LESSON MAKER PRO

Circle Polygon Lab

Plan precise regular shapes on a circular rim.

HIGH SCHOOL · MA.912.GR.5.4

MA.912.GR.5.4 "Construct a regular polygon inscribed in a circle. Regular polygons are limited to triangles, quadrilaterals and hexagons."

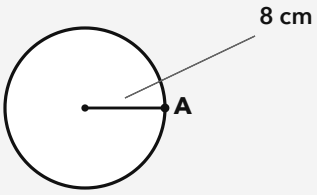
NAME _____ DATE _____

EQUAL TURNS, EQUAL SIDES

To inscribe a regular polygon, place its vertices at equal central angles around the circle, then connect consecutive vertices. For n sides, each central angle is 360/n degrees. A regular hexagon is special because each side equals the circle's radius.

WORKED EXAMPLE

Use the circle shown. Describe how to construct a regular hexagon with A as one vertex.



1. Set a compass to the radius OA.
2. Keep the compass width fixed and step around the circle from A, marking five more points.
3. Use a straightedge to connect each consecutive point and return to A.

Answer: A regular hexagon is formed. Each side is 8 cm.

PRACTICE 4 problems

1 A regular triangle is inscribed in a circle. Find each central angle.

ANSWER _____

2 A circle has radius 5 cm. An inscribed regular hexagon is made by stepping the compass around the circle. What is each side length?

ANSWER _____

3 A student divides a circle into four equal central angles and connects adjacent points. Name the polygon and give each central angle.

ANSWER _____

_____

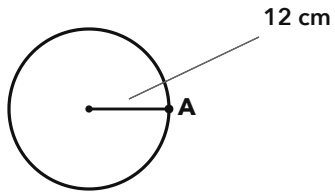
4 Point A is on a circle with center O. Describe two construction moves that make an inscribed regular quadrilateral with A as a vertex.

ANSWER _____

_____

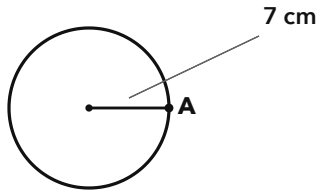
APPLY IT Show your work

1 A gaming club is placing three LEDs on the rim of the logo shown. The LEDs must be vertices of an inscribed regular triangle. What central angle separates neighboring LEDs, and what should the club connect?



ANSWER _____

2 The film club is making the round photo-booth frame shown. Four clips must be equally spaced and form an inscribed regular quadrilateral. What central angle separates clips, and what polygon do the clips form?



ANSWER _____

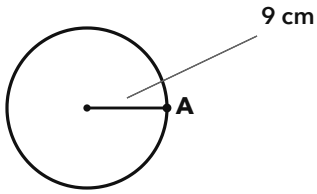
3 Actually construct a regular hexagon on teacher-provided unlined paper. Use a compass to draw a circle of radius 3 cm and mark center O and rim point A. Keep the compass set to OA, step around the rim to mark B, C, D, E and F, then use a straightedge to connect consecutive vertices and return to A. Keep construction marks visible. Check all six vertices lie on the circle and all six side lengths match OA. Submit your finished construction and explain why the equal chord lengths make it regular. A teacher may support safe tool use or provide an accessible digital compass/straightedge.

WORK SPACE

ANSWER _____

CHALLENGE One step up

The circle shown has radius 9 cm. A stage designer wants an inscribed equilateral triangle and an inscribed regular hexagon that share vertex A. State the central-angle marks for each polygon. Then compare their side lengths.



WORK SPACE AND ANSWER

ANSWER KEY # Circle Polygon Lab

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A regular triangle is inscribed in a circle. Find each central angle.	**120°**
2	A circle has radius 5 cm. An inscribed regular hexagon is made by stepping the compass around the circle. What is each side length?	**5 cm**
3	A student divides a circle into four equal central angles and connects adjacent points. Name the polygon and give each central angle.	**square; 90°**
4	Point A is on a circle with center O. Describe two construction moves that make an inscribed regular quadrilateral with A as a vertex.	**Draw a diameter through A and O. Draw a second diameter perpendicular to the first, then connect the four endpoints.**

PART 2 · APPLY IT

1. **120°; connect the three marked points to form an equilateral triangle.** Divide 360° into three equal central angles. Connecting the three equally spaced rim points makes a regular triangle.
2. **90°; a square.** Divide 360° into four equal central angles. Four equally spaced points on a circle form an inscribed square.
3. **Completed inscribed regular hexagon ABCDEF; each side is 3 cm.** Inspect the actual circle and connected hexagon, six rim vertices and unchanged compass-step marks. Each chord equals the radius 3 cm; six equal chords give six equal central angles of 60°. Either clockwise or counterclockwise construction is valid. Supply paper/tools and observe their use; a description alone does not complete this task.

CHALLENGE

Triangle: 120° central-angle marks. Hexagon: 60° central-angle marks. The triangle side is 9sqrt(3) cm, the hexagon side is 9 cm, so the triangle side is longer by 9(sqrt(3) - 1) cm.

Accept equivalent construction language that uses equal central angles or correct compass and straightedge steps. Accept 9sqrt(3) - 9 cm as an equivalent challenge comparison. For Apply 3, supply unlined paper and compass/straightedge or an accessible digital equivalent; inspect the learner's actual completed construction and radius-step evidence. The teacher figure shows one possible orientation, not a requirement to copy the answer.

Apply 3: completed inscribed regular hexagon (six equal 3 cm sides)

