

## Test #2 – Linear Systems and Analytic Geometry

### Part A: Multiple Choice [K/U, 10 marks]

1. What is the slope of the line  $y = -\frac{2}{5}x + 8$  ?

- a.  $-\frac{2}{5}$                       b. 8                      c.  $\frac{5}{2}$                       d.  $-\frac{1}{8}$

2. Which of the following points is **not** on the line  $x + y = 7$ ?

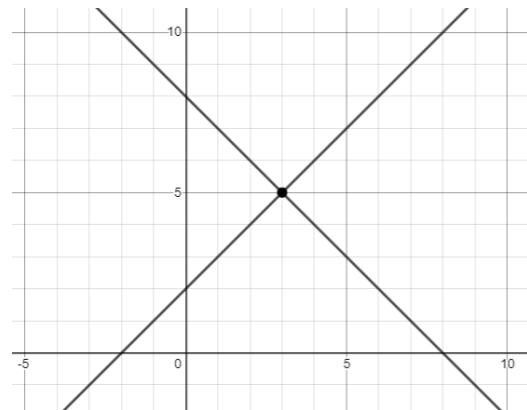
- a. (1, 6)                      b. (-3, 10)                      c. (-8, 1)                      d. (15, -8)

3. Which of the following cannot be the *number* of solutions to a linear system?

- a. 0                      b. 1                      c. 2                      d. Infinite

4. What is the solution of the system shown?

- a. (3, 5)                      b. (5, 3)  
c. (8, 8)                      d. (0, 2)



5. What is the solution of the system  $\begin{cases} x + 3y = 7 \\ 3x - 5y = 7 \end{cases}$  ?

- a. (1, 2)                      b. (4, 1)                      c. (-2, 3)                      d. (10, -1)

6. What is the **midpoint** between the points L(4, 8) and I(12, 10)?  
a. (4, 1)      **b.** (8, 9)      c. (1, 4)      d. (9, 8)
7. What is the **distance** between the points N(4, 5) and E(4, 11)?  
**a.** 6      b. 11.04      c. 17.88      d. 36
8. What is the slope of a line **perpendicular** to the line that passes through A(1, 4) and R(2, 6)?  
a.  $\frac{1}{2}$       **b.**  $-\frac{1}{2}$       c. 2      d. -2
9. What is the radius of the circle given by  $x^2 + y^2 = 64$  ?  
a. 4096      b. 64      c. 32      **d.** 8
10. Naomi is trying to balance a piece of pizza on her index finger. The point she needs to locate is called the...  
**a.** Centroid      b. Circumcentre      c. Orthocentre      d. Pointeroni

**Bonus.** What is the secret word hidden on this page?

LINEAR (the point names)



MPM 2D  
Mr. Kempe

Name: \_\_\_\_\_  
Date: \_\_\_\_\_

4. Define **perpendicular bisector**.

5. Define **altitude** of a triangle.

Part C: Problem Solving

Complete any 5 of the following 6 problems. Each problem worth is 4 marks.

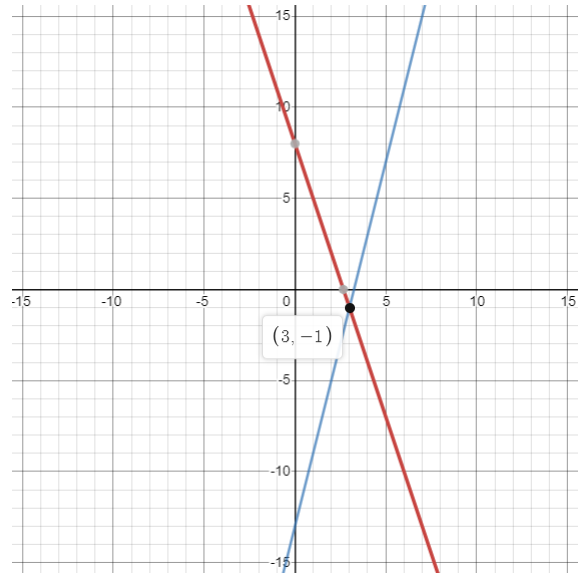
1. Solve the system  $y = -3x + 8$   
 $4x - y = 13$  using the method of your choice.

*Substitution:*

$$\begin{aligned} 4x - (-3x + 8) &= 13 \\ 7x - 8 &= 13 \\ 7x &= 21 \\ x &= 3 \end{aligned}$$

$$\begin{aligned} y &= -3(3) + 8 \\ y &= -1 \end{aligned}$$

The solution is (3, -1)



*Elimination:*

$$\begin{array}{r} 3x + y = 8 \\ + 4x - y = 13 \\ \hline 7x = 21 \\ x = 3 \end{array}$$

$$\begin{aligned} y &= -3(3) + 8 \\ y &= -1 \end{aligned}$$

The solution is (3, -1)

2. The sum of two numbers is 37. The larger number, subtract twice the smaller number, is 16. Determine the two numbers.

Let  $x$  be the larger number,  $y$  the smaller.

$$\begin{aligned}x + y &= 37 \\x - 2y &= 16\end{aligned}$$

*Substitution*

$$y = 37 - x$$

$$\begin{aligned}x - 2(37 - x) &= 16 \\x - 74 + 2x &= 16 \\3x &= 90 \\x &= 30\end{aligned}$$

$$\begin{aligned}y &= 37 - (30) \\y &= 7\end{aligned}$$

The larger number is 30, the smaller is 7.

