

# Classifying Polygons

Geometry Worksheet · Grade 6–8

Name: \_\_\_\_\_

Date: \_\_\_\_\_

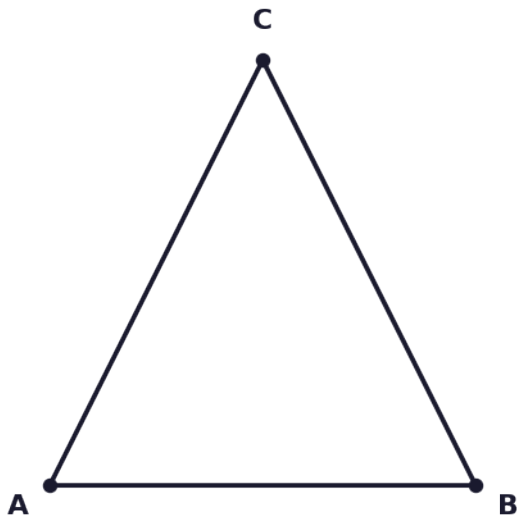
## Learning Objectives

- Identify whether a figure satisfies the three conditions to be classified as a polygon
- Name polygons correctly by listing vertices consecutively in order
- Classify polygons by their number of sides and recognize common polygon types

## Problems

1. Which of the following is the correct definition of a polygon? Choose the best answer: (A) Any closed figure with curved or straight sides, (B) A plane figure formed by three or more line segments where each side intersects exactly two other sides only at their endpoints, (C) Any figure with four or more corners, (D) A figure made of parallel lines.

2. Look at the triangle shown below with vertices labeled A, B, and C. Is this figure a polygon? State YES or NO and identify how many sides it has.

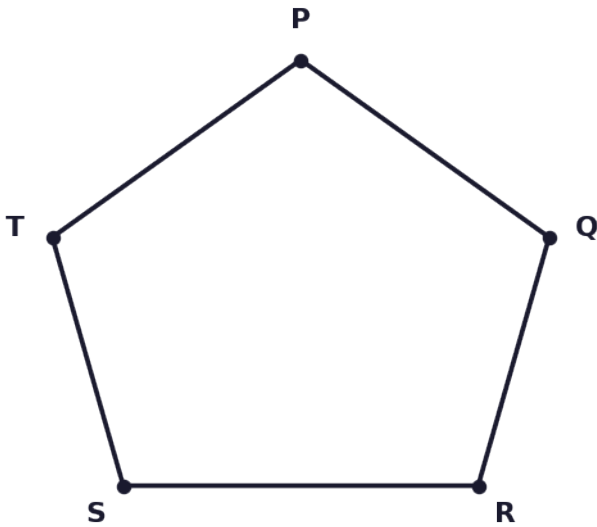


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3. A circle is drawn on paper. Explain why a circle is NOT a polygon. Reference the conditions a polygon must meet in your explanation.

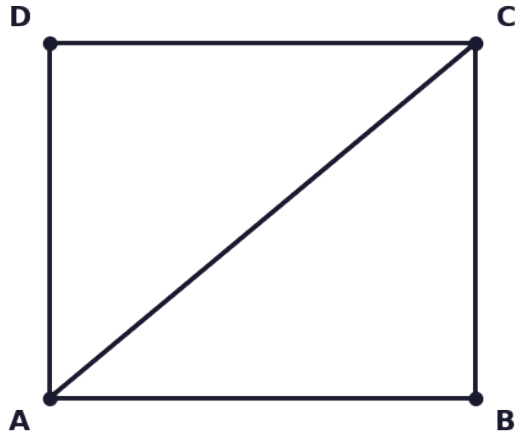
4. The five-sided polygon below has vertices labeled P, Q, R, S, and T going around in order. Write two valid names and one invalid name for this polygon, and explain why the invalid name does not work.



5. Look at the figure below. A diagonal line segment has been drawn inside a quadrilateral connecting two non-adjacent vertices. Does this figure still qualify as a polygon? Explain using the conditions for polygons.

