

Solve each of the following systems of equations using multiplication with the addition method.

1. 
$$\begin{cases} 3x - y = 9 & 3(3) - y = 9 \\ 2x + y = 6 & 9 - y = 9 \end{cases}$$
  

$$\begin{array}{r} 3x - y = 9 \\ + \quad 2x + y = 6 \\ \hline 5x = 15 \\ \frac{5x}{5} = \frac{15}{5} \\ x = 3 \end{array}$$
  

$$\begin{array}{r} 9 - y = 9 \\ -9 \quad -9 \\ \hline -y = 0 \\ \frac{-y}{-1} = \frac{0}{-1} \\ y = 0 \end{array}$$
  
**(3, 0)**  
**y = 0**

2. 
$$\begin{cases} 7x + 5y = 18 & (2, \frac{4}{5}) \\ x - 5y = -2 \end{cases}$$
  

$$\begin{array}{r} 7x + 5y = 18 \\ + \quad x - 5y = -2 \\ \hline 8x = 16 \\ \frac{8x}{8} = \frac{16}{8} \\ x = 2 \end{array}$$
  

$$\begin{array}{r} 2 - 5y = -2 \\ -5y = -4 \\ \frac{-5y}{-5} = \frac{-4}{-5} \\ y = \frac{4}{5} \end{array}$$
  
**(2, 4/5)**

3. 
$$\begin{cases} 3x - 3y = -15 \\ -3x - 3y = -3 \end{cases}$$
  

$$\begin{array}{r} 3x - 3y = -15 \\ + \quad -3x - 3y = -3 \\ \hline -6y = -18 \\ \frac{-6y}{-6} = \frac{-18}{-6} \\ y = 3 \end{array}$$
  

$$\begin{array}{r} 3x - 3(3) = -15 \\ 3x - 9 = -15 \\ +9 \quad +9 \\ \hline 3x = -6 \\ \frac{3x}{3} = \frac{-6}{3} \\ x = -2 \end{array}$$
  
**(-2, 3)**

4. 
$$\begin{cases} 4x - 5y = 7 \\ -4x + 5y = 7 \end{cases}$$
  

$$\begin{array}{r} 4x - 5y = 7 \\ + \quad -4x + 5y = 7 \\ \hline 0 = 14 \end{array}$$
  
**no solution**

5. 
$$\begin{cases} 2x + 3y = 4 \\ -2x - 3y = -4 \end{cases}$$
  

$$\begin{array}{r} 2x + 3y = 4 \\ + \quad -2x - 3y = -4 \\ \hline 0 = 0 \end{array}$$
  
**infinite solutions**

6. 
$$\begin{cases} -x - y = 8 \\ 2x - y = -1 \end{cases}$$
  

$$\begin{array}{r} -x - y = 8 \\ -1(2x - y = -1) \\ \hline -x - y = 8 \\ -2x + y = 1 \\ \hline -(-3) - y = 8 \\ 3 - y = 8 \\ -y = 5 \\ \frac{-y}{-1} = \frac{5}{-1} \\ y = -5 \end{array}$$
  

$$\begin{array}{r} -x - y = 8 \\ -x - y = 8 \\ \hline -3x = 9 \\ \frac{-3x}{-3} = \frac{9}{-3} \\ x = -3 \end{array}$$
  
**(-3, -5)**

7. 
$$\begin{cases} x + y = -7 \\ 3x + y = -9 \end{cases}$$
  

$$\begin{array}{r} x + y = -7 \\ -1 + y = -7 \\ \hline y = -6 \end{array}$$
  

$$\begin{array}{r} x + y = -7 \\ + \quad -x - y = 7 \\ \hline 2x = -2 \\ \frac{2x}{2} = \frac{-2}{2} \\ x = -1 \end{array}$$
  
