Jakarta International School

8^{th} Grade – AG1

Practice Test - Blue

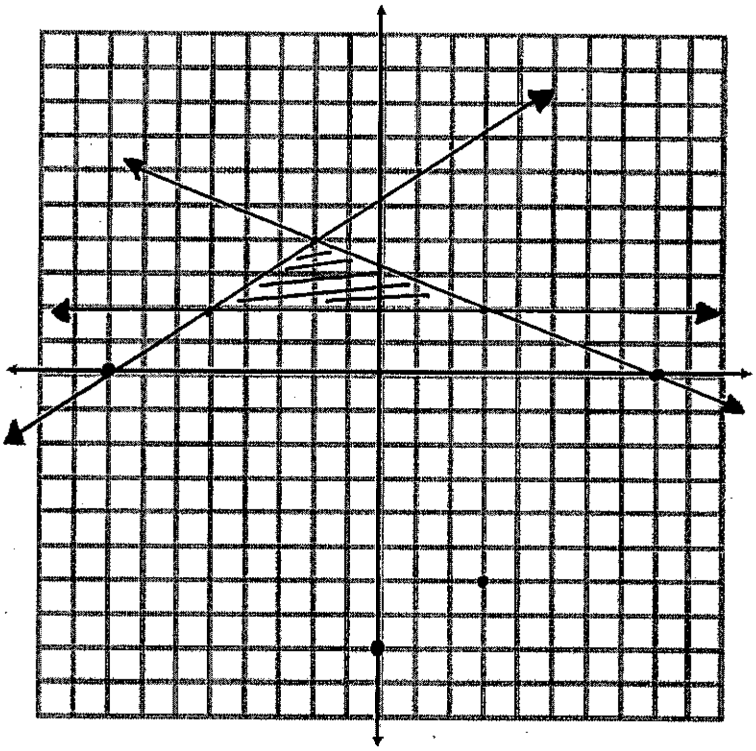
Linear Systems

Name: SOLUTIONS

Date:

Score: $\frac{\quad}{28}$

Goal 5: Solve and apply linear systems



1. Graph each system of equations on the same set of axes. Find the area of the triangle whose vertices are the points of intersection. (5 pts)

$3y-2x=16$ A. $y=\frac{2}{3}x+\frac{16}{3}$

$2y=4$ B. $y=2$

$5y+2x=16$ C. $y=\frac{-2}{5}x+\frac{16}{5}$

Point-Slope Form

A. $y-0=\frac{2}{3}(x--8)$: Point $(-8,0)$ Slope $=\frac{2}{3}$

C. $y-0=\frac{-2}{5}(x-8)$: Point $(8,0)$ Slope $=\frac{-2}{5}$

Triangle Area $=\frac{1}{2}$ Base $\cdot$ Height $=\frac{1}{2}\cdot 8\cdot 2=$ $\boxed{\text{8 square units}}$

2. Prince Neva Ben Rich takes out two loans. He borrows \$800 more from a credit union that charges 12% interest than from a bank that charges 15% interest. If his interest payments total \$420 annually, how much does he borrow at each rate? (5 pts)

Let $x=$ the amount he borrows from the credit union

$y=$ the amount he borrows from the bank

\$2000 at 12% \$1200 at 15%

(1) $.12x+.15y=420$

(2) $x-y=800$

Substitution Method

(2) $x=800+y$

substitute into 1.

$.12(800+y)+.15y=420$

$96+.12y+.15y=420$

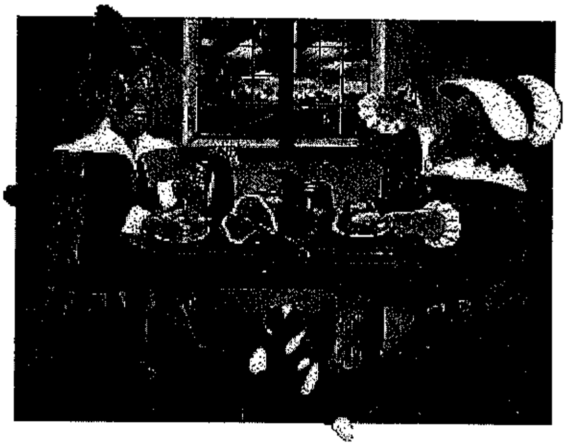
$.27y=324$

$y=1200$

so $x=2000$

3. The Sprats

Jack Sprat and his wife like to dine out at their favorite restaurant, Rhymes, once a month. Their favorite menu items are the ballad salad platter (delivered with a song), Southern fried chicken pick'ens with green beans, and baked steak with potatoes. They always order two of the three items, sharing the choices.



After dinner, the Sprats like to have dessert. Their three favorite desserts are ice cream, apple pie and fresh fruit. The restaurant lists the calories for each dessert, and one night the Sprats made the following observations about their favorite desserts:

- A slice of pie and the fresh fruit has 540 total calories.
- A bowl of ice cream and the fresh fruit together have 16 fewer calories than a slice of pie.
- Two bowls of ice cream and a slice of pie totals 938 calories.

