College Algebra I Mid-Year Exam Review

Date:_____ **Time:**_____ **Location:**_____

Materials to Bring:

- 2 # 2 pencils
- water
- CALCULATOR (Graphing TI 83/84)

REVIEW OF FOUNDATIONS OF ALGEBRA:

1. Which algebraic expression represents the statement "4 more than the product of 6 and a number"?

F. $4n + 6$ H. $4 - 6n$

G. $6 - 4n$ I. $6n + 4$

2. What is the value of $-9 + (2^3 - 3^2)$?

A. -26 B. -10 C. -8 D. -4

3. Which ordered pair is not a solution of $y = 2x + 1$?

F. $(3, 7)$ G. $(0, 1)$ H. $(-1, 1)$ I. $(-3, -5)$

4. Which expression is equivalent to $-3.2(2x - 2.1)$?

A. $-6.4x + 6.72$ C. $6.4x + 6.72$

B. $-6.4x - 6.72$ D. $-6.4x + 2.1$

5. Toby purchased 5 tickets online for a show. The tickets cost $12 each plus there was a $3.50 service fee for the order. How much money did Toby spend for the tickets?

F. \$15.50 G. \$51.50 H. \$60 I. \$63.50

$y = 12(5) + 3.50$

6. What is the value of $3^3 - (4^2 - 2^3)$?

A. -1 B. 7 C. 19 D. 35

$27 - (16 - 8)$

$27 - 8$

$8x + 4 + 6x$

7 Which expression is equivalent to $4(2x + 1) - (-6x)$?

F. $14x + 4$ G. $8x - 2$ H. $2x + 4$ I. $-14x - 4$

8 Cherie is laying square tiles on her square kitchen floor. She buys the tiles for \$2 per square foot tile. If her total estimated cost for the tiles is \$288, what is the length of her floor in feet?

$2x^2 = 288$

$x = \sqrt{144}$

12ft x 12ft

9 Simplify $8^2 \div 4 + 3(6 - 3) + 2^3$.

$64 \div 4 + 3(3) + 8$

$16 + 9 + 8 = 33$

10 What is the value of $3 + |x - 2|$ for $x = -3$?

$3 + |-3 - 2|$

$3 + 5 = 8$

11 Evaluate $x(y - z)^2$ for $x = -1$, $y = 5$, and $z = -3$.

$-1(5 - -3)^2$

$-1(8)^2 = -64$

12 Write an equation for the sentence: the difference of $6n$ and -5 is -13.

$6n - -5 = -13$

$6n + 5 = -13$

13 What is the solution of the equation $9x + 12 = 39$?

$-12 \quad -12$

$9x = 27$

$x = 3$

14 Jack is taking his family to the fair. He plans to take \$5 for each admission ticket plus \$35 for food. Write an equation that models the amount of money Jack takes to the fair.

$y = 5x + 35$

x = # of ppl

y = total amt of $

15 What is the value of the expression $(-7)(3) - (5)(-3)$?

$-21 + 15 = -6$

REVIEW OF EQUATIONS:

Convert the given amount to the given unit.

16. 8 ft; in.

$8(12) = 96$ in

17. 2.5 miles; ft

$2.5(5280)$

13,200 ft

18. 260 sec; min

$\frac{260}{60} = 4.3$ min

Solve each proportion. Use the Multiplication Property of Equality or the Cross Product Property. Explain your choice.

19. $\frac{1}{a} = \frac{6}{18}$

$6a = 18$

$a = 3$

20. $\frac{x+1}{15} = \frac{-4}{5}$

$-4(15) = 5(x+1)$

$-60 = 5x + 5$

$-65 = 5x$

$-13 = x$

21. $\frac{2}{q} = \frac{8}{q+12}$

$2(q+12) = 8q$

$2q + 24 = 8q$

$24 = 6q$

$4 = q$

Solve each proportion.

22. $\frac{2.5}{10} = \frac{m}{4}$

$10m = 10$

$m = 1$

23. $\frac{14}{49} = \frac{4}{x}$

$14x = 196$

$x = 14$

24. $\frac{k}{10} = \frac{9}{6}$

$6k = 90$

$k = 15$

25. What percent of 50 is 30?

$\frac{30}{50} = \frac{x}{100}$

$x = 60\%$

26. What is 45% of 120?

$\frac{x}{120} = \frac{45}{100}$

$x = 54$

Tell whether each percent change is an increase or decrease. Then find the percent change.

