Solving a Linear System By Elimination Practice

Use the following information to answer the first question.

Consider the following linear systems.

A. $6x + 9y = 12$ $2x + 9y = -4$	B. $-3x - y = 5$ $7x + 2y = -6$
C. $x + 8y = 15$ $-x - 4y = 30$	D. $-4x - 12y = 9$ $-4x + y = 0$

1. When asked to solve the linear systems above, which example would require the next step to be *adding* the two equations?
   A) A B) B C) C D) D

Use the following information to answer the next question.

Andrew was asked to solve this linear system by using the elimination method:
$8x + 4y = 12$
$12x - 2y = -20$

2. His first step would be to
   A) multiply the first equation by 12.
   B) multiply the second equation by 4.
   C) multiply the first equation by 4 and the second equation by 2.
   D) multiply the first equation by 3 and the second equation by 2.

3. The value of *y* in the solution of
   $10 = 2x + y$
   $2 + y = x$
   is ______.

Use the following information to answer the next question.

Janine was asked to solve the linear system

$9x + 2y = -15$
$4x - 3y = 5$

Her work is shown below.

Step 1	$3(9x + 2y = -15)$ $2(4x - 3y = 5)$
Step 2	$27x + 6y = -45$ $8x - 6y = 10$
Step 3	$35x = 35$
Step 4	$x = 1$
Step 5	$4(1) - 3y = 5$ $-3y = 1$ $y = -(1/3)$
Step 6	The solution is $\left(1, -\frac{1}{3}\right)$.

4. Janine's first error was made in step
   A) 2 B) 3 C) 4 D) 5

5. Solve the following linear system by using the elimination method. Begin by clearing the fractions.

$$\frac{1}{2}x + \frac{3}{4}y = 11$$

$$\frac{2}{5}x - y = -4$$

6. Solve and verify the linear system

   $6x - y - 4 = 0$

   $-10x - 2y = -3$

7. The mean attendance at the Winnipeg Folk Festival for 2006 and 2008 was 45 265. The attendance in 2008 was 120 more than the attendance in 2006. What was the attendance in each year? Solve with a linear system.

Solving a Linear System By Elimination Practice Solutions

Use the following information to answer the first question.

Consider the following linear systems.	
A. $6x + 9y = 12$ $2x + 9y = -4$	B. $-3x - y = 5$ $7x + 2y = -6$
C. $x + 8y = 15$ $-x - 4y = 30$	D. $-4x - 12y = 9$ $-4x + y = 0$

1. When asked to solve the linear systems above, which example would require the next step to be *adding* the two equations?

   A) A B) B C) C D) D

Solution

The key to answering this question is the analysis of the coefficients (the numbers in front of the letters).

In example A, since the coefficients are the same for the variable y, to eliminate this variable, the next step is to **subtract** the equations.

In example B, neither letter has the same coefficient. Thus before **adding** or **subtracting**, at least one of the equations must be **multiplied** by a number.

In example D, the coefficients for the variable 'x' are the same. The next step would be to **subtract** the equations.

In example C, the coefficients for the variable 'x' are positive one and negative one. To eliminate this variable, **add** the equations.

The correct answer is C.

Use the following information to answer the next question.

Andrew was asked to solve this linear system by using the elimination method: $8x + 4y = 12$ $12x - 2y = -20$

2. His first step would be to

A) multiply the first equation by 12.

B) multiply the second equation by 4.

C) multiply the first equation by 4 and the second equation by 2.

D) multiply the first equation by 3 and the second equation by 2.

Solution

Since the coefficients for each of the variables is different, Andrew must first multiply at least one of the equations by a number. The goal is to get the same number (independent of signs) as a coefficient for one of the variables.

When the first equation is multiplied by 3, the coefficient for 'x' is 24. When the second equation is multiplied by 2, the coefficient for 'x' is also 24. The next step of **subtracting** the equations can now occur.

The correct answer is D.

3. The value of y in the solution of

$10 = 2x + y$

$2 + y = x$

is ______.

Solution

Rearrange the equations in the same format. Subtract 'y' from both sides.

$10 = 2x + y$

$2 = x - y$

Add the equations to eliminate 'y'.

$10 = 2x + y$

$\underline{2 = x - y}$

$12 = 3x$

$x = 4$

Substitute $x = 4$ into either original equation to determine the value for y.

$2 + y = (4)$

$y = 2$

The solution is (4,2).

