

# 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:**  $720^\circ$



Hexagon ( $n = 6$ ): angle sum =  $720^\circ$ .

### Practice Problems

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

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



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



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



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9. Equilateral triangle: find each interior angle.



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



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



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



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



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5. Regular pentagon: find each interior angle.



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12. Regular octagon: find each interior angle.



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6. Regular hexagon: find each interior angle.



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



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7. Square: find each interior angle.



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



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◆ 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?



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## Answer Keys

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|---------------------------------------|---------------------------------------|----------------------------------------|----------------------------------------|
| 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  $180^\circ$ .

**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  $360^\circ$ .

**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  $540^\circ$ .

**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  $1080^\circ$ .

**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  $540^\circ$ , so each angle is  $540 \div 5 = 108^\circ$ . So the final answer is  $108^\circ$ .

**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  $720^\circ$ ; divide by 6 to get  $120^\circ$  each. So the final answer is  $120^\circ$ .

**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  $360^\circ$ , so each angle is  $360 \div 4 = 90^\circ$ . So the final answer is  $90^\circ$ .

**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  $1440^\circ$ .

**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  $180^\circ$ , each angle is  $180 \div 3 = 60^\circ$ . So the final answer is  $60^\circ$ .

**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  $1080^\circ$ , and  $1080 \div 8 = 135^\circ$ . So the final answer is  $135^\circ$ .

**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  $900^\circ$ .

**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  $720^\circ$ , so each angle is  $720 \div 6 = 120^\circ$ . So the final answer is  $120^\circ$ .

**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  $1260^\circ$ .

**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  $144^\circ$ . So the final answer is  $144^\circ$ .

**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  $1800^\circ$ .

**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  $1260^\circ$ , and  $1260 \div 9 = 140^\circ$  for each angle. So the final answer is  $140^\circ$ .

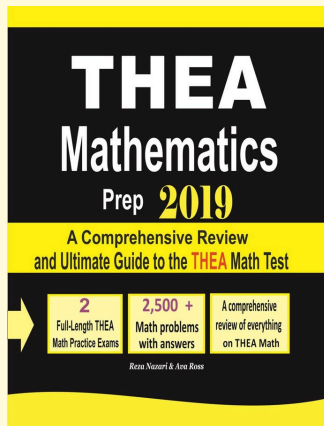
**24.** Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Divide the perimeter by the 5 equal sides:  $65 \div 5 = 13$  cm per side. So the final answer is 13 cm.



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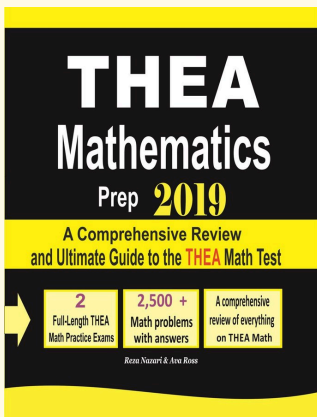
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