

**LESSON 164** .....

1. A) Opposite sides are parallel.  
B) Opposite angles are congruent.  
C) Opposite sides are congruent.  
F) Diagonals bisect each other.  
H) One pair of sides is parallel and congruent.
2. Opposite angles are congruent, so  $x = 62$ .  
Consecutive angles are supplementary, so  $y = z = 118$ .
3. Opposite sides must be congruent.  
 $x + 2y = 26$  and  $x + y = 18$   
Subtract eq2 from eq1 to get  $y = 8$ .  
Plug  $y$  into eq2 to get  $x = 10$ .  
So,  $x = 10$  and  $y = 8$ .
4. Diagonals must bisect each other.  
 $x - 4y = 7$  and  $2x + y = 5$   
 $x = 4y + 7$  and  $2x + y = 5$   
 $2(4y + 7) + y = 5$   
 $y = -1$   
 $x = 4(-1) + 7 = 3$   
So,  $x = 3$  and  $y = -1$ .
5. In a parallelogram, opposite angles are congruent, and consecutive angles are supplementary.  
Let  $x$  and  $3x$  be the two angles.  
 $x + 3x = 180$ ;  $x = 45$   
So, the angles are  $45^\circ$ ,  $135^\circ$ ,  $45^\circ$ , and  $135^\circ$ .
6. Base  $\angle$ s of an isosceles  $\triangle$  are congruent, so  $m\angle 1 = 31^\circ$ .  
A triangle has  $180^\circ$ , so  $m\angle 2 = 180 - 31 - m\angle 1 = 118^\circ$ .  
Diagonals bisect opposite angles, so  $m\angle 3 = m\angle 1 = 31^\circ$ .  
Opposite angles are congruent, so  $m\angle 4 = m\angle 2 = 118^\circ$ .  
There are many ways to find these angle measures that are all correct. For example, you could say  $m\angle 1 = m\angle 3$  and  $m\angle 2 = m\angle 4$  because A diagonal divides a rhombus into two congruent isosceles triangles.
7. Diagonals are perpendicular, so  $m\angle 1 = 90^\circ$ .  
A triangle has  $180^\circ$ , so  $m\angle 2 = 180 - 57 - m\angle 1 = 33^\circ$ .  
Diagonals bisect opposite angles, so  $m\angle 3 = 57^\circ$ .  
Alt. interior  $\angle$ s are congruent, so  $m\angle 4 = m\angle 2 = 33^\circ$ .  
Alt. interior  $\angle$ s are congruent, so  $m\angle 5 = 57^\circ$ .
8. Diagonals are congruent and bisect each other.  
 $PR = QS = 2QX$   
 $5x - 11 = 2(x + 5)$ ;  $x = 7$   
 $PR = QS = 5(7) - 11 = 24$
9. The midsegment is half the sum of the bases.  
 $30 = (x + 36)/2$ ;  $x = 24$

10. Base angles are congruent, so  $x = 80$ .  
Non-base angles are supplementary, so  $y = 100$ .  
Base angles are congruent, so  $z = y = 100$ .
11. C; Diagonals are not necessarily perpendicular.
12. Non-vertex angles are congruent, so  $m\angle 1 = m\angle 2$ .  
Angles in a quadrilateral add up to  $360^\circ$ .  
 $m\angle 1 + m\angle 2 + 57 + 85 = 360$   
 $m\angle 1 + m\angle 1 + 57 + 85 = 360$   
 $m\angle 1 = m\angle 2 = 109^\circ$
13. Diagonals are perpendicular, so  $m\angle 1 = 90^\circ$ .  
A triangle has  $180^\circ$ , so  $m\angle 2 = 180 - 50 - m\angle 1 = 40^\circ$ .  
Vertex angles are bisected by a diagonal, so  $m\angle 3 = 50^\circ$ .
14. parallelogram, rhombus, rectangle, square
15. D; A quadrilateral with congruent opposite sides is a parallelogram. A parallelogram with perpendicular diagonals is a rhombus.
16. 2. Angles in a quadrilateral add up to  $360^\circ$ .  
3. Distributive Property  
4. Division Property  
5. Definition of supplementary angles  
6. If consecutive interior angles are supplementary, then lines are parallel.  
7. Definition of parallelogram
17. Both pairs of opposite sides are parallel.  
Both pairs of opposite sides are congruent.  
One pair of opposite sides is parallel and congruent.