

### 8.2 Linear Combinations

fancy way of talking about  
2 variable equations

Real-Life Applications

### Direct Relations

Y changes as X does

$$2x + 3y = 6$$

X	Y
-2	$1\frac{2}{3}$
0	2
2	$2\frac{2}{3}$

$$\begin{aligned}
 -4 + 3y &= 6 \\
 +4 & \\
 \hline
 3y &= 10 \\
 \frac{3y}{3} &= \frac{10}{3} \\
 y &= 3\frac{1}{3}
 \end{aligned}$$

$$\begin{aligned}
 4 + 3y &= 6 \\
 -4 & \\
 \hline
 3y &= 2 \\
 y &= \frac{2}{3}
 \end{aligned}$$

$$\begin{aligned}
 \frac{1}{3}x - 2y &= 7 & -1 - 2y &= 7 & -1 - 2y &= 7 \\
 & & +1 & & -1 - 2y &= 7 \\
 & & \frac{-2y}{-2} &= \frac{8}{-2} & -2y &= 6 \\
 & & y &= -4 & y &= -3
 \end{aligned}$$

X	Y
-3	-4
0	-3.5
3	-3

$$\begin{aligned}
 \frac{-2y}{-2} &= \frac{7}{-2} \\
 y &= -\frac{7}{2} = -3.5
 \end{aligned}$$

### Writing in slope intercept form

$y = mx + b$  solve for y

$$\begin{aligned}
 2x + 4y &= 9 & -2x - 3y &= 9 \\
 -2x & & +2x & \\
 \hline
 4y &= -\frac{2x}{4} + \frac{9}{4} & -3y &= 2x + 9 \\
 \frac{4y}{4} &= -\frac{2x}{4} + \frac{9}{4} & \frac{-3y}{-3} &= \frac{2x}{-3} + \frac{9}{-3} \\
 y &= -\frac{1}{2}x + \frac{9}{4} & y &= -\frac{2}{3}x - 3
 \end{aligned}$$

### Finding Intercepts

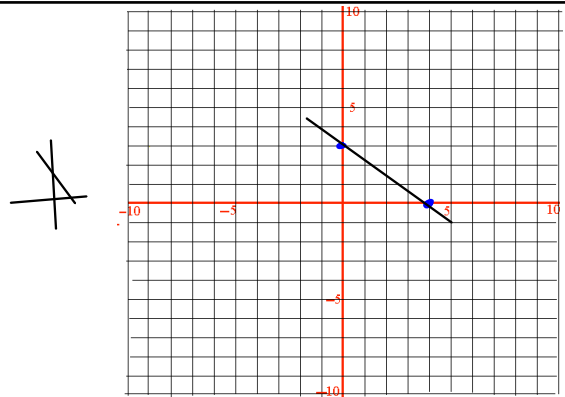
from standard form

$$ax + by = c$$

$$\text{the } x\text{-int} = \frac{c}{a}$$

$$\text{the } y\text{-int} = \frac{c}{b}$$

$$\begin{aligned}
 3x + 4y &= 12 & -2x - \frac{1}{3}y &= 8 \\
 x\text{-int} &= 4 & x\text{-int} &= \frac{8}{-2} = -4 \\
 y\text{-int} &= 3 & y\text{-int} &= -32
 \end{aligned}$$



Writing Linear combinations  
use given variables to write equations

Shirts are sold for \$12. The store buys the shirts for \$7. Write a combination to represent Profit  
P = profit s = # sold b = # bought

$$P = 12s - 7b$$

John is practicing for the Triathlon. He swims at 8mi/h Jogs at 18mi/h then bikes at 30mi/h. Write an equation of time practicing.

t = time s = time swim j = time Jog b = time bike

$$t = 8s + 18j + 30b$$

for 1-6

use  $x = -2, 0, 2$  for 1-5

$x = -3, 0, 3$  for 6