

## Substitution and Elimination to Solve a System of Equations DRILL

In questions 1–5, solve for  $x$  and  $y$  in these systems of equations:

Drill  
1–5

$$y = x - 1$$

$$7x = -3y + 2$$

$$x + 4y = 2$$

$$-x + y = 8$$

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

$$2x + y = 10$$

$$4x + 2y = 1$$

$$8x + 4y = 2$$

If Nischal is traveling at 40 miles per hour for 3 hours, how far will he have traveled?

What is the rate in feet per second a hockey puck travels if it goes 30 feet in 10 seconds?

### Solutions

Use substitution to solve this system of equations:

$$3x = 2y$$

$$x = y + 1$$

Plug in  $y + 1$  for  $x$  into the first equation:

$$3(y + 1) = 2y$$

$$3y + 3 = 2y$$

$$y + 3 = 0$$

$$y = -3$$

Then substitute  $-3$  in for  $y$  into the second equation:

$$x = y + 1$$

$$x = -3 + 1$$

$$x = -2$$

So the solution is  $x = -2$  and  $y = -3$ .

Use substitution to solve this system of equations:

$$y = x - 1$$

$$7x = -3y + 2$$

Plug in  $x - 1$  for  $y$  into the second equation:

$$7x = -3(x-1) + 2$$

$$7x = -3x + 3 + 2$$

$$7x = -3x + 5$$

$$10x = 5$$

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

Now, plug this value of  $x$  into the first equation:

$$y = x - 1$$

$$y = \frac{1}{2} - 1$$

$$y = -\frac{1}{2}$$

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

Use elimination to solve this system of equations:

$$x + 4y = 2$$

$$-x + y = 8$$

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$$0 + 5y = 10$$

Then, solve for  $y$ :

$$5y = 10$$

$$y = \frac{10}{5}$$

$$y = 2$$

Then, plug 2 back in for  $y$  and solve for  $x$ :

$$x + 4y = 2$$

$$x + 4(2) = 2$$

$$x + 8 = 2$$

$$x = -6$$

So the solution set is  $x = -6$  and  $y = 2$ .

Solve using elimination by doubling the first equation and adding it to the second:

$$2\left(x - \frac{1}{2}y = 3\right) \quad 2x - y = 6$$

$$2x - y = 6$$

$$2x + y = 10$$

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$$4x + 0 = 16$$

Then solve for  $x$  and plug it into either original equation to solve for  $y$ :

$$4x = 16$$

$$x = 4$$

$$2x + y = 10$$

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

$$8 + y = 10$$

$$y = 2$$

So the solution is  $x = 4$  and  $y = 2$ .

Multiply the first equation by 2 to notice a pattern:

$$4x + 2y = 1$$

$$8x + 4y = 2$$

As you may recognize, this is identical to the second equation:  $8x + 4y = 2$  .

Since the two equations are identical and would therefore overlap if graphed in the  $x$ - $y$  coordinate plane, there would be *infinitely* many solutions.

Multiply the rate by the time to find the total distance:

$$40 \times 3 = 120$$

So Nischal has traveled a total of 120 miles.

Divide the distance by the time to find the rate:

$$30 \div 10 = 3$$

So the puck is traveling 3 feet/second.

## PSAT Resource Links

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<https://www.crackpsat.net/psat/reading/>

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