Date: Friday, September 24th, 2021

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Course: MPM2D - Principles of Mathematics.

Goal: (Overal Review)
1. Chapter 1 - System of Linear Equations.
2. Chapter 2 - Analytic Geometry -

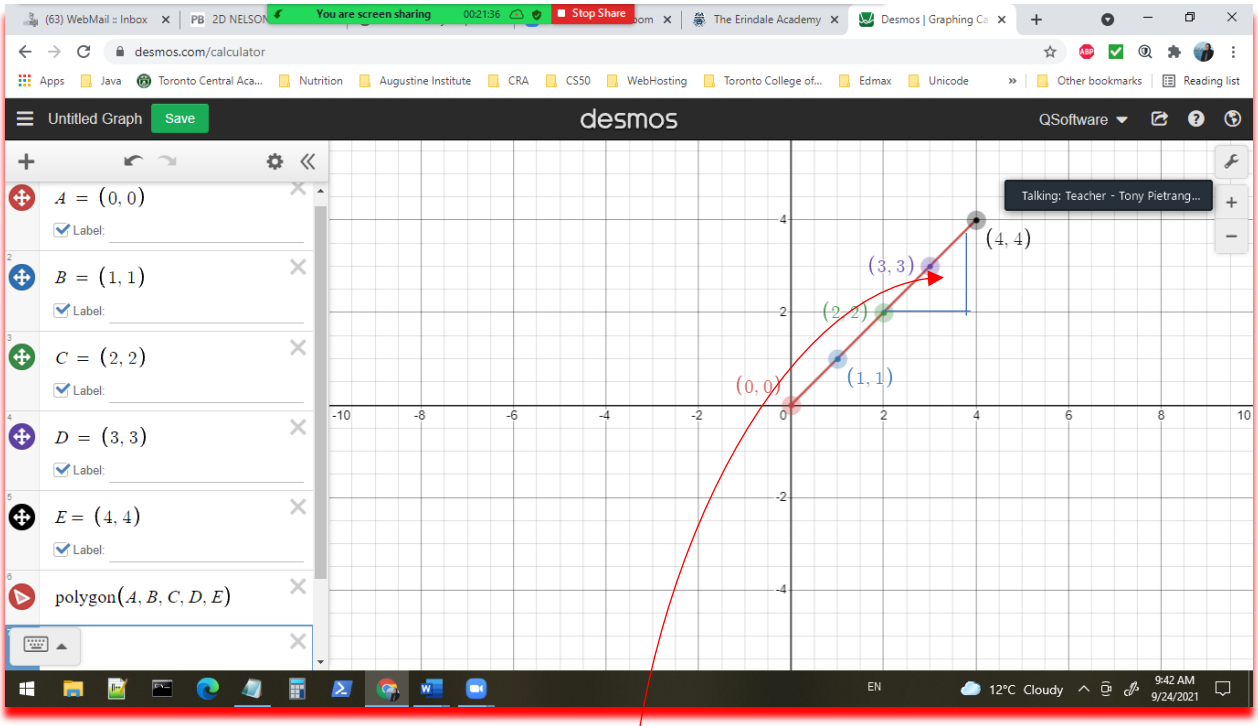
Chapter 1 – System of Linear Equations:

Randomly Ask questions:

What is a linear relation? There is a correlation between two variables:

This means one variable affects another variable. The first variable is called the independent variable. The second variable, which reacts by the change in the first variable is called the dependent variable.

The independent variable (x)	The dependent Variable (y)	Points (x, y)
0	0	(0, 0)
1	1	(1, 1)
2	2	(2, 2)
3	3	(3, 3)
4	4	(4,4)



Any two points, we get a straight line.

3) Equations for a straight line:

1. y = mx + b
2. Ax + By = C, ← Ax + By + C = 0
3. $(y_2 - y_1) = m(x_2 - x_1)$

Δ = delta, which means change in (something, usually in mathematics, change x, and change in y)

m = slope = $\frac{\Delta y}{\Delta x} = \frac{rise}{run} = \frac{y2-y1}{x2-x1}$

point 1(x_1, y_1) = (4, 4)

point 2$((x_2, y_2)$ = (2, 2)

m = slope = $\frac{\Delta y}{\Delta x} = \frac{rise}{run} = \frac{y2-y1}{x2-x1} = \frac{2-4}{2-4} = \frac{-2}{-2} = 1$

1. y = 1x + b

Point 3 = (X_3, y_3) = (3, 3)

