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Date: ____________________

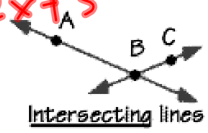
Worksheet 6-2: Relationship between Two Lines

A line has no endpoints; therefore you cannot measure how long it is. A line segment however, has 2 endpoints and the length of a line segment can be measured.

Relationships between Two Lines:

(i) Intersecting Lines (**not at a 90°** right angle)

$y=-2x+3$ $y=3x$

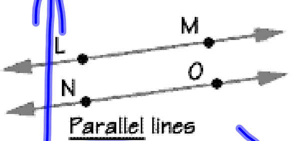


$\overleftrightarrow{AB}$ intersects $\overleftrightarrow{BC}$ at point B

Intersecting lines: Lines that have just one point in common.

- Slopes of intersecting lines are **different**.
- They have one common point.
- The intersection point is the common solution where the same x-value gives the same y-value.

(ii) Parallel Lines (never intersect one another)



$\overleftrightarrow{LM}$ is parallel to $\overleftrightarrow{NO}$
$\overleftrightarrow{LM} \parallel \overleftrightarrow{NO}$

Parallel lines: Lines that lie in the same plane but don't intersect.

- Slopes of parallel lines are the **same**.
- The y-intercepts of parallel lines are different.
- They have no common points.

$m=4$

1. State whether each line is parallel to, or intersecting with the line $y = 4x + 1$.

(a) $y = -4x + 1$ $m=-4$ Intersecting

(b) $y = 4x - 7$ $m=4$ parallel

(c) $y = \frac{1}{4}x + 3$ $m=\frac{1}{4}$ Intersecting

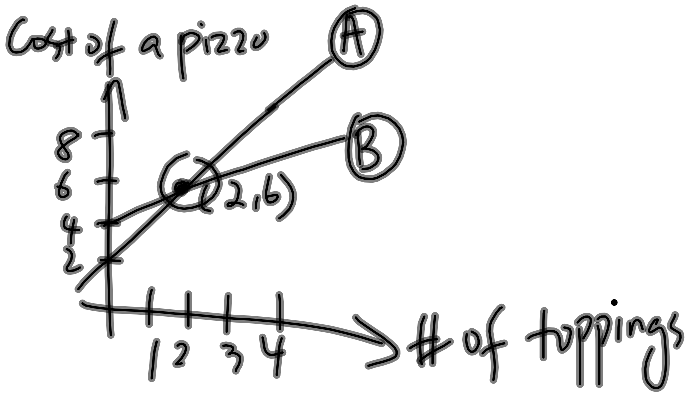
(d) $y = -\frac{1}{4}x$ $m=-\frac{1}{4}$ Intersecting

(e) $y = 2x + 1$ $m=2$ intersecting

The Linear Systems

Systems of Linear Equations:
A system of linear equations consists of **two or more** linear equations.
A system of linear equations can be graphed on the same Cartesian plane.

Point of Intersection as Solution:
When graphed, the point of intersection represents the solution to the system of linear equations. The ordered pair (x, y) for the point of intersection must satisfy each equation in the system. (The point that is on all the lines is the solution to the system of linear equations.)


Cost of a pizza
A
B
8
6
4
2
(2,6)
1 2 3 4
# of toppings

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There are three ways to solve a system of linear equations.

1. By Graphing
2. By Substitution
3. By Elimination

Solution to a Linear System of Equations

When a problem can be represented by two linear equations in two different variables, then **the point of intersection** is the solution to this system of linear equation. This point satisfies both equations **i.e.** When substituting the values of the x- and y-coordinate of this point into both equations, it will make both equations true (**L.S. = R.S.**).

Practice:

2. **Which ordered pair is the solution to the given system of linear equations?** **L.S. = R.S. Check*

(a) $x + y = 6$ — ① ; $2x - y = 0$ — ② ; $(-2, 4)$ or $(2, 4)$

∴ (2,4) is the solution

* (-2,4) x=-2, y=4

Check ①

L.S.	R.S.
(-2)+(4)	6
= 2	

L.S ≠ R.S.

(-2,4) is not the solution.

(2,4) x=2, y=4

Check ①

L.S.	R.S.
2+4	6
= 6	

L.S = R.S.

Check ②

L.S.	R.S.
2(2)-4	0
= 0	

L.S. = R.S.

(b) $-x + 2y = -1$ — ① ; $2x + y = 2$ — ② ; $(-1, -1)$ or $(1, 0)$

(-1,-1) x=-1, y=-1

Check ①

L.S.	R.S.
-(-1)+2(-1)	-1
= 1 - 2	
= -1	

Check ②

L.S.	R.S.
2(-1)+(-1)	2
= -2 - 1	
= -3	

L.S ≠ R.S.

(-1,-1) is not the solution

(1,0) x=1, y=0

Check ①

L.S.	R.S.
-x+2y	-1
= -(1)+2(0)	
= -1+0	
= -1	

L.S. = R.S.

Check ②

L.S.	R.S.
2(1)+0	2
= 2	

L.S. = R.S

(1,0) is the solution.

