

Geometry: Solving Trapezoids Using Properties



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DIRECTIONS

Use trapezoid properties to solve for x and find missing measures. For the midsegment, use $MN = (b_1 + b_2) / 2$.

- 1 Isosceles Trap. — Legs equal. Solve for x :

$$AB = 3x + 2, \quad CD = 5x - 8$$

Answer: _____

- 2 Isosceles Trap. — Base angles equal. Find x :

$$\angle A = (4x + 5)^\circ, \quad \angle B = (6x - 15)^\circ$$

Answer: _____

- 3 Isosceles Trap. — Diagonals equal. Find x :

$$AC = 4x - 3, \quad BD = 2x + 9$$

Answer: _____

- 4 Co-Interior Angles — Sum = 180° . Solve for x :

$$\angle A = (2x + 20)^\circ, \quad \angle D = (4x - 8)^\circ$$

Answer: _____

- 5 Midsegment Theorem — Find MN :

$$b_1 = 8, \quad b_2 = 14$$

Answer: _____

- 6 Midsegment Theorem — Find b_2 :

$$MN = 10, \quad b_1 = 6$$

Answer: _____

- 7 Midsegment — Solve for x and find MN :

$$MN = 2x + 5, \quad AB = 18, \quad CD = 3x - 1$$

Answer: _____

- 8 Midsegment — Solve for x and find MN :

$$MN = x + 4, \quad b_1 = 3x - 2, \quad b_2 = x + 6$$

Answer: _____

- 9 Co-Interior Angles — Find $m\angle C$:

$$m\angle B = 125^\circ$$

Answer: _____

- 10 Isosceles Trap. — Find all four angles:

$$m\angle A = 68^\circ$$

Answer: _____

- 11 Isosceles Trap. — Upper base angles equal. Find x :

$$\angle C = (3x + 8)^\circ, \quad \angle D = (5x - 12)^\circ$$

Answer: _____

- 12 Midsegment — Solve for x and find MN :

$$MN = 2x + 3, \quad AB = 3x + 1, \quad CD = 9$$

Answer: _____



Answer Key & Solutions

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TEACHER NOTES

*Isosceles trap: legs equal, base angles equal, diagonals equal. Co-interior angles sum to 180° .
Midsegment = $(b_1+b_2)/2$, parallel to both bases.*

1 Isosceles Trap. — Legs equal. Solve for x:

$$AB = 3x + 2, \quad CD = 5x - 8$$

$$= x = 5, \quad AB = CD = 17$$

$$\text{Legs equal: } 3x+2=5x-8 \rightarrow 10=2x \rightarrow x=5.$$

2 Isosceles Trap. — Base angles equal. Find x:

$$\angle A = (4x + 5)^\circ, \quad \angle B = (6x - 15)^\circ$$

$$= x = 10, \quad m\angle A = m\angle B = 45^\circ$$

$$\text{Base angles equal: } 4x+5=6x-15 \rightarrow 20=2x \rightarrow x=10.$$

3 Isosceles Trap. — Diagonals equal. Find x:

$$AC = 4x - 3, \quad BD = 2x + 9$$

$$= x = 6, \quad AC = BD = 21$$

$$\text{Diagonals equal: } 4x-3=2x+9 \rightarrow 2x=12 \rightarrow x=6.$$

4 Co-Interior Angles — Sum = 180° . Solve for x:

$$\angle A = (2x + 20)^\circ, \quad \angle D = (4x - 8)^\circ$$

$$= x = 28, \quad m\angle A = 76^\circ, \quad m\angle D = 104^\circ$$

$$\angle A + \angle D = 180^\circ: (2x+20) + (4x-8) = 180 \rightarrow 6x+12=180 \rightarrow x=28.$$

5 Midsegment Theorem — Find MN:

$$b_1 = 8, \quad b_2 = 14$$

$$= MN = 11$$

$$MN = (b_1+b_2)/2 = (8+14)/2 = 11.$$

6 Midsegment Theorem — Find b_2 :

$$MN = 10, \quad b_1 = 6$$

$$= b_2 = 14$$

$$10 = (6+b_2)/2 \rightarrow 20=6+b_2 \rightarrow b_2=14.$$

7 Midsegment — Solve for x and find MN:

$$MN = 2x + 5, \quad AB = 18, \quad CD = 3x - 1$$

$$= x = 7, \quad MN = 19$$

$$2x+5=(18+3x-1)/2=(3x+17)/2 \rightarrow 4x+10=3x+17 \rightarrow x=7.$$

8 Midsegment — Solve for x and find MN:

$$MN = x + 4, \quad b_1 = 3x - 2, \quad b_2 = x + 6$$

$$= x = 2, \quad MN = 6$$

$$x+4=(3x-2+x+6)/2=(4x+4)/2=2x+2 \rightarrow x=2. \quad MN=6.$$

Check: $(4+8)/2=6 \checkmark$

9 Co-Interior Angles — Find $m\angle C$:

$$m\angle B = 125^\circ$$

$$= m\angle C = 55^\circ$$

$$\angle B + \angle C = 180^\circ \text{ (co-interior)} \rightarrow \angle C = 180^\circ - 125^\circ = 55^\circ.$$

10 Isosceles Trap. — Find all four angles:

$$m\angle A = 68^\circ$$

$$= m\angle B = 68^\circ, \quad m\angle C = m\angle D = 112^\circ$$

$$\angle B = \angle A = 68^\circ \text{ (base angles equal)}. \quad \angle C = \angle D = 180^\circ - 68^\circ = 112^\circ$$

(co-interior).

11 Isosceles Trap. — Upper base angles equal. Find x:

$$\angle C = (3x + 8)^\circ, \quad \angle D = (5x - 12)^\circ$$

$$= x = 10, \quad m\angle C = m\angle D = 38^\circ$$

$$\text{Upper base angles equal: } 3x+8=5x-12 \rightarrow 20=2x \rightarrow x=10.$$

12 Midsegment — Solve for x and find MN:

$$MN = 2x + 3, \quad AB = 3x + 1, \quad CD = 9$$

$$= x = 4, \quad MN = 11$$

$$2x+3=(3x+1+9)/2=(3x+10)/2 \rightarrow 4x+6=3x+10 \rightarrow x=4. \quad MN=11.$$

Check: $(13+9)/2=11 \checkmark$

