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Unit 6: Solving Systems of Linear Equations Graphically**6.1 Systems of Linear Equations & Graphs**

Recall: To **SOLVE** an equation means to identify the value of the variable which satisfies the equation (makes the equation true).

Ex. Solve $2x - 1 = 9$

System of Linear Equations:

Ex. Solve the system: $y = 2x$ and $y = x + 2$

Numerically

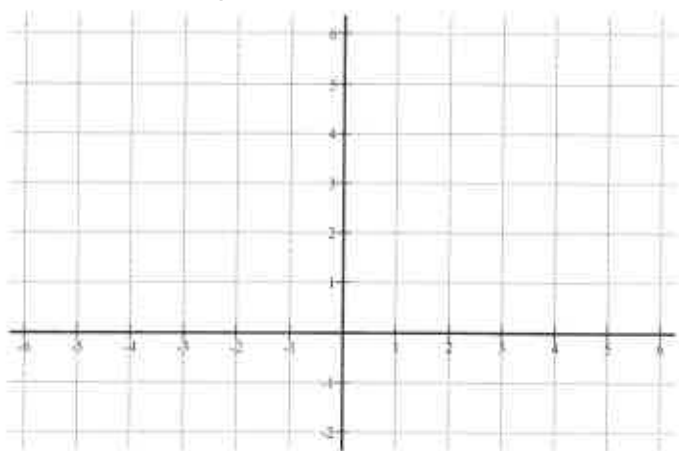
$$y = 2x$$

x	y
0	
1	
2	
3	
4	

$$y = x + 2$$

x	y
0	
1	
2	
3	
4	

Graphically



Algebraic Verification

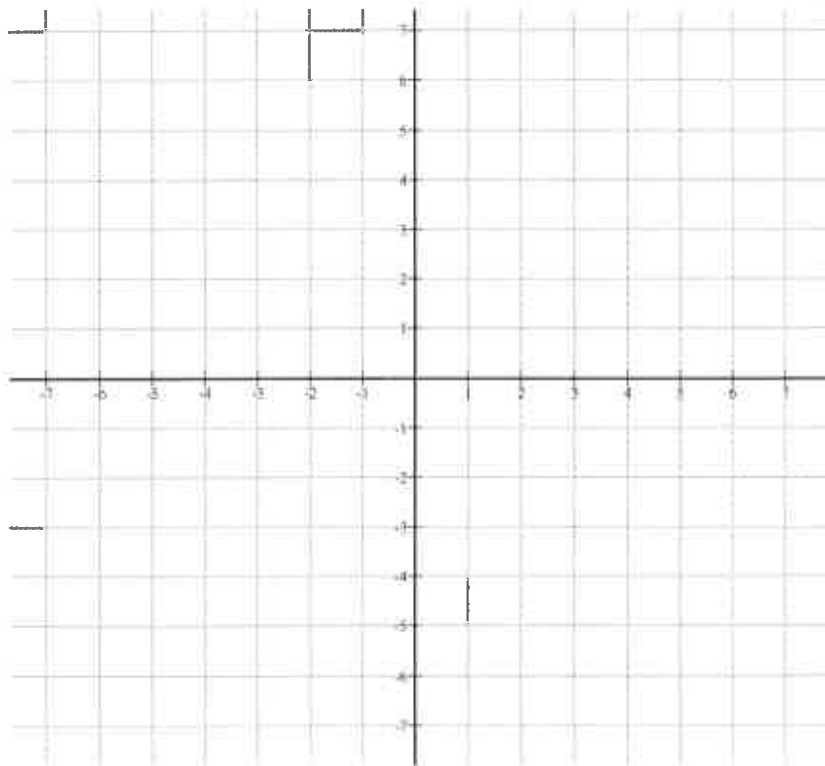
Solution (to a system of linear equations):

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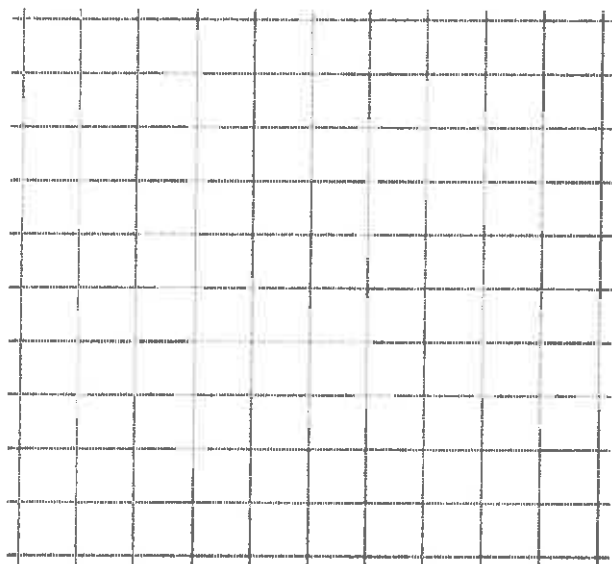
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Ex. Consider the system of linear equations $2x + y = 2$ and $x - y = 7$. Identify the solution of the system by graphing, then verify the solution.