**(-1, -6)**

8. 
$$\begin{cases} x + 3y = 19 \\ x + y = 1 \end{cases}$$
  

$$\begin{array}{r} x + 3y = 19 \\ - \quad x + y = 1 \\ \hline 4y = 20 \\ \frac{4y}{4} = \frac{20}{4} \\ y = 5 \end{array}$$
  

$$\begin{array}{r} x + 3(5) = 19 \\ x + 15 = 19 \\ \frac{x}{1} = \frac{19 - 15}{1} \\ x = 4 \end{array}$$
  
**(4, 5)**

9. 
$$\begin{cases} 3x - y = 8 \\ x + 2y = 5 \end{cases}$$
  

$$\begin{array}{r} 3x - y = 8 \\ 2(3x - y = 8) \\ \hline 6x - 2y = 16 \\ x + 2y = 5 \\ \hline 7x = 21 \\ \frac{7x}{7} = \frac{21}{7} \\ x = 3 \end{array}$$
  

$$\begin{array}{r} 3 + 2y = 5 \\ 2y = 2 \\ \frac{2y}{2} = \frac{2}{2} \\ y = 1 \end{array}$$
  
**(3, 1)**

10. 
$$\begin{cases} x + 3y = 15 \\ 5x - 3y = 17 \end{cases}$$
  

$$\begin{array}{r} x + 3y = 15 \\ + \quad 5x - 3y = 17 \\ \hline 6x = 32 \\ \frac{6x}{6} = \frac{32}{6} \\ x = 4 \end{array}$$
  

$$\begin{array}{r} x + 3y = 15 \\ 4 + 3y = 15 \\ 3y = 11 \\ \frac{3y}{3} = \frac{11}{3} \\ y = \frac{11}{3} \end{array}$$
  
**(4, 1)**  
**y = 1**

11. 
$$\begin{cases} 2x + 3y = 17 \\ 3x + 4y = 24 \end{cases}$$
  

$$\begin{array}{r} 3(2x + 3y = 17) \rightarrow 6x + 9y = 51 \\ -2(3x + 4y = 24) \rightarrow -6x - 8y = -48 \\ \hline y = 3 \end{array}$$
  

$$\begin{array}{r} 2x + 3(3) = 17 \\ 2x + 9 = 17 \\ 2x = 8 \\ \frac{2x}{2} = \frac{8}{2} \\ x = 4 \end{array}$$
  
**(4, 3)**  
**x = 4**

12. 
$$\begin{cases} 7x + 5y = 2 \\ 8x - 9y = 17 \end{cases}$$
  

$$\begin{array}{r} 6(7x + 5y = 2) \rightarrow 42x + 30y = 12 \\ 5(8x - 9y = 17) \rightarrow 40x - 45y = 85 \\ \hline 103x = 103 \\ \frac{103x}{103} = \frac{103}{103} \\ x = 1 \end{array}$$
  

$$\begin{array}{r} 7(1) + 5y = 2 \\ 7 + 5y = 2 \\ 5y = -5 \\ \frac{5y}{5} = \frac{-5}{5} \\ y = -1 \end{array}$$
  
**(1, -1)**  
**y = -1**

13. 
$$\begin{cases} \frac{2(x-y)}{2} = \frac{2}{2} \\ \frac{3(x-y)}{3} = \frac{3}{3} \end{cases}$$
  
 $x-y=1$   
 $x-y=1$  Same line  
**Infinite sol.**

15. 
$$\begin{cases} -3(x+y=6) \\ 3x+3y=8 \end{cases}$$
  

$$\begin{array}{r} -3x-3y=-18 \\ 3x+3y=8 \\ \hline 0=-10 \end{array}$$
  
**no solution**

16. 
$$\begin{cases} 5x = 2y + 4 \\ y = -3x + 9 \end{cases}$$

$$\begin{array}{r} 5x-2y=4 \\ 2(3x+y=9) \\ \hline 5x-2y=4 \\ 6x+2y=18 \\ \hline 11x=22 \\ x=2 \end{array}$$
  
