Name: KEY Date:________________ Block:_____

8.1 Solving Linear Systems Graphically

Bell Work:

Ms. Lo went to her favourite Starbucks on Lonsdale and 3rd and spent $11.50. A brownie costs $3.50 and she bought two coffees. What was the cost of a coffee?

a) Define your variables. Write "let" statements (i.e. define your independent and dependent variables).

Let c rep. the cost of a coffee. Let T rep. total cost.

b) Write an algebraic equation to represent the problem (i.e. make sure both variables are in the equation).

$T = 2c + 3.50 \rightarrow 11.50 = 2c + 3.50$

c) Solve your equation.

$c = 4$

Therefore, one coffee costs $ 4 .

Vocabulary:

Term	Definition
Point of Intersection	A point at which two lines touch or cross
System	Two or more linear equations involving common variables
Solution	▪ a point of intersection on a graph ▪ an ordered pair that satisfies both equations ▪ a pair of values occurring in the tables of values of both equations

Example 1: Paden already has $16 in his savings account while his sister Lucca has $34. Both of them have just started new jobs. Each day they work Paden adds $5 to his savings, while Lucca adds $2.

a) Fill in the table of values:

Paden's Total Savings:

Day	Total Savings ($)
0	16
1	21
2	26
3	31
4	36
5	41
6	46

Lucca's Total Savings:

Day	Total Savings ($)
0	34
1	36
2	38
3	40
4	42
5	44
6	46

b) Write an equation to represent Paden's total savings and Lucca's total savings. Write "let" statements (i.e. define your independent and dependent variables).

let T rep total savings   Paden: $T = 5d + 16$

let d rep # of days.   Lucca: $T = 2d + 34$

c) The siblings want to know if they will ever have the same amount of money. If so, what will the amount be and on what day?

They will have the same amt of money (\$46) on day 6.

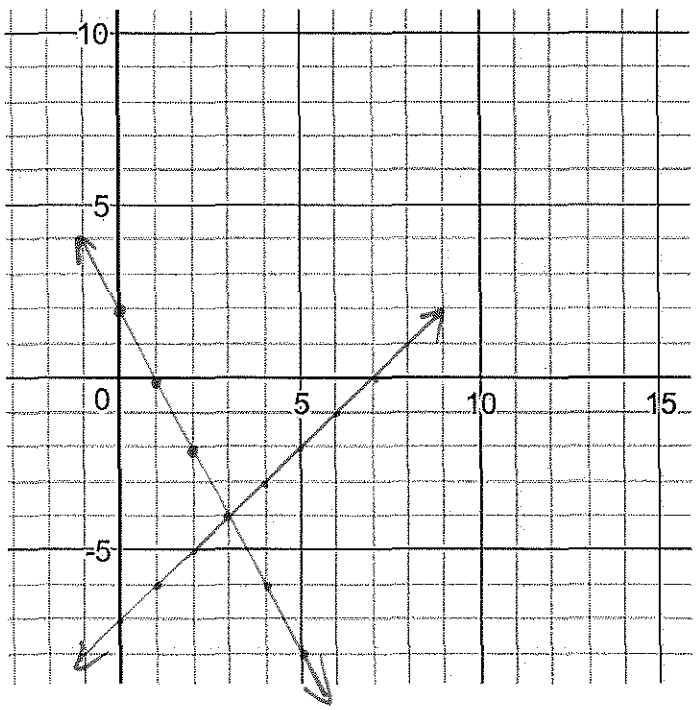
- Therefore the **solution** (x, y) to this system of linear equations is: (6, 46).
- That means that both equations if graphed will **intersect** at the point: (6, 46).

Example 2: Consider the system of linear equations $2x + y = 2$ and $x - y = 7$. Identify the point of intersection of the lines by graphing. Verify the solution using LS/RS.

Rearrange to $y = mx + b$

$y = -2x + 2$

$y = x - 7$



LS	RS
y	$x - 7$
-4	$3 - 7$
	-4

LS = RS ✓

LS	RS
y	$-2x + 2$
-4	$-2(3) + 2$
	$-6 + 2$
	-4

LS = RS ✓

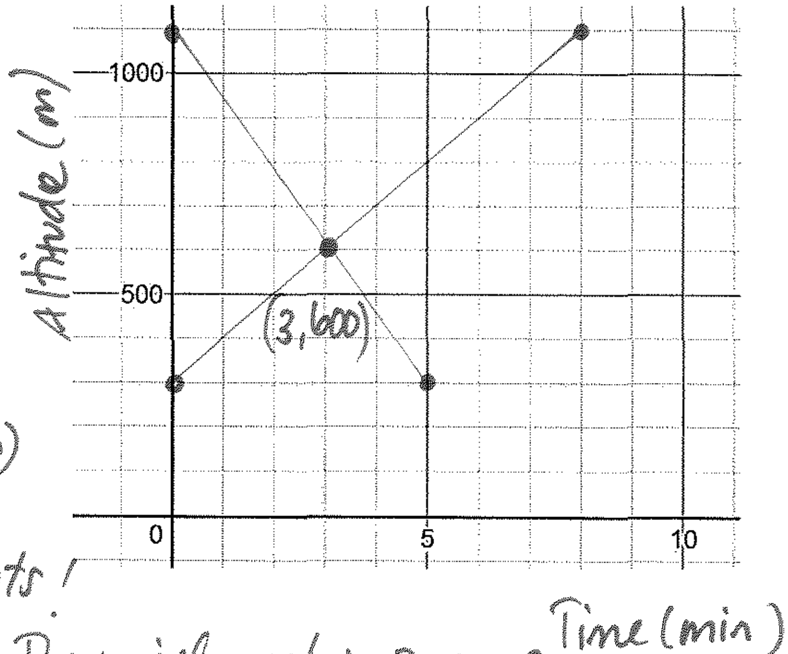
$\therefore$ (3, −4) is the sol^n to both lines.