Ex. Guy solved the linear system $x - 2y = 12$ and $3x - 2y = 4$. His solution is $(2, -5)$. Verify whether Guy's solution is correct. Explain how Guy's results can be illustrated on a graph.

Ex. Eric works on the 23rd floor of a building. It takes Eric 90 s to walk down the stairs to the 14th floor. Nathan works on the 14th floor and can get to the 30th floor by elevator in 40 s. Suppose both men leave their offices at the same time. Create a graph to model their travel. What does the point of intersection represent?



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6.2 Modelling & Solving Linear Systems

Ex. Translate each description into an algebraic expression. Define your variable.

- a) Double a boat's speed increased by 3 km/h

- b) \$7 less than the ticket price

- c) Triple a number decreased by half the number

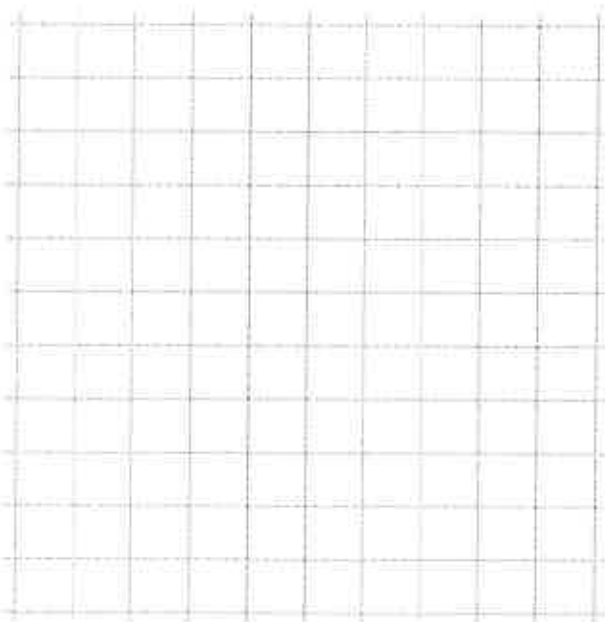
Ex. People can rent ski and snowboard equipment from two places at Winterland Resort.

Option A charges a one-time \$30 fee and then \$8 per hour.

Option B charges \$14 per hour.

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

- b) Solve the system graphically. What does the solution represent?

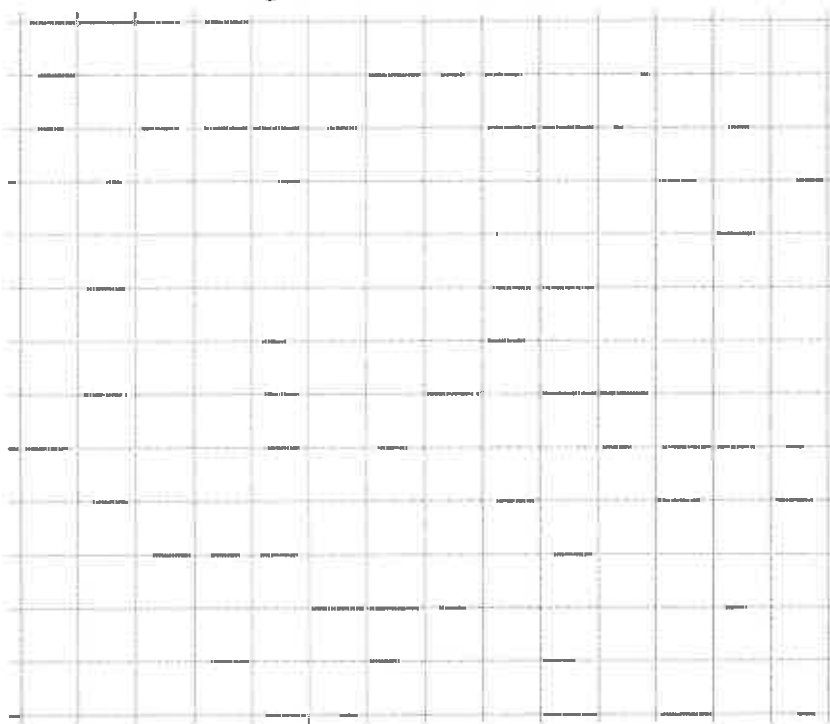


Ex. Two hopper-bottom grain bins are being emptied starting at the same time.

- The larger bin holds 45 m^3 of grain. It is emptied at a rate of 1 m^3 per minute.
- The smaller bin stores 30 m^3 of grain. This bin is emptied at a rate of 0.5 m^3 per minute.