2. (3) = 1(3) + b
   3 = 3 + b
   3 – 3 = 3 – 3 + b

$0 = 0 + b$

$b = 0$

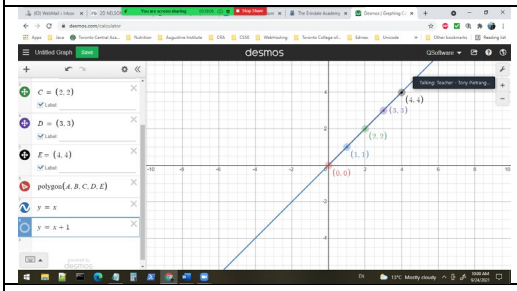
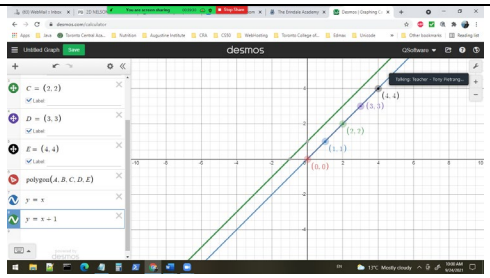
3. $y = 1x + 0$

   $y = x$

Point 3 = $(X_3, y_3) = (3, 3)$

We another line, and say it has a slope of m = 1 as well.

Y = 1x + 1

Equation 1: y=x	Equation 2: y=x + 1
	
Observation: 1. Straight line 2. Line passes through origin (0, 0), b = 0, when x = 0	Observation: 1. Straigtht line 2. Y-intercept (b = 1), when x = 1
These two lines have the same slope m = 1 They have different points of y-intercept These lines are parallel. There is no solution to these linear equations.	

Chapter 1: System of Linear Equations:

In Summary

Key Idea

- Three useful ways to represent a linear relation are
  - a table of values
  - a graph
  - an equation

Need to Know

- A linear relation has the following characteristics:
  - The first differences in a table of values are constant.
  - The graph is a straight line.
  - The equation has a degree of 1.
- The equation of a linear relation can be written in a variety of equivalent forms, such as
  - standard form: $Ax + By + C = 0$
  - slope y-intercept form: $y = mx + b$
- A graph and a table of values display some of the ordered pairs for a relation. You can use the equation of a relation to calculate ordered pairs.

In Summary

Key Idea

- You can solve a problem that involves a linear relation by solving the associated linear equation.

Need to Know

- You can solve a linear equation in one variable by graphing the associated linear relation and using the appropriate coordinate of an ordered pair on the line. For example, to solve $3x - 2 = 89$, graph $y = 3x - 2$ and look for the value of x at the point where $y = 89$ on the line.

Question 1:

$3x - 2 = 89$

$y = 3x - 2$

$89 = 3x - 2$

$89 + 2 = 3x$

91 = 3x

x = 91/3 = $30\frac{1}{3}$

If x is 50, what is the value of y?

y = 3x -2, what is why if x is 50? <= y =

Solution:

A linear system has a solution, when there is a point of intersection.

In Summary

Key Idea

- You can solve a system of linear equations by graphing both equations on the same axes. The ordered pair (x, y) at the point of intersection gives the solution to the system.

Need to Know

- You may not be able to determine an accurate solution to a system of equations using a hand-drawn graph.
- To determine an accurate solution to a system of equations, you can use graphing technology. When you use a graphing calculator, express the equations in slope y-intercept form.

A Liner system has 3 possibilities:

1. No point of intersection (no solution)
2. One point of intersection (one point)
3. Many points of intersection (many solutions, lines are collinear)

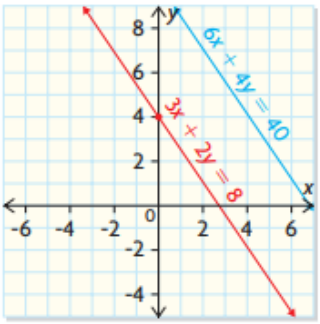
In Summary

Key Idea

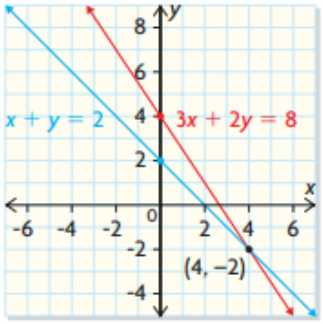
- A linear system can have no solution, one solution, or an infinite number of solutions.

Need to Know

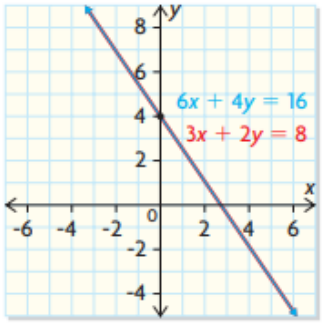
- When a linear system has no solution, the graphs of both lines are parallel and never intersect. For example, the system $3x + 2y = 8$ and $6x + 4y = 40$ does not have a solution. The coefficients in the equations are multiplied by the same amount, but the constants are not.



