

Trapezoid Toolbox

Use midsegments, angles, and isosceles trapezoid facts.

HIGH SCHOOL • MA.912.GR.1.5

MA.912.GR.1.5 "Prove relationships and theorems about trapezoids. Solve mathematical and real-world problems involving postulates, relationships and theorems of trapezoids."

NAME _____

DATE _____

KEY TRAPEZOID RELATIONSHIPS

In any trapezoid, the midsegment joins the midpoints of the legs. It is parallel to both bases, and its length is the average of the base lengths. In an isosceles trapezoid, angles on the same base are congruent, and angles along either leg sum to 180 degrees.

WORKED EXAMPLE

A trapezoid has bases 14 cm and 26 cm. Find the length of its midsegment.

1. Midsegment length = half the sum of the base lengths.
2. Length = $(14 + 26) / 2$
3. Length = $40 / 2 = 20$ cm

Answer: 20 cm

PRACTICE 6 problems

- 1** A trapezoid has bases of 8 cm and 18 cm. Find the length of its midsegment.

ANSWER _____

- 2** A trapezoid has a midsegment of 17 cm. One base is 22 cm. Find the other base.

ANSWER _____

- 3** The bases of a trapezoid are $x + 1$ cm and $3x - 5$ cm. Its midsegment is 18 cm. Find x .

ANSWER _____

- 4** ABCD is an isosceles trapezoid with AB parallel to CD. If angle A = 72 degrees, find angle B, angle C, and angle D.

ANSWER _____

- 5** In trapezoid ABCD, AB is parallel to CD. Angles A and D lie on the same leg. If angle A = $4x + 6$ degrees and angle D = $5x + 3$ degrees, find x .

ANSWER _____

- 6** An isosceles trapezoid has legs with lengths $3x + 1$ cm and $5x - 7$ cm. Find x and the length of each leg.

ANSWER _____

APPLY IT Show your work

- 1** An outdoor music festival uses a trapezoid-shaped stage frame. Its parallel front and back edges are 16 m and 30 m. A crossbar joins the midpoints of the nonparallel sides. How long is the crossbar?

WORK SPACE

ANSWER _____

- 2** A gaming club makes an isosceles trapezoid-shaped sign. Each lower base angle measures 68 degrees. What is the measure of each upper base angle?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

An isosceles trapezoid has diagonals with lengths $4x + 6$ cm and $6x - 12$ cm. Find x and the length of each diagonal. Explain the relationship that lets you write your equation.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A trapezoid has bases of 8 cm and 18 cm. Find the length of its midsegment.	13 cm
2	A trapezoid has a midsegment of 17 cm. One base is 22 cm. Find the other base.	12 cm
3	The bases of a trapezoid are $x + 1$ cm and $3x - 5$ cm. Its midsegment is 18 cm. Find x .	$x = 10$
4	ABCD is an isosceles trapezoid with AB parallel to CD. If angle A = 72 degrees, find angle B, angle C, and angle D.	angle B = 72 degrees, angle C = 108 degrees, angle D = 108 degrees
5	In trapezoid ABCD, AB is parallel to CD. Angles A and D lie on the same leg. If angle A = $4x + 6$ degrees and angle D = $5x + 3$ degrees, find x .	$x = 19$
6	An isosceles trapezoid has legs with lengths $3x + 1$ cm and $5x - 7$ cm. Find x and the length of each leg.	$x = 4$; each leg is 13 cm

PART 2 • APPLY IT

- 23 m** The crossbar is the midsegment. Half the sum of 16 m and 30 m is 23 m.
- 112 degrees** An upper base angle and a lower base angle along the same leg are supplementary. Subtract 68 degrees from 180 degrees.

CHALLENGE

$x = 9$; each diagonal is 42 cm. The diagonals of an isosceles trapezoid are congruent, so $4x + 6 = 6x - 12$.

Accept equivalent algebraic forms and correct angle notation. For the challenge, require students to state that diagonals of an isosceles trapezoid are congruent before equating the expressions.