 $y = -3(2) + 9$   
 $y = -6 + 9$   
 $y = 3$   
**(2, 3)**

17. 
$$\begin{cases} 3x = 5y + 13 \\ x - 2y = 5 \end{cases}$$

18. 
$$\begin{cases} 7x + 2y + 1 = 0 \\ 3x = 4y + 19 \end{cases}$$

19. 
$$\begin{cases} 4x - 3y = -20 \\ 5 + x = -8y \end{cases}$$
  

$$\begin{array}{r} 4x-3y=-20 \\ x+8y=-5 \\ \hline 4x-3y=-20 \\ -4x-32y=20 \\ \hline -35y=0 \\ y=0 \end{array}$$
  
 $5+x=0$   
 $x=-5$   
**(-5, 0)**

$$\begin{array}{r} 3x-5y=13 \\ 3(x-2y=5) \\ \hline 3x-5y=13 \\ -3x+6y=-15 \\ \hline y=-2 \end{array}$$
  
 $x-2(-2)=5$   
 $x+4=5$   
 $x=1$   
**(1, -2)**

$$\begin{array}{r} 7x+2y=-1 \\ 3x-4y=19 \\ \hline 14x+4y=-2 \end{array}$$
  
 $3=4y+19$   
 $-16=4y$   
 $y=-4$   
 $17x=17$   
 $x=1$   
**(1, -4)**

20. 
$$\begin{cases} \frac{x}{2} + \frac{2y}{8} = \frac{13}{10} \\ 3(x-y) = x-10 \end{cases}$$
  
 $5x+2y=13$   
 $5(1)+2y=13$   
 $2y=8$   
 $y=4$

21. 
$$\begin{cases} \frac{x}{8} + \frac{y}{4} = \frac{2}{2} \\ \frac{2x}{8} - \frac{y}{2} = -2 \end{cases}$$
  
 $2x+3y=30$   
 $4x-3y=-12$   
 $6x=18$   
 $x=3$   
**(3, 8)**

$$\begin{cases} 2x-3y=-10 \\ 5x+2y=13 \end{cases}$$
  
 $4x-6y=-20$   
 $15x+6y=39$   
 $19x=19$   
 $x=1$   
**(1, 4)**

$$\begin{array}{r} \frac{2(3)}{3} - \frac{y}{2} = -2 \\ \frac{6}{3} - \frac{y}{2} = -2 \\ 2 - \frac{y}{2} = -2 \end{array}$$
  
 $\frac{y}{2} = 4$   
 $y=8$

For each of the following problems, write a system of equations and solve.

22. The sum of two numbers is 42 and their difference is 30. Determine each of the numbers.

$$\begin{cases} x+y=42 \\ x-y=30 \end{cases}$$
  

$$\frac{2x}{2} = \frac{72}{2}$$
  
**x=36** **y=6**

23. The sum of two numbers is 125 and their difference is 47. Determine each of the numbers.

~~$$\begin{cases} x+y=125 \\ x-y=47 \end{cases}$$~~  

$$\begin{cases} x+y=125 \\ x-y=47 \end{cases}$$
  

$$\frac{2x}{2} = \frac{172}{2}$$
  
**x=86** **y=39**  
**86 and 39**

Choose the letter of the best answer choice.

$$\begin{array}{r} 15x \\ -15x \end{array}$$

24. If the system:  $\begin{cases} 3x + 2y = 8 \\ 5x - 7y = -3 \end{cases}$  is to be solved by the elimination of x and the first equation is multiplied by 5, then by which of the following numbers should the second equation be multiplied?

A. -5

B. -3

C. -2

D. 7

25. If the system:  $\begin{cases} 2x - 9y = -3 \\ 9x - 2y = 8 \end{cases}$  is to be solved by the elimination of y and the first equation is multiplied by 2, then by which of the following numbers should the second equation be multiplied?

A. -9

B. -2

C. 2

D. 9

$$\begin{array}{r} -18y \\ 18y \end{array}$$

26. If the system:  $\begin{cases} 5x + 11y = 2 \\ 2x - 6y = 7 \end{cases}$  is to be solved by the elimination of x and the second equation is multiplied by -5, then by which of the following numbers should the first equation be multiplied?

