

Applications of Linear Systems Using Substitution

Practice

Solve the following linear systems using substitution.

a) ① $2x - 3y = 18$

② $y = (-3x + 5)$

sub ② into ①

$$2x - 3(-3x + 5) = 18$$

$$2x + 9x - 15 = 18$$

$$11x = 18 + 15$$

$$\frac{11x}{11} = \frac{33}{11}$$

③ $x = 3$

sub ③ into ②

$$y = -3(3) + 5$$

$$y = -9 + 5$$

$$y = -4$$

∴ The P.O.I. is $(3, -4)$

b) ① $4x + 2y = -6$

② $3x - 3y = 18$

Isolate y in ①

$$\frac{2y}{2} = \frac{-6 - 4x}{2}$$

③ $y = (-3 - 2x)$ new ①

sub ③ into ②

$$3x - 3(-3 - 2x) = 18$$

$$3x + 9 + 6x = 18$$

$$9x = 18 - 9$$

$$\frac{9x}{9} = \frac{9}{9}$$

④ $x = 1$

sub ④ into ③

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

$$y = -3 - 2$$

$$y = -5$$

∴ The P.O.I. is $(1, -5)$

Applications

1. The cost to rent Pythagorean Hall is \$200 plus \$30/person. The cost to rent Cayley Club is \$1000 plus \$20 for each guest. Determine the number of guests that could attend this function such that both the Hall and Club would cost the same amount.

Pythagorean Hall: ① $C = (30n + 200)$

Cayley Club: ② $C = 20n + 1000$

sub ① into ②

$$(30n + 200) = 20n + 1000$$

$$30n - 20n = 1000 - 200$$

$$\frac{10n}{10} = \frac{800}{10}$$

③ $n = 80$

sub ③ into ②

$$C = 20(80) + 1000$$

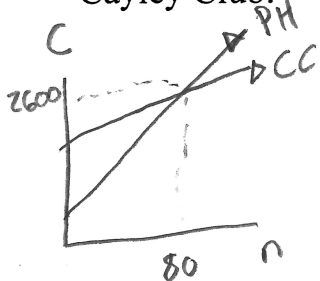
$$= 1600 + 1000$$

$$= 2600$$

∴ The P.O.I.

$$(80, 2600)$$

∴ Both halls would charge \$2600 if 80 guests attended.



2. Lourdes hosts a movie night as a fundraiser. Tickets cost \$3 for students and \$5 for adults. A total of 200 people attend the movie. If a total of \$670 is raised from the movie ticket sales, how many students attended?

Let x represent the number of students who attend the movie.

Let y represent the number of adults who attend the movie.

① $x + y = 200$

② $3x + 5y = 670$

Isolate x in ①

③ $x = (200 - y)$ new ①

sub ③ into ②

$$3(200 - y) + 5y = 670$$

$$600 - 3y + 5y = 670$$

$$2y = 670 - 600$$

$$\frac{2y}{2} = \frac{70}{2}$$

④ $y = 35$

sub ④ into ③

$$x = 200 - 35$$

$$x = 165$$

∴ There were 165 adults and 35 students.

Practice

1. Two sisters depart in separate cars from Guelph towards Quebec. When Morgan departs Guelph at noon, Avalon has already travelled 45 km from Guelph. Morgan is driving at 105km/hr and Avalon is cruising at 100 km/hr. When will Morgan catch up to Avalon and how far will they be from Guelph?

Let d represent the distance travelled (in kilometers)

Let t be the elapsed time since noon (in hours).

2. A school art club is having a raffle. The tickets cost \$2 for students and \$5 for teachers. If 130 tickets were sold and the revenue (money brought in) from the raffle was \$365, how many tickets were purchased by teachers?

Let x be the number of tickets purchased by the students.

Let y be the number of tickets purchased by the teachers.

3. Two friends go to the cafeteria to purchase pizza and pop. Gabriella purchases two slices of pizza and a pop for \$5.90. Greta purchases three slices of pizza and two pop for \$9.45. How much does one pizza slice cost and how much does one pop cost?

Let x represent the cost of one slice of pizza (\$).

Let y represent the cost of one pop (\$).

Answers: 1. 945 km in 9 hours, 2. 95 students and 35 teachers, 3. pop is \$1.20 and pizza is \$2.35