

Circle Shape Studio

Construct three regular polygons inside given circles.

HIGH SCHOOL • HSG-CO.D.13

CCSS.Math.Content.HSG-CO.D.13 "Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle."

NAME _____

DATE _____

You will need: Pencil; Compass; Straightedge

USE EQUAL DISTANCES, NOT ESTIMATED ANGLES

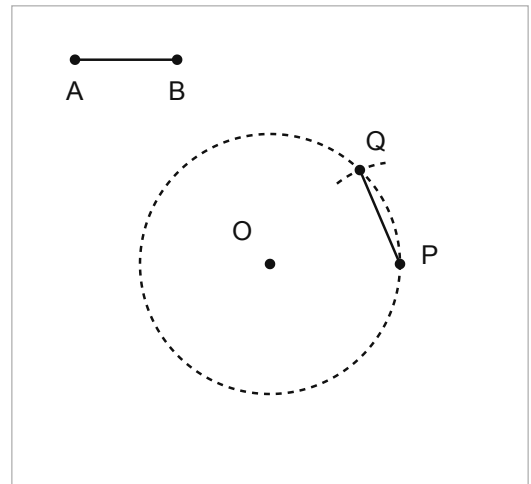
Construct on each canvas with a compass and straightedge. Keep arcs visible. Dashed full circles are given circles centered at O. Use the printed radius, not a protractor. Equal chords subtend equal central angles.

WORKED EXAMPLE

Copy segment AB as a chord PQ starting at P on the circle.

1. Set the compass to AB. With center P, draw an arc and label its upper intersection with the given circle Q.
2. Join PQ. Its length equals the unchanged compass opening AB.

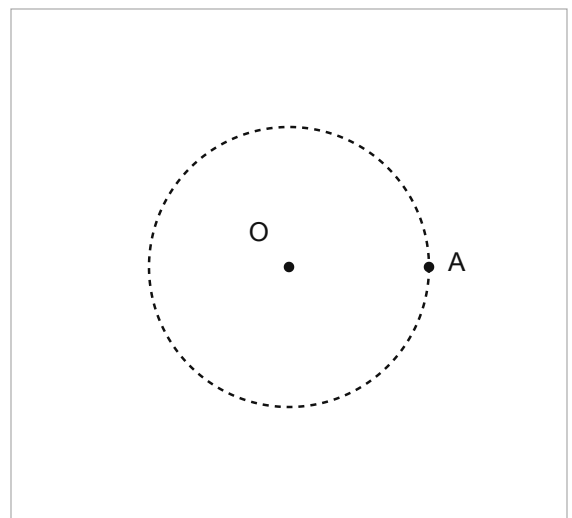
Answer: $PQ = AB$; no angle measurement is needed.



PRACTICE 4 problems

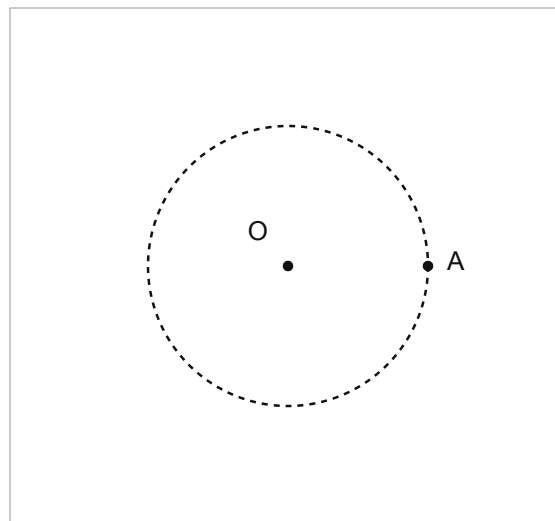
- 1 From A, step the radius around the circle to construct six equally spaced points A through F. Join neighboring points to make a regular hexagon. Explain why the compass opening stays fixed.