A. -11

B. 2

C. 5

D. 6

27. If the system:  $\begin{cases} 8x - 2y = 6 \\ 4x + y = 7 \end{cases}$  is to be solved by the elimination of y and the second equation is multiplied by 2, then by which of the following numbers should the first equation be multiplied?

A. -8

B. -4

C. -1

D. 1

*Stays the same*

28. If the system:  $\begin{cases} 8x = 2y - 5 \\ 3x - 7y = -9 \end{cases}$  is to be solved by the elimination of y and the second equation is multiplied by 2, then by which of the following numbers should the first equation be multiplied?

A. -8

B. -7

C. -3

D. 7

$$\begin{array}{r} -7(8x - 2y = -5) \\ 2(3x - 7y = -9) \end{array}$$

29. If the system:  $\begin{cases} 3x + 2y - 6 = 0 \\ 3x + 4y = 7x + 9 \end{cases}$  is to be solved by the elimination of x and the first equation is multiplied by 4, then which of the following numbers should the second equation be multiplied?

A. -3

B. -2

C. 2

D. 3

$$\begin{array}{r} 4(3x + 2y = 6) \quad 12x \\ 3(-4x + 4y = 9) \quad -12x \end{array}$$

30. What is the value of x if the system:  $\begin{cases} x - 3y = 6 \\ 3x + 3y = 30 \end{cases}$  is solved by elimination?  $\frac{4x = 36}{4} \quad x = 9$

- A. -6      B. 1      C. 3      **D. 9**

31. What is the value of y if the system:  $\begin{cases} 3x - 2y = 8 \\ 4x - 5y = 13 \end{cases}$  is solved by elimination?  $\frac{-12x + 8y = -32}{17x - 15y = 39} \quad \frac{-7y = 7}{-7} \quad y = -1$

- A. -7      **B. -1**      C. 1      D. 2

32. When using the multiplication with addition method to solve the system of equations:  $\begin{cases} 6x - 4y = -3 \\ 4(3x + y = 3) \end{cases}$  which of the following could be a possible first step?

- A.  $\begin{cases} 6x - 4y = -3 \\ y = 3 - 3x \end{cases}$  *Substitution*
- B.  $\begin{cases} 6x - 4y = -3 \\ 12x + 4y = 12 \end{cases}$**
- C.  $\begin{cases} x = \frac{4y - 3}{6} \\ 3x + y = 3 \end{cases}$  *Substitution*
- D.  $\begin{cases} 6x - 4y = -3 \\ x = \frac{3 - y}{3} \end{cases}$  *Substitution*

33. Which of the following represents the solution to the system:  $\begin{cases} 6x + 4y = 10 \\ -2(3x - 3y = 2) \end{cases}$ ?

- A.  $(\frac{1}{15}, \frac{3}{5})$
- B.  $(\frac{19}{15}, \frac{3}{5})$**   $\frac{6x + 4y = 10}{-6x + 4y = -4} \quad \frac{10y = 6}{y = \frac{6}{10} = \frac{3}{5}}$
- C.  $(\frac{6}{5}, \frac{13}{15})$
- D.  $(\frac{2}{5}, \frac{7}{5})$

34. If  $5x + 2y = 12$  and  $3x - 2y = 4$ , then what does  $x + y$  equal?

- A. -6      B. 1      C. 2      **D. 3**
- $\frac{5x + 2y = 12}{3x - 2y = 4} \quad \frac{8x = 16}{x = 2}$

35. If  $6x - 3y = 9$  and  $2x + 3y = 15$  then what does  $x - y$  equal?

- A. -6      **B. 0**      C. 3      D. 6
- $\frac{6x - 3y = 9}{2x + 3y = 15} \quad \frac{8x = 24}{x = 3}$
- $\frac{6(3) - 3y = 9}{18 - 3y = 9} \quad \frac{-3y = -9}{y = 3}$
- $\frac{x - y}{3 - 3} \quad \boxed{0}$