Name:	Date:	Period:

2.7 Systems with 3 Variables Notes

1 $2x + 3y + 3z = 6$
2 $6x - 3y + 4z = 12$
3 $2x - 3y + 2z = 6$

A. Notice that the first two equations could be combined to form the new equation $8x + 7z = 18$.

How was this accomplished?

Adding 1 + 2

1 $2x + 3y + 3z = 6$
2 $6x - 3y + 4z = 12$
$8x + 7z = 18$ A

B. Now there is an equation with only x and z, find another equation with only x and z to be able to solve the system. Choose a different pair of equations to combine and find a way to eliminate y so that the new equation only has x and z.

1 $2x + 3y + 3z = 6$
3 $2x - 3y + 2z = 6$
B $4x + 5z = 12$

C. Then solve the system of two equations to find x and z.

A $8x + 7z = 18$
B $4x + 5z = 12$ $\times(-2)$

A $8x + 7z = 18$
B $-8x - 10z = -24$
$-3z = -6$

$z = 2$

B $4x + 5(2) = 12$
$4x + 10 = 12$
$4x = 2$
$x = \frac{2}{4} = \frac{1}{2}$

D. Now for which variable do you still need to solve? y

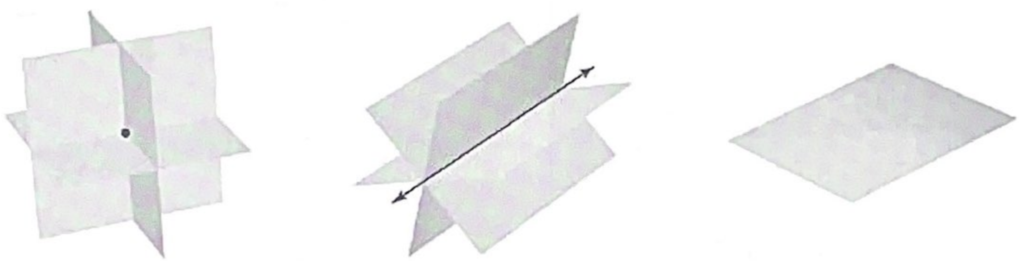
E. Solve for the remaining variable. Then write the solution as a point in (x, y, z) form.

1 $2\left(\frac{1}{2}\right) + 3y + 3(2) = 6$
$1 + 3y + 6 = 6$
$3y + 7 = 6$
$3y = -1$
$y = \frac{-1}{3}$

$\boxed{\left(\frac{1}{2}, \frac{-1}{3}, 2\right)}$

Systems with 3 VARIABLES	1. Choose 2 equations in which you can easily eliminate a variable. Let's call this new equation **Equation A**. 2. Eliminate the same variable from the unused equation and any other equation. Let's call this new equation **Equation B.** 3. Use Equation A + B and SOLVE that system. 4. Substitute your answer from Step 3 into any of the original equations find the remaining variable. Your solution is (x,y,z). coordinate triplet

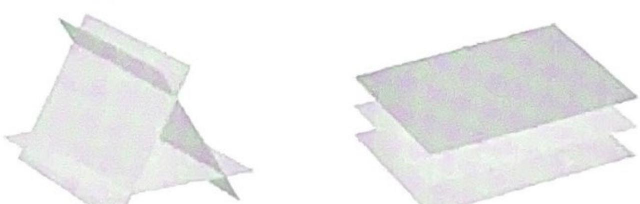
Types of Solutions to a System with 3 Variables



(a) One solution (a point)

(b) Infinite number of solutions (a line)

(c) Infinite number of solutions (a plane)



(d) No solution

(e) No solution

Additional Example

① $2x - 6y + 9z = -8$

② $5x + y + 2z = 10$

③ $3x + y - 8z = -28$

$\times(-1)$

② $5x + y + 2z = 10$

$-3x - y + 8z = 28$

Ⓐ $2x + 10z = 38$

① $2x - 6y + 9z = -8$

$\times(6)$

$30x + 6y + 12z = 60$

Ⓑ $32x + 21z = 52$

Ⓐ $\times(-16)$ $-32x - 160z = -608$

Ⓑ $32x + 21z = 52$

$-139z = -556$

$z = 4$

Ⓐ $2x + 10(4) = 38$

$2x + 40 = 38$

$2x = -2$

$x = -1$

③ $3(-1) + y - 8(4) = -28$

$-5 + y + -32 = -28$

$y + -35 = -28$

$y = 7$

solution

$\boxed{(-1, 7, 4)}$