ANSWER _____



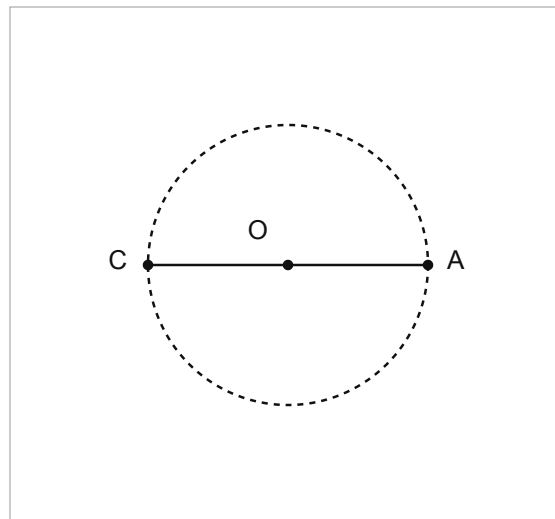
- 2** Construct an equilateral triangle inscribed in this circle. Start at A, use six radius steps, and join every other point. Explain why the three sides are equal.

ANSWER _____



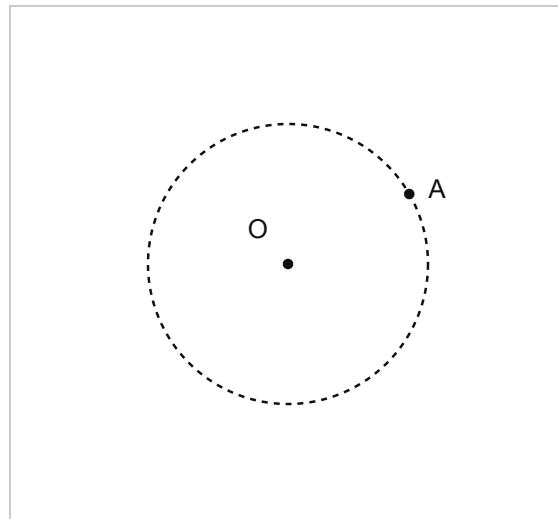
- 3** AC is a diameter. Construct its perpendicular bisector with equal-radius compass arcs. Label where the bisector meets the given circle B and D. Join A-B-C-D-A. Explain why it is a square.

ANSWER _____



- 4** Construct a second inscribed equilateral triangle with the shown starting point A. Leave the six radius steps visible. Explain why rotating the starting point does not change the construction method.

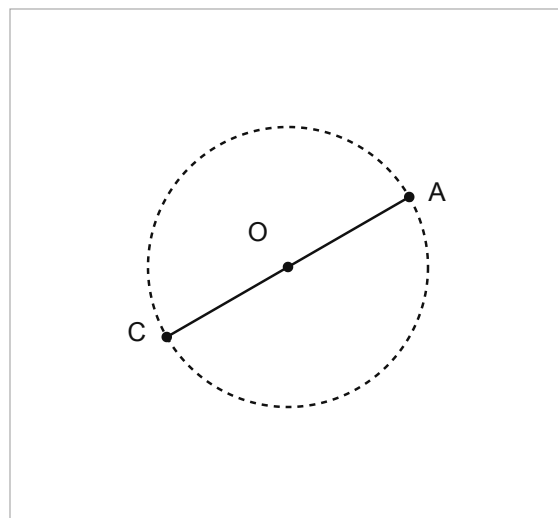
ANSWER _____



APPLY IT Show your work

- 1** A logo needs a square with A as one corner and AC as a diagonal. Construct it in the given circle. Explain why simply drawing a horizontal line through O would not work here.

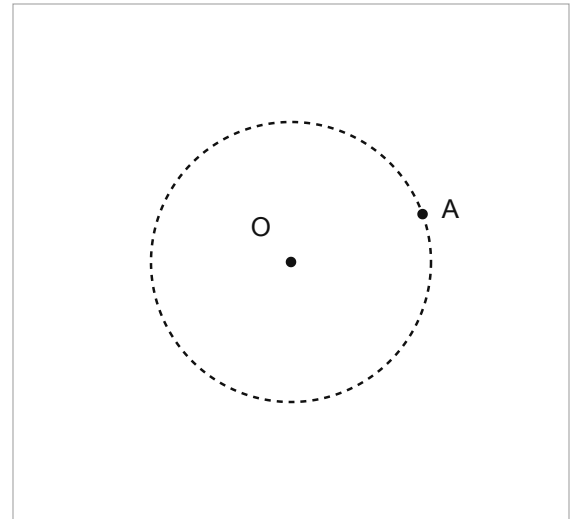
REASONING AND ANSWER



2

A circular badge needs a regular hexagonal border. Construct it from A. A classmate wants to use a compass opening smaller than OA . Explain why that would not produce this regular hexagon.

