MPM 1D9 **Semester 2, 2016 - 2017**

Grade 9 Pre-AP Math
Unit 4 Test – Linear Relations

Mr. Nolfi

Victim: Mr. Solutions Masterfully done Mr. N.!!

KU	APP	TIPS	COM
27 /27	15 /15	10 /10	10 /10

INSTRUCTIONS – Read each question ***carefully!!*** For full marks, *show all work where required*.

Modified True/False (5 KU)

Indicate whether each statement is ***true*** or ***false***. If false, ***change*** ~~the~~ ***underlined part*** to make the statement true.

1. F ✗ The y-intercept of the line $4x+2y-6=0$ is **-6**. ✓ = ½ mark **Change:** 3 ✓

2. T ✓ The line $x=-1$ is **perpendicular to** the line $y=-1$. **Change:** _____

3. F ✓ The x-intercept of the line $y=-5x+10$ is **10**. **Change:** 2 ✗

4. F ✓ If a line has a slope of $3/2$, then any line perpendicular to it must have a slope of **$-3/2$**. **Change:** $-\frac{2}{3}$ ✗

5. F ✓ If the dependent variable of a linear relation *increases* by 7 for every *decrease* of 5 in the independent variable, the slope must be **$7/5$**. **Change:** $-\frac{7}{5}$ ✗

Multiple Choice (4 KU)

Identify the choice that best completes the statement or answers the question.

6. a ✓ For the line $2x+5y+10=0$, which statement is true?

(a) The line goes *downward* to the right and intersects the y-axis *below* the x-axis.
(b) The line goes *downward* to the right and intersects the y-axis *above* the x-axis.
(c) The line goes *upward* to the right and intersects the y-axis *below* the x-axis.
(d) The line goes *upward* to the right and intersects the y-axis *above* the x-axis.

7. a ✓ If the run (Δx) and the rise (Δy) have *the same* signs, what must the slope be?

(a) Positive **(b)** Zero **(c)** Negative **(d)** Undefined

8. d ✓ What is the slope of the line with an x-intercept of 3 and a y-intercept of –10?

(a) $-\frac{3}{10}$ **(b)** $\frac{3}{10}$ **(c)** $-\frac{10}{3}$ **(d)** $\frac{10}{3}$

9. d ✓ ***Why*** is x set to zero to find the y-intercept of a line?

(a) Setting a value to zero is an age-old mathematical trick that always works like a charm!
(b) To find the y-intercept of a line, x must be set to zero.
(c) All points on the x-axis have a y-co-ordinate of zero.
(d) All points on the y-axis have an x-co-ordinate of zero.

K	–0
A	–0
T	–0
C	–0

Problems

10. Determine the slope-*y*-intercept equation of the line passing through the points $A(-4, -9)$ and $B(3, -4)$. (Write both the slope and *y*-intercept in fraction form. ***Do not*** convert to decimal form!) **(5 KU)**

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4-(-9)}{3-(-4)} = \frac{5}{7}$ ✓ ✓

∴ the equation of the line takes the form $y = \frac{5}{7}x + b$

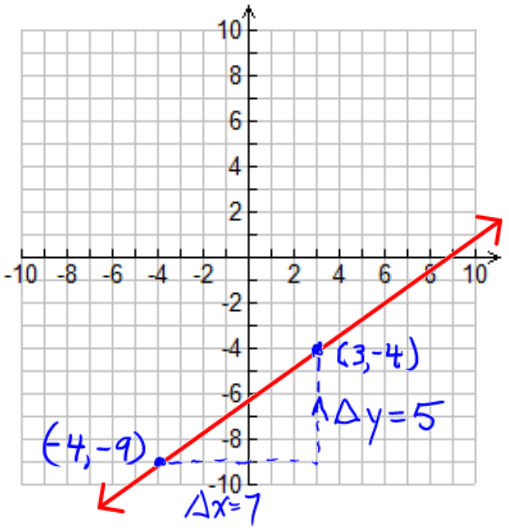
∵ $(3, -4)$ lies on the line,

$-4 = \frac{5}{7}\left(\frac{3}{1}\right) + b$ ✓

$\therefore \frac{-28}{7} = \frac{15}{7} + b$

$\therefore b = \frac{-28}{7} - \frac{15}{7} = \frac{-43}{7}$ ✓

∴ the equation of the line is $\boxed{y = \frac{5}{7}x - \frac{43}{7}}$ ✓



Expect: $m = \frac{5}{7}$, $b = -6$

agree !!

