Pre-Calculus CP 1 – Section 7.1 & 7.2 Notes **Name:** KEY
Solving Systems of Equations

Warm Up: Solve the system of equations.

a) $x-y=-4$ $x=y-4$
$x+2y=5$
$y-4+2y=5$
$y=3$
$x=3-4=-1$

b) $6x-3y-4=0$
$x+2y-4=0$
$x=-2y+4$
$6(-2y+4)-3y=4$
$-12y+24-3y=4$
$20=15y$
$\frac{4}{3}=y$
$x=-2\left(\frac{4}{3}\right)+4$
$=-\frac{8}{3}+\frac{12}{3}=\frac{4}{3}$

Examples

Two Solution Case

a) $x-y=-4$ $\rightarrow x=y-4$
$x^2-y=-2$
$(y-4)^2-y=-2$
$y^2-8y+16-y=-2$
$y^2-9y+18=0$
$(y-6)(y-3)=0$
$y=6,3$
$x=2,-1$
$(2,6)$ & $(-1,3)$

b) $x^2+y=0$ $y=-x^2$
$x^2-4x-y=0$
$x^2-4x+x^2=0$
$2x^2-4x=0$
$2x(x-2)=0$
$x=0,2$
$y=0,-4$
$(0,0)$ & $(2,-4)$

No Real Solution Case

a) $-\frac{2}{3}x+y=2 \rightarrow y = \frac{2x}{3}+2$

$2x-3y=6$

$2x-3\left(\frac{2x}{3}+2\right)=6$

$2x-2x-6=6$

$-6=6$

NO soln!

b) $x+y=4$ $\quad y=-x+4$

$x^2+y=2$

$x^2+(-x+4)=2$

$x^2-x+2=0$

not factorable, so

$$\frac{-(-1)\pm\sqrt{1^2-4(1)(2)}}{2(1)}$$

$$=\frac{1\pm\sqrt{1-8}}{2} = \text{no real soln!!}$$

Applications

A total of $20,000 is invested in two funds paying 6.5% and 8.5% simple interest. The investor wants a yearly interest check of $1600 from the two investments. Write and solve a system of equations to determine how much is invested at each interest rate.

$x+y=20{,}000 \qquad x=20{,}000-y$

$.065x+.085y=1600$

$.065(20{,}000-y)+.085y=1600$

$1300-.065y+.085y=1600$

$.02y=300$

$y=15{,}000 \rightarrow 8.5\%$

$x=5{,}000 \rightarrow 6.5\%$

A small fast-food restaurant invests $5,000 to produce a new food item that will sell for $3.49. Each item can be produced for $2.16.

a) How many units must be sold to break even?
b) How many units must be sold to make a profit of $8500?

$R = 3.49x$ (Revenue)
$C = 5{,}000 + 2.16x$ (cost)

(a) $3.49x = 5{,}000 + 2.16x$
$1.33x = 5{,}000$
$x \approx 3760$ units

(b) $P = R - C = 3.49x - (5{,}000 + 2.16x)$
$8500 = 1.33x - 5000$
$13{,}500 = 1.33x$
$x \approx 10{,}151$ units

The perimeter of a rectangle is 280 cm and the width is 20 cm less than the length. Find the dimensions of the rectangle.

$2l + 2(l-w) = 280$
$2l + 2l - 40 = 280$
$4l = 320$
$l = 80$
$w = 80 - 20 = 60$