# Similar Circles Worksheet

Geometry · Common Core HSG-C.A.1

> Prove that all circles are similar.

## Practice

Builds the skill step by step.

1. Which statement is true about any two circles?

   A. They are always similar.

   B. They are always congruent.

   C. They are similar only if their radii are equal.

   D. They are never similar.

2. Circle A has radius 3 and circle B has radius 12. What scale factor dilates circle A onto circle B (after translating the centers together)?

3. Circle P has radius 10 and circle Q has radius 4. What scale factor maps circle P onto circle Q?

4. To map one circle onto another, which transformation moves the center onto the other center?

   A. a rotation about a point on the circle

   B. a reflection across the circle

   C. a translation

   D. a dilation

5. After the centers match, which transformation makes the radii match?

   A. a translation

   B. a rotation

   C. a reflection

   D. a dilation centered at the shared center

6. Two circles have radii 5 and 15. What is the ratio of their circumferences, smaller to larger?

7. Circle A has diameter 8 and circle B has diameter 20. What scale factor maps A onto B?

8. Two circles have radii 2 and 6. What is the ratio of their areas, smaller to larger?

9. Why are two squares always similar but two rectangles not always similar?

   A. Squares have more sides.

   B. Every square has the same shape (all sides equal, all right angles); rectangles can have different length-to-width ratios.

   C. Squares are always congruent.

   D. Rectangles are never similar.

10. A circle with radius 6 is dilated by a scale factor of $\frac{1}{2}$ about its center. What is the radius of the image?

ALBERT

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## On Level

Grade-level practice.

1. Circle A is centered at (1, 2) with radius 3. Circle B is centered at (5, −1) with radius 9. What translation vector maps the center of A to the center of B? Give it as (a, b).

2. For the same circles (A: center (1, 2), radius 3; B: center (5, −1), radius 9), what scale factor is used after the translation?

3. Two circles have circumferences 12π and 30π. What is the scale factor from the smaller to the larger?

4. Two circles have areas 16π and 100π. What is the scale factor from the smaller to the larger?

5. Explain why any two circles are similar.

6. The ratio of the radii of two circles is 3 : 5. The smaller circle has a circumference of 18 cm. What is the circumference of the larger circle?

7. Circle C has center (0, 0) and radius 2. Which single transformation maps it onto the circle with center (0, 0) and radius 7?

   A. a translation 5 units right

   B. a dilation centered at (0, 0) with scale factor 3.5

   C. a rotation of 90°

   D. a dilation with scale factor 5

8. A circle with radius 4 is dilated so its area becomes 9 times as large. What is the new radius?

9. Which pair of figures is NOT always similar?

   A. two squares

   B. two equilateral triangles

   C. two circles

   D. two ellipses

10. Circle A has radius 6. Circle B is the image of A under a dilation with scale factor k, and circle B has diameter 3. What is k?

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## Challenge

Multi-step and word problems that stretch it.

1. Circle A: $(x - 2)^2 + (y + 1)^2 = 9$. Circle B: $(x + 3)^2 + (y - 4)^2 = 36$. What is the scale factor from A to B?

2. For those circles (A: center $(2, -1)$, radius 3; B: center $(-3, 4)$, radius 6), what translation vector maps A's center to B's center? Give it as $(a, b)$.

3. A circle with radius 5 centered at the origin is dilated by a scale factor of 3 about the point $(5, 0)$, which is on the circle. What is the center of the image?

4. For the same dilation (circle of radius 5 centered at the origin, dilated by 3 about $(5, 0)$), what is the radius of the image?

5. Two circles have the same center. What is the fewest number of transformations needed to map one onto the other?

   A. two: a translation and a dilation

   B. three

   C. one: a dilation about the shared center

   D. zero

6. Two circles have circumferences in the ratio 2 : 7. What is the ratio of their areas, smaller to larger?

7. A student says, "Two circles are similar only if they have the same center." Explain why the student is wrong.

8. The circle $x^2 + y^2 = 4$ is dilated about the origin so that it passes through (0, 10). What is the scale factor?

9. Circle A has circumference $10\pi$ and circle B has area $49\pi$. What is the scale factor from A to B?

10. Why is the argument "all circles are similar" different from "all triangles are similar"?

    A. A circle's shape is fixed by one number (its radius); triangles need more information, so not all triangles are similar.

    B. All triangles are also similar.

    C. Circles have no angles, so similarity doesn't apply.

    D. Circles are always congruent.