

KNOWLEDGE	132
APPLICATION	120
THINKING	120
COMMUNICATION	level

MPM2D - UNIT 1: SYSTEMS OF LINEAR EQUATIONS

KNOWLEDGE

1. Solve the linear system graphically.

① $3x + 5y = -9$

② $2x - y = 7$

Out of 9

① $3x + 5y = -9$

$\frac{5y}{5} = \frac{-3x-9}{5}$

$y = -\frac{3}{5}x - 1.8$ ✓

$m = -\frac{3}{5}$ rise/run ✓

$b = -1.8$

or
 $(0, -1.8)$ ✓

② $2x - y = 7$

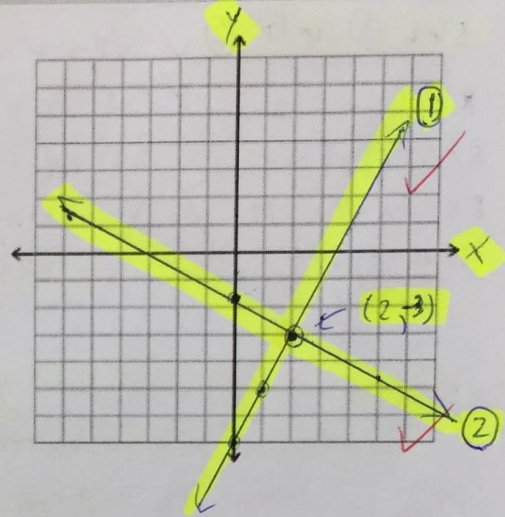
$-y = -2x + 7$

$y = 2x - 7$ ✓

$m = \frac{2}{1}$ rise/run ✓

$b = -7$

or
 $(0, -7)$ ✓



∴ P.O.I is (2, -3) ✓

2. Gary drove his pickup truck from Cornwall to Chatham. He left Cornwall at 8:15 a.m. and drove at a steady 100 km/h along Highway 401. The graph below shows how the fuel in the tank varied over time.

Out of 3

a.) What do the coordinates of the point (5, 25.5) tell you about the amount of fuel?

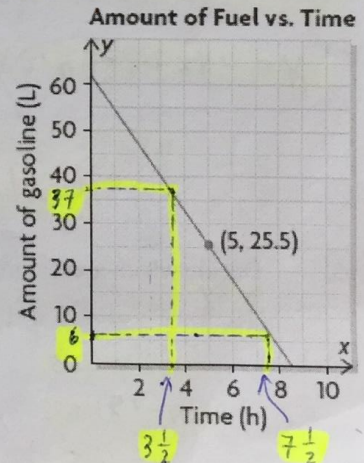
after 5h there will be 25.5L of fuel left in the tank ✓

b.) How much fuel was in the tank at 11:45 a.m.?

from 8:15am to 11:45am → 3½h passed
∴ about 37L left (from graph) ✓

c.) The low fuel warning light came on when 6 L of fuel remained. At what time did this light come on?

after about 7½h (from graph)
∴ 8:15am + 7½h → 3:45pm ✓



3. Use either substitution or elimination to solve for the linear system below.

$$3 \left(x - \frac{1}{3}y = -1 \right) \rightarrow \textcircled{1} 3x - y = -3 \rightarrow \frac{-y}{-1} = \frac{-3x-3}{-1} \rightarrow \textcircled{3} y = 3x + 3$$

$$12 \left(\frac{2}{3}x - \frac{1}{4}y = -1 \right) \rightarrow \textcircled{2} 8x - 3y = -12$$

Sub $\textcircled{3}$ into $\textcircled{2}$

Sub $x=3$ in $\textcircled{3}$

$$8x - 3y = -12$$

$$8x - 3(3x + 3) = -12$$

$$8x - 9x - 9 = -12$$

$$-x = -12 + 9$$

$$-x = -3$$

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

$$x = 3$$

$$y = 3x + 3$$

$$y = 3(3) + 3$$

$$y = 12$$

Out of 10

\therefore P.O.I is $(3, 12)$

4. Milk is leaking from a carton at a rate of 4 mL/min. There is 1500 mL of milk in the carton at 8:30 a.m.

a.) Write an equation for this situation.

b.) Use your equation to determine algebraically when 1 L of milk will be left in the carton.

