Name: key Date: Block:

8.2/9.1 Modeling and Solving Linear Systems Graphically and Algebraically

Bell Work Do the following systems of two linear equations have one solution, no solution, or an infinite number of solutions? Explain your choice.

a) $6x - 3y = 12$
$2x - y = 4$

$6x - 3y = 12$ | $2x - y = 4$
$6x - 12 = 3y$ | $2x - 4 = y$
$2x - 4 = y$ |

SAME! (infinite soln)

b) $y = x + 7$
$x + y = 7$

$y = x + 7$
$y = -x + 7$
(one soln)

c) $y = 2x - 1$
$y = 2x + 1$

parallel
(no soln)

Example 1: People can rent ski and snowboard equipment from two places at Whistler Resort. Option A charges a one-time $30 fee and then $5 per hour. Option B charges $20 per hour.

a) Create a system of linear equations to model the rental charges.

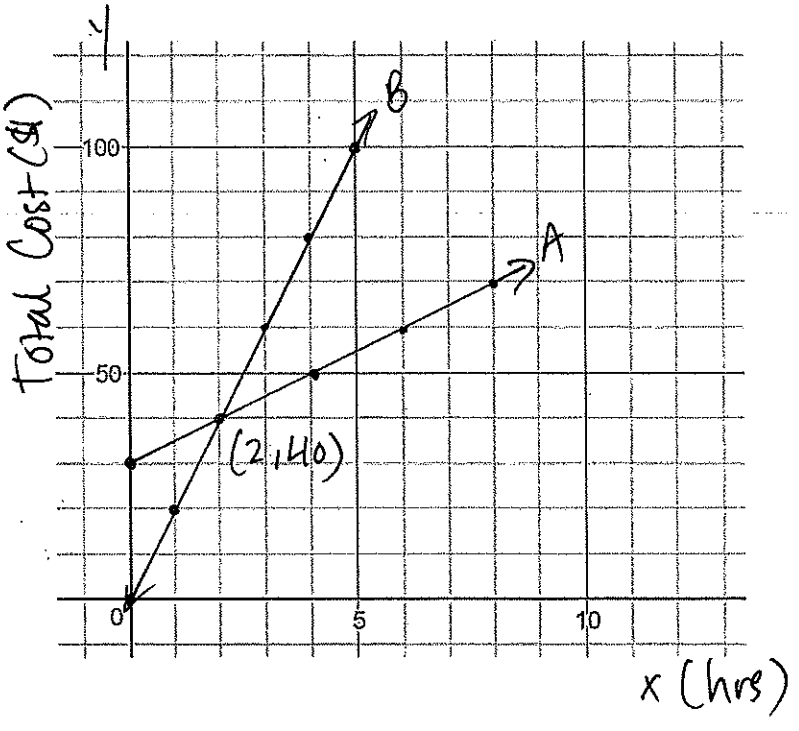
Let y represent The total cost

Let x represent The number of hours

Option A: $y = 30 + 5x$ ①

Option B: $y = 20x$ ②

b) Solve the linear system algebraically. Then graph the system. What does the solution represent?



Sub ① in ②

$30 + 5x = 20x$

$30x = 15x$

$2 = x$

To Find y, sub $x = 2$ back into either equation.

$y = 40$.

At 2 hours, the 2 options cost $40.

Example 2: A movie theater charges $11 for an adult ticket and $8 for children's or senior's tickets. Suppose 240 people went to see the movie and ticket sales totaled $2370.

a) The manager wants to know how many adults went to see the movie. What system of linear equations could help the manager determine the answer?

Let a represent the number of adults.

Let s represent the number of seniors / children.

$a + s = 240 \rightarrow a = 240 - s$ ①

$11a + 8s = \$2370$ ②

b) Solve the system algebraically.

Sub ① in ②

$11(240 - s) + 8s = 2370 \rightarrow -3s = -270$

$2640 - 11s + 8s = 2370 \rightarrow s = 90$

Therefore, 140 adults and 90 children/seniors attended the movie.

Your Turn

1. Two grain bins are being emptied starting at the same time. The larger bin holds 40 m^3 of grain. It is emptied at a rate of 2m^3 per minute. The smaller bin stores 30 m^3 of grain. This bin is emptied at a rate of 1m^3 per minute.

   a) Model the volume of grain remaining as a function of time using a system of linear equations.