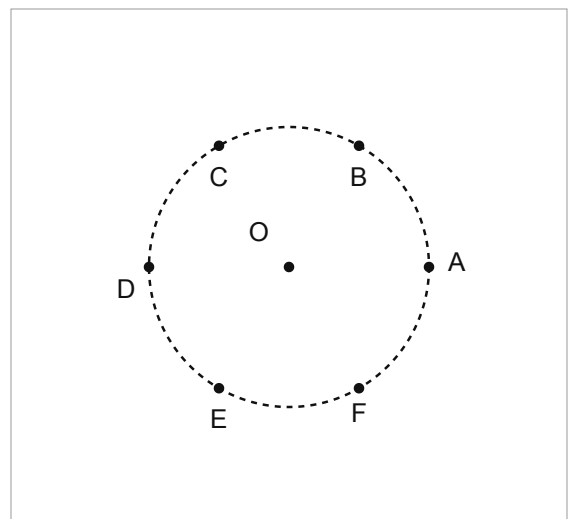
REASONING AND ANSWER



CHALLENGE One step up

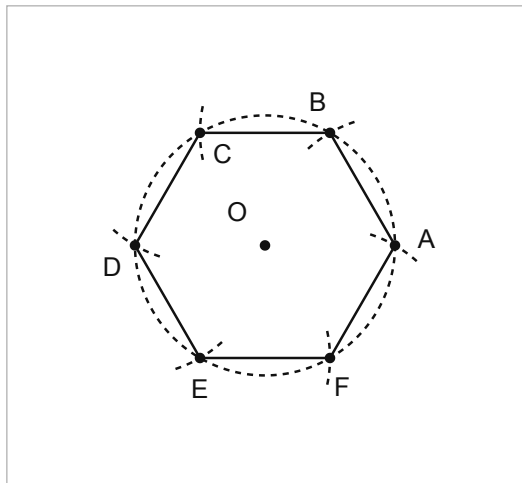
The six points shown are equally spaced. Construct TWO different equilateral triangles using only these points. Explain why both triangles are equilateral and why joining three neighboring points would fail.

REASONING AND ANSWER



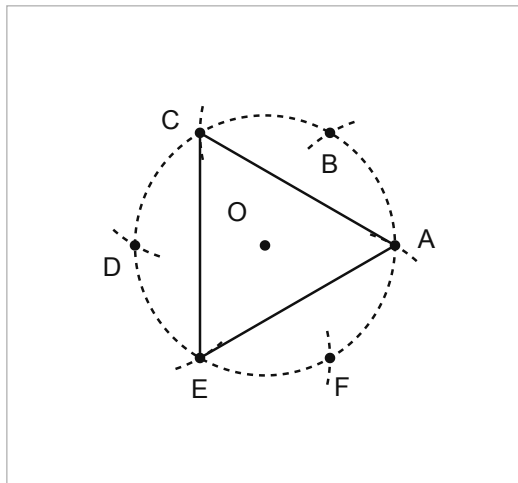
PRACTICE 1

Keep the compass at OA. Each chord equals the radius; six equilateral center triangles give six 60° central angles and a regular hexagon.



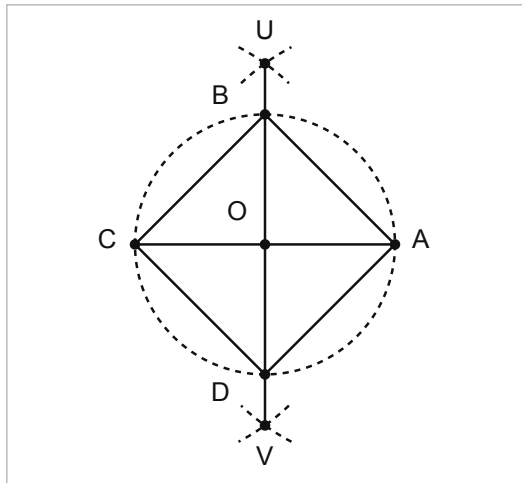
PRACTICE 2

Construct A through F, then join A-C-E-A. Each side subtends an equal 120° central angle, so the three chords are congruent. The triangle is equilateral.