11. The following questions deal with the equation $2x - 3y - 6 = 0$, an equation of a line in ***standard form***.

(a) Write the equation in the form $y = mx + b$ and state the slope and *y*-intercept. (Again, write both the slope and *y*-intercept in fraction form. ***Do not*** convert to decimal form!) **(4 KU)**

$2x - 3y - 6 = 0$ ✓

$\therefore 2x - 3y - 6 - 2x + 6 = 0 - 2x + 6$

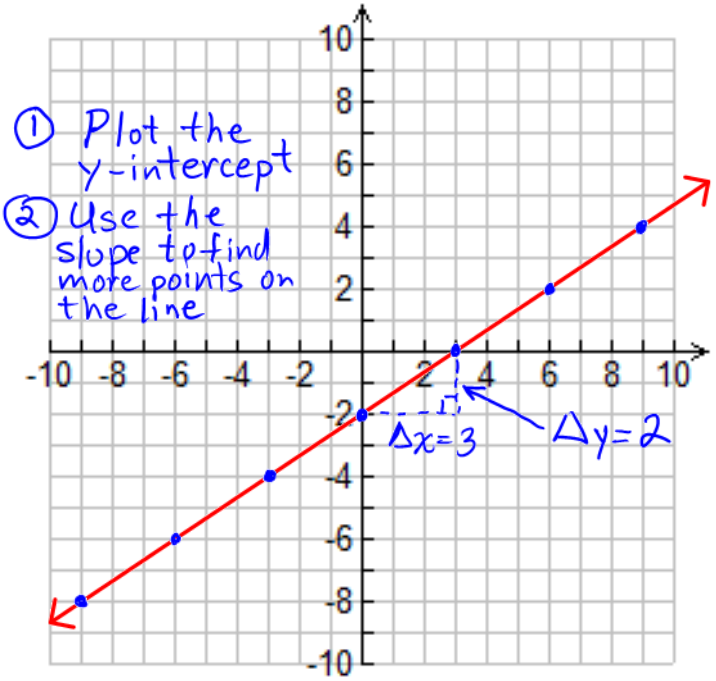
$\therefore -3y = -2x + 6$

$\therefore \frac{-3y}{-3} = \frac{-2x}{-3} + \left(\frac{6}{-3}\right)$ ✓

$\therefore \boxed{y = \frac{2}{3}x - 2}$ ✓ ✓

$\therefore m = \frac{2}{3}$ and $b = -2$

(b) Use the slope-*y*-intercept form of the equation that you found in (a) to sketch a graph of the line. **(3 KU)**



✓

K	−0	A	−0	T	−0	C	−0

(c) Find the intercepts of the line by using the equation given in standard form ($2x-3y-6=0$). Use your answers to verify that the graph in (b) is correct. **(3 KU)**

