

2023 MTAP Saturday Program in Mathematics Grade 8 Session 3

Part I. Solve and answer each part below as indicated.

A. Determine whether each ordered pair is a solution of the given systems of linear equations in two variables.

1. $(4, 1); \begin{cases} x + y = 5 \\ x - y = 3 \end{cases}$

2. $(1, -3); \begin{cases} x - 7y = -22 \\ 5x + 2y = 1 \end{cases}$

3. $(-2, 7); \begin{cases} 5x + 2y = 24 \\ 4x + 3y = 29 \end{cases}$

4. $(\frac{2}{3}, -\frac{11}{9}); \begin{cases} 6x + 9y = 12 \\ 2x - 3y = 4 \end{cases}$

5. $(8, 5); \begin{cases} x - 1.3y = 1.5 \\ 1.2x - y = 4.6 \end{cases}$

6. $(-\frac{9}{12}, \frac{1}{24}); \begin{cases} 0.2x - 0.3y = 1 \\ 0.3x - 0.2y = 4 \end{cases}$

7. $(2, -4); \begin{cases} \frac{x}{2} + \frac{y}{3} = -\frac{1}{3} \\ \frac{x}{2} + 2y = -7 \end{cases}$

8. $(-\frac{1}{5}, \frac{2}{7}); \begin{cases} \frac{2x}{3} + \frac{y}{4} = -\frac{13}{210} \\ \frac{4x}{5} - \frac{3y}{8} = -\frac{187}{700} \end{cases}$

B. Complete the table below.

Linear Equation in Two Variables	Relationship of the Ratio of the Constants/ Coefficients	Graph (Intersecting Lines, Parallel Lines or Coincident Lines)	Number of Solutions	Type of Linear System	Type of Equations in a Linear System
1. $\begin{cases} x + y = 15 \\ x - y = 29 \end{cases}$					
2. $\begin{cases} 3x - y = 4 \\ 6x - 2y = 8 \end{cases}$					
3. $\begin{cases} 6x + 4y = 8 \\ 120x + 80y = 40 \end{cases}$					
4. $\begin{cases} 0.04x - 0.05y = 0.22 \\ 0.2x - 0.6y = 0.4 \end{cases}$					
5. $\begin{cases} \frac{2x}{5} + \frac{2y}{3} = \frac{62}{15} \\ \frac{3x}{20} + \frac{y}{4} = \frac{57}{5} \end{cases}$					

$$1 \neq -1$$

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

$$\frac{1}{20} = \frac{1}{20} \neq \frac{1}{5}$$

$$\frac{1}{5} \neq \frac{1}{12}$$

$$\frac{8}{3} = \frac{8}{3} \neq \frac{62}{171}$$

C. Solve the system of linear equations in two variables using any method.

1. $\begin{cases} x + y = 13 \\ x - y = 3 \end{cases}$

2. $\begin{cases} x + y = -2 \\ x - y = 26 \end{cases}$

3. $\begin{cases} 2x + y = 4 \\ x - 2y = 1 \end{cases}$

4. $\begin{cases} 4x - 2y = -15 \\ 16x - 8y = -100 \end{cases}$

5. $\begin{cases} 16x - 20y = 32 \\ 24x - 30y = 48 \end{cases}$

6. $\begin{cases} 10x - y = -145 \\ 13x + 3y = -339 \end{cases}$

7. $\begin{cases} 21x - 5y = -18 \\ 7x - 3y = 8 \end{cases}$

8. $\begin{cases} 9x + 3y = 66 \\ 2x - 3y = 5 \end{cases}$

9. $\begin{cases} 1.7x - 2.5y = 72.5 \\ 3.4x - 4.9y = 143.8 \end{cases}$

10. $\begin{cases} \frac{x}{4} + \frac{y}{3} = \frac{5}{12} \\ \frac{x}{2} + y = 1 \end{cases}$

11. $\begin{cases} x - \frac{y-3}{12} = -\frac{41}{72} \\ \frac{x-4}{5} + y = \frac{31}{60} \end{cases}$

12. $\begin{cases} \frac{x+y}{3} + \frac{y-x}{9} = -10 \\ \frac{x-y}{.27} - \frac{y}{54} = \frac{2}{3} \end{cases}$

