MPM 1D9 | **Grade 9 Pre-AP Math** | **Semester 1, 2014 - 2015**

Unit 4 Test – Linear Relations

TIPS questions marked holistically

Ms. Kugavaratharajah, Mr. Nolfi

Victim: Mr. Solutions

Masterfully done Mr. K.!!

KU	APP	TIPS	COM
21 /21	14 /14	13 /13	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)**

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

$\therefore$ the equation of the line takes the form

$y = \frac{5}{7}x + b$

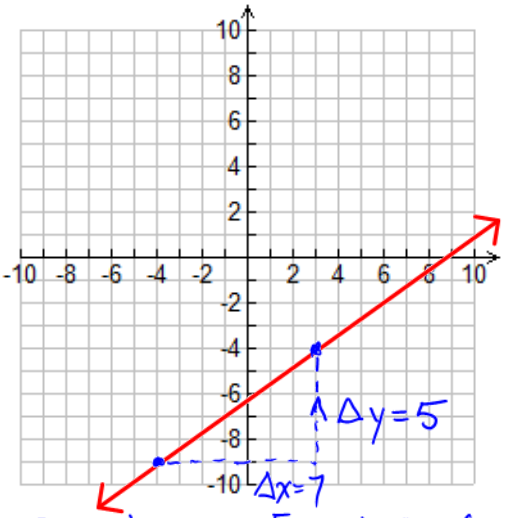
$\because$ $(3, -4)$ lies on the line,

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

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

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

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



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)**

$2x - 3y - 6 = 0$ ✓

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

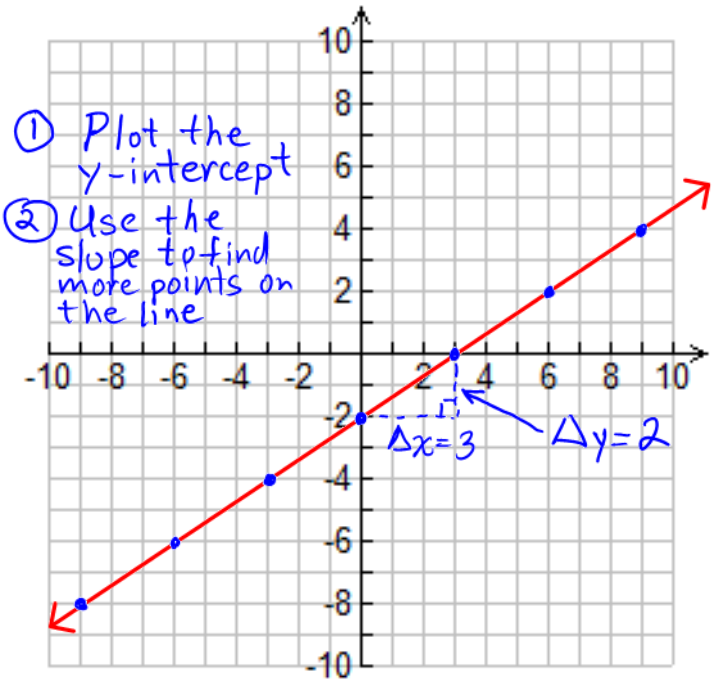
$\therefore -3y = -2x + 6$

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

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

$\therefore m =$ $\frac{2}{3}$ ✓ 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

12. Hafsa has a large collection of 5¢ and 10¢ stamps that she would like to use to send a parcel to a friend. Answer the questions found below given that it costs exactly $5.00 (500¢) to mail the parcel.

(a) If Hafsa uses only 5¢ stamps, how many would she need to mail the parcel? How many would she need if she uses only 10¢ stamps? **(2 APP)**

5¢ stamps $= \frac{5}{0.05} = 100$ ✓

10¢ stamps $= \frac{5}{0.10} = 50$ ✓

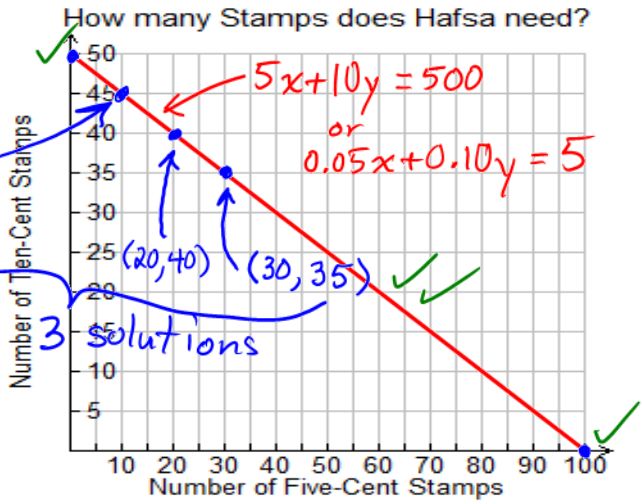
(b) Let x represent the number of 5¢ stamps and y represent the number of 10¢ stamps. Keeping in mind that cost of mailing the parcel is $5.00 (500¢), write an equation, in standard form, that relates x and y. **(3 APP)**