x-intercept $\rightarrow y=0$

$2x-3(0)-6=0$

$\therefore 2x-6=0$

$\therefore x=3$ ✓

y-intercept $\rightarrow x=0$

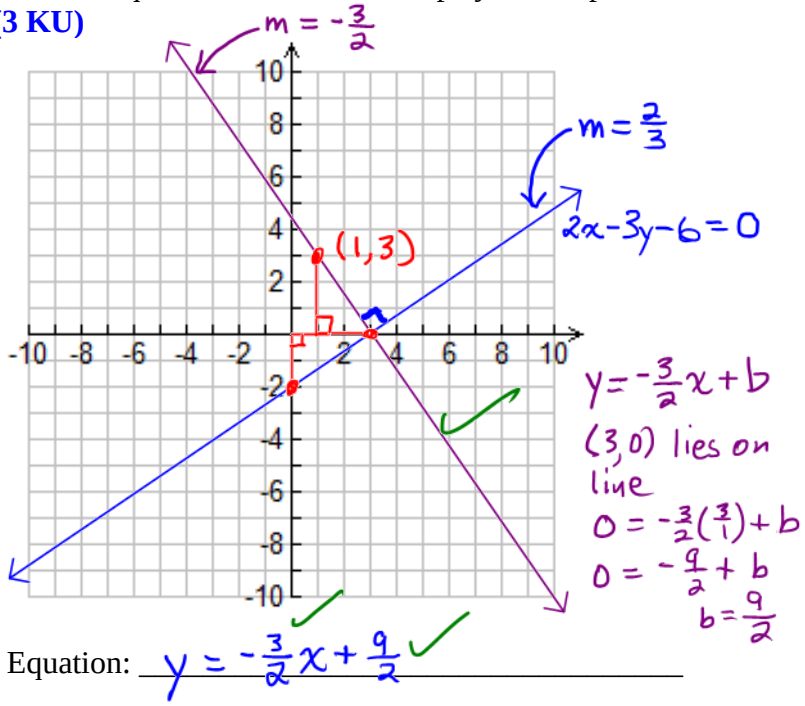
$2(0)-3y-6=0$

$\therefore -3y-6=0$

$\therefore -3y=6$

$\therefore y=-2$ ✓

(d) Sketch a graph of the line that is both perpendicular to and passes through the x-intercept of $2x-3y-6=0$. State the equation of the line in slope-y-intercept form. **(3 KU)**



Equation: $y=-\frac{3}{2}x+\frac{9}{2}$ ✓

12. Music Mine and **iBuyTunes** are two online music providers. Music Mine charges \$7 per month and \$1.50 per song while iBuyTunes charges \$10 per month and \$1 per song. Let C represent the total cost for one month and n represent the total number of songs downloaded. **(15 APP)**

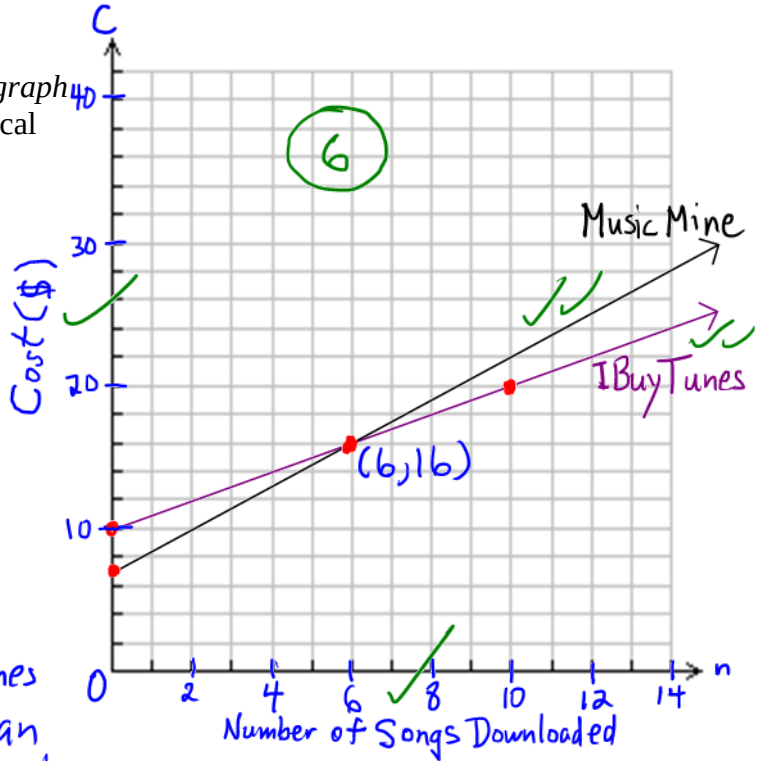
(a) For each company, write an equation relating C to n.

(4)

Music Mine: $C=1.5n+7$ ✓

iBuyTunes: $C=n+10$ ✓ (or $1n+10$)

(b) Using the grid at the right, sketch the graphs of both equations from part (a). *Be sure to label the graph and axes appropriately*. Use a scale of 2 for the vertical axis and a scale of 1 for the horizontal axis.



(6)

(c) State the point of intersection **and** explain what it represents in this situation.

(2)

Point of Intersection: (6,16) ✓

Meaning: Both companies charge ✓ \$16 for downloading 6 songs

(d) How will you decide which company offers a better plan?

