SOLVE LINEAR SYSTEMS USING ELIMINATION

1. Solve each linear system.

a) $x + 3y = 5$ ①
$5x + 2y = 12$ ②

Multiply one of the equations: ① × 5 → $5(x + 3y = 5)$
$5x + 15y = 25$ ③

Add or subtract the equations to eliminate one of the variables and then solve: (② & ③)	Solve for the other variable: (Sub $y = 1$ into ①)	Solution:
$5x + 2y = 12$ $-(5x + 15y = 25)$ $\emptyset\ [2y - 15y] = [12 - 25]$ $-13y = -13$ $\frac{-13y}{-13} = \frac{-13}{-13}$ $y = 1$	$x + 3y = 5$ $x + 3(1) = 5$ $x + 3 = 5$ $x = 5 - 3$ $x = 2$	∴ POI is $(2, 1)$

b) $3x + 2y = 2$ ①
$x + 4y = 14$ ②

Multiply one of the equations: ② × 3 → $3(x + 4y = 14)$
$3x + 12y = 42$ ③

Add or subtract the equations to eliminate one of the variables and then solve: (① & ③)	Solve for the other variable: (Sub $y = 4$ into ②)	Solution:
$3x + 2y = 2$ $-(3x + 12y = 42)$ $\emptyset\ [2y - 12y] = [2 - 42]$ $-10y = -40$ $\frac{-10y}{-10} = \frac{-40}{-10}$ $y = 4$	$x + 4y = 14$ $x + 4(4) = 14$ $x + 16 = 14$ $x = 14 - 16$ $x = -2$	∴ POI is $(-2, 4)$

c) $3x - y = 2$ ①
$2x + 3y = 16$ ②

Multiply one of the equations: ① x 3	3(3x − y = 2) 9x − 3y = 6 ③	
Add or subtract the equations to eliminate one of the variables and then solve: ② & ③	Solve for the other variable: Sub x = 2 into ①	Solution:
2x + 3y = 16 + 9x − 3y = 6 [2x + 9x] ∅ = [16 + 6] 11x = 22 11 11 x = 2	3x − y = 2 3(2) − y = 2 6 − y = 2 6 − 2 = y 4 = y	∴ POI is (2, 4)

2. A local band called Rawk held a concert where 5000 people attended with *x* representing the number of lower bowl tickets and *y* representing the number of upper bowl seating tickets.
This is represented by the equation: $x + y = 5000$ ①

The lower bowl tickets cost $60 while the upper bowl tickets cost $40. Ticket sales totaled $264 000.
This is represented by the equation: $60x + 40y = 264\,000$ ②

How many lower bowl and upper bowl tickets were sold?

① x 60 60(x + y = 5000)
60x + 60y = 300 000 ③

② & ③
60x + 40y = 264 000
− 60x + 60y = 300 000
∅ [40y − 60y] = [264 000 − 300 000]
−20y = −36 000
−20 −20
y = 1800

Sub y = 1800 into ①
x + y = 5000
x + 1800 = 5000
x = 5000 − 1800
x = 3200

POI = (3200, 1800)
(3200 ↑ lower, 1800 ↑ upper)

∴ They sold 3200 lower bowl & 1800 upper bowl tickets.