

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° . 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 | _____ | 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° . How many sides does it have? _____



Answer Keys

- | | |
|------------------|---|
| 1. 180° | 13. 135° |
| 2. 360° | 14. 150° |
| 3. 540° | 15. 140° |
| 4. 720° | 16. 60° |
| 5. 900° | 17. 45° |
| 6. 1080° | 18. 36° |
| 7. 1260° | 19. 90° |
| 8. 1440° | 20. 120° |
| 9. 1800° | 21. 135° |
| 10. 2340° | 22. Yes; $3 \times 120^\circ = 360^\circ$ |
| 11. 108° | 23. 80° |
| 12. 120° | 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° : $360 - 90 - 100 - 80 = 90^\circ$. |
| 6. $(8 - 2) \times 180 = 1080^\circ$. | 20. The sum is 540° : $540 - 100 - 110 - 120 - 90 = 120^\circ$. |
| 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° , 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° , 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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