$$(8, 5)$$

$$(12, -14)$$

$$\{\frac{7}{5}, \frac{6}{5}\}$$

No solution

$$\{(x, y) | 4x - 5y = 8\}$$

$$(-18, -35)$$

$$(-\frac{47}{19}, -\frac{129}{19})$$

$$(\frac{71}{11}, \frac{29}{11})$$

$$(25, -12)$$

$$(1, \frac{1}{2})$$

$$(-\frac{3}{4}, \frac{5}{6})$$

$$(-9, -18)$$

D. Solve and illustrate each inequality in the number line on the right.

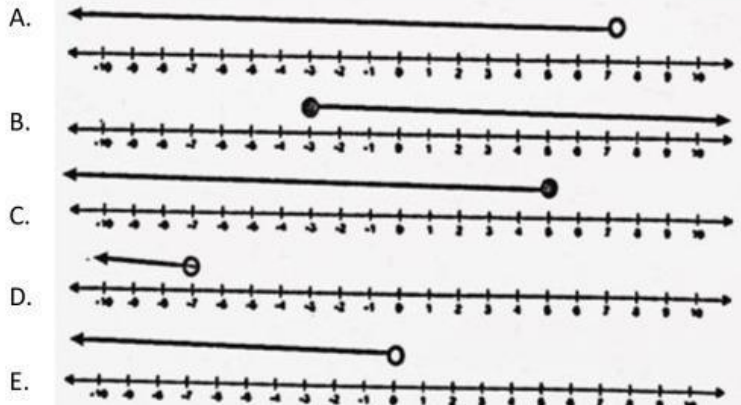
1. $x < 7$

2. $x \geq -3$

3. $3x - 8 \leq 7$

4. $4x - 16 > 8x + 12$

5. $15\left(x + \frac{1}{3}\right) < 5(1 - 2x)$



E. Graph each of the following linear inequalities in a Cartesian Plane.

1. $x > -3$

4. $y < -\frac{3}{4}x + 2$

7. $x - y \geq 8$

2. $y < -6$

5. $y \geq \frac{1}{2}x - 6$

8. $3x - y < 15$

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F. Tell whether the given point is a solution to the system of linear inequalities.

1. $(-7, -3); \begin{cases} y < 0 \\ y > x + 5 \end{cases}$

3. $(-12, -13); \begin{cases} 4x + 5y \leq -7 \\ x - 6y > 8 \end{cases}$

2. $(-15, 12); \begin{cases} y > x - 5 \\ y < x + 10 \end{cases}$

4. $(-10, 35); \begin{cases} y \leq 5 \\ 4x + y \leq 12 \\ 3x + 4y \geq -36 \end{cases}$

G. Solve the system of linear inequalities by graphing.

1. $\begin{cases} y \geq 5 \\ y > -2x - 3 \end{cases}$

2. $\begin{cases} y \leq \frac{x}{4} + 7 \\ y < -\frac{3x}{5} - 5 \end{cases}$

3. $\begin{cases} x - 5y > 10 \\ y > 4x - 12 \end{cases}$

4. $\begin{cases} 7x + y \geq -28 \\ 2x - y \geq -16 \end{cases}$

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Part II. Analyze and solve each problem carefully.

1. What is the value of a that will make $\begin{cases} 5x - 2y = -20 \\ y = \frac{5}{2}x + a \end{cases}$ dependent?
2. The graph of the equations $ax + 2y = -9$ and $4x - by = 40$ intersect at $(1, -6)$. What are the values of a and b , respectively?
3. What is the value of k so that the lines whose equations $3x - y = 7$ and $-14 + 8kx = 2y$ are coincident lines?
4. The sum of two numbers is 22 and their difference is 52. What are the numbers?
5. The sum of the ages of Nikki and his son is 55. Ten years ago, Nikki was six times as old as his son. How old are they now?
6. Urban Ross deposited Php200 000 in two separate accounts – a certain amount at 3.5% annual interest and the remaining amount at 4%. If at the end of the year, the interest gained from both accounts was Php7 625, how much did he invest in each account?
7. One canned juice drink is 5% lemon juice while another is 15% lemon juice. How many liters of each should be mixed to get 15 liters, that is 12% lemon juice?
8. Mr. Dayto drove his car from Maligaya City to Maunlad City at 9 AM. Mr. Bunda rode his motorcycle from Maunlad City to Maligaya City around 1 PM. If the two cities are 800 kilometers apart, the sum of their speeds was 120 kph, and they met at 5 PM, what is the speed of each?
9. Aida can clean the whole house in 12 hours. One day, her friend Florinda helped her, and it only took 4 hours. How long will Florinda take if she could clean the house alone?
10. The units digit of a two – digit number exceeds the tens digit by two. When the digits are interchanged and the number is subtracted from the original number, their difference is -18. What is the original number?

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| A. $a = 10$ | G. Nikki – 40 years old, Nikki's son – 15 years old |
| B. $a = 3, b = 6$ | H. Php75 000 at 3.5% annual interest, Php125 000 at 4% annual interest |
| C. $k = \frac{3}{4}$ | I. 4.5 liters of 5% lemon juice, 10.5 liters of 15% lemon juice |
| D. 37 and -15 | J. Mr. Dayto's car – 80 kph, Mr. Bunda's motorcycle – 40 kph |
| E. 6 hours | |
| F. 79 | |