Interior Angles of Polygons

Name: _____	Date: _____	Score: _____ / 24

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°. 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°, 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°: $4\times 180^\circ = 720^\circ$. So all six interior angles together measure 720°.

Answer: 720°

PRACTICE

Find the requested angle sum or angle measure.

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

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°, 95°, and 100°. What is the measure of its fourth angle? _____
24. A regular polygon has each interior angle equal to 150°. How many sides does it have? _____

Answer Keys

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

Step-by-Step Explanations

1. $(3-2) \times 180 = 180^\circ$.
2. $(4-2) \times 180 = 360^\circ$.
3. $(5-2) \times 180 = 540^\circ$.
4. $(6-2) \times 180 = 720^\circ$.
5. $(7-2) \times 180 = 900^\circ$.
6. $(8-2) \times 180 = 1080^\circ$.
7. $(9-2) \times 180 = 1260^\circ$.
8. $(10-2) \times 180 = 1440^\circ$.
9. $(12-2) \times 180 = 1800^\circ$.
10. $(15-2) \times 180 = 2340^\circ$.
11. $540 \div 5 = 108^\circ$.
12. $720 \div 6 = 120^\circ$.
13. $1080 \div 8 = 135^\circ$.
14. $1800 \div 12 = 150^\circ$.
15. $1260 \div 9 = 140^\circ$.
16. $360 \div 6 = 60^\circ$.
17. $360 \div 8 = 45^\circ$.
18. $360 \div 10 = 36^\circ$.
19. The sum is 360°: $360 - 90 - 100 - 80 = 90^\circ$.
20. The sum is 540°: $540 - 100 - 110 - 120 - 90 = 120^\circ$.
21. The interior angle sum of an octagon is $(8-2) \times 180 = 1080^\circ$. Divided equally among 8 angles, each is $1080 \div 8 = 135^\circ$.
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.
23. A quadrilateral's interior angles sum to 360°, so the fourth angle is $360 - 85 - 95 - 100 = 80^\circ$.
24. Each exterior angle is $180 - 150 = 30^\circ$. Since exterior angles total 360°, the number of sides is $360 \div 30 = 12$.

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