*Elimination*

$$\begin{array}{r}x + y = 37 \\- x - 2y = 16 \\ \hline 3y = 21 \\ y = 7\end{array}$$

$$\begin{aligned}x + y &= 37 \\x + 7 &= 37 \\x &= 30\end{aligned}$$

The larger number is 30, the smaller is 7.

3. "Violet Uprising" paint is 85% purple dye by volume. "Maive Over Please" paint is 55% purple dye by volume. A painter needs to make 1.5L of "Purplexing" which is 75% dye by volume. How much "Violet" and "Maive" paint will she need to make it?

Let  $v$  be the volume of violet,  $m$  be maive.

$$\begin{aligned}v + m &= 1.5 \\ 0.85v + 0.55m &= 0.75(1.5)\end{aligned}$$

*Substitution*

$$\begin{aligned}m &= 1.5 - v \\ 0.85v + 0.55(1.5 - v) &= 1.125 \\ 0.85v + 0.825 - 0.55v &= 1.125 \\ 0.3v &= 0.3 \\ v &= 1\end{aligned}$$

$$\begin{aligned}m &= 1.5 - (1) \\ m &= 0.5\end{aligned}$$

You need 1L of violet and 0.5L of maive.

*Elimination*

$$\begin{array}{rcll}v + m = 1.5 & \times 0.85 & 0.85v + 0.85m = 1.275 \\ 0.85v + 0.55m = 1.125 & & \underline{0.85v + 0.55m = 1.125} \\ & & 0.3m = 0.15 \\ & & m = 0.5\end{array}$$

$$\begin{aligned}v + m &= 1.5 \\ v + 0.5 &= 1.5 \\ v &= 1\end{aligned}$$

You need 1L of violet and 0.5L of maive.

4. Determine the equation of the **perpendicular bisector** of the line segment running between the points A(4, 6) and B(10, 8).

$$\text{Midpoint: } M_{AB} = \left( \frac{4+10}{2}, \frac{6+8}{2} \right) = \left( \frac{14}{2}, \frac{14}{2} \right) = (7, 7)$$

$$\text{Slope: } m_{AB} = \frac{8-6}{10-4} = \frac{2}{6} = \frac{1}{3}$$

Negative reciprocal: -3

$$\begin{aligned} y &= mx + b \\ 7 &= -3(7) + b \\ 7 &= -21 + b \\ 28 &= b \end{aligned}$$

The equation of the bisector is  $y = -3x + 28$ .

5. Show that the quadrilateral formed by the points A(1,1), B (6,6), C(13,7), and D(8,2) is a **rhombus**.

$$d_{AB} = \sqrt{50}$$

$$d_{BC} = \sqrt{50}$$

$$d_{CD} = \sqrt{50}$$

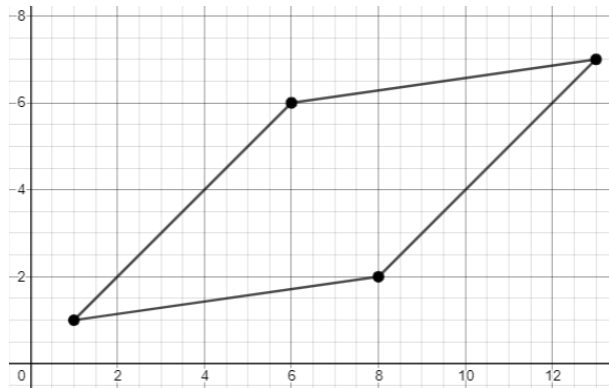
$$d_{DA} = \sqrt{50}$$

$$m_{AB} = 1$$

$$m_{BC} = \frac{1}{7}$$

$$m_{CD} = 1$$

$$m_{DA} = \frac{1}{7}$$



This is a rhombus because the opposite sides are equal and parallel (but not perpendicular, which would be a square.)

6. A lawn sprinkler that sprays in a circle has a range of 12ft.



- a. Write the equation that models the range of the sprinkler, with the sprinkler head at the center.

$$x^2 + y^2 = 12^2$$
$$x^2 + y^2 = 144$$

- b. If Daniel is standing at the point  $(-4, 11)$ , will he get soaked by the sprinkler?

$$x^2 + y^2 \stackrel{?}{=} 144$$
$$(-4)^2 + (11)^2 \stackrel{?}{=} 144$$
$$16 + 121 \stackrel{?}{=} 144$$
$$137 < 144$$

Daniel is within the radius, so yes, he will get soaked.

## Formula Sheet

Slope Formula:  $m = \frac{y_2 - y_1}{x_2 - x_1}$

Slope Y-intercept Form:  $y = mx + b$

Parallel lines have the **same slope**.

Perpendicular lines have slopes that are **negative reciprocals**. (Such as  $\frac{2}{5}$  and  $-\frac{5}{2}$  .)

Midpoint Formula:  $M_{AB} = \left( \frac{x_A + x_B}{2}, \frac{y_A + y_B}{2} \right)$

Distance formula:  $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Equation of a Circle:  $x^2 + y^2 = r^2$