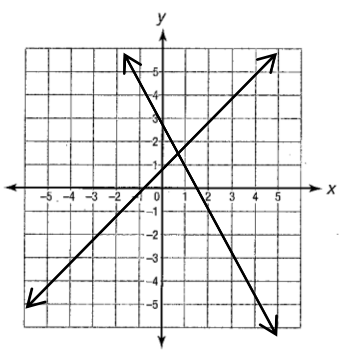
Notes

Topic 06: Solving Decontextualized Systems of Equations

"Decontextualized equations" simply means just numbers and variables. No word problems here.

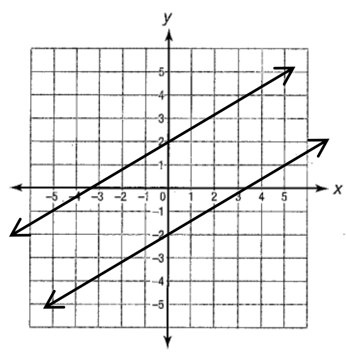
"Systems of equations" means that there are 2 different equations. You have to determine whether there is:
(i) one solution, (ii) no solutions, or (iii) infinite solutions.



One Solution.

Here, you have ***intersecting lines***. There will be only one point of intersection. That coordinate will be the solution to both equations.

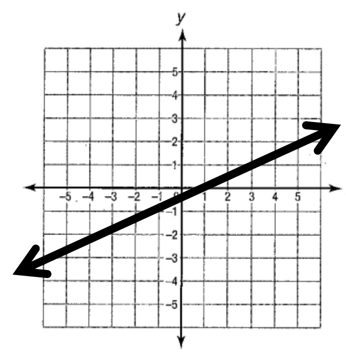
Intersecting lines have ***different slopes***.



No Solutions.

Here, you have ***parallel lines***. Parallel lines will never intersect.

Parallel lines have the ***same slope***, and ***different y-intercepts***.



Infinite Solutions.

Here, you have ***overlapping lines***. There will be infinite points along both lines that will work as a solution to both equations.

Overlapping lines have the ***same slope***, and the ***same y-intercept***.

Notes

Sample Question 1: Below are the equations for two lines.

$$y = 2x + 1$$

$$y = x + 3$$

Which of the following best describes these two lines?

(A) The lines will intersect only at (2 , 5).
(B) The lines will intersect only at (1 , 3).
(C) The lines will never intersect.
(D) The lines have infinite solutions.

You can solve this question by setting each equation equal to the other. That is, you know that where the lines intersect, the "y-values" will be the same. Therefore:

$y = 2x + 1$ and $y = x + 3$ can equal

$$2x + 1 = x + 3$$

Next, subtract "x" from each side (you want to get all the variables together!)

$$2x + 1 - x = x + 3 - x$$

$$x + 1 = 3$$

Next, use inverse operations and subtract 1 from bother sides.

$$x + 1 - 1 = 3 - 1$$

$$x = 2$$

Plug back "x = 2" in either of the original equations, and you get "y = 5"

$y = 2x + 1 \rightarrow y = 2(2) + 1 \rightarrow y = 5$ and $y = x + 3 \rightarrow y = 2 + 3 \rightarrow y = 5$

(A)	The lines will intersect only at (2 , 5).	***This is the right answer!***
(B)	The lines will intersect only at (1 , 3).	***Not the right answer, satisfies the first equation, but not the second.***
(C)	The lines will never intersect.	***Not the right answer. Would be if equations were y = 2x +1 and y = 2x +3***
(D)	The lines have infinite solutions.	***Not the right answer. Would be if equations were y = 2x +1 and y = 2x +1***

Notes

A ***very similar question*** to Sample Question 1 is below. Take a look above to compare!

Sample Question 2: Consider the following equation.

$$2x + 1 = x + 3$$

Which of the following best describes this equation?

(A) There is only one solution, x = 2.
(B) There is only one solution, x = 1.
(C) There are no solutions.
(D) There are infinite solutions.

As above, subtract "x" from each side.

$$2x + 1 - x = x + 3 - x$$

$$x + 1 = 3$$

As above, use inverse operations and subtract 1 from bother sides.

$$x + 1 - 1 = 3 - 1$$

$$x = 2$$

(A)	There is only one solution, x = 2.	***This is the right answer!***
(B)	There is only one solution, x = 1.	***Not the right answer.***
(C)	There are no solutions.	***Not the right answer. Would be if the equation was 2x +1 = 2x +3***
(D)	There are infinite solutions.	***Not the right answer. Would be if the equation was 2x +1 = 2x +1***