1L = 1000 mL

a.) Let y be the milk left in the carton in mL
Let x be the # of minutes

b.) $y = 1000$

$$y = -4x + 1500$$

$$1000 = -4x + 1500$$

$$1000 - 1500 = -4x$$

$$-500 = -4x$$

$$\frac{-500}{-4} = \frac{-4x}{-4}$$

$$125 = x$$

125 min + 8:30 am
is 10:35 am

Out of 7

\therefore 1L of milk left at 10:35 am

5. Decide whether each ordered pair is a solution to the given system of equations.

x, y
 $(10, 5); x - y = 5$ and $y = 5x - 40$

$$x - y = 5$$

$$(10) - (5) = 5$$

$$5 = 5$$

$$L.S. = R.S.$$

$$y = 5x - 40$$

$$(5) = 5(10) - 40$$

$$5 \neq 10$$

$$L.S. \neq R.S.$$

$\therefore (10, 5)$ is not a solution to this linear system

Out of 3

APPLICATION

1. Courtney paid a one-time registration fee to join a fitness club. She also pays a monthly fee. After three months, she had paid \$315. After seven months, she had paid \$535. Determine the registration fee and the monthly fee.

Let x be the monthly fee ✓

Let y be the one time registration fee ✓

① $315 = y + 3x$ ✓

② $535 = y + 7x$ ✓

$-220 = 0 - 4x$

$\frac{-220}{-4} = \frac{-4x}{-4}$ ✓

$55 = x$ ✓

Out of 10 ✓

Sub $x = 55$ into ① ✓

$315 = y + 3x$

$315 = y + 3(55)$

$315 = y + 165$ ✓

$315 - 165 = y$

$150 = y$ ✓

∴ the one time registration fee is \$150 and the monthly fee is \$55. ✓

2. A Grade 10 class is raising money for a school building project in Uganda. To buy 35 desks and 3 chalkboards, the students need to raise \$2082. To buy 40 desks and 2 chalkboards, they need to raise \$2238. Determine the cost of a desk and the cost of a chalkboard.

Let x be the cost of a desk ✓

Let y be the cost of a chalkboard ✓

Out of 10 ✓

① $35x + 3y = 2082 \rightarrow 2(35x + 3y = 2082) \rightarrow$ ① $70x + 6y = 4164$ ✓

② $40x + 2y = 2238 \rightarrow 3(40x + 2y = 2238) \rightarrow$ ② $120x + 6y = 6714$ ✓

sub $x = 51$ into ①

$35(51) + 3y = 2082$

$1785 + 3y = 2082$ ✓

$3y = 2082 - 1785$

$\frac{3y}{3} = \frac{297}{3}$

$y = 99$ ✓

$-50x + 0 = -2550$

$\frac{-50x}{-50} = \frac{-2550}{-50}$ ✓

$x = 51$ ✓

∴ a desk costs \$51 and a chalkboard \$99 ✓

THINKING

1. Jennifer has nickels, dimes, and quarters in her piggy bank. In total, she has 49 coins, with a value of \$5.20. If she has five more dimes than all the nickels and quarters combined, how many of each type of coin does she have?

let x be the # of nickels ✓
 let y be the # of dimes ✓
 let z be the # of quarters ✓

① $x + y + z = 49$ ✓
 ② $0.05x + 0.10y + 0.25z = 5.20$ ✓
 ③ $x + z = y - 5 \rightarrow$ ③ $x - y + z = -5$ ✓

① $x + y + z = 49$ ✓
 ③ $x - y + z = -5$ ✓
 ⊖
 $0 + 2y + 0 = 54$ ✓
 $\frac{2y}{2} = \frac{54}{2}$ ✓
 $y = 27$ ✓

① $0.05(x + y + z) = 2.45$ ✓
 $\rightarrow 0.05x + 0.05y + 0.05z = 2.45$ ✓

② $0.05x + 0.10y + 0.25z = 5.20$ ✓
 ⊖
 $0 - 0.05y - 0.20z = -2.75$

④ $-0.05y - 0.20z = -2.75$ ✓

sub $y = 27$ into ④ ✓

$-0.05(27) - 0.20z = -2.75$ ✓
 $-1.35 - 0.20z = -2.75$ ✓
 $-0.20z = -2.75 + 1.35$ ✓
 $-0.20z = -1.40$ ✓
 $\frac{-0.20z}{-0.20} = \frac{-1.40}{-0.20}$ ✓
 $z = 7$ ✓

sub $y = 27$ & $z = 7$ into ① ✓

$x + (27) + (7) = 49$ ✓
 $x = 49 - 27 - 7$ ✓
 $x = 15$ ✓

Out of 17

∴ there are 15 nickels, 27 dimes & 7 quarters ✓

2. Create a situation you can represent by a system of linear equations that has the ordered pair (10, 15) as its solution.

① $2x + 3y = 65$ ✓

② $x + y = 25$ ✓

Out of 3

It cost \$2 per pound of jellybeans and \$3 per pound of juke jubes. Mr. Bawa spent \$65 total. If Mr. Bawa got 25 pounds of candy, how many pounds of each type is there. ✓