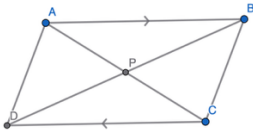


Check Your Understanding 5.3

Name: _____ Period: _____ Date: _____

Show all work. Write CPCTC in full before using it. For proofs: flowchart or paragraph form only.

Basic	Intermediate	Advanced
Row 1 Spiral — Classification and Definitions → Organizing the family		
Basic — Spiral (final appearance) 1. A shape has 4 equal sides. Name every type of shape that meets this description.	Intermediate — Spiral 2. A student draws a quadrilateral with two pairs of congruent consecutive sides and claims it must be a kite. (a) Is the student correct? What additional information would confirm this? (b) Could the shape be a rhombus instead? Explain what distinguishes a kite from a rhombus using the definitions.	Advanced — Spiral 3. Write a careful argument explaining why proving the rectangle diagonal theorem is sufficient to also prove the square diagonal theorem — without any additional work. Use conditional logic and subset notation.
Row 2 Spiral — Parallelogram Properties → Proving the engine		
Basic — Spiral 4. In parallelogram JKLM, $\angle J = (5x - 8)^\circ$ and $\angle L = (3x + 12)^\circ$. Find x and all four angles. 	Intermediate — Spiral 5. In parallelogram ABCD, the diagonals intersect at P. $AP = (2x + 5)$, $CP = (4x - 3)$, and $BP = (y + 8)$. Find x and then find the full length of diagonal AC. 	Advanced — Spiral 6. In parallelogram ABCD, diagonal AC is drawn. Explain why $\triangle ABC \cong \triangle CDA$ and name every pair of equal parts that follows from this congruence. How many of the four parallelogram properties can be extracted from this single pair of congruent triangles?

Basic	Intermediate	Advanced
Special Parallelograms → Adding constraints, inheriting results		
<i>Basic</i> 7. The diagonals of a parallelogram are equal. What type must it be? 8. The diagonals of a parallelogram are perpendicular. What type must it be? 9. In rectangle ABCD, diagonal $AC = 3x + 4$ and diagonal $BD = 5x - 8$. Find x and each diagonal. 10. In rhombus PQRS, one diagonal has length 16 and the other 12. Find each side.	<i>Intermediate</i> 11. In rhombus ABCD, $\angle ABC = 64^\circ$. Find all four angles and the four angles at the diagonal intersection. 12. A quadrilateral has vertices $W(0, 0)$, $X(4, 0)$, $Y(4, 3)$, $Z(0, 3)$. Use slope and distance to determine which type of special parallelogram it is. 13. A quadrilateral has vertices $A(0, 2)$, $B(3, 0)$, $C(6, 2)$, $D(3, 4)$. Use slope to show the diagonals are perpendicular. What type could this be?	<i>Advanced</i> 14. Prove the rectangle diagonal theorem: if a parallelogram is a rectangle, then its diagonals are congruent. Write a complete proof citing every reason. 15. A student claims: 'I proved rectangles have equal diagonals. Since squares are rectangles, squares also have equal diagonals — no separate proof needed.' Explain carefully why this is correct, using conditional logic and subset relationships.
Algebra Spiral Solve equations	<i>Algebra Spiral</i> Solve each equation. Show all steps. (a) $6x - 3 = 2x + 13$ (b) $4(3y + 2) = 7y - 6$ (c) $(5/6)m - 4 = (1/3)m + 2$	

Answers — CYU 5.3**Row 1 Spiral**

1. Square and rhombus.

2a. Not necessarily — needs to be two pairs of consecutive sides (not opposite). Also needs to not have all four sides equal, or it would be a rhombus.

2b. A rhombus has all four sides equal (two pairs of consecutive AND opposite). A kite has only two pairs of consecutive equal sides, and the pairs are adjacent, not all four equal.

3. Square $\subset$ rectangle. The theorem: if ABCD is a rectangle, then its diagonals are equal. Since every square is a rectangle, applying this to a square is valid by the law of syllogism. No new proof is needed.

Row 2 Spiral

4. Opposite angles equal: $5x - 8 = 3x + 12 \rightarrow x = 10$. $\angle J = \angle L = 42^\circ$. $\angle K = \angle M = 138^\circ$.

5. $AP = CP \rightarrow 2x + 5 = 4x - 3 \rightarrow x = 4$. $AP = CP = 13$. $AC = 26$.

6. Alternate interior angles (both pairs of parallel sides) + reflexive $\rightarrow$ ASA $\rightarrow \triangle ABC \cong \triangle CDA$. Equal parts: $AB = CD$, $BC = AD$ (opposite sides), $\angle ABC = \angle CDA$ (opposite angles), plus the two pairs of alternate interior angles. Three of the four properties follow from one diagonal.

Special Parallelograms

7. Rectangle (or square).

8. Rhombus (or square).

9. $x = 6$. Each diagonal = 22.

10. Half-diagonals = 8 and 6. Side = $\sqrt{64 + 36} = 10$.

11. $\angle ABC = 64^\circ \rightarrow \angle ADC = 64^\circ$. $\angle BAD = \angle BCD = 116^\circ$. Diagonals bisect vertex angles: $\angle ABE = \angle CBE = 32^\circ$. Intersection angles all 90° .

12. All angles 90° (horizontal and vertical sides), sides unequal ($4 \neq 3$). Rectangle.

13. Diagonal AC slope = 0 (horizontal). Diagonal BD slope = undefined (vertical). Perpendicular diagonals $\rightarrow$ rhombus (verify parallelogram first).

14. $\triangle ABC \cong \triangle BAD$ (SAS: AB shared, $\angle ABC = \angle BAD = 90^\circ$, $BC = AD$ parallelogram). $AC = BD$ (CPCTC). ■

15. Square $\subset$ rectangle. Theorem: if rectangle then equal diagonals. Every square is a rectangle, so by law of syllogism: if square then equal diagonals. The subset relationship makes the proof redundant.

Algebra Spiral

(a) $x = 4$

(b) $y = -2$

(c) $m = 24$