Geometry: Conditions for a Parallelogram

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DIRECTIONS *Use the 6 conditions of a parallelogram to solve for x and find missing measures. Show all work.*

1 Opposite Sides (C2) — Solve for x:

$AB = 3x + 5, \quad CD = 5x - 7$

Answer: _____

2 Opposite Angles (C3) — Solve for x:

$\angle A = (4x + 10)^\circ, \quad \angle C = (6x - 8)^\circ$

Answer: _____

3 Consecutive Angles (C6) — Find m∠B:

$m\angle A = 112^\circ$

Answer: _____

4 Diagonals Bisect (C4) — Solve for x:

$AE = 2x + 3, \quad CE = 5x - 9$

Answer: _____

5 Opposite Sides (C2) — Solve for x, find length:

$AD = 4x - 2, \quad BC = 2x + 8$

Answer: _____

6 Opposite Angles (C3) — Solve for x:

$\angle B = (3x + 20)^\circ, \quad \angle D = (5x - 12)^\circ$

Answer: _____

7 Consecutive Angles (C6) — Solve for x:

$\angle A = (2x + 40)^\circ, \quad \angle B = (3x - 10)^\circ$

Answer: _____

8 Diagonals Bisect (C4) — Solve for x:

$BE = 3x - 1, \quad DE = 4x - 7$

Answer: _____

9 Opposite Sides (C2) — Solve for x and y:

$AB = 6x - 2,\ CD = 4x + 6,\ AD = y + 12,\ BC = 3y - 4$

Answer: _____

10 Find m∠B, m∠C, and m∠D given m∠A:

$m\angle A = 70^\circ$

Answer: _____

11 Diagonals Bisect (C4) — Solve for x and y:

$AE = 3x + 5,\ CE = 5x - 3,\ BE = 2y + 7,\ DE = 4y - 5$

Answer: _____

12 Opposite Angles (C3) — Solve for x and find m∠A:

$\angle A = (5x - 15)^\circ, \quad \angle C = (3x + 9)^\circ$

Answer: _____

Answer Key & Solutions

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TEACHER NOTES *C2: Opp. sides equal. C3: Opp. angles equal. C4: Diagonals bisect each other. C6: Consecutive angles are supplementary (sum = 180°).*

1 Opposite Sides (C2) — Solve for x:

$AB = 3x + 5,\quad CD = 5x - 7$

= $x = 6$

Opposite sides are equal: 3x+5=5x–7 → 12=2x → x=6.

2 Opposite Angles (C3) — Solve for x:

$\angle A = (4x + 10)^\circ,\quad \angle C = (6x - 8)^\circ$

= $x = 9,\quad m\angle A = 46^\circ$

Opposite angles are equal: 4x+10=6x–8 → 18=2x → x=9.

3 Consecutive Angles (C6) — Find m∠B:

$m\angle A = 112^\circ$

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

Consecutive angles are supplementary: 180°–112°=68°.

4 Diagonals Bisect (C4) — Solve for x:

$AE = 2x + 3,\quad CE = 5x - 9$

= $x = 4,\quad AE = CE = 11$

Diagonals bisect → AE=CE: 2x+3=5x–9 → 12=3x → x=4.

5 Opposite Sides (C2) — Solve for x, find length:

$AD = 4x - 2,\quad BC = 2x + 8$

= $x = 5,\quad AD = BC = 18$

Opposite sides equal: 4x–2=2x+8 → 2x=10 → x=5. Length=4(5)–2=18.

6 Opposite Angles (C3) — Solve for x:

$\angle B = (3x + 20)^\circ,\quad \angle D = (5x - 12)^\circ$

= $x = 16,\quad m\angle B = 68^\circ$

Opposite angles equal: 3x+20=5x–12 → 32=2x → x=16.

7 Consecutive Angles (C6) — Solve for x:

$\angle A = (2x + 40)^\circ,\quad \angle B = (3x - 10)^\circ$

= $x = 30$

Consecutive angles sum to 180°: (2x+40)+(3x–10)=180 → 5x=150 → x=30.

8 Diagonals Bisect (C4) — Solve for x:

$BE = 3x - 1,\quad DE = 4x - 7$

= $x = 6,\quad BE = DE = 17$

Diagonals bisect → BE=DE: 3x–1=4x–7 → 6=x. BE=3(6)–1=17.

9 Opposite Sides (C2) — Solve for x and y:

$AB = 6x - 2,\ CD = 4x + 6,\ AD = y + 12,\ BC = 3y - 4$

= $x = 4,\quad y = 8$

AB=CD → 6x–2=4x+6 → x=4. AD=BC → y+12=3y–4 → y=8.

10 Find m∠B, m∠C, and m∠D given m∠A:

$m\angle A = 70^\circ$

= $m\angle B = 110^\circ,\ m\angle C = 70^\circ,\ m\angle D = 110^\circ$

∠C=∠A=70° (opposite). ∠B=∠D=180°–70°=110° (consecutive).

11 Diagonals Bisect (C4) — Solve for x and y:

$AE = 3x + 5,\ CE = 5x - 3,\ BE = 2y + 7,\ DE = 4y - 5$

= $x = 4,\quad y = 6$

AE=CE → 3x+5=5x–3 → x=4. BE=DE → 2y+7=4y–5 → y=6.

12 Opposite Angles (C3) — Solve for x and find m∠A:

$\angle A = (5x - 15)^\circ,\quad \angle C = (3x + 9)^\circ$

= $x = 12,\quad m\angle A = 45^\circ$

Opposite angles equal: 5x–15=3x+9 → 2x=24 → x=12. m∠A=5(12)–15=45°.