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6. Match each polygon to its correct name based on the number of sides. Fill in the table below.

Number of Sides	Polygon Name
3	
4	
5	
6	
8	
10	

7. A figure has vertices W, X, Y, Z, and V labeled in order around a closed shape with all straight sides and no sides crossing each other. List ALL possible valid names for this polygon.

8. Examine the four figures described below. Identify each as a polygon or not a polygon, and give a reason for each. Figure 1: A closed shape made of 6 straight sides with no sides crossing. Figure 2: An open



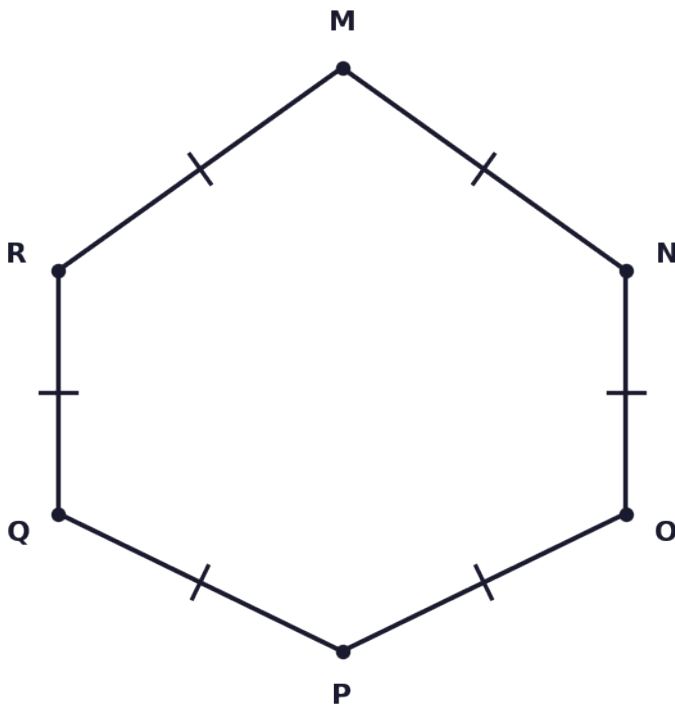
shape made of 4 straight line segments that do not connect at all endpoints. Figure 3: A shape that looks like a star where some sides cross over each other. Figure 4: A closed shape with 5 straight sides where no sides cross.

**9.** Polygon ABCDEFG is a heptagon (7-sided polygon). Vertex A is connected in order to B, C, D, E, F, and G, then back to A. How many sides does this polygon have? How many vertices does it have? How many diagonals can be drawn from vertex A alone (connecting A to non-adjacent vertices)?

Number of diagonals from one vertex =  $n - 3$

**10.** Polygon MNOPQR is a regular hexagon (all sides equal, all angles equal). Each interior angle of a regular hexagon measures 120 degrees. The total sum of interior angles of any hexagon is given by the formula  $(n - 2) \times 180$ , where  $n$  is the number of sides. Use this formula to verify that the sum of interior angles equals 720 degrees, then confirm that each individual angle in the regular hexagon is 120 degrees.

**Regular Hexagon MNOPQR**



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# Classifying Polygons — Answer Key

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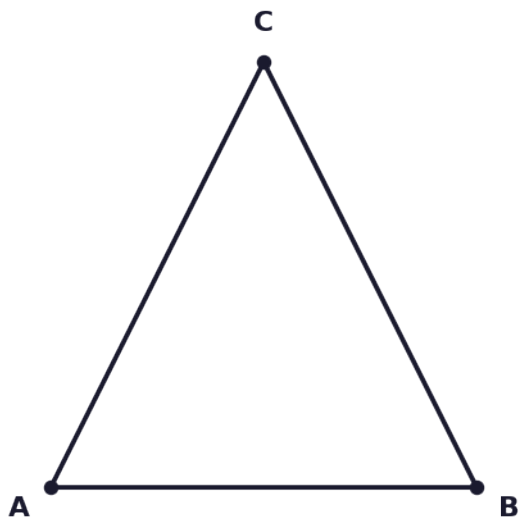
## Answer Key

