

Algebra 201-007-50 03

Test 1

September 26, 2008

Name: SOLUTIONS

Student Number:

1. (8 marks). Solve for x in the following equations:

a) $5 - 3(x + 2) + 6(x + 1) = -x - 23$

$$5 - 3x - 6 + 6x + 6 = -x - 23$$

$$3x + 5 = -x - 23$$

$$3x + x = -23 - 5$$

$$4x = -28$$

$$x = \frac{-28}{4}$$

$$x = -7$$

b) $\frac{1}{3}(x + 5) = 6x - 1$

$$3 \cdot \frac{1}{3}(x + 5) = 3(6x - 1)$$

$$x + 5 = 18x - 3$$

$$5 + 3 = 18x - x$$

$$8 = 17x$$

$$\frac{8}{17} = x$$

2. (10 marks). Solve the following linear inequalities. Give the solution graph and solution set (indicate which is which for marks).

a) $3(x+1) > 7x - (2x+4) + 2$

$$3x+3 > 7x - 2x - 4 + 2$$

$$3x+3 > 5x - 2$$

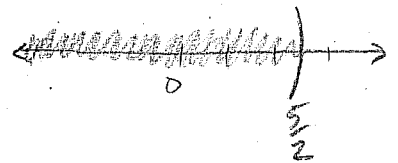
$$3x - 5x > -2 - 3$$

$$-2x > -5$$

$$\frac{-2x}{-2} < \frac{-5}{-2}$$

$$x < \frac{5}{2}$$

SOLUTION GRAPH:



SOLUTION SET:

$$(-\infty, \frac{5}{2})$$

b) $18 > 4x - 6 \geq 14$

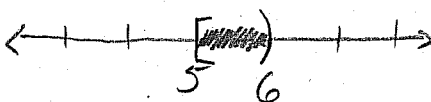
$$18+6 > 4x \geq 14+6$$

$$24 > 4x \geq 20$$

$$\frac{24}{4} > \frac{4x}{4} \geq \frac{20}{4}$$

$$6 > x \geq 5$$

SOLUTION GRAPH:



SOLUTION SET:

$$[5, 6)$$

3. (5 marks). A woman has \$175 in five and ten dollar bills. How many of each does she have if she has twice as many ten dollar bills than five dollar bills?

LET x BE THE NUMBER OF 5 DOLLAR BILLS
THEN $2x$ IS THE NUMBER OF 10 DOLLAR BILLS

$$5x + 10(2x) = 175$$

$$5x + 20x = 175$$

$$25x = 175$$

$$x = \frac{175}{25}$$

$$x = 7$$

∴ SHE HAS 7 FIVES AND 14 TENS.

4. (3 marks). Solve for B in the following formula:

$$P = q(1 - B) + 5$$

$$P = q - qB + 5$$

$$qB = P + q + 5$$

$$B = \frac{P + q + 5}{q}$$

5. (6 marks). Find the x -intercept and y -intercept of the linear equation $3x + 7y = -21$ (indicate which is which for marks). Use the intercepts to graph this equation.

