

# Interior Angles of Polygons

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Q Quick Review

For any polygon with  $n$  sides, the **interior angles add up to**  $(n - 2) \times 180^\circ$ . The idea: you can split the polygon into  $(n - 2)$  triangles, and each triangle contributes  $180^\circ$ . If the polygon is **regular** (all sides and angles equal), each interior angle is the total divided by  $n$ :  $\frac{(n-2) \times 180^\circ}{n}$ . The **exterior angles** of any polygon always add to  $360^\circ$ , so each exterior angle of a regular polygon is  $\frac{360^\circ}{n}$ .

◇ **Example:** Find the sum of the interior angles of a hexagon (6 sides).  
 ⇒ The formula for the sum of interior angles is  $(n - 2) \times 180^\circ$ . A hexagon has  $n = 6$  sides, so first compute  $n - 2 = 6 - 2 = 4$ . That tells us the hexagon splits into 4 triangles. Now multiply by  $180^\circ$ :  $4 \times 180^\circ = 720^\circ$ . So all six interior angles together measure  $720^\circ$ .

**Answer:**  $720^\circ$

## PRACTICE

Find the requested angle sum or angle measure.

- |   |       |  |       |
|---|-------|--|-------|
| 1. Interior angle sum: triangle           | _____ | 12. Each interior angle: regular hexagon                                     | _____ |
| 2. Interior angle sum: quadrilateral      | _____ | 13. Each interior angle: regular octagon                                     | _____ |
| 3. Interior angle sum: pentagon           | _____ | 14. Each interior angle: regular 12-gon                                      | _____ |
| 4. Interior angle sum: hexagon            | _____ | 15. Each interior angle: regular nonagon                                     | _____ |
| 5. Interior angle sum: heptagon (7 sides) | _____ | 16. Each exterior angle: regular hexagon                                     | _____ |
| 6. Interior angle sum: octagon            | _____ | 17. Each exterior angle: regular octagon                                     | _____ |
| 7. Interior angle sum: nonagon (9 sides)  | _____ | 18. Each exterior angle: regular decagon                                     | _____ |
| 8. Interior angle sum: decagon (10 sides) | _____ | 19. Quadrilateral with angles $90^\circ, 100^\circ, 80^\circ, ?$             | _____ |
| 9. Interior angle sum: 12-gon             | _____ | 20. Pentagon with four angles $100^\circ, 110^\circ, 120^\circ, 90^\circ, ?$ | _____ |
| 10. Interior angle sum: 15-gon            | _____ |  |       |
| 11. Each interior angle: regular pentagon | _____ |  |       |

## ◆ Word Problems

21. A stop sign is a regular octagon. What is the measure of each of its interior angles? \_\_\_\_\_
22. A floor tile is a regular hexagon. Three hexagonal tiles meet at a point. Show that they fit perfectly with no gap. \_\_\_\_\_
23. A quadrilateral window has angles of  $85^\circ, 95^\circ, \text{ and } 100^\circ$ . What is the measure of its fourth angle? \_\_\_\_\_
24. A regular polygon has each interior angle equal to  $150^\circ$ . How many sides does it have? \_\_\_\_\_



## Answer Keys

- |                  |   |
|------------------|---|
| 1. $180^\circ$   | 13. $135^\circ$                           |
| 2. $360^\circ$   | 14. $150^\circ$                           |
| 3. $540^\circ$   | 15. $140^\circ$                           |
| 4. $720^\circ$   | 16. $60^\circ$                            |
| 5. $900^\circ$   | 17. $45^\circ$                            |
| 6. $1080^\circ$  | 18. $36^\circ$                            |
| 7. $1260^\circ$  | 19. $90^\circ$                            |
| 8. $1440^\circ$  | 20. $120^\circ$                           |
| 9. $1800^\circ$  | 21. $135^\circ$                           |
| 10. $2340^\circ$ | 22. Yes; $3 \times 120^\circ = 360^\circ$ |
| 11. $108^\circ$  | 23. $80^\circ$                            |
| 12. $120^\circ$  | 24. 12 sides                              |

### Step-by-Step Explanations

- |  |  |
|--|--|
| 1. $(3 - 2) \times 180 = 180^\circ$ .    | 15. $1260 \div 9 = 140^\circ$ .  |
| 2. $(4 - 2) \times 180 = 360^\circ$ .    | 16. $360 \div 6 = 60^\circ$ .  |
| 3. $(5 - 2) \times 180 = 540^\circ$ .    | 17. $360 \div 8 = 45^\circ$ .  |
| 4. $(6 - 2) \times 180 = 720^\circ$ .    | 18. $360 \div 10 = 36^\circ$ .   |
| 5. $(7 - 2) \times 180 = 900^\circ$ .    | 19. The sum is $360^\circ$ : $360 - 90 - 100 - 80 = 90^\circ$ .  |
| 6. $(8 - 2) \times 180 = 1080^\circ$ .   | 20. The sum is $540^\circ$ : $540 - 100 - 110 - 120 - 90 = 120^\circ$ .  |
| 7. $(9 - 2) \times 180 = 1260^\circ$ .   | 21. The interior angle sum of an octagon is $(8 - 2) \times 180 = 1080^\circ$ . Divided equally among 8 angles, each is $1080 \div 8 = 135^\circ$ .                      |
| 8. $(10 - 2) \times 180 = 1440^\circ$ .  | 22. Each interior angle of a regular hexagon is $720 \div 6 = 120^\circ$ . Three of them give $3 \times 120 = 360^\circ$ , exactly a full turn, so they fit with no gap. |
| 9. $(12 - 2) \times 180 = 1800^\circ$ .  | 23. A quadrilateral's interior angles sum to $360^\circ$ , so the fourth angle is $360 - 85 - 95 - 100 = 80^\circ$ .   |
| 10. $(15 - 2) \times 180 = 2340^\circ$ . | 24. Each exterior angle is $180 - 150 = 30^\circ$ . Since exterior angles total $360^\circ$ , the number of sides is $360 \div 30 = 12$ .                                |
| 11. $540 \div 5 = 108^\circ$ .           |  |
| 12. $720 \div 6 = 120^\circ$ .           |  |
| 13. $1080 \div 8 = 135^\circ$ .          |  |
| 14. $1800 \div 12 = 150^\circ$ .         |  |



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