9.8 Notes Completing the Square & Converting to Standard Form

Name: 3/11/19

$(x-h)^2+(y-k)^2=r^2$

## Making a Perfect Trinomial Square

$\boxed{*\left(\frac{b}{2}\right)^2=c}$

1) $x^2-10x+\underline{25}$ $(x-5)^2$

$\left(\frac{-10}{2}\right)^2=(-5)^2=25$

25 / -5 × -5 / -10

2) $x^2+11x+\underline{30.25}$

$\left(\frac{11}{2}\right)^2=\frac{121}{4}=30.25$

30.25 / $\frac{11}{2}$ × $\frac{11}{2}$ / 11

$(x+5.5)^2$ or $\left(x+\frac{11}{2}\right)^2$

3) $x^2+14x+\underline{49}$

$\left(\frac{14}{2}\right)^2=49$ $(x+7)^2$

## Completing the Square...
## But We Are Not Doing the Whole Thing!!!

1) Move c to the right side of the equation. Move a and b to the left. $ax^2+bx+c=0$
2) Make a perfect trinomial square on the left. Remember what you add to one side, you must add to the other. $\left(\frac{b}{2}\right)^2$
3) Factor on the left. Simplify on the right.
4) ~~Take the square root of both sides.~~
5) ~~Solve for x.~~

Directions: Do the first 3 steps of completing the square.

1) $x^2=27-6x$

$x^2+6x+\underline{9}=27+\underline{9}$

$\left(\frac{6}{2}\right)^2=9$ 3 / 6 × 3 / 3 $(x+3)^2=36$

2) $\frac{2x^2+8x}{2}=\frac{12}{2}$

$x^2+4x+\underline{4}=6+\underline{4}$

$\left(\frac{4}{2}\right)^2=4$ $(x+2)^2=10$

3) $y^2+16=8y$

$y^2-8y+\underline{16}=-16+\underline{16}$

$\left(\frac{-8}{2}\right)^2=16$ $(y-4)^2=0$

16 / -4 × -4 / -8

# Writing the Standard Form of a Circle

- You will move "c" to the right side of the equation.
- Group your x's and group your y's.
- Do the first 3 steps of completing the square to the x and to the y.
- Write your final answer in standard form.

$(x-h)^2 + (y-k)^2 = r^2$

Directions: Write the equation of the circle in standard form.

4) $x^2 + y^2 + 6x - 10y + 9 = 0$

$(\frac{6}{2})^2 = 9$ $\quad (\frac{10}{2})^2 = 25$

$x^2 + 6x + \underline{9} + y^2 - 10y + \underline{25} = -9 + \underline{9} + \underline{25}$

$(x+3)^2 + (y-5)^2 = 25$ $\quad$ center $= (-3, 5)$

$r = \sqrt{25} = 5$

5) $x^2 + y^2 - 18x - 22y + 2 = 0$

$(\frac{-18}{2})^2 = 81$ $\quad (\frac{-22}{2})^2 = 121$

$x^2 - 18x + \underline{81} + y^2 - 22y + \underline{121} = -2 + \underline{81} + \underline{121}$

$(x-9)^2 + (y-11)^2 = 200$ $\quad$ center $(9, 11)$

radius $= \sqrt{200} \approx 14.14$

Application! Find the center and radius of the circle.

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

$(\frac{-12}{2})^2 = 36$ $\quad (\frac{2}{2})^2 = 1$

$x^2 - 12x + \underline{36} + y^2 + 2y + \underline{1} = 12 + \underline{36} + \underline{1}$

$(x-6)^2 + (y+1)^2 = 49$ $\quad$ center $(6, -1)$

radius $= 7$

7) $x^2 + y^2 + 3x + 8y + 9.25 = 0$

$x^2 + 3x + \underline{\frac{9}{4}} + y^2 + 8y + \underline{16} = -9.25 + \underline{\frac{9}{4}} + \underline{16}$

$(x + \frac{3}{2})^2 + (y+4)^2 = 9$

center $(-\frac{3}{2}, -4)$

$r = 3$