Example 3: A red tram carries passengers down Grouse Mountain in Vancouver. It travels from an altitude of about 1100 m to an altitude of 300 m. The ride takes 5 min. There is also a blue tram that can go up the mountain in 8 min.

Sketch a graph to represent the system involving the trams' altitudes and times.

Tram		Red	Blue
Start	Time	0	0
	Altitude	1100	300
End	Time	5	8
	Altitude	300	1100
Graph		(0, 1100)	(0, 300)
		(5, 300)	(8, 1100)

graph your end points!



∴ They will meet in 3min @ 600m.

Practice:

Example 4: Deborah already has $40 in her savings account while her brother Josh has $50. Both of them have just started new jobs. Each day they work Deborah adds $10 to her savings, while Josh adds $8.

a) Fill in the table of values:

Deborah's Total Savings:

Day	Total Savings ($)
0	40
1	50
2	60
3	70
4	80
5	90

Josh's Total Savings:

Day	Total Savings ($)
0	50
1	58
2	66
3	74
4	82
5	90

b) Write an equation to represent Deborah's total savings and Josh's total savings. Write "let" statements (i.e. define your independent and dependent variables).

let T rep Total Savings

let d rep. # of days

Josh: $T = 8d + 50$

Deb: $T = 10d + 40$

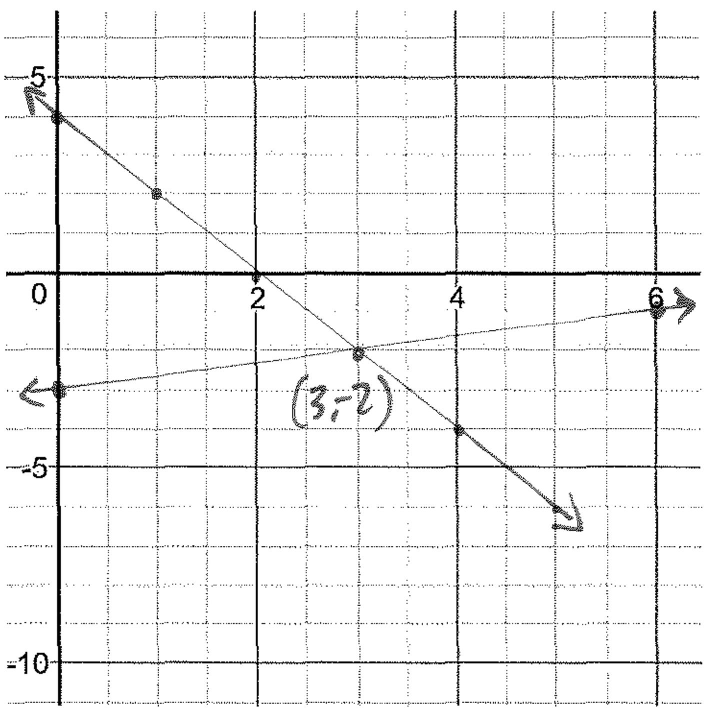
c) The siblings want to know if they will ever have the same amount of money. If so, what will the amount be and on what day?

(5, 90)

On day 5, they will both have \$90.

- Therefore the **solution** (x, y) to this system of linear equations is: (5, 90)
- That means that both equations if graphed will **intersect** at the point: (5, 90)

<u>Example 5:</u> What is the solution to the systems of linear equations $x - 3y = 9$ and $2x + y = 4$? Verify the solution.



Rearrange to $y = mx + b$

$x - 3y = 9$

$x - 9 = 3y$

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

$2x + y = 4$

$y = -2x + 4$

The point of Intersection is $(3, -2)$.

LS	RS
$x - 3y$	9
$3 - 3(-2)$	
$3 + 6$	
9	

✓ LS = RS

LS	RS
$2x + y$	4
$2(3) + (-2)$	
$6 - 2$	
4	

✓ LS = RS

<u>Example 6:</u> For each system of linear equations, verify whether the given point is a solution.

a. $3x - y = 2$
$x + 4y = 32$

(2, 5)

LS	RS
$3x - y$	2
$3(2) - 5$	
$6 - 5$	
1	

LS ≠ RS

$\therefore$ (2, 5) is not the soln.

b. $2x + 3y = -12$
$4x - 3y = -6$

(-3, -2)

LS	RS
$2x + 3y$	-12
$2(-3) + 3(-2)$	
$-6 - 6$	
-12	

✓ LS = RS

But must check the other eqtn.

LS	RS
$4x - 3y$	-6
$4(-3) - 3(-2)$	
$-12 + 6$	
-6	

✓ LS = RS

$\therefore$ (-3, -2) is the soln!

<u>HW:</u> P. 428 #8, 11, 15, 17, 18