

## 7.2 Word Problems and Circles

Tips to solving word problems

- 1) Identify variables - what are you trying to solve for?
- 2) Write equations - translate from English to math  
\* Value • Variable \*
- 3) Solve by substitution

### Word Problems

- a) A personal aircraft is traveling with the wind and flies 520 miles in 4 hours. On the return trip, the airplane is traveling against the wind and takes 5 hours to travel the same distance. Find the speed of the airplane in still air.

- b) A field goal is 3 points and the extra point after a touchdown is 1 point. In a recent post-season, Adam Vinatieri of the Indianapolis Colts made a combined total of 21 field goals and extra-point kicks for a total of 49 points. How many field goals and how many extra-point kicks did he make?

$e$  = extra-point kicks  
 $f$  = field goals

$$\begin{aligned} f + e &= 21 & e &= 21 - f \\ 3f + 1e &= 49 & e &= 21 - 14 = 7 \\ 3f + 21 - f &= 49 & & \\ 2f + 21 &= 49 & & \\ -21 & -21 & & \\ \hline 2f &= 48 & f &= 14 \\ \frac{2f}{2} & & & \end{aligned}$$

14 field goals  
7 extra point kicks

- c) The revenue for a production of Wizard of Oz by a theatre group is  $y = -50t^2 + 300t$  where  $t$  is the ticket price in dollars. The cost for the production is  $y = 600 - 50t$ . Determine the ticket price that will allow the production to break even. (Hint: a company breaks even when the revenue is equal to the cost)

$$\begin{aligned} y &= -50t^2 + 300t \\ y &= 600 - 50t \end{aligned}$$

$$\begin{aligned} -50t^2 + 300t &= 600 - 50t \\ +50t^2 - 300t & \quad -300t + 50t^2 \end{aligned}$$

$$0 = 600 - 350t + 50t^2$$

$$0 = 50t^2 - 350t + 600$$

$$0 = 50(t^2 - 7t + 12) \quad \begin{matrix} 12t^2 \\ -3t -4t \end{matrix}$$

$$\begin{aligned} 0 &= 50(t-3)(t-4) \\ t &= 3, 4 \end{aligned}$$

\$3 or \$4

Standard Form of a Circle:

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

$r$  : radius

$(h, k)$  : Center

1. Identify the center and radius of each equation:

a)  $(x + 10)^2 + (y + 5)^2 = 25$   
 $C: (-10, -5)$   $r^2$

$$r = \sqrt{25} = 5$$

b)  $(x + 9)^2 + (y + 1)^2 = 16$

c)  $(x - 14)^2 + (y + 8)^2 = 15$

d)  $(x + 12)^2 + (y - 6)^2 = 13$

$$C: (-12, 6)$$

$$r = \sqrt{13}$$

e)  $(x - 2)^2 + (y - 3)^2 = 1$

f)  $(x - 4)^2 + (y + 13)^2 = 5$

2. Find the center and radius for each circle pictured. Then write the equation of the circle in standard form.

a)

b)

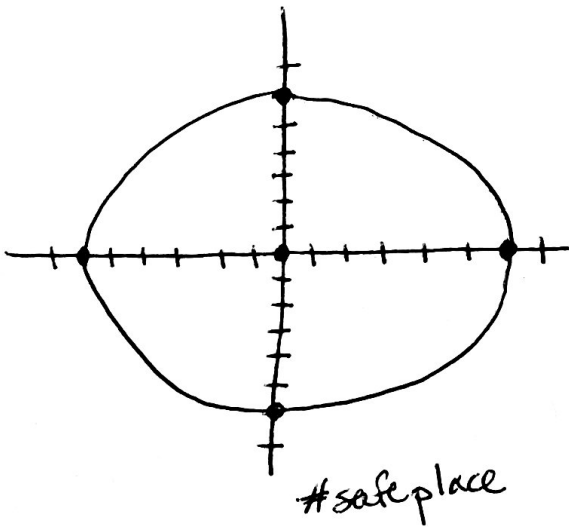
c)

d)

3. Identify the center and radius of each circle. Then sketch the graph.

a)  $x^2 + y^2 = 36$      $C: (0, 0)$   
 $r = 6$

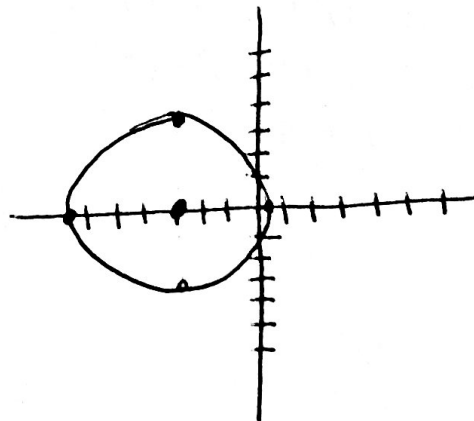
b)  $(x - 3)^2 + (y + 2)^2 = 4$



c)  $(x + 4)^2 + (y - 4)^2 = 1$

d)  $(x + 3)^2 + y^2 = 10$

$C: (-3, 0)$   
 $r = \sqrt{10} \approx 3.2$



3. Writing the equation of a circle give the center and a point on the circle:

a) Center:  $(\overset{h}{-2}, \overset{k}{-3})$ ; Point on the circle:  $(\overset{x}{15}, \overset{y}{2})$

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

$$(x+2)^2 + (y+3)^2 = r^2$$

$$(15+2)^2 + (2+3)^2 = r^2$$

$$(17)^2 + (5)^2 = r^2$$

$$289 + 25 = r^2$$

$$r^2 = 314$$

$$(x+2)^2 + (y+3)^2 = 314$$

b) Center:  $(1,0)$ ; Point on the circle:  $(10,15)$

c) Center:  $(-12,11)$ ; Point on the circle:  $(-17,12)$

d) Center:  $(\overset{h}{14}, \overset{k}{-10})$ ; Point on the circle:  $(\overset{x}{12}, \overset{y}{-13})$

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

$$(x-14)^2 + (y+10)^2 = r^2$$

$$(12-14)^2 + (-13+10)^2 = r^2$$

$$(-2)^2 + (-3)^2 = r^2$$

$$4 + 9 = r^2$$

$$13 = r^2$$

$$(x-14)^2 + (y+10)^2 = 13$$