Cost of x 5¢ stamps $= 5x$ cents or $0.05x$ dollars

Cost of y 10¢ stamps $= 10y$ cents or $0.10y$ dollars

Equation: $5x+10y=500$ or $0.05x+0.10y=5$ ✓ ✓ ✓

(c) Sketch a graph of the equation that you wrote in part (b). **(4 APP)**



(d) What do the intercepts of the above graph represent? **(2 APP)**

x-intercept: # 5¢ stamps needed if only 5¢ stamps are used ✓

y-intercept: # 10¢ stamps needed if only 10¢ stamps are used ✓

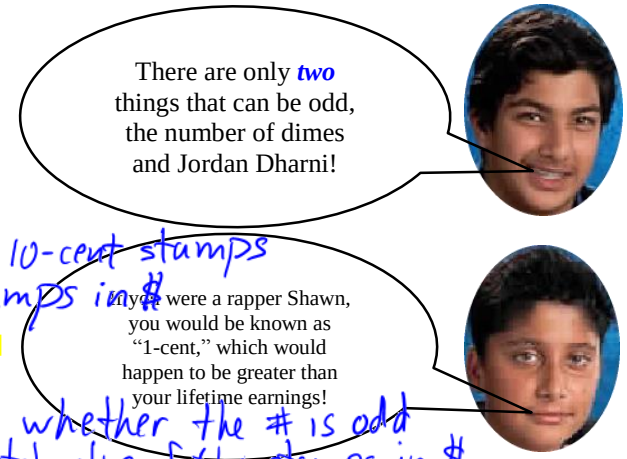
(e) Use the above graph to find ***three solutions*** to Hafsa's problem. In addition to stating each solution, verify that it is correct by calculating the total cost. **(3 APP)**

Solution 1: # 5¢ stamps 10 #10¢ stamps 45 Check: $10(0.05)+45(0.10)=5$ ✓

Solution 2: # 5¢ stamps 20 #10¢ stamps 40 Check: $20(0.05)+40(0.10)=5$ ✓

Solution 3: # 5¢ stamps 30 #10¢ stamps 35 Check: $30(0.05)+35(0.10)=5$ ✓

(f) Jordan and Shawn exchange harsh words about the nature of the solutions to Hafsa's problem. Jordan claims that it is possible for the number of 5¢ stamps to be odd but Shawn emphatically disagrees. He states that the number of 5¢ stamps must be even. Who is correct? Explain. **(3 TIPS)**



Shawn is correct. Whether the # of 10-cent stamps is even or odd, the total value of the stamps in # must have a zero in the hundredths place.
e.g. $2(0.10)=0.20$, $3(0.10)=0.30$

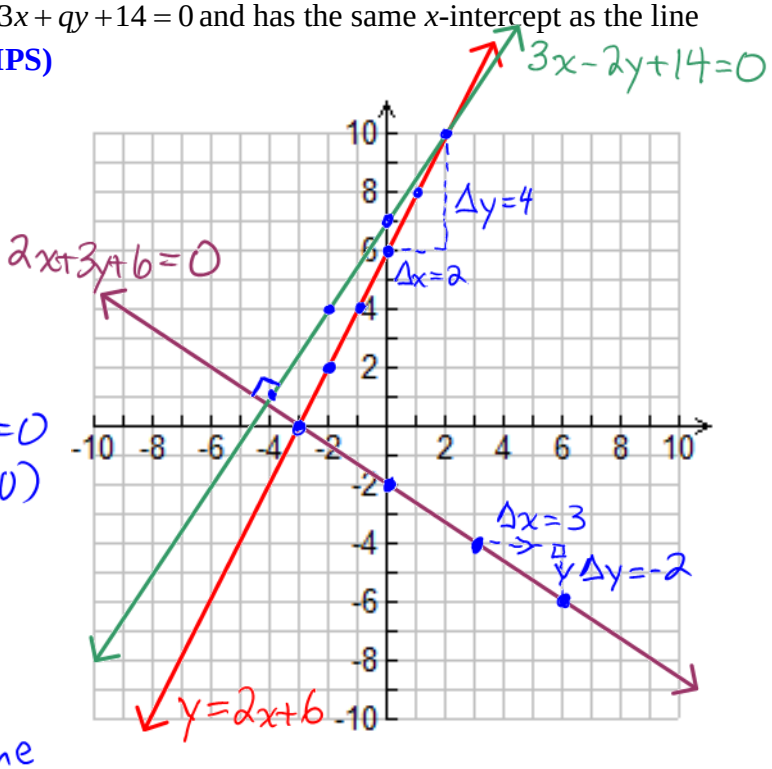
However, for 5¢ stamps, it does matter whether the # is odd or even. For an odd # of 5¢ stamps, the total value of the stamps in # must have a "5" in the hundredths place.
e.g. $2(0.05)=0.10$ BUT $3(0.05)=0.15$

Therefore, if an odd # of 5¢ stamps is used, the total value of the stamps in # must have a "5" in the hundredths place, regardless of the # of 10¢ stamps.

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