Today we learned about graphing circles in the coordinate plane. We discussed two forms that the circle equation can be written in. The Standard Form \((x-h)^2+(y-k)^2=r^2\) and the General Form \(Ax^2+By^2+Cx+Dy+E=0\).

Below are the notes that we took in class.

**Standard Form of a Circle**
\[
(x - h)^2 + (y - k)^2 = r^2
\]
Center is at \((h, k)\)

\(r\) is the radius of the circle

**General Form of a Circle**
\[
Ax^2 + By^2 + Cx + Dy + E = 0
\]

**EX 1** Write an equation of a circle with center \((3, -2)\) and a radius of 4.
\[
(x-3)^2 + (y+2)^2 = 16
\]

**EX 2** Write an equation of a circle with center \((-4, 0)\) and a diameter of 10.
\[
(x+4)^2 + y^2 = 25
\]

**EX 3** Write an equation of a circle with center \((2, -9)\) and a radius of \(\sqrt{11}\).
\[
(x-2)^2 + (y+9)^2 = 11
\]
EX 4 Find the coordinates of the center and the measure of the radius.

\[(x-h)^2 + (y-k)^2 = r^2\]
\[(x - 6)^2 + (y + 3)^2 = 25\]

Center: \((6, -3)\)
\[r = \sqrt{25} = 5\]

5. Find the center, radius, & equation of the circle.

The center is \((0, 0)\)
The radius is \(r = 5\)
The equation is \((x-0)^2 + (y-0)^2 = 25\)
\[x^2 + y^2 = 25\]

6. Find the center, radius, & equation of the circle.

The center is \((1, -3)\)
The radius is \(r = 7\)
The equation is \((x-1)^2 + (y+3)^2 = 49\)

7. Graph the circle, identify the center & radius.

\[(x - 3)^2 + (y - 2)^2 = 9\]
Center \((3, 2)\)
Radius \(r = 3\)

Converting from General to Standard
1. A needs to be 1. Divide if needed.
2. Move the x terms together and the y terms together.
3. Move E to the other side of the equals sign.
4. Complete the square (as needed) for x.
5. Complete the square (as needed) for y.
6. Factor the left & simplify the right.

8. Write the standard equation of the circle.

\[x^2 + y^2 - 8x + 7 = 0\]
\[x^2 - 8x + y^2 + 7 = 0\]
\[-7 = -1\]
\[x^2 - 8x + y^2 = -7\]
\[\left(x - 4\right)^2 + y^2 = 9\]
\[\left(x - 4\right)^2 + (y-0)^2 = r^2\]
\[r = 3\]
9. Write the **standard** equation of the circle.  
*State the center & radius.*

\[ x^2 + y^2 + 4x - 6y - 3 = 0 \]

\[ x^2 + 4x + y^2 - 6y - 3 = 0 \]

\[ x^2 + 4x + 4 + y^2 - 6y + 9 = 3 + 4 + 9 \]

\[ (x+2)^2 + (y-3)^2 = 16 \]

Center: \((2, 3)\)  
\[ r = 4 \]

10. Write the **standard** equation of the circle.  
*State the center & radius.*

\[ \frac{2}{x^2} + \frac{2}{y^2} - \frac{16}{x} + \frac{4}{y} + \frac{20}{2} = 0 \]

\[ \frac{x^2 + y^2 - 8x + 2y + 10}{2} = 0 \]

\[ x^2 + y^2 - 8x + 2y + 1 = -10 + \frac{16}{2} \]

\[ (x-4)^2 + (y+1)^2 = 7 \]

Center: \((4, -1)\)  
Radius: \(\sqrt{7}\)

11. Write the **general** form of the equation of the circle.

\[ (x-4)^2 + (y+3)^2 = 36 \]

\[ x^2 - 8x + 16 + y^2 + 6y + 9 = 36 \]

\[ x^2 - 8x + 16 + y^2 + 6y + 9 = 36 \]

\[ x^2 + y^2 - 8x + 6y + 25 = 36 \]

\[ x^2 + y^2 - 8x + 6y - 11 = 0 \]