$$x\text{-int! } y=0$$

$$3x + 7(0) = -21$$

$$3x = -21$$

$$x = \frac{-21}{3}$$

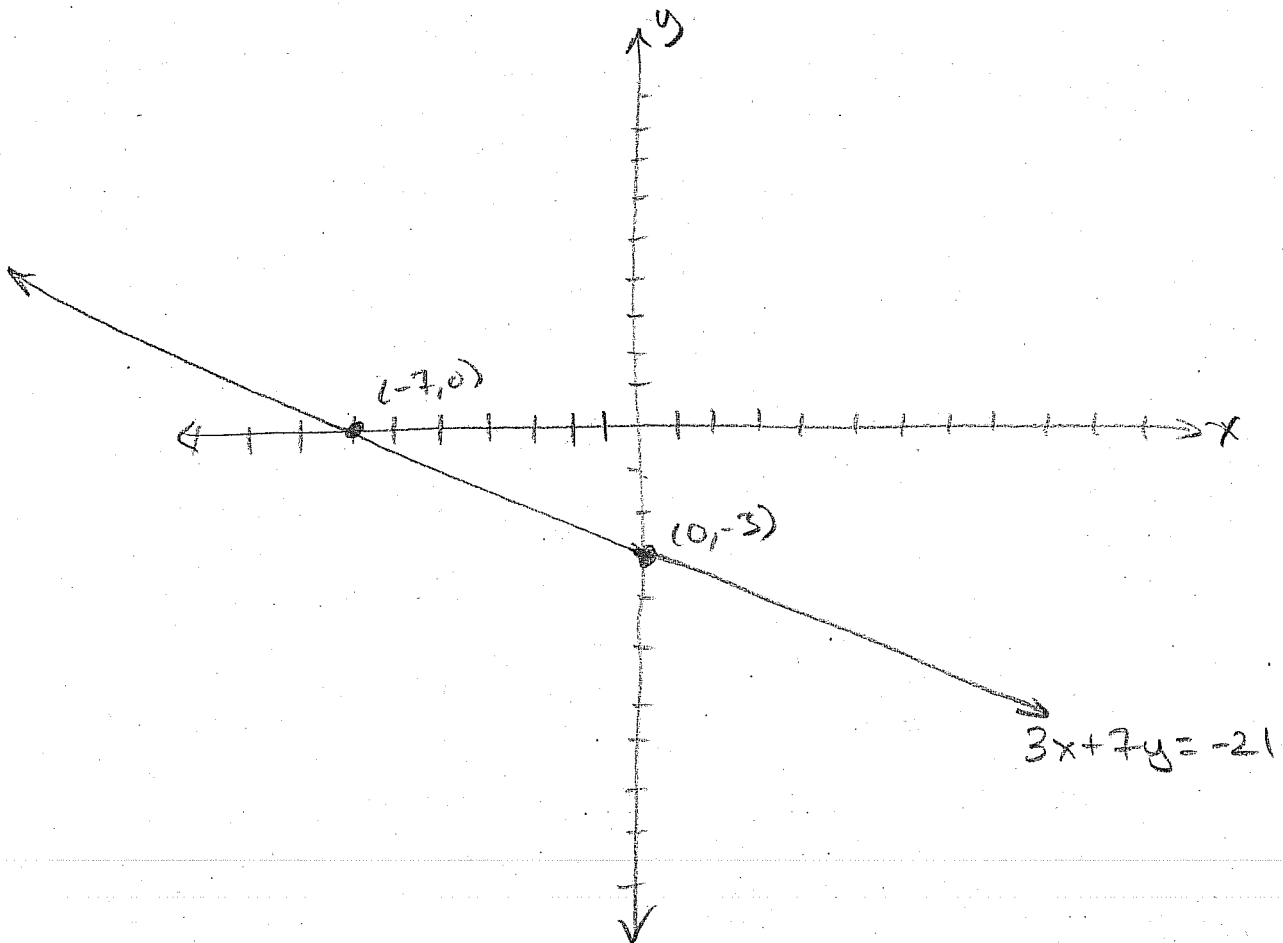
$$x = -7$$

$$y\text{-int! } x=0$$

$$3(0) + 7y = -21$$

$$7y = \frac{-21}{7}$$

$$y = -3$$



6. (6 marks). Find the equation of the line through the point $(15, -1)$ perpendicular to the line $5x - 20y = 13$

SLOPE! $5x - 20y = 13$

$$-20y = -5x + 13$$

$$y = \frac{-5}{-20}x + \frac{13}{-20}$$

$$y = \frac{1}{4}x - \frac{13}{20}$$

$$\therefore m_1 = \frac{1}{4}$$

PERPENDICULAR SLOPE!

$$m_1 \cdot m_2 = -1$$

$$\frac{1}{4}m_2 = -1$$

$$m_2 = -4$$

$$y = mx + b$$

$$-1 = (-4)(15) + b$$

$$-1 = -60 + b$$

$$59 = b$$

$$\therefore y = -4x + 59$$

7. (3 marks). Find the midpoint of the line segment between the points $(-1, 3)$ and $(5, 10)$.

$$(x_m, y_m) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left(\frac{-1 + 5}{2}, \frac{3 + 10}{2} \right)$$

$$= \left(\frac{4}{2}, \frac{13}{2} \right) = \left(2, \frac{13}{2} \right)$$

8. (5 marks). The line $15x + 3y = 17$ is parallel to the line $4y + kx = -6$.
Find k .

$$3y = -15x + 17$$

$$y = -\frac{15}{3}x + \frac{17}{3}$$

$$y = -5x + \frac{17}{3}$$

$$m_1 = -5$$

$$4y = -kx - 6$$

$$y = -\frac{k}{4}x - \frac{6}{4}$$

$$y = -\frac{k}{4}x - \frac{3}{2}$$

$$\therefore m_2 = -\frac{k}{4}$$

$$\therefore m_1 = m_2$$

$$-5 = -\frac{k}{4}$$

$$-20 = -k$$

$$\boxed{20 = k}$$

9. (6 marks). If it costs \$40 to rent 5 hours of computer time and it costs \$54 to rent 7 hours, then:

a) Express the cost, y , in a linear equation with the number of hours rented, x .

