LESSON MAKER PRO

Opposite Side Secrets

Use side lengths to solve and prove.

HIGH SCHOOL · GDA.GM.H.31.c

GDA.GM.H.31.c "Investigate, prove, and apply theorems about parallelograms and other quadrilaterals, including but not limited to both necessary and sufficient conditions for parallelograms and other quadrilaterals..."

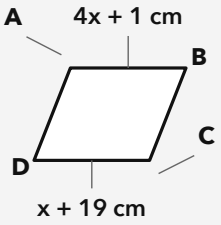
NAME _____ DATE _____

THE BIG IDEA

In a parallelogram, opposite sides have equal lengths. If both pairs of opposite sides in a quadrilateral have equal lengths, that is enough to prove it is a parallelogram. Set opposite-side expressions equal to find x, then substitute to find a length.

WORKED EXAMPLE

In the parallelogram, find x and the length of AB.

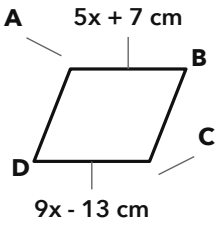


1. Opposite sides are equal: 4x + 1 = x + 19.
2. Subtract x and 1: 3x = 18, so x = 6.
3. Substitute into AB: 4(6) + 1 = 25.

Answer: x = 6; AB = 25 cm

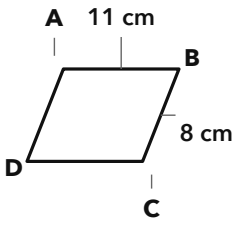
PRACTICE 6 problems

1 Find x for the parallelogram.



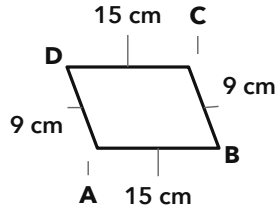
ANSWER _____

2 Find the perimeter of the parallelogram.



ANSWER _____

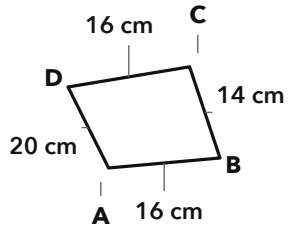
3 Do the marked side lengths prove that this quadrilateral is a parallelogram? Explain.



ANSWER _____

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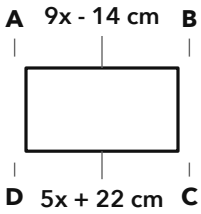
4 Do the marked side lengths prove that this quadrilateral is a parallelogram? Explain.



ANSWER _____

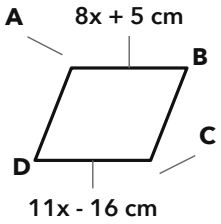
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5 Find x for the rectangle.



ANSWER _____

6 Find x and the length of AB for the parallelogram.

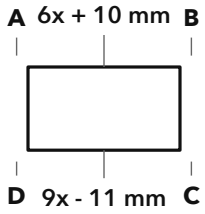


ANSWER _____

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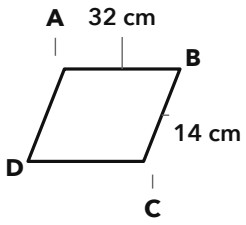
APPLY IT Show your work

1 A designer is checking the top and bottom edges of a rectangular phone case. Use the figure to find x and the length of each edge.



ANSWER _____

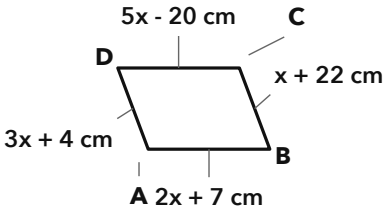
2 A skate shop cuts a parallelogram decal for a board. How much border tape is needed to go once around the decal? Use the figure.



ANSWER _____

CHALLENGE One step up

Find x and explain why the marked side lengths prove that this quadrilateral is a parallelogram.



WORK SPACE AND ANSWER

Opposite Side Secrets

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find x for the parallelogram.	**x = 5**
2	Find the perimeter of the parallelogram.	**38 cm**
3	Do the marked side lengths prove that this quadrilateral is a parallelogram? Explain.	**Yes. Both pairs of opposite sides have equal lengths.**
4	Do the marked side lengths prove that this quadrilateral is a parallelogram? Explain.	**No. One pair of opposite sides has lengths 14 cm and 20 cm, which are not equal.**
5	Find x for the rectangle.	**x = 9**
6	Find x and the length of AB for the parallelogram.	**x = 7; AB = 61 cm**

PART 2 · APPLY IT

1. **x = 7; each edge is 52 mm** Opposite edges of a rectangle are equal, so 6x + 10 = 9x - 11 and x = 7. Substituting gives 52 mm.
2. **92 cm** Each opposite side has the same length, so the perimeter is 32 + 14 + 32 + 14 = 92 cm.

CHALLENGE

x = 9. At x = 9, AB = CD = 25 cm and BC = DA = 31 cm. Both pairs of opposite sides are equal, so the quadrilateral is a parallelogram.

For explanations, accept any clear statement that compares the relevant pairs of opposite sides. Students may write perimeter calculations in any order.