

# Geometry: Parallelogram Properties

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## DIRECTIONS

Use the four properties of parallelograms to solve each problem. Show your equation setup and all work.

- 1 Opposite sides are equal. Find x:

$$\overline{AB} = x + 7, \quad \overline{CD} = 2x + 2$$

Answer: \_\_\_\_\_

- 2 In parallelogram PQRS,  $PQ = RS$ . Find x:

$$PQ = 4x + 2, \quad RS = 2x + 6$$

Answer: \_\_\_\_\_

- 3 Find the perimeter of the parallelogram:

$$AB = 14, \quad BC = 3$$

Answer: \_\_\_\_\_

- 4 Opposite angles of a parallelogram are equal. Find x:

$$\angle A = (2x + 8)^\circ, \quad \angle C = (x + 26)^\circ$$

Answer: \_\_\_\_\_

- 5 Find the opposite angle in the parallelogram:

$$\angle A = 115^\circ$$

Answer: \_\_\_\_\_

- 6 Opposite angles of a parallelogram are equal. Find x:

$$\angle A = (2x + 14)^\circ, \quad \angle C = (x + 32)^\circ$$

Answer: \_\_\_\_\_

- 7 Find the consecutive angle (supplementary) in the parallelogram:

$$\angle A = 75^\circ$$

Answer: \_\_\_\_\_

- 8 Consecutive angles are supplementary. Find x:

$$\angle A = (5x + 6)^\circ, \quad \angle B = (2x + 132)^\circ$$

Answer: \_\_\_\_\_

- 9 Find x and angle Q (consecutive angles are supplementary):

$$\angle P = (3x + 44)^\circ, \quad \angle Q = ?$$

Answer: \_\_\_\_\_

- 10 Diagonals bisect each other. Find x:

$$\overline{AO} = 4x + 3, \quad \overline{OC} = x + 24$$

Answer: \_\_\_\_\_

- 11 Diagonals bisect each other. Find x:

$$\overline{BO} = 3x + 7, \quad \overline{OD} = x + 19$$

Answer: \_\_\_\_\_

- 12 The diagonals of a parallelogram bisect each other. Find AC:

$$\overline{AO} = 12$$

Answer: \_\_\_\_\_



# Answer Key & Solutions

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## TEACHER NOTES

1) Opposite sides equal:  $AB=CD$ ,  $BC=AD$ . 2) Opposite angles equal: angle A = angle C, angle B = angle D. 3) Consecutive angles supplementary: angle A + angle B = 180. 4) Diagonals bisect each other:  $AO = OC$ ,  $BO = OD$ .

1) Opposite sides are equal. Find x:

$$\overline{AB} = x + 7, \quad \overline{CD} = 2x + 2$$

$$= x = 5$$

Set  $x+7 = 2x+2$ , solve for  $x = 5$ .

2) In parallelogram PQRS,  $PQ = RS$ . Find x:

$$PQ = 4x + 2, \quad RS = 2x + 6$$

$$= x = 2$$

Opposite sides are equal:  $4x+2 = 2x+6$ ,  $x = 2$ .

3) Find the perimeter of the parallelogram:

$$AB = 14, \quad BC = 3$$

$$= P = 34$$

$P = 2(AB+BC) = 2(14+3) = 2(17) = 34$ .

4) Opposite angles of a parallelogram are equal. Find x:

$$\angle A = (2x + 8)^\circ, \quad \angle C = (x + 26)^\circ$$

$$= x = 18$$

Set  $2x+8 = x+26$ , solve:  $x = 18$ .

5) Find the opposite angle in the parallelogram:

$$\angle A = 115^\circ$$

$$= \angle C = 115^\circ$$

Opposite angles are equal: angle C = angle A = 115 degrees.

6) Opposite angles of a parallelogram are equal. Find x:

$$\angle A = (2x + 14)^\circ, \quad \angle C = (x + 32)^\circ$$

$$= x = 18$$

Set  $2x+14 = x+32$ , solve:  $x = 18$ .

7) Find the consecutive angle (supplementary) in the parallelogram:

$$\angle A = 75^\circ$$

$$= \angle B = 105^\circ$$

Consecutive angles sum to 180: angle B =  $180 - 75 = 105$  degrees.

8) Consecutive angles are supplementary. Find x:

$$\angle A = (5x + 6)^\circ, \quad \angle B = (2x + 132)^\circ$$

$$= x = 6$$

Set  $(5x+6)+(2x+132) = 180$ , solve:  $x = 6$ .

9) Find x and angle Q (consecutive angles are supplementary):

$$\angle P = (3x + 44)^\circ, \quad \angle Q = ?$$

$$= x = 7, \quad \angle Q = 115^\circ$$

$3x+44 = 65 \rightarrow x = 7$ .  $Q = 180 - 65 = 115$  degrees.

10) Diagonals bisect each other. Find x:

$$\overline{AO} = 4x + 3, \quad \overline{OC} = x + 24$$

$$= x = 7$$

$AO = OC$  (diagonals bisect):  $4x+3 = x+24$ ,  $x = 7$ .



**11** Diagonals bisect each other. Find x:

$$\overline{BO} = 3x + 7, \quad \overline{OD} = x + 19$$

$$= \quad x = 6$$

$$BO = OD: 3x+7 = x+19, x = 6.$$

**12** The diagonals of a parallelogram bisect each other.  
Find AC:

$$\overline{AO} = 12$$

$$= \quad \overline{AC} = 24$$

$$AC = 2 \times AO = 2 \times 12 = 24 \text{ (O is the midpoint).}$$