- When a linear system has one solution, the graphs of the two lines intersect at a single point. For example, the system $3x + 2y = 8$ and $x + y = 2$ has one solution. The coefficients and constants in the equations are not multiplied by the same amount.



- When a linear system has an infinite number of solutions, the graphs of both equations are identical and intersect at every point. For example, the system $3x + 2y = 8$ and $6x + 4y = 16$ has an infinite number of solutions. The coefficients and constants in the equations are multiplied by the same amount.



We solved equations via:

1. Process of substitution (one variable, and substituted into another: L.S. = R.S.
2. Process of elimination (added or subtracted equations to isolate one variable: L.S. = R.S.

Chapter 2: Analytic Geometry:

1. Equation of midpoint
2. Equation of Pythagorean Theorem
3. Properties of Geometric Shapes (Triangle, Quadrilateral) – Look at document: Shapes and Properties.

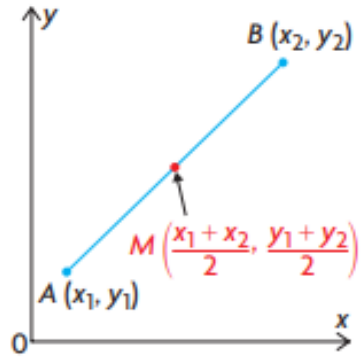
In Summary

Key Idea

- The coordinates of the midpoint of a line segment are the means of the coordinates of the endpoints.

Need to Know

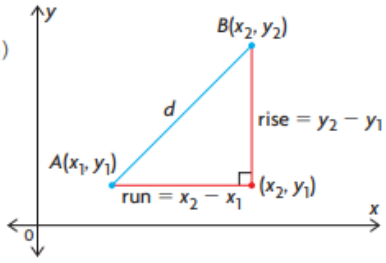
- The formula $(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ can be used to calculate the coordinates of a midpoint.
- The coordinates of a midpoint can be used to determine an equation for a median in a triangle or the perpendicular bisector of a line segment.



In Summary

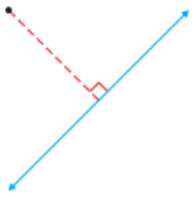
Key Idea

- The distance, d, between the endpoints of a line segment, $A(x_1, y_1)$ and $B(x_2, y_2)$, can be calculated using the distance formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$



Need to Know

- The Pythagorean theorem is used to develop the distance formula, by calculating the straight-line distance between two points.
- The distance between a point and a line is the shortest distance between them. It is measured on a perpendicular line from the point to the line.



Question 2:

Point A(4, 4)

Point B(0, 0)

What is the midpoint:

Midpoint M(x, y) = ((x1 + x2) / 2, (y1 + y2) / 2)) ←

Question 3:
Y = 2x + 3

Give an equation that is parallel to the above line?

Question 4:

Name the type of Triangle, who has two angles or two sides that are the same?

Question 5: (Pythagorean Theorem)
Calculate Length of a line segment:

P(3, 2)
Q(6, 6)

Length PQ = $\sqrt{(x2 - x1)^2 + (y2 - y1)^2}$

Break:
11:02 AM (Toronto Time)
11:02 PM (China Time)
10:02 PM (Vietnam Time)

Return (15 minutes)
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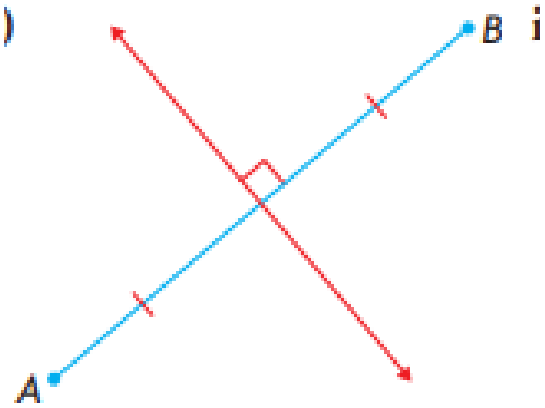
10:18 PM (Vietnam Time)



m1 x m2 = -1

Two lines with slopes m1, m2, if their product is -1, then they are perpendicular to each other.

m2 = $\frac{-1}{m1}$

Question 6:
Slopes of two lines that are perpendicular (90°)

y = x; y = m_1x

Find equation of a line that is (90°) to y = x.

Answer: