

Unit 1 Pretest Review

MPM2D

Jensen

1) Solve each linear system by graphing.

a) $l_1: y = 4x - 5$
 $l_2: y = \frac{2}{3}x + 5$

solution: $x=3, y=7$

Line 1

$y = 4x - 5$

slope = $m = \frac{4}{1}$

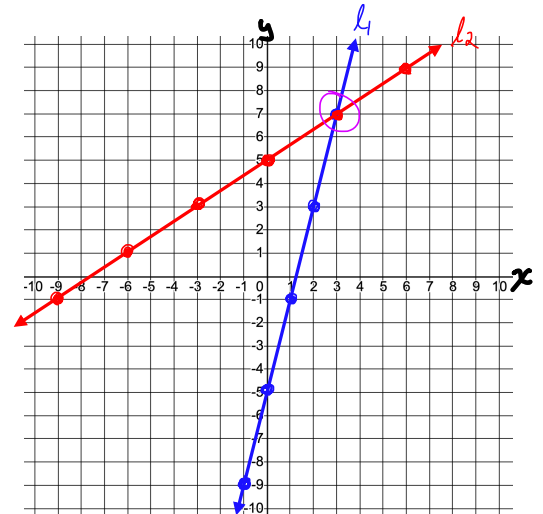
y-int = $b = -5$

Line 2

$y = \frac{2}{3}x + 5$

slope = $m = \frac{2}{3}$

y-int = $b = 5$



b) $l_1: 3x + y = 1$
 $l_2: x + 4y = 4$

solution: $x=0, y=1$

Line 1

$3x + y = 1$

$y = -3x + 1$

slope = $m = -\frac{3}{1}$

y-int = $b = 1$

Line 2

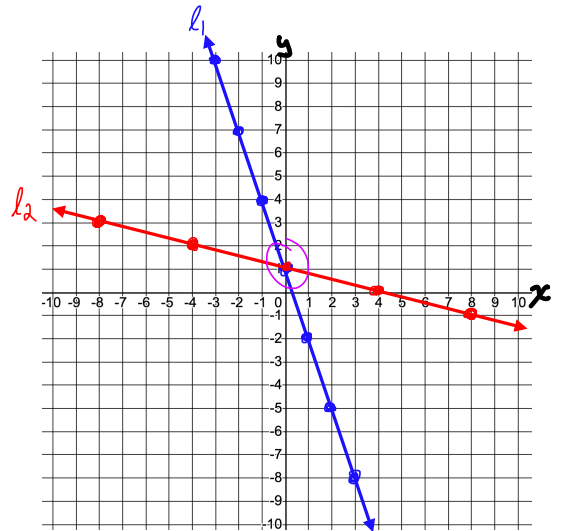
$x + 4y = 4$

$4y = -x + 4$

$y = -\frac{1}{4}x + 1$

slope = $m = -\frac{1}{4}$

y-int = $b = 1$



c) $l_1: y = -2x + 5$
 $l_2: y = \frac{1}{2}x - 5$

solution: $x=4, y=-3$

Line 1

$y = -2x + 5$

slope = $m = -\frac{2}{1}$

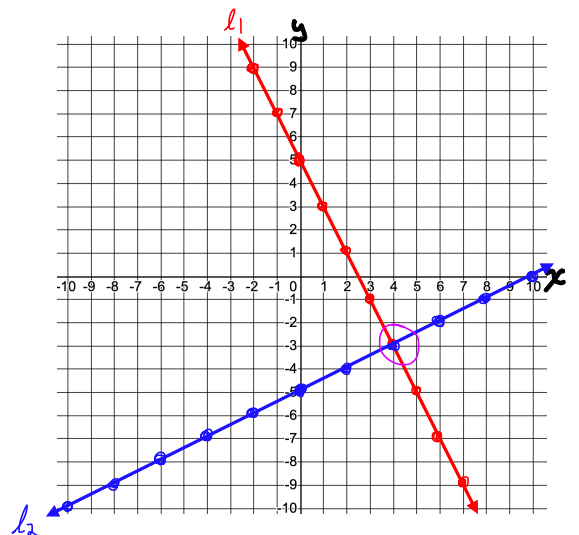
y-int = $b = 5$

Line 2

$y = \frac{1}{2}x - 5$

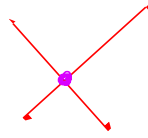
slope = $m = \frac{1}{2}$

y-int = $b = -5$

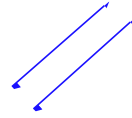


2) What are the different possibilities for the number of solutions to a linear system. Explain each scenario.

- 1 solution if the lines have different slopes.



- 0 solutions if the lines are parallel (same slope) but have different y-intercepts.



Parallel and distinct.

- Infinitely many solutions if the lines have the same slope and same y-intercepts.