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

b) Represent the linear system graphically. Describe how the information shown in the graph relates to the grain bins.



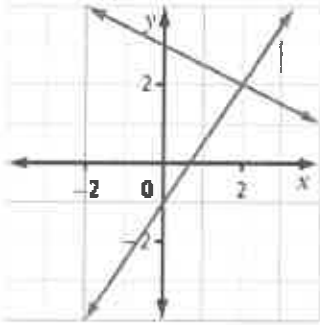
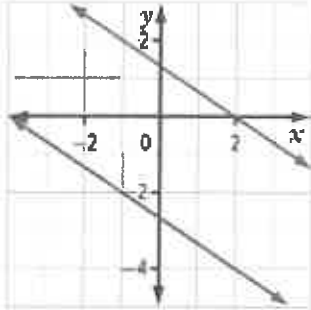
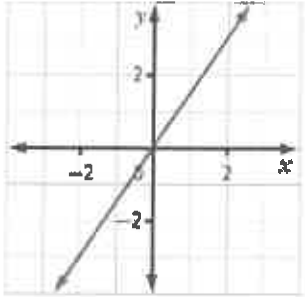
6.3 Number of Solutions for Systems of Linear Equations

In terms of solutions, there are 3 possibilities when solving a system of linear equations:

- 1.
- 2.
- 3.

Before solving, you can predict the number of solutions by comparing the _____

and the _____ of the equations.

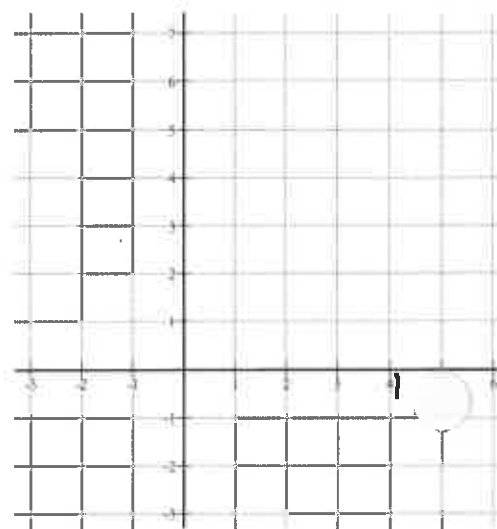
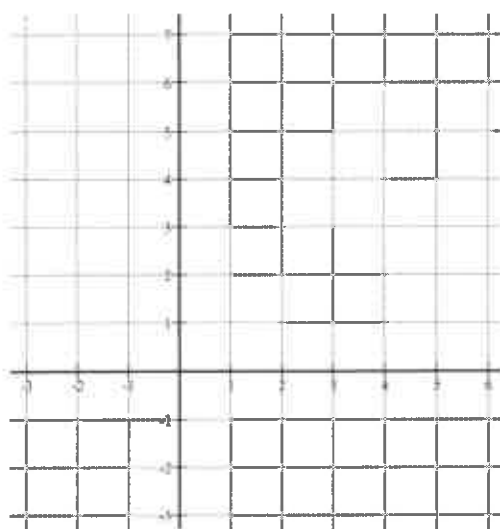
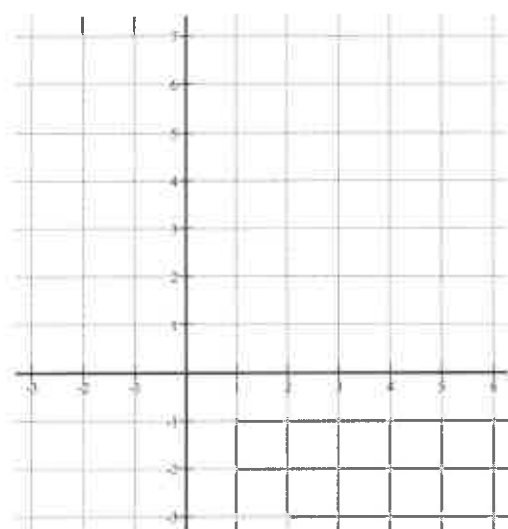
	Intersecting Lines	Parallel Lines	Coincident Lines
Number of Solutions			
Graph			
Slopes:			
y-intercepts:			

Ex. Predict the number of solutions for each system of linear equations. Explain your reasoning, and then confirm each answer by graphing the linear system.

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

b) $4x + 10y = 30$
 $2x + 5y = 35$

c) $10x - 6y = -12$
 $21y = 42 + 35x$



Example 2: Sabrina's teacher gives her the following systems of linear equations and tells her that each system has either no solution or an infinite number of solutions. How can Sabrina determine each answer by inspecting the equations?

a) $2x + 3y = 12$
 $2x + 3y = 20$

b) $2x + 3y = 12$
 $4x + 6y = 24$