We learned how to find area and circumference. See if you can work backwards to find radius, diameter, circumference...

1. If $A = 9\pi$ cm²
   Find the radius & Circumference.

$\frac{9\pi}{\pi} = \frac{\pi r^2}{\pi}$

$\sqrt{9} = \sqrt{r^2}$

$r = 3$ cm

$C = 2\pi r$
$C = 2 \cdot \pi \cdot 3$
$C = 6\pi$ cm

2. If $A = 3\pi$ cm²
   Find the diameter.

Find the radius and then double it

$Area = \pi r^2$

$\frac{3\pi}{\pi} = \frac{\pi r^2}{\pi}$ ÷ by π on both sides

$\sqrt{3} = \sqrt{r^2}$

$\sqrt{3} = r$

≈ 1.732

$\times 2$

$d = 3.46$cm

2nd: take the √ of both sides

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3. If $C = 10\pi$ cm
   Find the Area.

$C = 2\pi r$

$\frac{10\pi}{2\pi} = \frac{2\pi r}{2\pi}$ ÷ by 2π

$5 = r$

$A = \pi \cdot 5^2$

$A = 25\pi$ cm²

4. If $A = 8$ cm²
   Find the diameter.

$A = \pi r^2$

$\frac{8}{\pi} = \frac{\pi r^2}{\pi}$

$\sqrt{2.546} = \sqrt{r^2}$

$1.5957 = r$

$\times 2$

$3.19 = d$

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5. C = 314 m

A = _____

$C = 2\pi r$

$\frac{314}{2\pi} = \frac{2\pi r}{2\pi}$

$49.97 = r$

$A = \pi(49.97)^2$

$A = 2497.465856\pi\ m^2$

OR

$A = 7846.02\ m^2$

when typing into the calculator put parentheses around 2π

so it looks like this → $314 \div (2\pi)$

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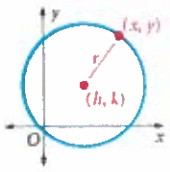
12-5 Circles in the Coordinate Plane

1 Writing an Equation of a Circle

You can use the Distance Formula to find an equation of a circle with center (h, k) and radius r. Let (x, y) be any point on the circle. Then the radius r is the distance from (h, k) to (x, y).



$r = \sqrt{(x - h)^2 + (y - k)^2}$ Distance Formula

$r^2 = (x - h)^2 + (y - k)^2$ Square both sides.

This essentially proves the following theorem.

Key Concepts

Theorem 12-13

An equation of a circle with center (h, k) and radius r is $(x - h)^2 + (y - k)^2 = r^2$.

IF the center is at the origin (0,0) then you can use

$x^2 + y^2 = r^2$

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The equation $(x - h)^2 + (y - k)^2 = r^2$ is in **standard form.** You may also call it the *standard equation* of a circle.

1 EXAMPLE Writing the Equation of a Circle

Write the standard equation of the circle with center (5, −2) and radius 7.

$(x - h)^2 + (y - k)^2 = r^2$ Use standard form.

$(x - 5)^2 + [y - (-2)]^2 = 7^2$ Substitute (5, −2) for (*h*, *k*), and 7 for *r*.

$(x - 5)^2 + (y + 2)^2 = 49$ Simplify.

1 Write the standard equation of each circle.

a. center (3, 5); radius 6

$h = 3 \quad K = 5$

$(x-3)^2 + (y-5)^2 = 6^2$

$(x-3)^2 + (y-5)^2 = 36$

b. center (−2, −1); radius $\sqrt{2}$

$h = -2 \quad K = -1$

$(x--2)^2 + (y--1)^2 = (\sqrt{2})^2$

$(x+2)^2 + (y+1)^2 = 2$

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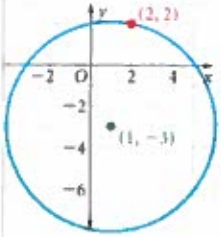
If you know the center of a circle and a point on the circle, you can write the standard equation of the circle.

2 EXAMPLE Using the Center and a Point on a Circle



Write the standard equation of the circle with center (1, −3) that passes through the point (2, 2).

$r = \sqrt{(x - h)^2 + (y - k)^2}$ Use the Distance Formula to find *r*.

$= \sqrt{(2 - 1)^2 + (2 - (-3))^2}$ Substitute (1, −3) for (*h*, *k*), and (2, 2) for (*x*, *y*).

$= \sqrt{1 + 25} = \sqrt{26}$ Simplify.

$(x - h)^2 + (y - k)^2 = r^2$ Use standard form.

$(x - 1)^2 + [y - (-3)^2] = (\sqrt{26})^2$ Substitute (1, −3) for (*h*, *k*), and $\sqrt{26}$ for *r*.

$(x - 1)^2 + (y + 3)^2 = 26$ Simplify.