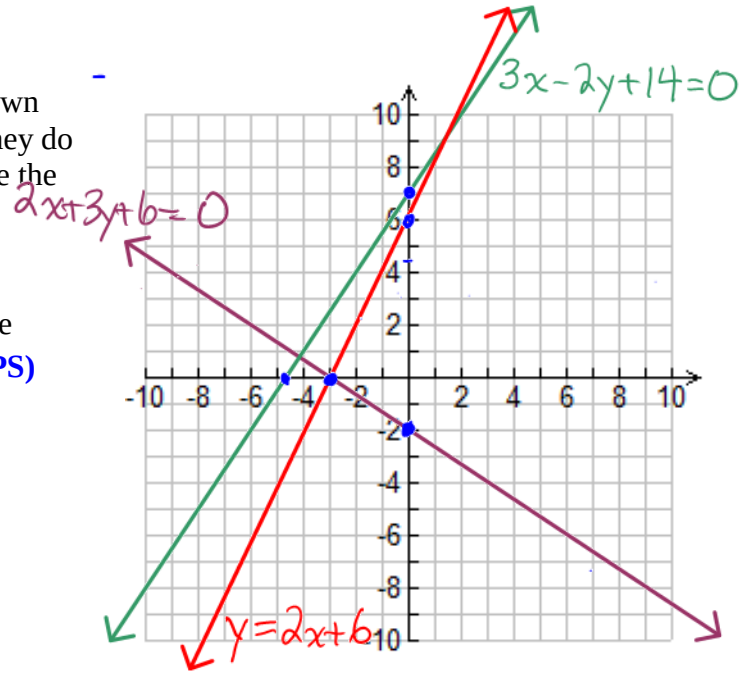
(3)

Music Mine charges less for downloading fewer than 6 songs (graph is lower from 0 to 6). ✓ IBuyTunes charges less for downloading more than 6 songs. ✓ I would choose the plan with the lower cost for the number of songs I wish to download. ✓

K	-0	A	-0	T	-0	C	-0

13. In the equations given below, p and q represent unknown coefficients of equations of lines in standard form. They do not represent variable values! Your task is to calculate the values of these unknown coefficients.

The line $px+3y+6=0$ is perpendicular to the line $3x+qy+14=0$ and has the same x-intercept as the line $y=2x+6$. Determine the values of p and q. **(10 TIPS)**



① x-intercept of $y=2x+6$

On the x-axis, $y=0$

$\therefore\ 0=2x+6$

$\therefore\ -6=2x$

$\therefore\ -3=x$ ✓

② $\therefore$ the x-intercept of $px+3y+6=0$ must be -3, which means that $(-3,0)$ lies on $px+3y+6=0$ ✓

$\therefore\ p(-3)+3(0)+6=0$ ✓

$\therefore\ -3p+6=0$

$\therefore\ p=2$ ✓

$\therefore$ the equation of the first given line is $2x+3y+6=0$

③ Slope of $2x+3y+6=0$

$2x+3y+6-2x-6=0-2x-6$

$\therefore\ 3y=-2x-6$

$\therefore\ \frac{3y}{3}=\frac{-2x}{3}-\frac{6}{3}$

$\therefore\ y=-\frac{2}{3}x-2$ ✓

④ Slope of $3x+qy+14=0$

$3x+qy+14-3x-14=0-3x-14$

$\therefore\ qy=-3x-14$

$\therefore\ \frac{qy}{q}=\frac{-3x}{q}-\frac{14}{q}$

$\therefore\ y=-\frac{3}{q}x-\frac{14}{q}$ ✓

⑤ $\therefore$ the slope of $2x+3y+6=0$ is $-\frac{2}{3}$ ✓

and the slope of $3x+qy+14=0$ is $-\frac{3}{q}$ ✓

Since the lines are perpendicular,

$\frac{-2}{3}=-\left(\frac{q}{-3}\right)$ ✓

$\therefore\ -\frac{2}{3}=\frac{q}{3}$

$\therefore\ \frac{3}{1}\left(-\frac{2}{3}\right)=\frac{3}{1}\left(\frac{q}{3}\right)$

$\therefore\ -2=q$ ✓

$\therefore\ p=2$ and $q=-2$

K	−0	A	−0	T	−0	C	−0