   let V rep. the volume. $V = 40 - 2t$ ①

   let t rep the number of minutes. $V = 30 - t$ ②

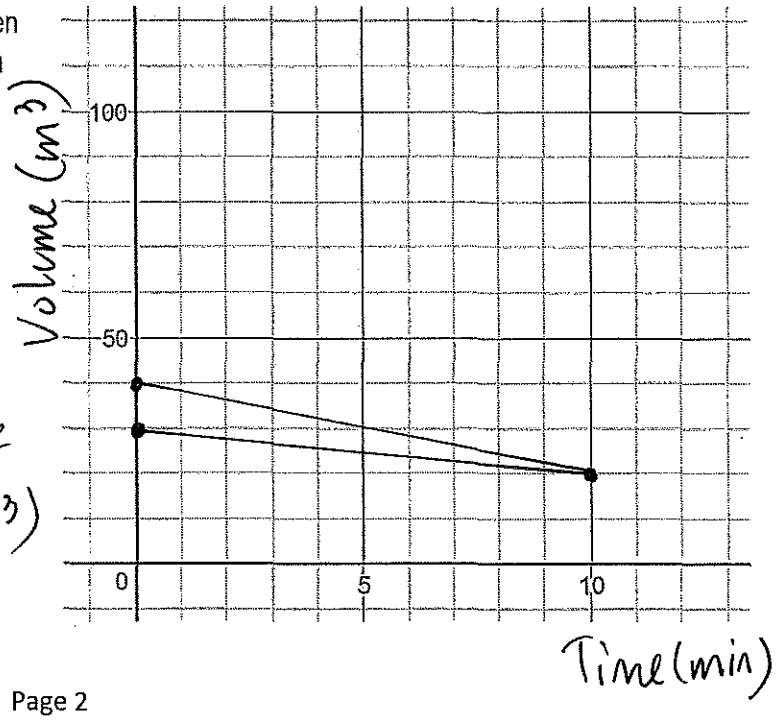
   b) Solve the linear system algebraically. Then graph the system. What does the solution represent?

   Sub ① in ②

   $40 - 2t = 30 - t$

   $10 = t \quad V = 20$

   At 10 min, they both have the same volume (20m^3)



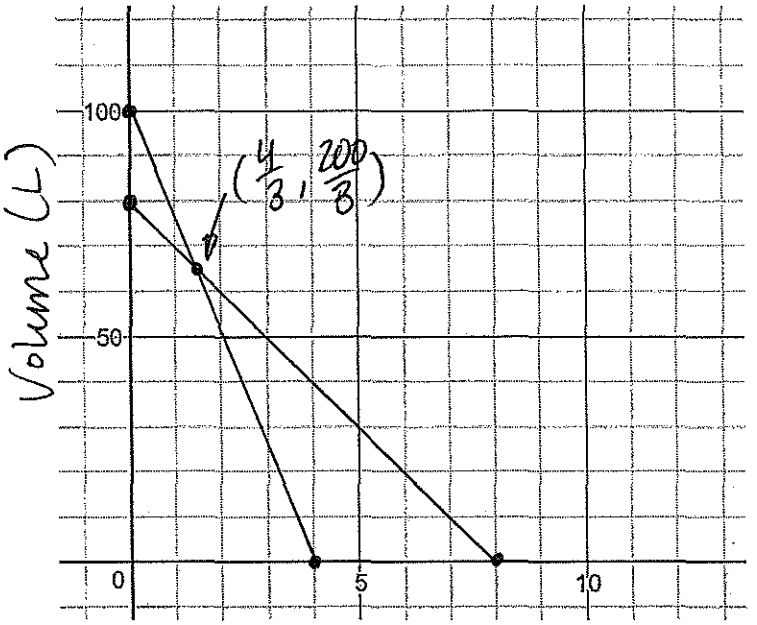
2. Two pools start draining at the same time. The larger pool contains 100 L of water and drains at a rate of 25 L/min. The smaller pool contains 80 L of water and drains at a rate of 10 L/min.

a) Model the draining of the pools algebraically using a system of linear equations.

let V rep the volume. $V = 100 - 25t$ ①

let t rep the number of min. $V = 80 - 10t$ ②

b) Solve the linear system algebraically. Then graph the system. What does the solution represent?



Sub ① in ②

$100 - 25t = 80 - 10t$

$20 = 15t$

$\frac{4}{3} = t$

$V = \frac{200}{3}$

at about 1.33 min both pools have 66.7 L.

3. During a performance by a theater company, the main act was on stage for 3 min less than twice the time of the opening act. Together, the two acts performed 132 min.

a) Write a system of linear equations to represent the length of time each act performed.

let m rep. the time of the main act.

let a rep. the time of the opening act.

b) Solve the linear system algebraically. What does the solution represent?

① $m + a = 132$

② $2a - 3 = m$

Sub ② in ①

$2a - 3 + a = 132$

$3a = 132$

$a = 45$ ✓

$m = 87$ ✓

HW: Section 8.2 p. 440 #1, 2, 5, 6, 7, 8, 11, 17, 18