2 Write the standard equation of the circle with center ~~(2, 3)~~ that passes through the point (−1, 1).

use the distance Formula to Find the radius.

$h = 2 \quad K = 3$

$d = \sqrt{(2+1)^2 + (3-1)^2}$

$d = \sqrt{3^2 + 2^2}$

$d = \sqrt{9+4}$

$d = \sqrt{13}$ so the radius is $\sqrt{13}$

square the radius to put the radius into eq

$(\sqrt{13})^2$

$(x-2)^2 + (y-3)^2 = 13$

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2 Finding the Center and Radius of a Circle

If you know the standard equation of a circle, you can describe the circle by naming its center and radius. Then you can use this information to graph the circle.

3 EXAMPLE Graphing a Circle Given its Equation

Find the center and radius of the circle with equation $(x - 7)^2 + (y + 2)^2 = 64$.

$(x - 7)^2 + (y + 2)^2 = 64$

$(x - 7)^2 + (y - (-2))^2 = 8^2$ Use standard form.

h k r

The center is $(7, -2)$ and the radius is 8.

100 is r^2 square root to Find the radius

$\sqrt{100} = r$

$10 = r$

3 Find the center and radius of the circle with equation $(x - 2)^2 + (y - 3)^2 = 100$.

$x - 2 = 0$ $y - 3 = 0$

$+2 \quad +2$ $+3 \quad +3$

$x = 2$ $y = 3$

so center $(2, 3)$

h k

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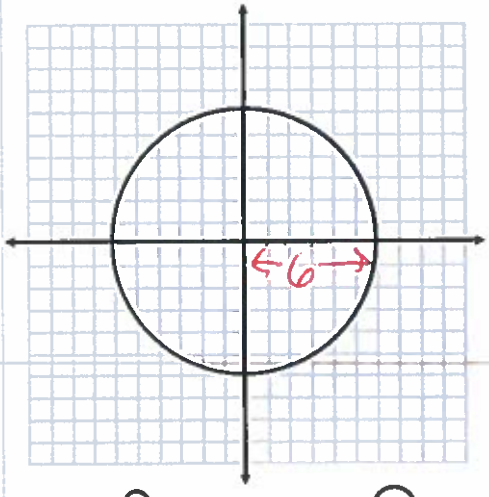
★ Now combine Area&Circumfence with Eqs. of Circles.

The equation of a circle in the coordinate plane with center (0, 0) is $x^2 + y^2 = r^2$

r is the radius



Write the equation of the circle. Find C & A.

1st Find the radius: 6

eq: $x^2 + y^2 = 36$

C = (0,0)

A = 36π un^2

remember this is r^2

$A = \pi r^2$

$= \pi \cdot 6^2$

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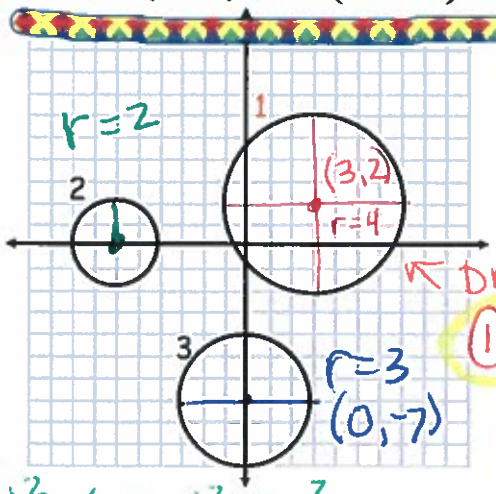
The equation of a circle in the coordinate plane with center (h, k) is $(x - h)^2 + (y - k)^2 = r^2$



Write the equation of the circle. Find C & A.

1st: Determine the center and radius of each graph.

center (-6,0)

↖ Draw diameters to Find center

① $(x-3)^2+(y-2)^2=16$

$C = 2\cdot\pi\cdot 4$ $C = 8\pi$ un

$A = \pi r^2$ $A = 16\pi$ un^2

② $(x-(-6))^2+(y-0)^2=2^2$

$(x+6)^2+y^2=4$

$C = 2\cdot\pi\cdot 2$ $A = \pi\cdot 2^2$

$C = 4\pi$ un $A = 4\pi$ un^2

③ $(x-0)^2+(y-(-7))^2=3^2$

$x^2+(y+7)^2=9$

$C = 2\pi\cdot 3$ $A = \pi\cdot 3^2$

$C = 6\pi$ un $A = 9\pi$ un^2

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example. $C = 2\pi$.

Find the equation of the circle if the center is at (-5, 6).

$C = 2\pi r$

$\frac{2\pi}{2\pi} = \frac{2\pi r}{2\pi}$

$1 = r$

$(x-(-5))^2+(y-6)^2=1^2$

$(x+5)^2+(y-6)^2=1$

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