Parallel and coincident

3) Solve each linear system using the method of substitution.

a) $l_1: y = 2x + 4$
 $l_2: x - 4y = -9$

① $y = 2x + 4$
 $y = 2(-1) + 4$
 $y = -2 + 4$
 $y = 2$

② $x - 4y = -9$
 $x - 4(2x + 4) = -9$
 $x - 8x - 16 = -9$
 $-7x = 7$
 $x = -1$

solution: $x = -1, y = 2$

b) $l_1: 2x = 7 - y$
 $l_2: 3x - 2y = 21$

① $2x = 7 - y$
 $y = 7 - 2x$
 $y = 7 - 2(5)$
 $y = -3$

② $3x - 2y = 21$
 $3x - 2(7 - 2x) = 21$
 $3x - 14 + 4x = 21$
 $7x = 35$
 $x = 5$

solution: $x = 5, y = -3$

c) $l_1: 3m + 9n = 1$
 $l_2: m + 3n = 2$

① $3m + 9n = 1$
 $3(2 - 3n) + 9n = 1$
 $6 - 9n + 9n = 1$
 $0n = -5$

② $m + 3n = 2$
 $m = 2 - 3n$

∞ NO solutions.

The lines are parallel and distinct.

d) $l_1: 2x - 3y = 6$
 $l_2: 2x - y = 7$

① $2x - 3y = 6$
 $2x - 3(2x - 7) = 6$
 $2x - 6x + 21 = 6$
 $-4x = -15$
 $x = \frac{15}{4}$

② $2x - y = 7$
 $2x - 7 = y$
 $2\left(\frac{15}{4}\right) - 7 = y$
 $\frac{15}{2} - \frac{14}{2} = y$
 $\frac{1}{2} = y$

solution: $x = \frac{15}{4}, y = \frac{1}{2}$

e) $l_1: 3x - 8 = -2y$
 $l_2: 2x + 3y = 7$

① $3x - 8 = -2y$
 $-\frac{3}{2}x + 4 = y$
 $-\frac{3}{2}(2) + 4 = y$
 $-3 + 4 = y$
 $y = 1$

② $2x + 3y = 7$
 $2x + 3(-\frac{3}{2}x + 4) = 7$
 $2x - \frac{9}{2}x + 12 = 7$
 $\frac{4}{2}x - \frac{9}{2}x = -5$
 $-\frac{5}{2}x = -5$
 $-5x = -10$
 $x = 2$

solution: $x=2, y=1$

f) $l_1: 2x = 6 - y$
 $l_2: 3x - 2y = 2$

① $2x = 6 - y$
 $y = 6 - 2x$
 $y = 6 - 2(2)$
 $y = 2$

② $3x - 2y = 2$
 $3x - 2(6 - 2x) = 2$
 $3x - 12 + 4x = 2$
 $7x = 14$
 $x = 2$

solution: $x=2, y=2$

4) Solve each linear system using the method of elimination.

a) $l_1: x - y = 14$
 $l_2: 2x + 5y = -7$

$2 \times$ ① $2x - 2y = 28$
 ② $2x + 5y = -7$ -
 $-7y = 35$
 $y = -5$

sub $y = -5$ into ①
 $x - y = 14$
 $x - (-5) = 14$
 $x + 5 = 14$
 $x = 9$

solution: $x=9, y=-5$

b) $l_1: 9x - 3y = 15$
 $l_2: 3x - y = 5$

① $9x - 3y = 15$
 $3 \times$ ② $9x - 3y = 15$ -
 $0x + 0y = 0$

Infinitely many solutions.
The lines are parallel and coincident.

c) $l_1: 3x + 4y = 17$
 $l_2: 7x - 2y = 17$

① $3x + 4y = 17$
 $2 \times$ ② $14x - 4y = 34$ +
 $17x = 51$
 $x = 3$

sub $x = 3$ into ①
 $3(3) + 4y = 17$
 $9 + 4y = 17$
 $4y = 8$
 $y = 2$

solution: $x=3, y=2$

d) $l_1: 2x + 5y = 18$
 $l_2: 3x + 5y - 17 = 0$

① $2x + 5y = 18$
 ② $3x + 5y = 17$ -
 $-x = 1$
 $x = -1$

sub $x = -1$ into ①
 $2(-1) + 5y = 18$
 $-2 + 5y = 18$
 $5y = 20$
 $y = 4$

solution: $x=-1, y=4$

e) $l_1: 3x = 34 - 2y$
 $l_2: 5x - 3y = -13$

f) $l_1: 5x + 2y = 5$
 $l_2: 2x + 3y = 13$

① $3x + 2y = 34$
 $3x \text{ ① } 9x + 6y = 102$
 $2x \text{ ② } 10x - 6y = -26$ +

