

Polygons

Name: _____ Date: _____ Score: _____ / 24

Quick Review and Helpful Hints

A polygon is a closed figure made of straight sides. The interior angles of a polygon with n sides add up to $(n - 2) \times 180^\circ$. In a *regular* polygon all sides and angles are equal, so each interior angle is $\frac{(n - 2) \times 180^\circ}{n}$. The perimeter is the sum of all the side lengths.

► **Example:** Find the sum of the interior angles of a hexagon (6 sides). **Work:** Use $(n - 2) \times 180^\circ$ with $n = 6$: $(6 - 2) \times 180 = 4 \times 180$.

★ **Answer:** 720°



Hexagon ($n = 6$): angle sum = 720° .

Practice Problems

Use the polygon shown to find the requested angle measure or perimeter.

1. Triangle: find the sum of the interior angles.



8. Decagon: find the sum of the interior angles.



2. Quadrilateral: find the sum of the interior angles.



9. Equilateral triangle: find each interior angle.



3. Pentagon: find the sum of the interior angles.



10. Regular pentagon with side 7: find the perimeter.



4. Octagon: find the sum of the interior angles.



11. Regular hexagon with side 5: find the perimeter.



5. Regular pentagon: find each interior angle.



12. Regular octagon: find each interior angle.



6. Regular hexagon: find each interior angle.



13. Heptagon: find the sum of the interior angles.



7. Square: find each interior angle.



14. Regular octagon with side 4: find the perimeter.





◆ Word Problems

15. A stop sign is a regular octagon with each side measuring 12 inches. What is its perimeter?



16. A regular hexagonal floor tile has each interior angle equal to how many degrees?



17. A picture frame is shaped like a regular pentagon with a side length of 9 cm. Find its perimeter.



18. What is the sum of the interior angles of a regular nonagon (9 sides)?



19. A regular hexagonal garden has side length 8 feet. Find the perimeter.



20. A regular decagonal table has 10 equal sides. What is the measure of each interior angle?



21. A regular heptagonal flower bed has each side measuring 6 meters. Find its perimeter.



22. An art mural is shaped like a regular dodecagon (12 sides). What is the sum of its interior angles?



23. A regular nonagon tile has all angles equal. What is the measure of each interior angle?



24. A regular pentagonal sign has perimeter 65 cm. What is the length of each side?





Answer Keys

- | | | | |
|---------------------------------------|---------------------------------------|--|--|
| 1. <input type="text" value="180°"/> | 7. <input type="text" value="90°"/> | 13. <input type="text" value="900°"/> | 19. <input type="text" value="48 ft"/> |
| 2. <input type="text" value="360°"/> | 8. <input type="text" value="1440°"/> | 14. <input type="text" value="32"/> | 20. <input type="text" value="144°"/> |
| 3. <input type="text" value="540°"/> | 9. <input type="text" value="60°"/> | 15. <input type="text" value="96 in"/> | 21. <input type="text" value="42 m"/> |
| 4. <input type="text" value="1080°"/> | 10. <input type="text" value="35"/> | 16. <input type="text" value="120°"/> | 22. <input type="text" value="1800°"/> |
| 5. <input type="text" value="108°"/> | 11. <input type="text" value="30"/> | 17. <input type="text" value="45 cm"/> | 23. <input type="text" value="140°"/> |
| 6. <input type="text" value="120°"/> | 12. <input type="text" value="135°"/> | 18. <input type="text" value="1260°"/> | 24. <input type="text" value="13 cm"/> |

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The diagram is a triangle, so $n = 3$. The angle sum is $(3 - 2) \times 180 = 180^\circ$. So the final answer is 180° .

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The diagram has 4 sides. Use $(n - 2) \times 180$: $(4 - 2) \times 180 = 360^\circ$. So the final answer is 360° .

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The diagram is a pentagon, so $(5 - 2) \times 180 = 540^\circ$. So the final answer is 540° .

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The octagon has 8 sides: $(8 - 2) \times 180 = 1080^\circ$. So the final answer is 1080° .

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A regular pentagon has equal angles. Its total is 540° , so each angle is $540 \div 5 = 108^\circ$. So the final answer is 108° .

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A regular hexagon has total angle measure 720° ; divide by 6 to get 120° each. So the final answer is 120° .

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A square has 4 equal angles. The total is 360° , so each angle is $360 \div 4 = 90^\circ$. So the final answer is 90° .

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The diagram is a decagon, so $(10 - 2) \times 180 = 1440^\circ$. So the final answer is 1440° .

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is An equilateral triangle has 3 equal angles. Since the total is 180° , each angle is $180 \div 3 = 60^\circ$. So the final answer is 60° .

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Perimeter is number of sides times side length: $5 \times 7 = 35$. So the final answer is 35.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The regular hexagon has 6 equal sides: $6 \times 5 = 30$. So the final answer is 30.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A regular octagon has total angle measure 1080° , and $1080 \div 8 = 135^\circ$. So the final answer is 135° .

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The heptagon has 7 sides: $(7 - 2) \times 180 = 900^\circ$. So the final answer is 900° .

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The regular octagon has 8 sides of length 4, so $8 \times 4 = 32$. So the final answer is 32.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A stop sign is a regular octagon with 8 equal sides: $8 \times 12 = 96$ inches. So the final answer is 96 in.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A regular hexagon has total angle measure 720° , so each angle is $720 \div 6 = 120^\circ$. So the final answer is 120° .

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The picture frame is a pentagon with 5 equal sides: $5 \times 9 = 45$ cm. So the final answer is 45 cm.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A nonagon has 9 sides, so $(9 - 2) \times 180 = 7 \times 180 = 1260^\circ$. So the final answer is 1260° .

19. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The garden is a regular hexagon, so it has 6 equal sides: $6 \times 8 = 48$ feet of edging. So the final answer is 48 ft.

20. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A decagon has angle sum $(10 - 2) \times 180 = 1440^\circ$; divide by 10 to get 144° . So the final answer is 144° .

21. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The flower bed is a heptagon with 7 equal sides, so $7 \times 6 = 42$ meters. So the final answer is 42 m.

22. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A dodecagon has 12 sides: $(12 - 2) \times 180 = 1800^\circ$. So the final answer is 1800° .

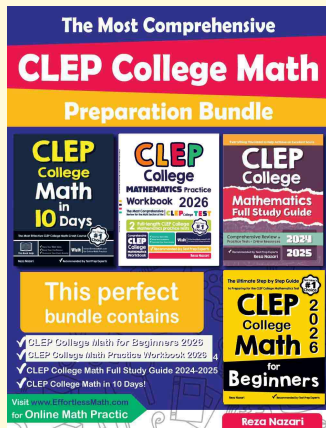
23. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A regular nonagon's total is 1260° , and $1260 \div 9 = 140^\circ$ for each angle. So the final answer is 140° .

24. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Divide the perimeter by the 5 equal sides: $65 \div 5 = 13$ cm per side. So the final answer is 13 cm.



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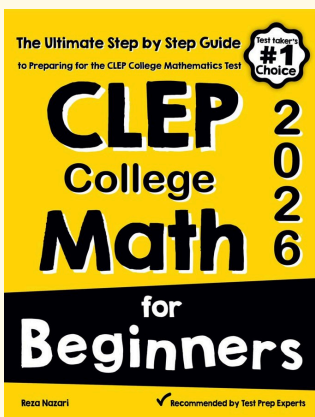
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