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### 1. Answer: B

- A polygon must be a plane figure formed by three or more line segments called sides.
  - Sides that share a common endpoint must be non-collinear.
  - Each side must intersect exactly two other sides, and only at their endpoints.
  - Answer B is the only choice that correctly captures all three conditions.
- 

### 2. Answer: Yes, it is a polygon with 3 sides



- The figure is made entirely of straight line segments (no curves).
  - It has 3 sides: AB, BC, and CA.
  - Each side intersects exactly two other sides only at the endpoints.
  - All three conditions for a polygon are satisfied, so YES it is a polygon with 3 sides.
- 

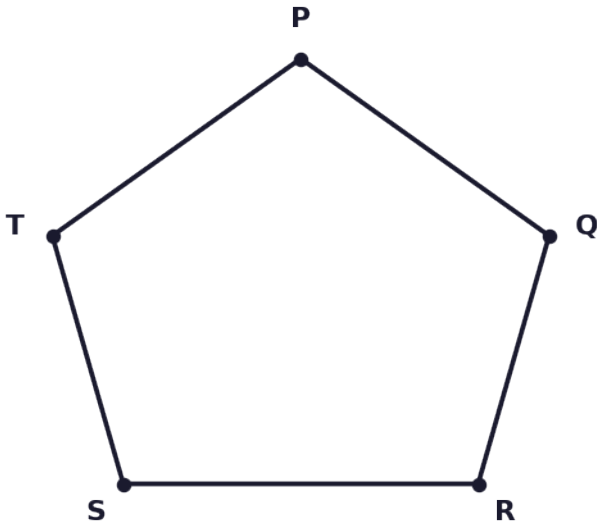
### 3. Answer: A circle is not a polygon because it has no straight line segments; it is entirely curved, violating the condition that a polygon must be formed by line segments.

- Condition 1 states a polygon must be formed by three or more line segments (straight sides).
  - A circle has no straight sides at all — it is one continuous curve.
  - Because it fails Condition 1, a circle cannot be classified as a polygon.
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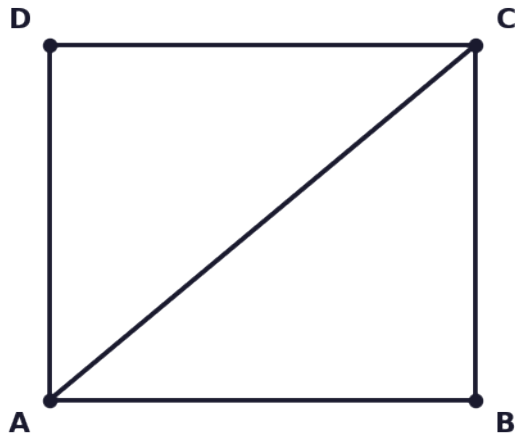
4. Answer: Valid: PQRST and PTSRQ. Invalid example: PRQTS (vertices not listed consecutively).



- Polygons are named by listing vertices consecutively (in order, either clockwise or counterclockwise).
- PQRST lists vertices in order going one direction — VALID.
- PTSRQ lists vertices in reverse order — also VALID.
- PRQTS skips around randomly and does not follow consecutive order — INVALID.

5. Answer: No. The interior diagonal causes one side to intersect more than two other sides, violating Condition 3.





- Condition 3 states each side must intersect exactly two other sides, only at their endpoints.
- The diagonal drawn inside the figure intersects sides at interior points, not just at endpoints.
- This also means you can form two separate polygons from the figure.
- Therefore, the figure with the interior diagonal does NOT qualify as a single polygon.