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{54 - 40}{7 - 5} = \frac{14}{2} = 7$$

$$y = mx + b$$

$$40 = 7(5) + b$$

$$40 = 35 + b$$

$$5 = b$$

$$\therefore y = 7x + 5$$

b) How many hours can you rent for \$75?

$$y = 75$$

$$75 = 7x + 5$$

$$70 = 7x$$

$$10 = x$$

\therefore YOU CAN RENT 10 HOURS

10. (6 marks.) Graph $2x - 7y < 14$.

$$2x - 7y = 14$$

x-int. $y = 0$
 $2x - 7(0) = 14$

$$2x = 14$$

$$x = 7$$

$\therefore (7, 0)$ is
THE x-int.

y-int. $x = 0$

$$2(0) - 7y = 14$$

$$-7y = 14$$

$$y = -2$$

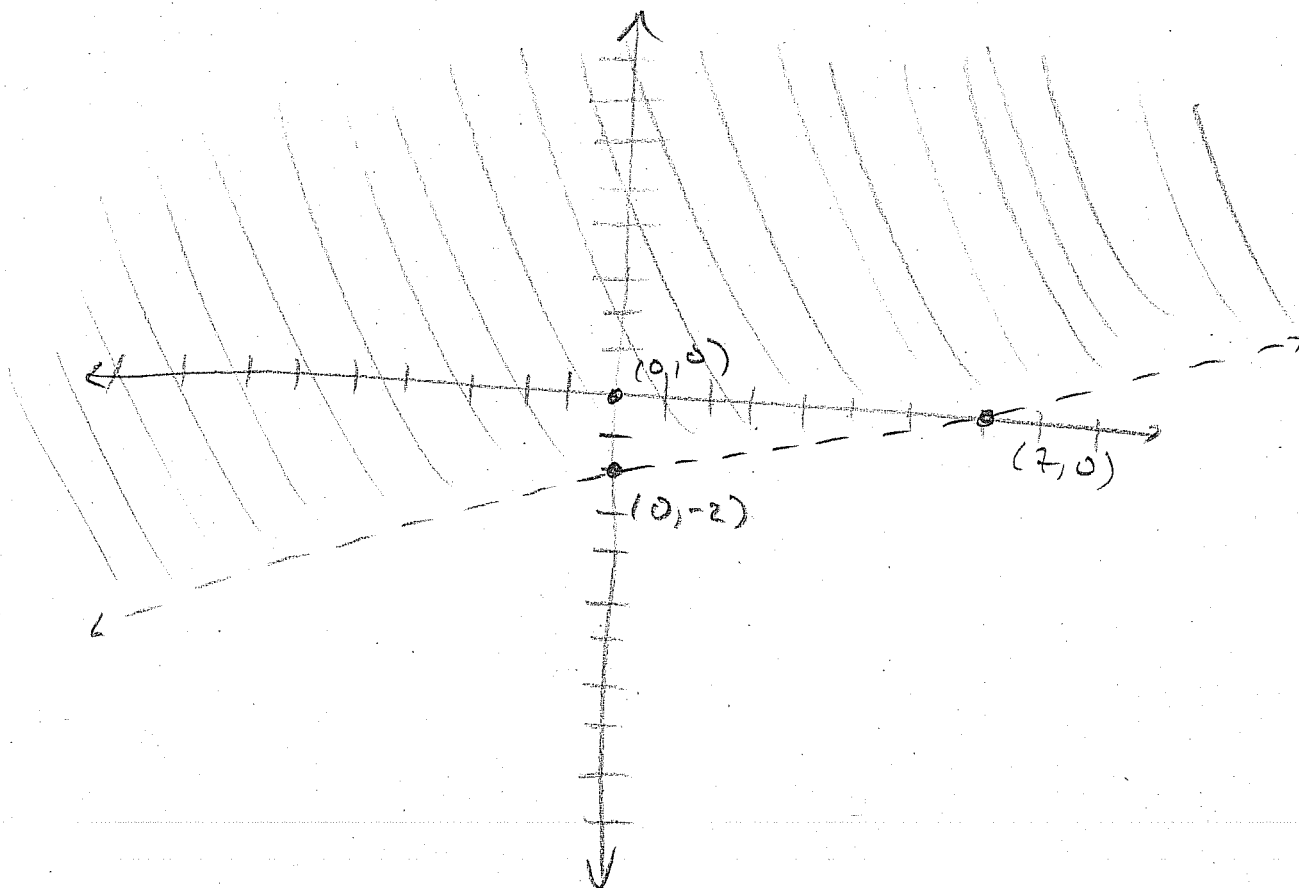
$\therefore (0, -2)$ is
THE y-int.

