

Circle Mapping Lab

Use dilations and translations to show circles are similar.

HIGH SCHOOL • MA.912.GR.6.5

MA.912.GR.6.5 "Apply transformations to prove that all circles are similar."

NAME _____

DATE _____

MAP ONE CIRCLE TO ANOTHER

A dilation changes a circle's radius by a scale factor and keeps the figure a circle. To map one circle onto another, dilate about the first center using target radius/original radius, then translate the center to the target center.

WORKED EXAMPLE

Map the circle with center $(1,-2)$ and radius 4 onto the circle with center $(7,5)$ and radius 10.

1. Scale factor = $10/4 = 5/2$.
2. Dilate about $(1,-2)$ by $5/2$, so the radius becomes 10.
3. Translate by $\langle 6,7 \rangle$ to move $(1,-2)$ to $(7,5)$.

Answer: Dilate about $(1,-2)$ by $5/2$, then translate by $\langle 6,7 \rangle$.

PRACTICE 6 problems

- 1** Circle A has center $(-3,8)$ and radius 24. Circle B has center $(9,-9)$ and radius 9. What dilation scale factor maps the radius of Circle A to the radius of Circle B?

ANSWER _____

- 2** A circle with center $(12,-9)$ and radius 24 is dilated about its center by $9/8$. It is then translated by $\langle -15,12 \rangle$. Find the image circle's center and radius.

ANSWER _____

- 3** Circle C has center $(9,0)$ and radius 24. Circle D has center $(-3,12)$ and radius 9. Describe a dilation and translation that map Circle C onto Circle D.

ANSWER _____

- 4** A circle has radius 27. It is dilated by $8/9$. What is its new radius?

ANSWER _____

- 5** Circle E has center $(12,3)$ and radius 9. Circle F has center $(-3,-9)$ and radius 27. Find the dilation scale factor and translation vector that map Circle E onto Circle F.

ANSWER _____

- 6** A circle is dilated about its center by $8/3$ and then translated by $\langle 12,-9 \rangle$. Its image has center $(3,15)$ and radius 24. Find the original circle's center and radius.

ANSWER _____

APPLY IT Show your work

- 1** Maya is designing circular profile badges for a school media page. Her first badge has center $(-8, 11)$ and radius 24 grid units. A second badge must have center $(16, -13)$ and radius 9 grid units. What transformation sequence maps the first badge onto the second badge?

WORK SPACE

ANSWER _____

- 2** In a video game, a circular arena boundary has center $(15, -12)$ and radius 27 units. A smaller arena boundary has center $(-9, 18)$ and radius 24 units. What transformation sequence maps the first arena onto the smaller arena?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Circle H has center $(-12, 15)$ and radius 24. Circle J has center $(3, -9)$ and radius 27. A student says the circles cannot be similar because they have different radii. Write exactly a pair of sentences that corrects the student by naming transformations that map Circle H onto Circle J.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Circle A has center $(-3,8)$ and radius 24. Circle B has center $(9,-9)$ and radius 9. What dilation scale factor maps the radius of Circle A to the radius of Circle B?	$3/8$
2	A circle with center $(12,-9)$ and radius 24 is dilated about its center by $9/8$. It is then translated by $\langle -15,12 \rangle$. Find the image circle's center and radius.	Center $(-3,3)$, radius 27
3	Circle C has center $(9,0)$ and radius 24. Circle D has center $(-3,12)$ and radius 9. Describe a dilation and translation that map Circle C onto Circle D.	Dilate about $(9,0)$ by $3/8$, then translate by $\langle -12,12 \rangle$.
4	A circle has radius 27. It is dilated by $8/9$. What is its new radius?	24
5	Circle E has center $(12,3)$ and radius 9. Circle F has center $(-3,-9)$ and radius 27. Find the dilation scale factor and translation vector that map Circle E onto Circle F.	Scale factor 3, then translate by $\langle -15,-12 \rangle$.
6	A circle is dilated about its center by $8/3$ and then translated by $\langle 12,-9 \rangle$. Its image has center $(3,15)$ and radius 24. Find the original circle's center and radius.	Center $(-9,24)$, radius 9

PART 2 • APPLY IT

- Dilate about $(-8,11)$ by $3/8$, then translate by $\langle 24,-24 \rangle$.** The radius scale factor is $9/24 = 3/8$. After dilating about the first center, translate 24 units right and 24 units down to reach the second center.
- Dilate about $(15,-12)$ by $8/9$, then translate by $\langle -24,30 \rangle$.** The radius scale factor is $24/27 = 8/9$. The translation moves the center 24 units left and 30 units up.

CHALLENGE

Dilate Circle H about $(-12,15)$ by $9/8$, changing its radius from 24 to 27. Then translate it by $\langle 15,-24 \rangle$ to match Circle J's center, so the circles are similar.

Accept equivalent descriptions of the correct dilation and translation, including a translation written in words. A correct mapping must use a positive scale factor that changes the original radius to the target radius and must send the original center to the target center.