

Circle Code

Find centers, radii, equations, and boundary points.

HIGH SCHOOL • MA.912.GR.7.3

MA.912.GR.7.3 "Graph and solve mathematical and real-world problems that are modeled with an equation of a circle. Determine and interpret key features in terms of the context."

NAME _____

DATE _____

CIRCLE FORM

A circle with center (h,k) and radius r can be written as $(x-h)^2+(y-k)^2=r^2$. The signs inside the parentheses are opposite the center coordinates, and the radius is the positive square root of the number on the right.

WORKED EXAMPLE

Find the center and radius of $(x-8)^2+(y+6)^2=49$.

1. Compare the equation with $(x-h)^2+(y-k)^2=r^2$.
2. $x-8$ gives $h=8$, and $y+6$ gives $k=-6$.
3. $r^2=49$, so $r=7$.

Answer: Center: $(8,-6)$; radius: 7

PRACTICE 6 problems

- 1** Find the center and radius of $(x+3)^2+(y-2)^2=9$.

ANSWER _____

- 2** Find the center and radius of $x^2+(y+4)^2=16$.

ANSWER _____

- 3** Write the equation of a circle with center $(2,-3)$ and radius 5.

ANSWER _____

- 4** A point on the circle $(x-2)^2+(y-2)^2=9$ has $x=2$. Find all possible y -values.

ANSWER _____

- 5** Find the x -intercepts of the circle $(x-1)^2+(y+3)^2=18$.

ANSWER _____

- 6** Rewrite $x^2+y^2-4x+2y=11$ in circle form. Then give the center and radius.

ANSWER _____

APPLY IT Show your work

1

A student uses a phone app to map the range of a portable charger sharing station. On a coordinate grid measured in meters, the station is at $(3,-2)$, and devices up to 5 meters away can connect. Write the boundary circle's equation. Is a device at $(0,2)$ in range, on the boundary, or outside? State what the center and radius mean.

WORK SPACE

ANSWER _____

2

A school esports team practices a game with a circular safe zone. The safe zone has center $(2,-1)$ and radius 3 map units. Write its equation. If a player travels along the horizontal line $y=-1$, what two x -values put the player on the boundary?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A circle is modeled by $x^2+y^2-2x+4y=20$. Find the points where the circle intersects the line $y=2$. Explain your reasoning.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the center and radius of $(x+3)^2+(y-2)^2=9$.	Center: (-3,2); radius: 3
2	Find the center and radius of $x^2+(y+4)^2=16$.	Center: (0,-4); radius: 4
3	Write the equation of a circle with center (2,-3) and radius 5.	$(x-2)^2+(y+3)^2=25$
4	A point on the circle $(x-2)^2+(y-2)^2=9$ has $x=2$. Find all possible y-values.	$y=5$ or $y=-1$
5	Find the x-intercepts of the circle $(x-1)^2+(y+3)^2=18$.	(-2,0) and (4,0)
6	Rewrite $x^2+y^2-4x+2y=11$ in circle form. Then give the center and radius.	$(x-2)^2+(y+1)^2=16$; center: (2,-1); radius: 4

PART 2 · APPLY IT

- $(x-3)^2+(y+2)^2=25$. The device at (0,2) is on the boundary. The center (3,-2) is the station location, and the radius 5 is the farthest connection distance in meters.** Use the station coordinates as the center and square the radius. For (0,2), the squared distance from the center is $3^2+4^2=25$, so the device is on the circle.
- $(x-2)^2+(y+1)^2=9$. The boundary x-values are -1 and 5.** The center and radius give the circle equation directly. Substitute $y=-1$, then solve $(x-2)^2=9$.

CHALLENGE

The intersection points are (-2,2) and (4,2). Completing the square gives $(x-1)^2+(y+2)^2=25$. Substituting $y=2$ gives $(x-1)^2=9$, so $x=-2$ or $x=4$.

Accept equivalent circle equations with terms written in either order. For intercepts and intersection points, accept the points in either order.