Verify

$10 = 2x + y$	$2 + y = x$
$10 = 2(4) + (2)$	$2 + (2) = (4)$
$10 = 8 + 2$	$4 = 4$
$10 = 10$	

The value of y in the solution is 2.

Use the following information to answer the next question.

Janine was asked to solve the linear system

$$9x + 2y = -15$$
$$4x - 3y = 5$$

Her work is shown below.

Step 1	$3(9x + 2y = -15)$ $2(4x - 3y = 5)$
Step 2	$27x + 6y = -45$ $8x - 6y = 10$
Step 3	$35x = 35$
Step 4	$x = 1$
Step 5	$4(1) - 3y = 5$ $-3y = 1$ $y = -(1/3)$
Step 6	The solution is $\left(1, -\frac{1}{3}\right)$.

4. Janine's first error was made in step

A) 2 B) 3 C) 4 D) 5

Solution

Steps one and two are both correct.

The first error occurs in step 3. It is true that the equations need to be added, but the values on the right side of the equal sign are not correct. It should be -35 and not positive 35.

The correct answer is B.

5. Solve the following linear system by using the elimination method. Begin by clearing the fractions.

$$\frac{1}{2}x + \frac{3}{4}y = 11$$

$$\frac{2}{5}x - y = -4$$

Solution

To clear fractions, each term in the equation needs to be multiplied by the least common denominator. In the first equation having denominators of 2 and 4, the LCD is 4. Multiply each term by 4.

$$4\left(\frac{1}{2}x + \frac{3}{4}y = 11\right)$$

= 2x + 3y = 44

In the second equation having a denominator of 5, the LCD is 5. Multiply each term by 5.

$$5\left(\frac{2}{5}x - y = -4\right)$$

= 2x – 5y = -20

We now have the equivalent linear system of:

2x + 3y = 44

2x – 5y = -20

Since the signs on the equal coefficients of the 'x' terms are the same, the equations are **subtracted.**

2x + 3y = 44

<u>2x – 5y = -20</u>

8y = 64

y = 8

Substitute y = 8 into either original equation to determine the value of x.

$$\frac{2}{5}x-(8)=-4$$

$$\frac{2}{5}x=4$$

Divide both sides of the equation by $\frac{2}{5}$.

x = 10

The solution is (10,8).

6. Solve and verify the linear system
6x – y – 4 = 0
-10x – 2y = -3

Solution

The equations should be in the same format; therefore, add 4 to both sides in the first equation.

6x – y = 4

-10x – 2y = -3

Multiply the first equation by 2, in order to get the same coefficient for the 'y' terms.

$2(6x - y = 4) \longrightarrow 12x - 2y = 8$

$-10x - 2y = -3 \longrightarrow \underline{-10x - 2y = -3}$

Since the signs on the 'y' terms is the same, **subtract** to eliminate these terms

$22x = 11$

$x = \frac{1}{2}$

Substitute $x = \frac{1}{2}$ into either original equation to find the value of y.

$-10\left(\frac{1}{2}\right) - 2y = -3$

$-5 - 2y = -3$

$-2y = 2$

$y = -1$

<u>Verify</u>

$6x - y - 4 = 0$	$-10x - 2y = -3$
$6\left(\frac{1}{2}\right) - (-1) - 4 = 0$	$-10\left(\frac{1}{2}\right) - 2(-1) = -3$
$3 + 1 - 4 = 0$	$-5 + 2 = -3$
$0 = 0$	$-3 = -3$

The solution is $x = \frac{1}{2}$ and $y = -1$.

7. The mean attendance at the Winnipeg Folk Festival for 2006 and 2008 was 45 265. The attendance in 2008 was 120 more than the attendance in 2006. What was the attendance in each year? Solve with a linear system.

Solution

Define the variables.

Let x = attendance in 2006

Let y = attendance in 2008

The equations to model this situation are:

$$\frac{x+y}{2} = 45265$$

y = x + 120

Clear the fraction in equation 1 by multiplying both sides by 2.

$$\frac{x+y}{2} = 45265 \longrightarrow x + y = 90\,530$$

The system of equations to solve is:

y = x + 120

x + y = 90 530

Put the equations in the same format.

-x + y = 120

x + y = 90 530

Add to eliminate the 'x' terms.

2y = 90 650

y = 45 325

Substitute $y = 45\,325$ into either original equation to solve for x.

$$y = x + 120$$

$$45\,325 = x + 120$$

$$x = 45\,205$$

The attendance in 2006 was 45 205 and the attendance in 2008 was 45 325.