*AAT

Name: Key

Chapter 7: Tasks #1-7 (IC)

Date: _____ Period: _____

Task #1:

Grace has found the following equation in her notebook:

$$x = \frac{-8 \pm \sqrt{8^2 - 4(1)(10)}}{2(1)}$$

$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$

She knows that she was using the quadratic formula to solve an equation and is wondering what the original equation might have looked like. Reconstruct her equation. Then find the solution (roots) of the equation. What are the *x*-intercepts for the graph of the equation?

original equation: $f(x) = x^2 + 8x + 10$

roots: $x = -4 \pm \sqrt{6} \approx (-1.55, -6.45)$

x-intercepts: $(-4-\sqrt{6}, 0)(-4+\sqrt{6}, 0) \approx (-1.55, 0)(-6.45, 0)$

Task #2:

John and Diana are studying quadratic functions. They have encountered the function below, written in three different forms:

$f(x) = x^2 - 2x - 3$

factored form — $f(x) = (x - 3)(x + 1)$

vertex form — $f(x) = (x-1)^2 - 4$ ⇝ $y + 3 = x^2 - 2x \pm 1$ → $y + 4 = (x-1)^2$

$+1$

$y = (x-1)^2 - 4$

Show that the three equations are equivalent. How can you get each form from the other two? What different information is available to John and Diana from each of the equations? What are the zeros, or roots, of the equation? Without graphing and without using a calculator, give the coordinates of the vertex of the parabola and the *x*- and *y*-intercepts.

Zeros: $(3, -1)$

Vertex: $(1, -4)$

x-intercepts $(3, 0), (-1, 0)$

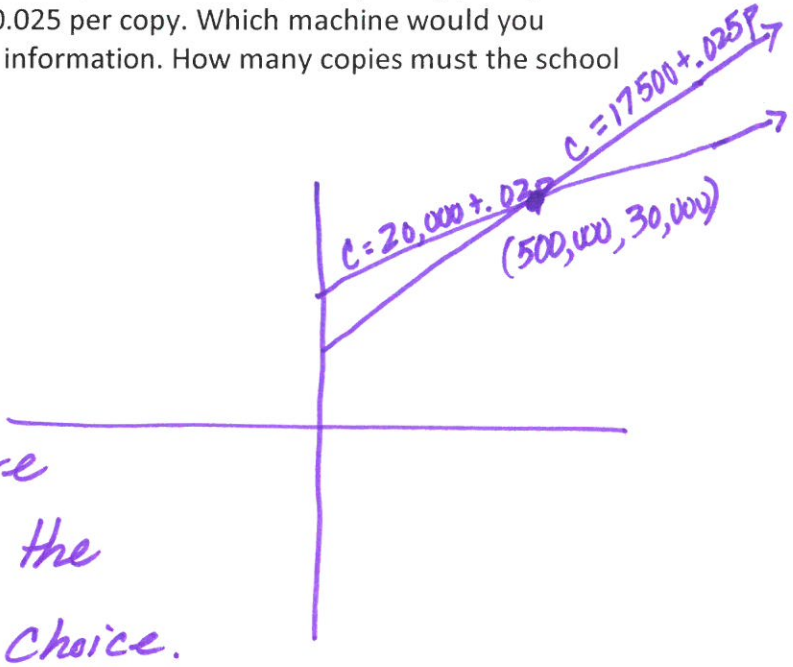
y-intercepts $(0, -3)$

Task #3:

The Pendleton County School District is trying to decide on a new copier. The purchasing committee has been given quotes on two new machines. One sells for $20,000 and costs $0.02 per copy to operate. The other sells for $17,500, but its operating costs are $0.025 per copy. Which machine would you recommend? Justify your choice with clear mathematics information. How many copies must the school make before the higher price is a reasonable choice?

$C = 20{,}000 + .02p$

$C = 17{,}500 + .025p$



The school must make more than 500,000 copies before the higher price is a reasonable choice.

Task #4:

Nathan likes to make up puzzles about integers. Some of his recent puzzles are below. Write symbolic sentences that represent Nathan's puzzles. Then solve each puzzle.