(c) $7x + 2y = 6$; $2x - 5y = -15$; $(-1, 1)$ or $(0, 3)$

(d) $-4x + y = 5$; $x - 3y = 18$; $(-3, -7)$ or $(7, -3)$

Answers: 2. (a) (2, 4), (b) (1, 0), (c) (0, 3), (d) (–3, –7)

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Worksheet 6-3: Solving Linear Systems by Graphing

The solution to a linear system is the point of intersection of the lines involved in the system. A linear system can be solved by graphing the lines, then identifying the (x, y) of the intersection point from the graph.

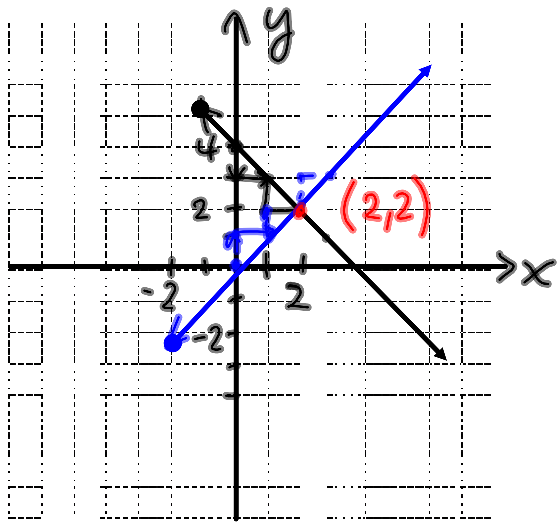
Practice:

1. Solve each system of linear equations graphically.

(a) $y = -x + 4$ — ①
$y = x$ — ②

① $y = -x + 4$ $m = -1$ rise $= -1$ run $= 1$ $b = 4$

② $y = x$ $m = 1$ rise $= 1$ run $= 1$ $b = 0$



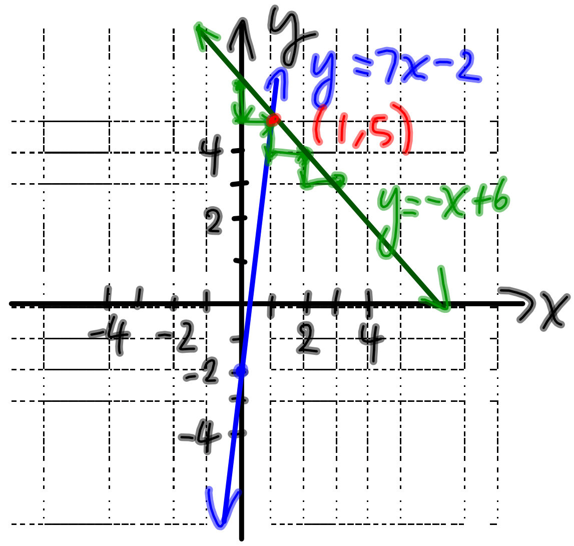
(2,2) is the solution.

$y = mx + b$

(b) $y = 7x - 2$
$y = -x + 6$

① $y = 7x - 2$ $m = 7 = \frac{7}{1}$ $b = -2$ rise $= 7$ run $= 1$

② $y = -x + 6$ $m = -1 = \frac{-1}{1}$ $b = 6$ rise $= -1$ run $= 1$



(1,5) is the solution

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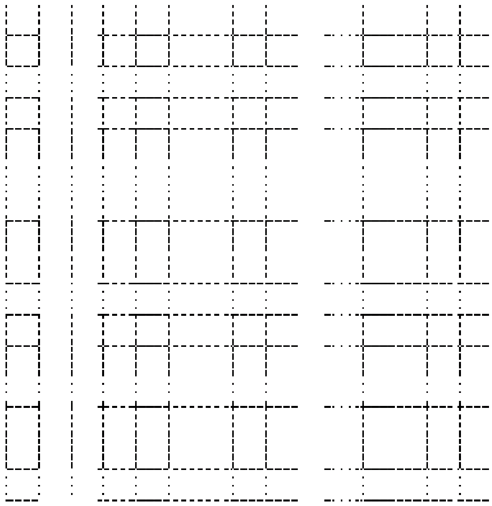
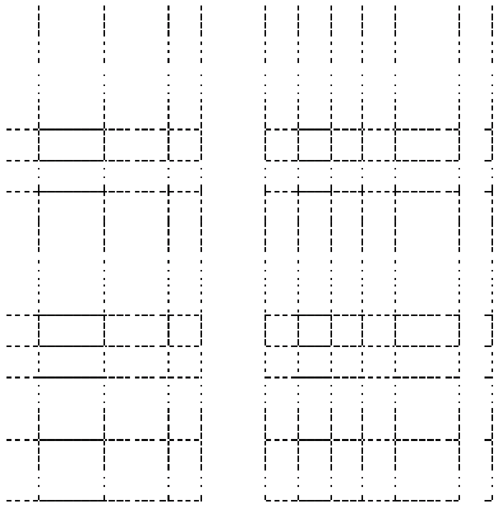
2. Solve each linear system by graphing.

(a) $y + 2x = -5$ $\longrightarrow$
$y = \frac{2}{3}x + 3$

① $y + 2x = -5$
$\quad -2x \quad -2x$
$y = -2x - 5$



(b) $2x + 3y = 8$
$x - 2y = -3$



Answers: 1. (a) $(2, 4)$ **, (b)** $(1, 0)$ **; 2. (a)** $(-3, 1)$ **, (b)** $(1, 2)$.