

Chapter 7 Skills Summary

1. Skill: Solve a linear system by graphing

- Strategy:
1. Draw the graphs after determining their intercepts, or their slopes and y-intercept
 2. The coordinates of the point of intersection are the solution of the linear system.
 3. Verify the solution by substituting the coordinates into the equations.

*** Remember to define your variables!!!

Example:

Solve the linear system $2x + 3y = 12$ and $x - y = 11$

by graphing.

$$2x + 3y = 12$$

$$\underline{x \text{ int } (y=0)}$$

$$2x + 3(0) = 12$$

$$2x = 12$$

$$x = 6 \rightarrow (6, 0)$$

$$\underline{y \text{ int } (x=0)}$$

$$2(0) + 3y = 12$$

$$3y = 12$$

$$y = 4 \quad (0, 4)$$

$$x - y = 11$$

$$\underline{x \text{ int } (y=0)}$$

$$x = 11$$

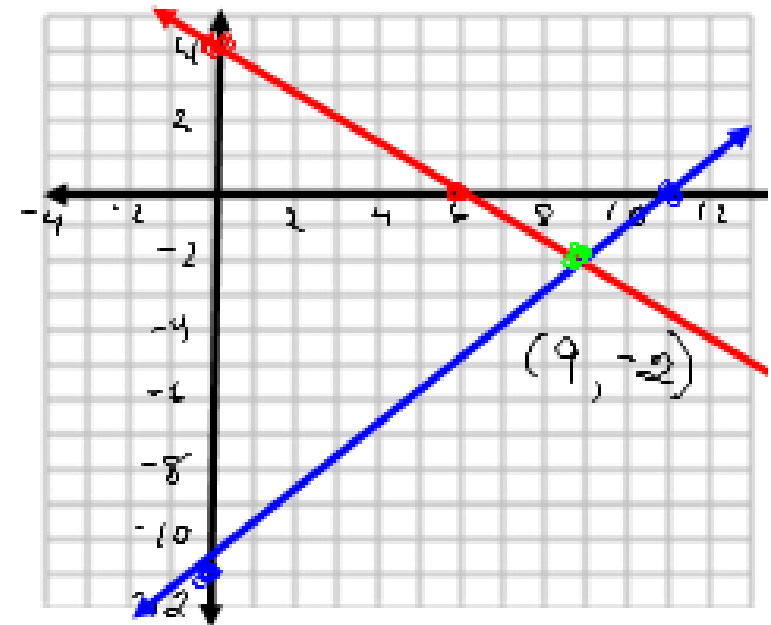
$$(11, 0)$$

$$\underline{y \text{ int } (x=0)}$$

$$0 - y = 11$$

$$\frac{-y}{-1} = \frac{11}{-1}$$

$$y = -11 \quad (0, -11)$$



2. Skill: Solve a linear system algebraically

Strategy: 1. Use substitution or elimination.

2. Verify the solution by substituting for x and y in both equations to check that the coordinates of the point of intersection satisfy both equations.

Examples: a) solve the linear system by using substitution

$$\begin{array}{l} x + 2y = 13 \\ 2x - 3y = -9 \end{array} \quad \rightarrow \text{solve an equation for } x \text{ or } y$$

$$x = -2y + 13$$

then plug into
the other equation

$$2(-2y + 13) - 3y = -9$$

$$-4y + 26 - 3y = -9$$

$$\frac{-7y}{-7} = \frac{-35}{-7}$$

$$y = 5$$

plug value into
equation solve
for x

$$x + 2(5) = 13$$

$$x = 13 - 10$$

$$x = 3$$

b) solve the linear system by using elimination

$$\begin{cases} 3a+2b=5 \\ 2a+3b=0 \end{cases}$$

**Equations need to be in same order!*
need to have a variable with exactly opposite value so one "cancels" out

$$\begin{array}{r} 9a + 6b = 15 \\ + \quad -4a - 6b = 0 \\ \hline \end{array}$$

$$\frac{5a}{5} = \frac{15}{5}$$

$$a = 3$$

Add the solve for variable

plug into equation
Solve for "other" variable

$$\begin{aligned} 3(3) + 2b &= 5 \\ 9 + 2b &= 5 \end{aligned}$$

$$\frac{2b}{2} = \frac{-4}{2}$$

$$b = -2$$

- c) WORD PROBLEM: A co-op that sells organic food made 25kg of soup mix by combining green peas that cost \$5/kg with red lentils that cost \$6.50/kg. This mixture costs \$140. What was the mass of peas in the mixture?

