

ANSWER MAZE



INTERIOR AND EXTERIOR ANGLES OF POLYGONS

Inside or Outside, Triangles or Sides?

One page · 10–15 minutes · nothing to prepare

FREE

4

An equilateral triangle is a regular polygon with 3 sides. How big is one exterior angle?

$60^\circ \rightarrow$ go to 2

$120^\circ \rightarrow$ go to 7

Which angle does the question ask for: the one inside the triangle or the one outside?

7

A convex polygon has 9 sides. What is the total of its interior angles?

$1260^\circ \rightarrow$ go to 1

$1620^\circ \rightarrow$ go to 5

Picture the diagonals from one corner. How many triangles, and how many sides?

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 4. Before any arithmetic, say what the box asks for: a total, one angle inside, one angle outside, or the number of sides. Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **4 7 1 6 3 8**: six boxes, then out.

Student sheet	page 3, one per student. At the top it shows the triangles from one corner, the exterior angles, and a regular polygon as three small drawings.
Answers	page 4.

Every wrong answer comes from one of two mistakes. The first is mixing up the interior and the exterior angle. For a regular polygon, $360 \div n$ is one exterior angle, and 180° minus that is one interior angle. Students often give one when the other is asked. One box asks for the number of sides from an interior angle of 160° . A student who divides 360 by 160 gets 2.25 sides, which cannot be a polygon. These wrong answers send the student to box 2.

The second mistake is counting one triangle for every side. The diagonals from one corner cut a polygon with n sides into $n - 2$ triangles, so its interior angles add up to $(n - 2) \times 180^\circ$. A student who uses $n \times 180$ gets a total that is 360° too big. Going back from a total, dividing by 180 gives the triangles, and the sides are 2 more. These wrong answers send the student to box 5. Boxes 2 and 5 ask the same kind of question again, and both of their answers lead back to the route.

The row at the bottom is the check. A clean run is six numbers. Each wrong answer adds at least one more. Guessing does not get a student out: every simple guessing rule, such as always taking the larger number, goes wrong within the first two boxes.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.
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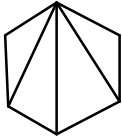
Answer Maze

Start at box 4 · interior and exterior angles

Name _____

Period _____

Date _____

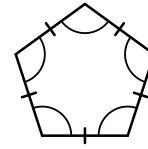
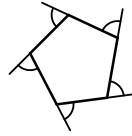


From one corner, the diagonals cut a polygon into triangles: **2 fewer than the sides**. So the interior angles add up to $(n - 2) \times 180^\circ$.

One **exterior** angle at every corner: they add up to **360°**, for every polygon.

Regular: all sides equal and all angles equal.

At every corner, the interior angle and the exterior angle add up to 180°. Choose an answer in each box, and go to the box it names.



1

A regular pentagon has 5 equal sides and 5 equal angles. How big is one interior angle?

72° → go to 2

108° → go to 6

Is the angle asked for inside the pentagon or outside it?

2

A regular decagon has 10 equal sides and 10 equal angles. How big is one exterior angle?

36° → go to 7

144° → go to 4

Which angle does the question name: the interior angle or the exterior angle?

3

Each interior angle of a regular polygon is 160°. How many sides does it have?

18 sides → go to 8

2.25 sides → go to 2

Which angle shares out the full turn: the one inside or the one outside?

4

An equilateral triangle is a regular polygon with 3 sides. How big is one exterior angle?

60° → go to 2

120° → go to 7

Which angle does the question ask for: the one inside the triangle or the one outside?

5

A convex polygon has 15 sides. What is the total of its interior angles?

2700° → go to 7

2340° → go to 1

Count the triangles from one corner, and compare them with the sides.

6

The interior angles of a convex polygon add up to 1800°. How many sides does it have?

12 sides → go to 3

10 sides → go to 5

The total counts triangles. Is the number of sides the same as the number of triangles?

7

A convex polygon has 9 sides. What is the total of its interior angles?

1260° → go to 1

1620° → go to 5

Picture the diagonals from one corner. How many triangles, and how many sides?

8

A convex pentagon has four angles of 100°, 120°, 95° and 110°. How big is its fifth angle?

475° → go to 5

115° → you are out

Before the arithmetic, say how many triangles a pentagon splits into from one corner.

Write each box number as you reach it:

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Answer Maze — answers

For the teacher

The route, in order. Boxes 2 and 5 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table.

4 → 7 → 1 → 6 → 3 → 8 → out

	Box	Right answer, and why	Wrong answer, and why a student picks it
1	Box 4 An equilateral triangle is a regular polygon with 3 sides. How big is one exterior angle?	120° . The exterior angles add up to 360°, shared by 3 equal angles: $360 \div 3 = 120^\circ$.	“60°” goes to box 2. A student who gives the interior angle instead of the exterior one picks 60°.
2	Box 7 A convex polygon has 9 sides. What is the total of its interior angles?	1260° . From one corner, the diagonals cut a polygon with 9 sides into 7 triangles: $7 \times 180^\circ = 1260^\circ$.	“1620°” goes to box 5. A student who counts 9 triangles, one for each side, picks this: $9 \times 180 = 1620$.
3	Box 1 A regular pentagon has 5 equal sides and 5 equal angles. How big is one interior angle?	108° . The interior angles add up to $(5 - 2) \times 180^\circ = 540^\circ$, shared by 5 equal angles: $540 \div 5 = 108^\circ$.	“72°” goes to box 2. A student who divides 360 by 5 picks this. That gives the exterior angle, not the interior one.
4	Box 6 The interior angles of a convex polygon add up to 1800°. How many sides does it have?	12 sides . $1800 \div 180 = 10$ triangles, and a polygon has 2 more sides than triangles: 12 sides.	“10 sides” goes to box 5. A student who stops at the number of triangles, 10, picks this.
5	Box 3 Each interior angle of a regular polygon is 160°. How many sides does it have?	18 sides . The exterior angle is $180^\circ - 160^\circ = 20^\circ$. The exterior angles add up to 360°, so $360 \div 20 = 18$ sides.	“2.25 sides” goes to box 2. A student who divides 360 by the interior angle picks this. A number of sides must be a whole number, so it cannot be right.
6	Box 8 A convex pentagon has four angles of 100°, 120°, 95° and 110°. How big is its fifth angle?	115° . A pentagon splits into 3 triangles, so its angles add up to 540°. $540 - (100 + 120 + 95 + 110) = 115^\circ$.	“475°” goes to box 5. A student who uses $5 \times 180 = 900$ for the total picks this. An angle of a convex polygon is less than 180°.
	Box 2 A regular decagon has 10 equal sides and 10 equal angles. How big is one exterior angle?	36° . The exterior angles add up to 360°, shared by 10 equal angles: $360 \div 10 = 36^\circ$.	“144°” goes to box 4. A student who gives the interior angle instead of the exterior one picks 144°.
	Box 5 A convex polygon has 15 sides. What is the total of its interior angles?	2340° . From one corner, the diagonals cut a polygon with 15 sides into 13 triangles: $13 \times 180^\circ = 2340^\circ$.	“2700°” goes to box 7. A student who counts 15 triangles, one for each side, picks this: $15 \times 180 = 2700$.

How to check any box. First decide what is asked. A total of interior angles is $(n - 2) \times 180^\circ$. A total of exterior angles is always 360°. One exterior angle of a regular polygon is $360 \div n$, and one interior angle is 180° minus that. A number of sides must be a whole number, 3 or more.

A student can find the last four boxes of the route by following the arrows backward from “you are out.” So ask a student with a clean row to explain one box.