27. Original amount: \$46
New amount: \$52

$\frac{52 - 46}{46} = .13$

13% increase

28. Original amount: \$25 New amount: \$35

$\frac{35 - 25}{25} = 40\%$ increase

29. There are 21 females in the Algebra 1 class. If 75% of the class is female, how many students are there in the class?

21 is 75% of what?

$\frac{21}{x} = \frac{75}{100}$

28

30. In 2005, a car sold new for $12,500. In 2008, value of the car was $8750. Find the percent decrease.

$\frac{8750 - 12500}{12500}$ = 30% decrease

Solve each equation. Check your answer.

31. $9g + 12 = 84$

$g = 8$

32. $\frac{1}{4}(z+2) = \frac{3}{4}$

$4\left(\frac{1}{4}z + \frac{1}{2} = \frac{3}{4}\right)$

$z + 2 = 3$

$z = 1$

33. $n + 11.2 = 25.1$

$n = 13.9$

34. $8x - 12 = 4x + 24$

$4x = 36$

$x = 9$

35. $\frac{1}{5}(x-8) = x - 16$

$5\left(\frac{1}{5}(x-8) = x-16\right)$

$x - 8 = 5x - 80$

$-4x = -72$

$x = 18$

36. $\frac{x-4}{6} = \frac{5}{4}$

$4(x-4) = 30$

$4x - 16 = 30$

$4x = 46$

$x = 11.5$

Solve each equation. If the equation is an identity, write *identity*. If it has no real-number solution, write *no solution*.

37. $\frac{1}{3}(6x-12) = 4\left(\frac{1}{2}x+1\right) - 2$

$2x - 4 = 2x + 4 - 2$

$-4 \neq 2$

$\emptyset$

38. $\frac{p-6}{2} = p - 4$

$p - 6 = 2p - 8$

$p = 2$

39. $2.6(t+2) = 2(1.3t+2) + 1.2$

$2.6t + 5.2 = 2.6t + 4 + 1.2$

$2.6t + 5.2 = 2.6t + 5.2$

Identity

40. $2x + 4 = 5(x+1) - 3(x+2)$

$2x + 4 = 5x + 5 - 3x - 6$

$2x + 4 = 2x - 1$

$4 \neq -1$

$\emptyset$

Define a variable and write an equation for each situation. Then solve.

41. A large cheese pizza costs $7.50. Each additional topping for the pizza costs $1.35. If the total bill for the pizza Sally ordered was $12.90, how many toppings did she order?

x = # toppings

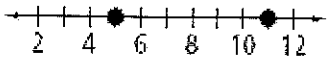
$7.5 + 1.35x = 12.90$

$1.35x = 5.4$

$x = 4$ toppings

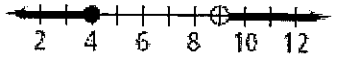
REVIEW OF INEQUALITIES:

42 Which of the following can be represented by this graph?



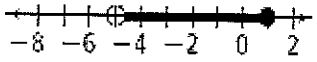
A. $5 < b < 11$ B. $11 \geq b \geq 5$ C. $|8 - b| = 8$ D. $|b - 8| = 3$

43 Which inequality can be represented by this graph?



F. $9 \leq b \leq 4$ G. $b \geq 9$ or $b > 4$ H. $b \leq 4$ or $b > 9$ I. $b < 4$ or $b > 9$

44 Which of the following sentences is represented by this graph?



F. The value of t is greater than -5 or less than 1.
G. The value of t is between -5 and 1.
H. The value of t is greater than -5 and less than 1.
I. The value of t is less than or equal to 1 and greater than -5.

45 Javier is on a diet. He is supposed to eat at least 1500 but not more than 1800 calories per day. Before his last meal of the day, he had consumed 1150 calories. According to Javier's diet plan, what number of calories may he consume at his last meal of the day?

$1500 \leq 1150 + x \leq 1800$

$350 \leq x \leq 650$

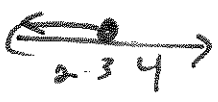
46 What is the intersection of the sets $A = \{2, 4, 6, 8, 10\}$ and $B = \{1, 2, 3, 4, 5\}$?