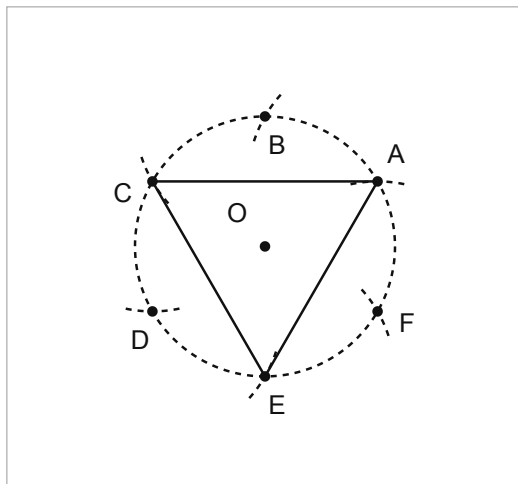
PRACTICE 3

Arcs from A and C intersect at U and V. UV passes through O and meets the circle at B and D. Join A-B-C-D-A. Equal 90° central angles give equal chords; every interior angle subtends a semicircle and is 90° .



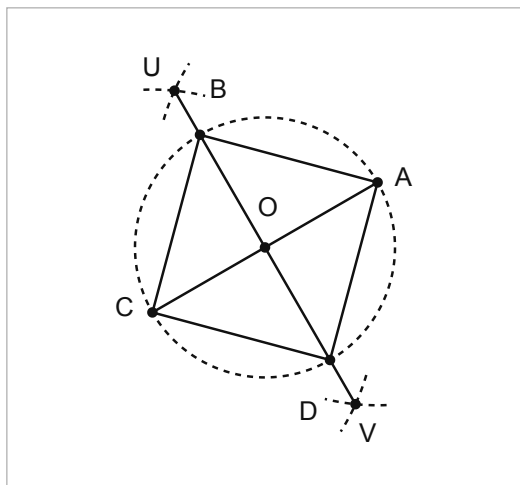
PRACTICE 4

Six radius steps again give equal 60° central angles. Join A-C-E-A. The starting direction changes the triangle's orientation, not its equal sides or 120° central spacing.



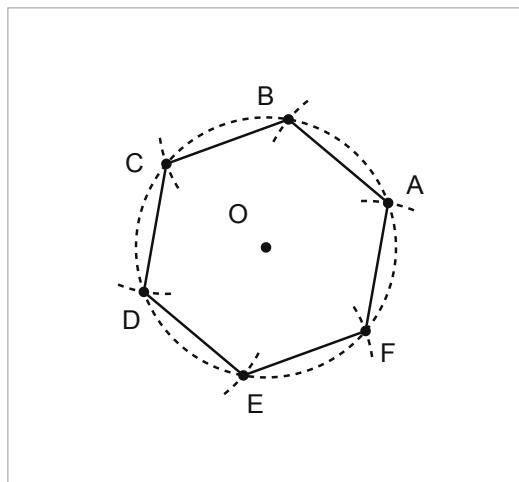
APPLY IT 1

The second diameter must be perpendicular to AC, not chosen by page direction. Use equal-radius arcs from A and C to locate U and V. Line UV meets the given circle at B and D; join A-B-C-D-A. The rotated diameter requires a correspondingly rotated perpendicular; equal quadrants produce a square.



APPLY IT 2

Use OA as the fixed opening; a smaller chord does not make a 60° step. Join the six radius-step points. Center triangles have three radius-length sides and are equilateral. Smaller chords have central angles below 60°, so six such steps do not close the full circle.



CHALLENGE

Join A-C-E-A and B-D-F-B. Each triangle uses three 120° arcs, hence three congruent chords. Three neighboring points give two 60° arcs and a 240° remaining arc; their chords are not all equal.

Require actual compass-and-straightedge work. Accept different arc widths and labels when they give exact constructions. Short dashed arcs in the key show compass marks; full dashed circles are the supplied circles. Key canvases are reduced reference views. Use the student canvases for construction.