How many calories are found in each of the three desserts? (5 pts)

Let p = pie calories
f = fruit calories
i = ice cream calories

(1) $p + f = 540$
(2) $i + f = p - 16$
(3) $2i + p = 938$

(1) $f = 540 - p$
substitute into (2)
$i + 540 - p = p - 16$
$i = 2p - 556$
Substitute and solve for p in (3)
$2(2p - 556) + p = 938$
$p = 410$

Pie contains 410 calories

Substitute p into (3)
$2i + 410 = 938$
$i = 264$

Ice cream contains 264 calories

Substitute p into (1)
$410 + f = 540$
$f = 130$

Fresh fruit contains 130 calories

Check: ★ Pie + Fruit = 540 calories
$410 + 130 = 540$ ✓

★ Ice cream + Fruit = Pie − 16 calories
$264 + 130 = 410 - 16$ ✓

★ 2 Ice Creams + Pie = 938
$2 \cdot 264 + 410 = 938$ ✓

4. **Study Time:** You need at least 3 total hours to do your English and history homework at a minimal level of quality. It is 12:00 p.m. on Sunday and your friend wants you to go to the movies at 7:00 p.m. Write a system of linear inequalities that shows the number of hours you could spend doing homework for each subject if you go to the movies. Graph your result. (5 pts)

let x = English homework hours

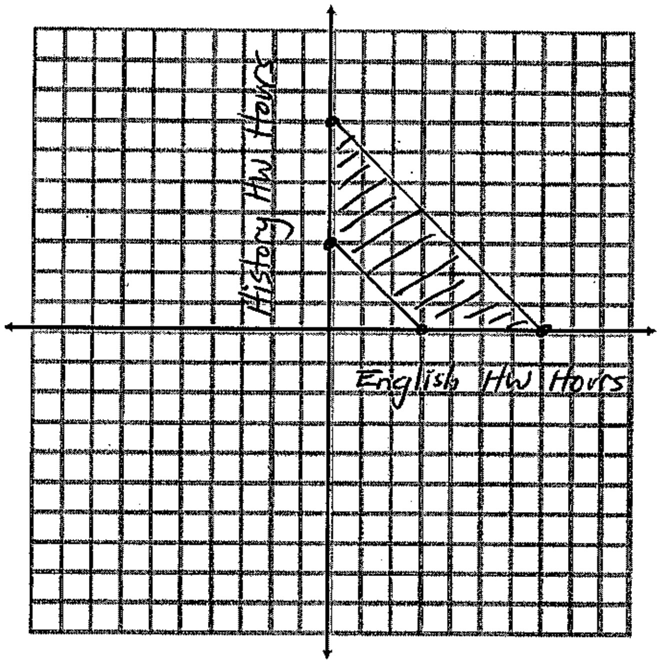
y = History homework hours

$x + y \geq 3$

$x + y \leq 7$

$x \geq 0$

$y \geq 0$



5. Assume a and b are nonzero constants and solve the system: (3 pts)

(1) $ax + by = 5$

(2) $ay - bx = 0$

multiply (2) by $\left(\frac{a}{b}\right)$ then combine with (1)

(2) $\frac{a}{b} \cdot ay - \frac{a}{b} \cdot bx = 0 \cdot \frac{a}{b}$

$\frac{a^2}{b} y - ax = 0$

$-ax + \frac{a^2}{b} y = 0$

(1) $ax + by = 5$

(2) $-ax + \frac{a^2}{b} y = 0$

$\left(b + \frac{a^2}{b}\right) y = 5$

$\left(\frac{b^2 + a^2}{b}\right) y = 5$

$\boxed{y = \frac{5b}{b^2 + a^2}}$

substitute y into (2)

$a\left(\frac{5b}{b^2 + a^2}\right) - bx = 0$

Solve for x:

$\frac{5ab}{b^2 + a^2} = bx$

$\boxed{\frac{5a}{b^2 + a^2} = x}$

check:

(1) $\frac{a \cdot 5a}{b^2 + a^2} + \frac{b \cdot 5b}{b^2 + a^2} = 5$

$\frac{5a^2 + 5b^2}{b^2 + a^2} = 5$

$\frac{5(a^2 + b^2)}{a^2 + b^2} = 5$ ✓

(2) $\frac{a \cdot 5b}{b^2 + a^2} - \frac{b \cdot 5a}{b^2 + a^2} = 0$

$\frac{5ab - 5ab}{b^2 + a^2} = 0$ ✓

6. Bubba Gump has been pretty hungry lately. Shrimp and Mussels are sold by the pound. Last week, Bubba bought \$4 worth of shrimp and \$2 worth of mussels for a total weight of 8 pounds. This week, he bought enough for himself and his girlfriend to share. He bought \$2 worth of shrimp and \$9 worth of mussels for a total weight of 20 pounds. Use a 4 step problem solving process to help Bubba figure out how much he paid per pound for Shrimp and Mussels. (5 pts)

Let x = the price per pound for shrimp

y = the price per pound for mussels

Last Week:

(1) $4\left(\frac{1}{x}\right) + 2\left(\frac{1}{y}\right) = 8$

This week:

(2) $2\left(\frac{1}{x}\right) + 9\left(\frac{1}{y}\right) = 20$

Let $u = \frac{1}{x}$ and $v = \frac{1}{y}$

(1) $4u + 2v = 8$

(2) $2u + 9v = 20$

Combine (1) and (2)

$$\begin{array}{r} 4u + 2v = 8 \\ + \quad -2(2u + 9v = 20) \\ \hline -16v = -32 \end{array}$$

$v = 2$ so $u = 1$

if $v = 2$, then $y = \$.50$ since $v = \frac{1}{y}$

if $u = 1$, then $x = \$1$ since $u = \frac{1}{x}$

So, shrimp cost \$1 per pound and mussels cost \$.50 per pound

Check:

$4\left(\frac{1}{1}\right) + 2\left(\frac{1}{.5}\right) \stackrel{?}{=} 8$

$4 + 4 = 8$ ✓ LAST WEEK

$2\left(\frac{1}{1}\right) + 9\left(\frac{1}{.5}\right) \stackrel{?}{=} 20$

$2 + 18 = 20$ ✓ THIS WEEK