

Consider the equation written in general form.

$x^2 + y^2 - 10y = 119$. How can we use completing the square to show that the equation resembles a circle?

$$x^2 + y^2 - 10y = 119$$

$$x^2 + y^2 - 10y + \left(\frac{-10}{2}\right)^2 = 119 + \left(\frac{-10}{2}\right)^2$$

$$x^2 + y^2 - 10y + 25 = 119 + 25$$

$$x^2 + (y - 5)^2 = 144$$

Complete the square to transform the equation to standard form.
What is the center and the radius of the circle? Graph it.

$$x^2 + y^2 - 6x + 4y - 12 = 0$$

$$x^2 - 6x + y^2 + 4y = 12$$

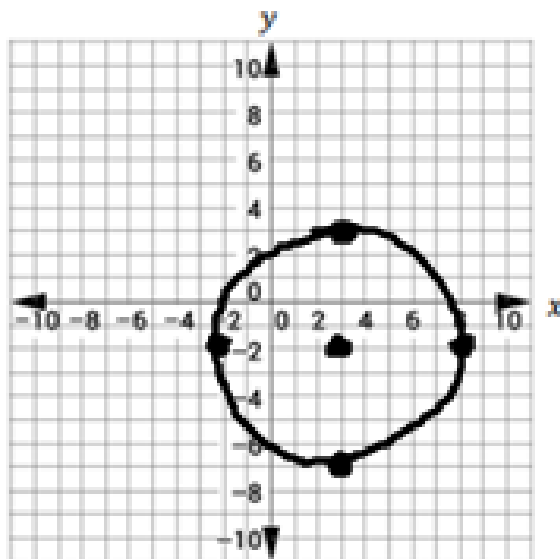
$$x^2 - 6x + \left(\frac{-6}{2}\right)^2 +$$

$$y^2 + 4y + \left(\frac{4}{2}\right)^2 =$$

$$12 + 9 + 4$$

$$x^2 - 6x + 9 + y^2 + 4y + 4 = 25$$

$$(x - 3)^2 + (y + 2)^2 = 25$$



$$(3, -2)$$
$$r = 5$$

$$x^2 + y^2 - 8x - 12y = -36$$

$$x^2 - 8x + y^2 - 12y = -36$$

$$x^2 - 8x + \left(\frac{-8}{2}\right)^2 +$$

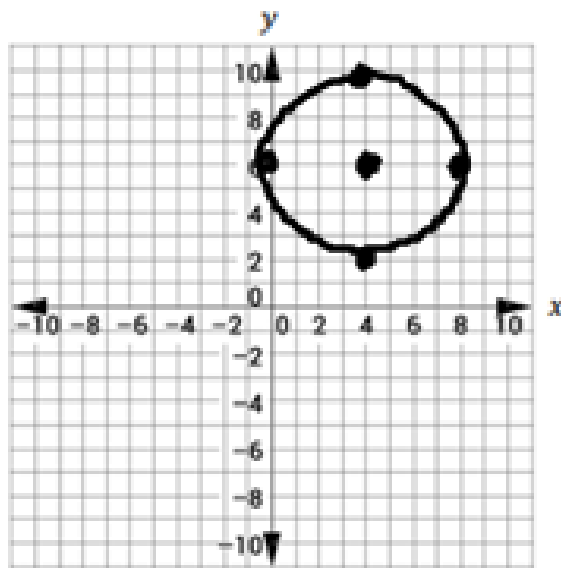
$$y^2 - 12y + \left(\frac{-12}{2}\right)^2 =$$

$$-36 + 16 + 36$$

$$x^2 - 8x + 16 + y^2 - 12y + 36 = 16$$

$$(x - 4)^2 + (y - 6)^2 = 16$$

$$(4, 6) \quad r = 4$$



$$x^2 + y^2 - 10x - 12y + 45 = 0$$

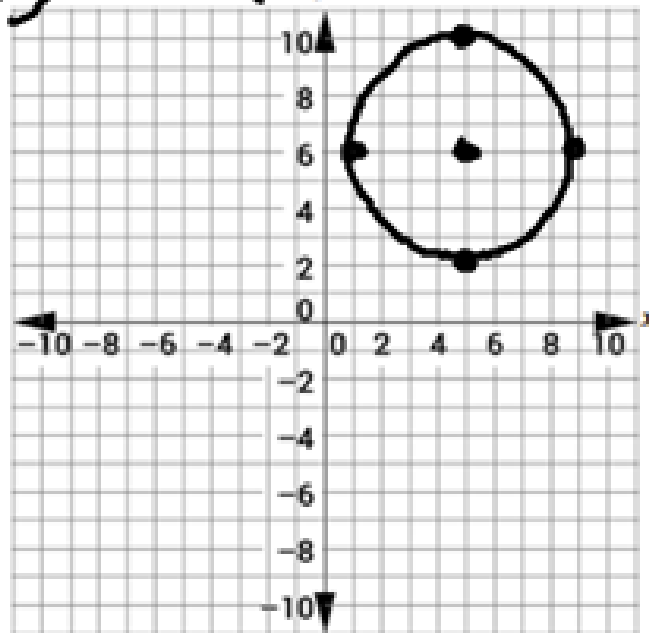
$$x^2 - 10x + y^2 - 12y = -45$$

$$x^2 - 10x + \left(\frac{-10}{2}\right)^2 + y^2 - 12y + \left(\frac{-12}{2}\right)^2 = -45 + 25 + 36$$