TEST POINT: $(0, 0)$

$$2(0) - 7(0) < 14$$

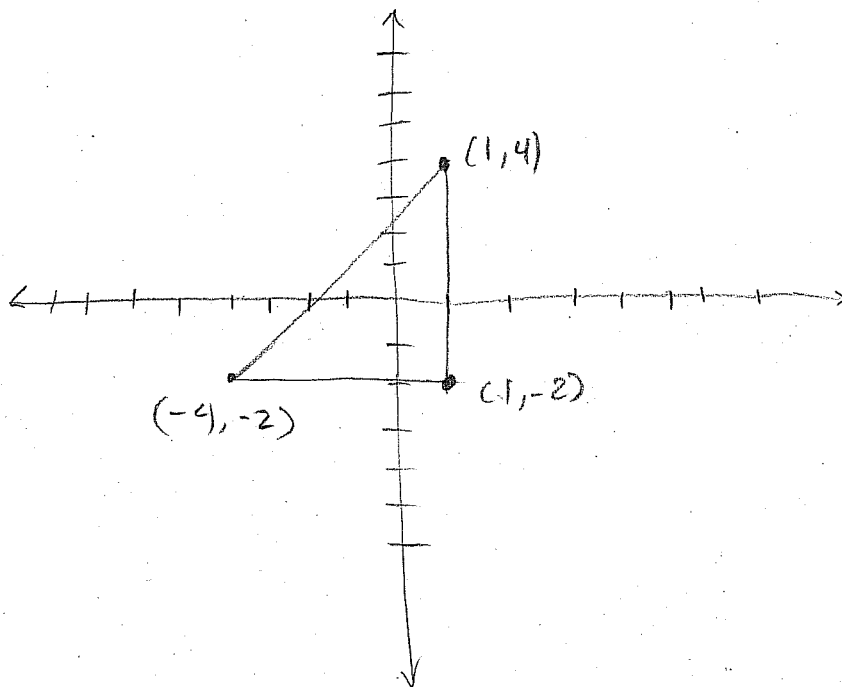
$$0 < 14$$

TRUE



11. (5 marks.) The points $(1, 4)$, $(1, -2)$ and $(-4, -2)$ are three vertices (corners) of a triangle.

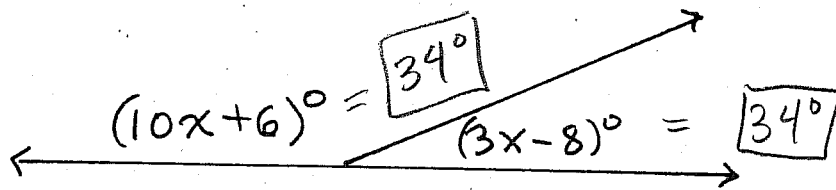
a) Draw the triangle on the rectangular coordinate system.



b) Find the area of the triangle.

$$A = \frac{b \cdot h}{2}$$
$$= \frac{5 \cdot 6}{2} = 15$$

12. (5 marks.) Find each angle:



$$(10x+6) + (3x-8) = 180$$

$$13x - 2 = 180$$

$$13x = 182$$

$$x = \frac{182}{13}$$

$$13$$

$$x = 14$$

$$10(14) + 6 = 146$$

$$3(14) - 8 = 34$$

13. (6 marks.) Solve the following system:

$$\textcircled{1} \quad 4x - 2y = -12$$

$$\textcircled{2} \quad 5x + 7y = 23$$

$\textcircled{1} \times 5 :$

$$20x - 10y = -60$$

$\textcircled{2} \times 4 :$

$$-(20x + 28y = 92)$$

$$\hline -38y = -152$$

$$\boxed{y = 4}$$

$$4x - 2(4) = -12$$

$$4x - 8 = -12$$

$$4x = -12 + 8$$

$$4x = -4$$

$$\boxed{x = -1}$$

14. (7 marks.) A garden is made up of roses and tulips. The number of tulips is 24 more than 4 times the number of roses. How many tulips and roses are there if there are 200 flowers in total?

LET x BE THE NUMBER OF ROSES
LET y BE THE NUMBER OF TULIPS

$$x + y = 200$$

$$y = 3x + 24$$

$$x + (3x + 24) = 200$$

$$4x = 200 - 24$$

$$4x = 176$$

$$x = 44$$

$$44 + y = 200$$

$$y = 200 - 44$$

$$y = 156$$

∴ THERE ARE 44 ROSES AND 156 TULIPS.