many units long is one side?

Answer: _____

- 5) A 5 by 6 rectangle has a 2 by 2 square cut from one corner. What is the area of the shape that is left, in square units?

Answer: _____

- 6) A 5 by 6 rectangle has a 2 by 2 square cut from one corner, leaving an L-shape. What is the perimeter of the L-shape in units?

Answer: _____

- 7) An L-shape is built from a 3 by 4 rectangle joined to a 2 by 4 rectangle with no overlap. What is its total area in square units?

Answer: _____

- 8) A 2 by 7 rectangle and a 4 by 5 rectangle both have a perimeter of 18 units. How many more square units of area does the 4 by 5 rectangle have?

Answer: _____

Answers — check yourself

1. 15
2. 22
3. 6
4. 5
5. 26
6. 22
7. 20
8. 6