**Sec 2.8 Geometry – Polygons & Quadrilaterals**

**Polygon:** A closed plane figure formed by three or more segments such that each segment intersects or connects end to end to form a closed shape.

**Simple Polygon:** A polygon in which sides only share each endpoint with one other side.

**Regular Polygon:** A polygon that is both equilateral and equiangular

Determine whether each figure below is a polygon or not a polygon.

1. [Image of a polygon]
2. [Image of a figure that is not a polygon]
3. [Image of a polygon]
4. [Image of a figure that is not a polygon]
5. [Image of a figure that is not a polygon]
6. [Image of a polygon]

Circle one of the following:
- It is a Polygon
- Not a Polygon

Name if Polygon:

**Concave Polygon:** A polygon in which a diagonal can be drawn such that part of one of the diagonals contains point in the exterior of the polygon.

**Convex Polygon:** A polygon in which no diagonal contains points in the exterior of the polygon.

Determine whether each figure below is a Convex or Concave.

7. [Image of a polygon with diagonals drawn]
8. [Image of a figure with points outside]
9. [Image of a figure with points outside]

Circle one of the following:
- CONVEX
- CONCAVE
**Quadrilateral:** A four-sided polygon.

**Parallelogram:** A quadrilateral with two pairs of parallel sides.

**Trapezoid:** A quadrilateral with exactly one pair of parallel sides.

**Rectangle:** A quadrilateral with four right angles.

**Rhombus:** A quadrilateral with four congruent sides.

**Square:** A quadrilateral with four congruent sides and four right angles.

**Kite:** A quadrilateral with exactly two pairs of congruent consecutive sides but opposite sides are not congruent.

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### The Hierarchy of Quadrilaterals

- **Convex Quadrilateral**
  - Parallelograms
  - Rhombi
  - Squares
  - Rectangles

- **Trapezoids**

- **Concave Quadrilateral**
  - Kites

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Answer each of the following with **ALWAYS**, **SOMETIMES**, or **NEVER**

10. A square is a rhombus.  **ALWAYS**
11. A rhombus is a square.  **SOMETIMES**
12. A trapezoid is a parallelogram.  **NEVER**
13. A rectangle is a rhombus.  **SOMETIMES**
14. A kite is a concave quadrilateral.  **SOMETIMES**
15. A parallelogram is a rectangle.  **SOMETIMES**
16. A rhombus is a trapezoid.  **NEVER**
17. A convex quadrilateral is a trapezoid.  **SOMETIMES**
18. A rectangle is a parallelogram.  **ALWAYS**
Using your knowledge of congruent triangles and parallel lines, determine the highest level and most appropriate definition of a quadrilateral for each ABCD quadrilateral below. Each definition in the word wall should be used exactly once. Briefly explain why for each quadrilateral.

1. **Trapezoid**: B/C AIA theorem tells us we have one set of opposite sides parallel and one that is not.

2. **Rhombus**: Using ASA we know that \( \triangle ABD \cong \triangle CDB \) and using CPCTC we know \( AB = CD = AD = CB \).

3. **Concave Quadrilateral**.

4. Both dashed figures can be assumed to be circles.

5. \( \triangle ABD \) and \( \triangle CBD \) are complimentary.

6. **Kite**: Assuming the circles have a different size radius, we would know we have 2 sets of consecutive sides that are congruent.

7. **Square**: By AAS, \( \triangle ABD \cong \triangle CDB \) by CPCTC. \( AB = CD = BC = DA \).

8. **Rectangle**: By consecutive int angles we know \( \angle ABD \) and \( \angle ADC \) are rt. We know \( \angle ABC \) and \( \angle ADC \) is rt.

9. **Parallelogram**: By the converse of alternate interior angles thm we know \( AB \parallel CD \) and \( BC \parallel AD \).