$$x^2 - 10x + 25 + y^2 - 12y + 36 = 16$$

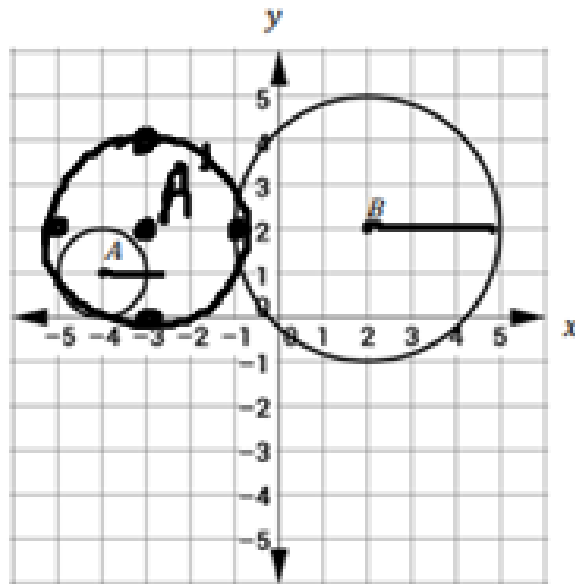
$$(x-5)^2 + (y-6)^2 = 16$$

$$(5, 6) \quad r=4$$



Transformations of Circles:

What transformation(s) will map circle A onto circle B?



$$(x, y) \Rightarrow (x+6, y+1)$$

Scale factor (K)
3x around pt A

Graph the result of a transformation of circle A using the rule $(x, y) \rightarrow (x + 1, y + 1)$ followed by a dilation of scale factor two centered at point A'

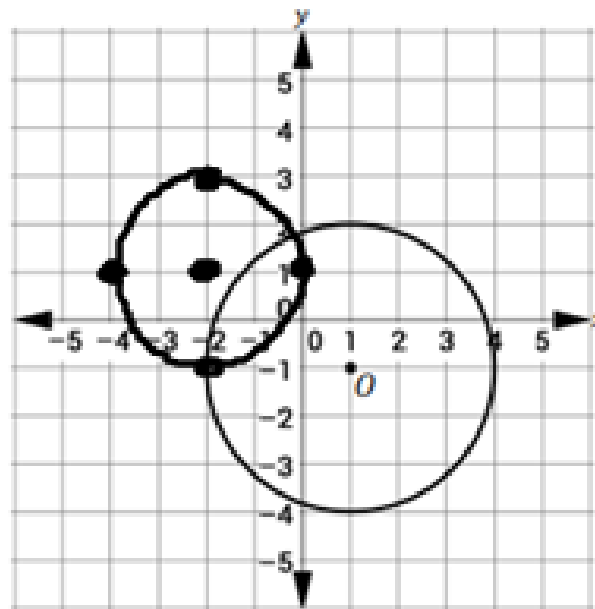
Describe where A'' will be located if circle A' is dilated by scale factor two centered at the origin instead of centered at point A' .

$$A'(-3, 2) \times 2 \quad A''(-6, 4)$$

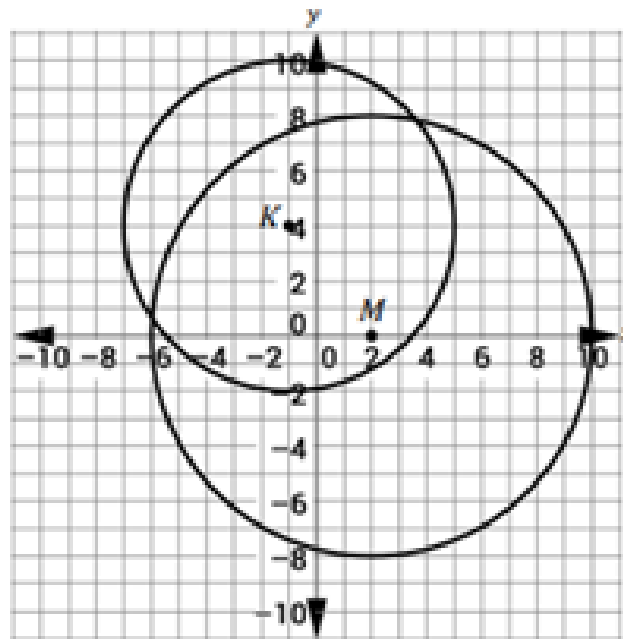
Your turn:

Graph the result of a transformation using the rule $(x, y) \rightarrow (x - 3, y + 2)$ followed by a dilation of scale factor $\frac{2}{3}$ centered on point O' on the coordinate plane below.

$$\frac{2}{3} \left(\frac{2}{3} \right)$$



Consider the following diagram.



Describe the sequence of transformations that carry circle K onto circle M .

$$(x, y) \Rightarrow (x+3, y-4)$$

$$K \text{ radius} = 6$$

$$M \text{ radius} = 8$$

$$\frac{8}{6} = \frac{4}{3}$$

Scale of $\frac{4}{3}$ centered at K .