1. Two numbers have a sum of 10. If you add the first number to twice the second number, the result is 8. What are the numbers?

$x + y = 10$

$x + 2y = 8$ $\quad (12, -2)$

2. One number is twice as large as a second number. The sum of the two numbers is 15. What are the numbers?

$x + y = 15$

$x = 2y$ $\quad (10, 5)$

3. The first number minus the second number is 2. Twice the first number minus twice the second number is 4. What are the numbers?

$x - y = 2$

$2x - 2y = 4$ $\quad$ (All Real #'s)

Task #5:

Marika has asked you to help her understand how to solve systems of equations. Solve each system of equations below using a different strategy. Then explain to Marika why you chose that strategy for that system. Which are best solved by substitution? Which might be easily graphed? Which could be solved by elimination?

(Substitution)

1. $y = x - 1$
   $3x - 4y = 8$

$3x - 4(x-1) = 8$

$3x - 4x + 4 = 8$

$-x = 4$

$x = -4$; $y = -4 - 1$

$y = -5$

$(-4, -5)$

(Elimination)

2. $3x + 2y = -10$ ·2
   $2x + 3y = 0$ ·3

$6x + 4y = -20$

$-(6x + 9y = 0)$

$-5y = -20$

$y = 4$

$2x + 3(4) = 0$

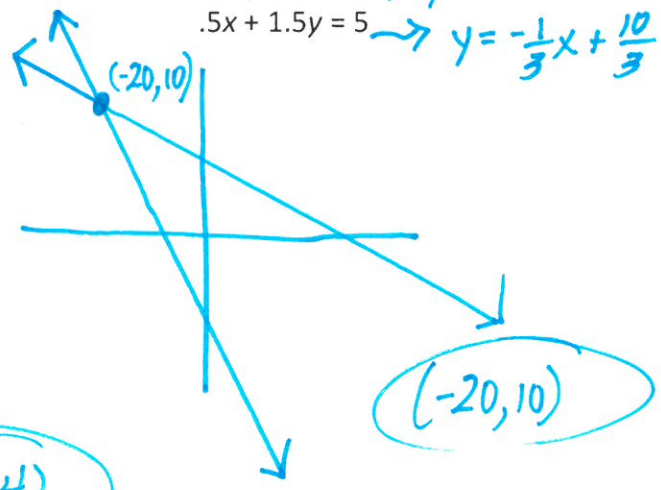
$2x = -12$

$x = -6$

$(-6, 4)$

(graphing)

3. $x + y = -10 \rightarrow y = -x - 10$
   $.5x + 1.5y = 5 \rightarrow y = -\frac{1}{3}x + \frac{10}{3}$



Task #6:

Theresa has been given the following system of linear equations that models a situation that she is investigating. Create the matrix equation that would also model the situation. Then solve for the two variables.

$6b + 4s = 1750$
$b + s = 400$

$\begin{bmatrix} 6 & 4 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} b \\ s \end{bmatrix} = \begin{bmatrix} 1750 \\ 400 \end{bmatrix}$

$b = 75$

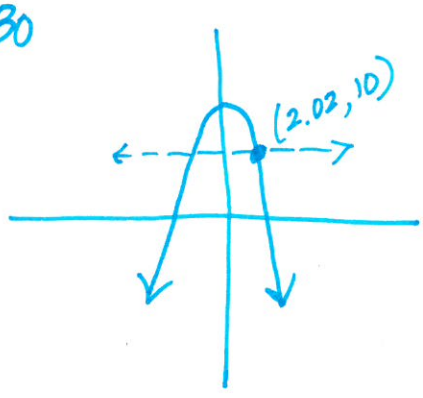
$s = 325$

Task #7:

Mr. Zeno's algebra class is conducting experiments with water balloons from the roof of the Pendleton County High School. Clarissa is using the formula $h = -4.9t^2 + h_1$, where h is the height of a falling object. She knows that t represents time in seconds and h_1 is the starting height of the object. Her group has found that the height of the high school is 30 meters. Graph Clarissa's information. Using your graph, find out when the balloon will be 10 meters from the ground.

$Y_1 = -4.9t^2 + 30$

$Y_2 = 10$



2.02 seconds