**6. Answer: See completed table**

Number of Sides	Polygon Name
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
8	Octagon
10	Decagon

- 3 sides → Triangle
- 4 sides → Quadrilateral
- 5 sides → Pentagon
- 6 sides → Hexagon
- 8 sides → Octagon
- 10 sides → Decagon

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**7. Answer: WXYZY — invalid; valid names include: WXYZV, WVZYX, XZYXW, XWVZY, YZVWX, YXWVZ, ZVWXY, ZYXWV, VWXYZ, VZYXW (any consecutive ordering starting from any vertex, clockwise or counterclockwise)**

- A polygon with 5 vertices can be named starting at any of the 5 vertices.
- From each starting vertex you can go clockwise or counterclockwise — giving 2 directions.
- Total valid names = 5 vertices × 2 directions = 10 valid names.
- Examples: WXYZV, WVZYX, XZYXW, XWVZY, YZVWX, YXWVZ, ZVWXY, ZYXWV, VWXYZ, VZYXW.

**8. Answer: Figure 1: Polygon (hexagon). Figure 2: Not a polygon (open figure, sides do not form a closed shape). Figure 3: Not a polygon (sides intersect at non-endpoint locations). Figure 4: Polygon (pentagon).**

- Figure 1: Closed, 6 straight sides, no crossings → satisfies all 3 conditions → POLYGON (hexagon).
- Figure 2: Not closed → fails Condition 1 (sides must form a closed plane figure) → NOT a polygon.
- Figure 3: Sides cross at non-endpoint interior points → fails Condition 3 → NOT a polygon.
- Figure 4: Closed, 5 straight sides, no crossings → satisfies all 3 conditions → POLYGON (pentagon).

**9. Answer: 7 sides, 7 vertices, 4 diagonals from vertex A**

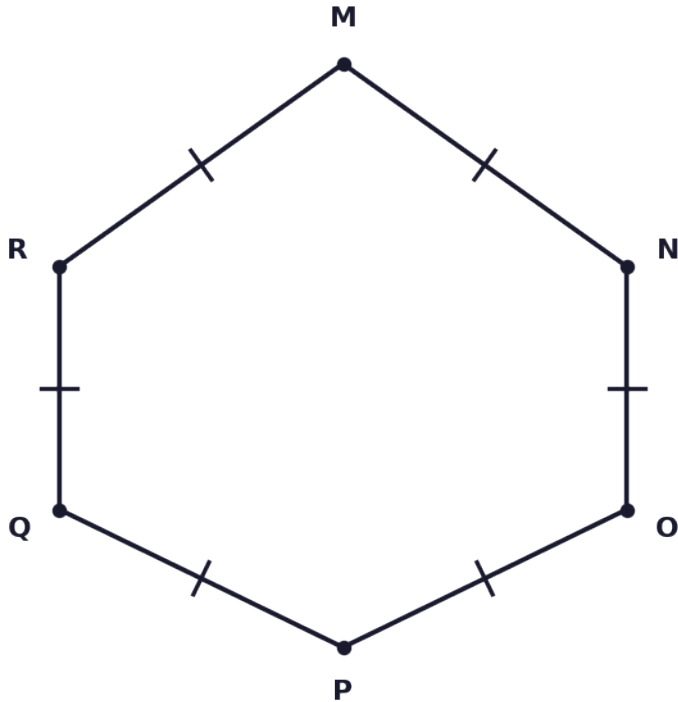
- A heptagon has 7 sides and 7 vertices by definition.
- From vertex A, you cannot draw a diagonal to itself (A), or to its two adjacent vertices (B and G).
- That leaves  $7 - 3 = 4$  non-adjacent vertices: C, D, E, and F.
- Therefore, 4 diagonals can be drawn from vertex A.

**10. Answer: Sum = 720 degrees; each angle = 120 degrees**

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**Regular Hexagon MNOPQR**



- A hexagon has  $n = 6$  sides.
- Apply the formula:  $S = (6 - 2) \times 180^\circ = 4 \times 180^\circ = 720^\circ$ .
- The sum of all interior angles is  $720^\circ$ .
- Since the hexagon is regular, all 6 angles are equal: each angle =  $720^\circ \div 6 = 120^\circ$ .
- This confirms each interior angle of a regular hexagon measures  $120^\circ$ .

