The definition of a parallelogram gives one way to prove that a quadrilateral is a parallelogram (show both pair of opposite sides are parallel). Complete the following theorems which provide four more ways.
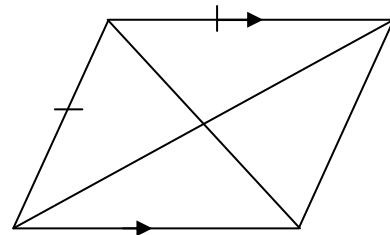
1) If both pairs of opposite sides of a quadrilateral are _____, then the quadrilateral is a parallelogram.

2) If one pairs of opposite sides of a quadrilateral are both _____ and _____, then the quadrilateral is a parallelogram.

3) If both pairs of opposite angles of a quadrilateral are _____, then the quadrilateral is a parallelogram.

4) If the _____ of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.

Decide whether each quadrilateral is a parallelogram. If the answer is yes, state the definition or theorem that applies.
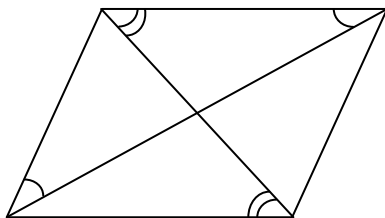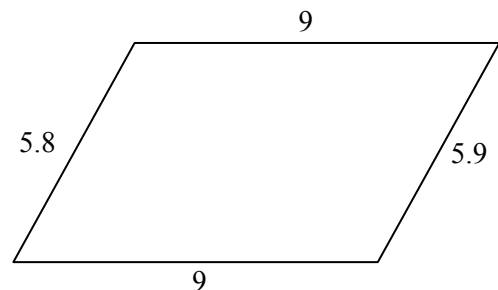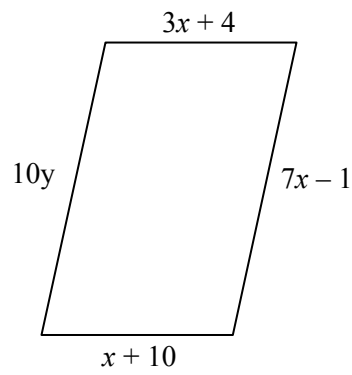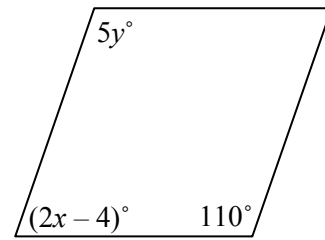
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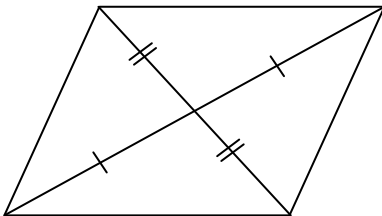
6)

7)

8)

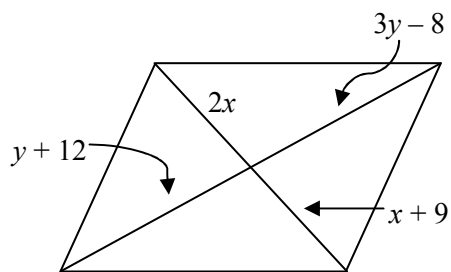**Find the values of x and y that make the quadrilateral a parallelogram.**

9)

$3x + 4$

$10y$

$7x - 1$

$x + 10$

10)

$5y°$

$(2x - 4)°$ $110°$

11)

$3y - 8$

$2x$

$y + 12$

$x + 9$

Answer Key

1) Congruent
2) Congruent and parallel
3) Congruent
4) Diagonals
5) Yes, diagonals bisect
6) No, could be trapezoid
7) Yes, both pairs of opposite sides are congruent (converse of alt. interior angle theorem)
8) No
9) $x = 3, y = 2$
10) $x = 37, y = 22$
11) $x = 9, y = 10$