$p \rightarrow$ mass of peas $r \rightarrow$ mass of lentils

$$\textcircled{1} \quad p + r = 25$$

$$\rightarrow \quad p = -r + 25$$

$$\textcircled{2} \quad 5p + 6.5r = 140$$

$$5(-r + 25) + 6.5r = 140$$

$$5r + 125 + 6.5r = 140$$

-125 -125

$$\frac{1.5r}{1.5} = \frac{15}{1.5}$$

$$r = 10$$

mass of peas

$$p + 10 = 25$$

$$p = 15$$

mass of peas
was 15kg.

2. **Skill: Determine the number of solutions of a linear system.**

Strategy: 1. Compare the graphs of the equations.

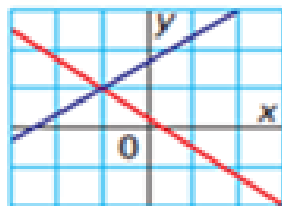
2. Compare the slope and y-intercepts of the line.

→ set up in
 $y = mx + b$

Possible Solutions for a Linear System

Intersecting Lines

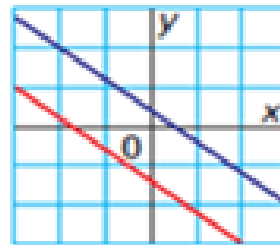
One solution



Equations have different slopes

Parallel Lines

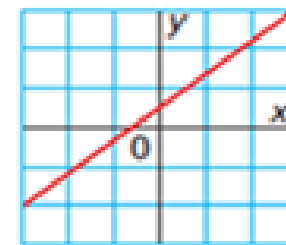
No solution



Equations have equal slopes

Coincident Lines

Infinite solutions



Equations have equal slopes and the same y-intercept

Coincident lines – lines that have equal slopes and the same y- intercept. Since the graphs coincide, every point on one line is also a point on the other line; so all the points are the line are solutions. Therefore, there are **infinite** (unlimited) solutions.

set into $y = mx + b$

* we need the slopes and y intercept to compare

Example: Determine the number of solutions for each linear system.

1. $x + 2y = 6$ and $x + y = -2$

$$x + 2y = 6$$

$$2y = \frac{-x}{2} + \frac{6}{2}$$

$$y = -\frac{1}{2}x + 3$$

$$x + y = -2$$

$$y = -x - 2$$

one solution!

Different slopes.

2. $3x + 5y = 9$ and $6x + 10y = 18$

$$3x + 5y = 9$$
$$\frac{5y}{5} = \frac{-3x}{5} + \frac{9}{5}$$

$$y = -\frac{3}{5}x + \frac{9}{5}$$

$$6x + 10y = 18$$

$$\frac{10y}{10} = \frac{-6x}{10} + \frac{18}{10}$$

$$y = -\frac{6}{10}x + \frac{18}{10}$$

$$y = -\frac{3}{5}x + \frac{9}{5}$$

infinite solutions!
coincident lines.

3. $2x - 5y = 30$ and $4x - 10y = 15$

$$2x - 5y = 30$$

$$-5y = \frac{-2x}{-5} + \frac{30}{-5}$$

$$y = \frac{2}{5}x - 6$$

$$4x - 10y = 15$$

$$-10y = \frac{-4x}{-10} + \frac{15}{-10}$$

$$y = \frac{2}{5}x - \frac{3}{2}$$

No solution
lines are
parallel
same slope
different
intercepts.