 $19x = 76$
 $x = 4$

sub $x=4$ into ②
 $5x - 3y = -13$
 $5(4) - 3y = -13$
 $20 - 3y = -13$
 $33 = 3y$
 $y = 11$

solution: $x=4, y=11$

$3x \text{ ① } 15x + 6y = 15$
 $2x \text{ ② } 4x + 6y = 26$ -

 $11x = -11$
 $x = -1$

sub $x=-1$ into ②
 $2x + 3y = 13$
 $2(-1) + 3y = 13$
 $-2 + 3y = 13$
 $3y = 15$
 $y = 5$

solution: $x=-1, y=5$

5) Petr has \$5000 invested in two plans. One plan pays 5% simple interest per year and the other pays 8%. At the end of the year, Petr receives a total of \$340 in interest. How much did he invest in each plan?

x = amount at 5%
 y = amount at 8%

① $x + y = 5000$ ② $0.05x + 0.08y = 340$
 $100 \times \text{②} \quad 5x + 8y = 34000$
 $5x \text{ ①} \quad 5x + 5y = 25000$ -

 $3y = 9000$
 $y = 3000$

sub $y=3000$ into ①
 $x + y = 5000$
 $x + 3000 = 5000$
 $x = 2000$

solution: Petr invested \$2000 at 5% and \$3000 at 8%.

6) A physics contest has 30 multiple choice questions. A correct answer gains 4 points, while a wrong answer loses 1 point. Rolly answered every question and scored 55 points. How many questions did he answer correctly?

x = # correct
 y = # wrong

① $x + y = 30$
 $② \quad 4x - y = 55$ +

 $5x = 85$
 $x = 17$

solution: Rolly got 17 correct.

7) One lawn fertilizer is 24% nitrogen, and another is 12% nitrogen. How much of each fertilizer should be mixed to obtain 100 kg of fertilizer that is 21% nitrogen?

x = amount of 24% nitrogen
 y = amount of 12% nitrogen

$$\textcircled{1} x + y = 100$$

$$\textcircled{2} 0.24x + 0.12y = 0.21(100)$$

sub $x=75$ into $\textcircled{1}$

$$100 \times \textcircled{2} \quad 24x + 12y = 2100$$

$$x + y = 100$$

$$12 \times \textcircled{1} \quad 12x + 12y = 1200 \quad -$$

$$75 + y = 100$$

$$12x = 900$$

$$y = 25$$

$$x = 75$$

Solution: 75 kg of 24% nitrogen and 25 kg of 12% should be mixed.

8) A small plane took 3 hours to fly 960 km from Ottawa to Halifax with a tail wind. On the return trip, flying into the wind, the plane took 4 hours. Find the wind speed and the speed of the plane in still air.

x = speed of plane in still air
 y = wind speed.

$$\textcircled{1} 3(x+y) = 960$$

$$\textcircled{2} 4(x-y) = 960$$

$$3x + 3y = 960$$

$$4x - 4y = 960$$

Remember:

distance = speed \times time

$$\frac{1}{3} \times \textcircled{1} \quad x + y = 320$$

sub $y=40$ into $\textcircled{1}$

$$\frac{1}{4} \times \textcircled{2} \quad x - y = 240 \quad -$$

$$x + y = 320$$

$$x + 40 = 320$$

$$x = 280$$

$$2y = 80$$

$$y = 40$$

Solution: The speed of the plane in still air is 280 km/h
 The speed of the wind is 40 km/h

9) The Outdoors Club held a car wash to raise money. They washed cars for \$5 each and vans for \$7 each. They washed 45 vehicles and earned \$243. How many of each type of vehicle did they wash?

x = # of cars
 y = # of vans

$$\textcircled{1} x + y = 45$$

$$\textcircled{2} 5x + 7y = 243$$

sub $y=9$ into $\textcircled{1}$

$$5 \times \textcircled{1} \quad 5x + 5y = 225 \quad -$$

$$x + y = 45$$

$$x + 9 = 45$$

$$x = 36$$

$$2y = 18$$

$$y = 9$$

Solution: They washed 36 cars and 9 vans

Answers

1)a) $x = 3, y = 7$ **b)** $x = 0, y = 1$ **c)** $x = 4, y = -3$

2) no solutions if the lines are parallel and distinct; 1 solution if the lines are not parallel; infinitely many solutions if the lines are parallel and coincident.

3)a) $x = -1, y = 2$ **b)** $x = 5, y = -3$ **c)** no solutions **d)** $x = \frac{15}{4}, y = \frac{1}{2}$ **e)** $x = 2, y = 1$ **f)** $x = 2, y = 2$

4)a) $(9, -5)$ **b)** infinite solutions **c)** $(3, 2)$ **d)** $(-1, 4)$ **e)** $(4, 11)$ **f)** $(-1, 5)$

5) \$2000 at 5% and \$3000 at 8%

6) 17

7) 75 kg of 24% nitrogen, 25 kg of 12% nitrogen

8) wind 40 km/h; plane in still air 280 km/h

9) 36 cars and 9 vans