$A \cap B = \{2, 4\}$

47 Solve and graph $15c - 4 \leq 12c + 5$ on the number line.

$3c \leq 9$

$c \leq 3$



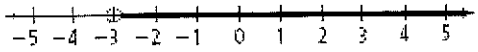
48 Is -2 a solution of the inequality $-2x + 5 \geq 9$?

$-2(-2) + 5 \geq 9$

$4 + 5 \geq 9$ yes

$9 \geq 9$ ✓

49 **Do you UNDERSTAND?** What inequality is shown in the graph? What are some inequalities that have this solution?



$x > -3$

Solutions: $-2, -1 \ldots$

Solve each inequality. Graph the solutions.

50. $6m + 1 \le 3m - 8$

$3m \le -9$

$m \le -3$

51. $4(3w - 1) \ge 20$

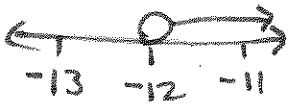
$12w - 4 \ge 20$

$12w \ge 24$

$w \ge 2$

52. $\frac{b}{3} > -4$

$b > -12$



53. $-2.2t \ge 11$

$t \le -5$

Solve each inequality, if possible. If the inequality has no solution, write *no solution*. If the solutions are all real numbers, write *all real numbers*.

54. $8n - 20 < 4(2n - 5)$

$8n - 20 < 8n - 20$

$\varnothing$

55. $4d - 9 \le 6d + 15$

$-2d \le 24$

$d \ge -12$

56. $5t - 6 - 3t \le 2(t - 2)$

$2t - 6 \le 2t - 4$

$0 \le 2$

IR

57. $8 - 7x > 15$

$-7x > 7$

$x < -1$

58. Suppose $U = \{3, 6, 9, 12, 15, 18, 21\}$ is the universal set and $M = \{3, 9, 15, 21\}$. What is M'?

$M' = \{6, 12, 18\}$

Solve each compound inequality.

59. $4 < n + 7 \le 12$

$-3 < n \le 5$

60. $-1 \le -4k \le 8$

$\frac{1}{4} \ge k \ge -2$

$-2 \le k \le \frac{1}{4}$

61. $4y < -24$ or $6y > 12$

$y < -6$ or $y > 2$

62. $-2p \leq -18$ or $3p < 9$

$p \geq 9$ or $p < 3$

Solve each equation or inequality. If there is not a solution, write *no solution*.

63. $|x| = 5$

$x = \pm 5$

64. $|a + 2| > 4$

$a + 2 > 4$ $\quad a + 2 < -4$

$a > 2$ or $a < -6$

65. $|3z - 6| = 9$

$3z - 6 = 9$ | $3z - 6 = -9$

$z = 5$ | $3z = -3$

$z = -1$

66. $|v + 4| \leq 10$

$v + 4 \leq 10$ $\quad v + 4 \geq -10$

$v \leq 6$ $\quad v \geq -14$

$-14 \leq v \leq 6$

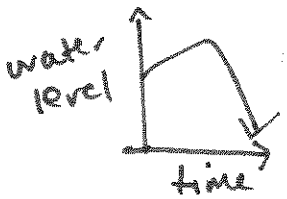
67. Given $F = \{3, 5, 7, 9, 11, 13\}$ and $G = \{2, 5, 8, 11\}$, what is $F \cup G$?

$F \cup G = \{2, 3, 5, 7, 8, 9, 11, 13\}$

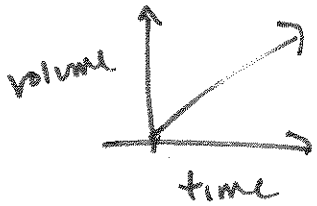
REVIEW OF FUNCTIONS:

Sketch a graph to represent the situation. Label each section.

68. The level of water in a river rose rapidly during the storm and then gradually decreased back to the original level.



69. The volume of a ball increased as more air was added.



Each set of ordered pairs represents a function. Write a rule that represents the function.

70. (0, 5), (1, 6), (2, 7), (3, 8), (4, 9)

0	5
1	6
2	7
3	8
4	9

$y = x + 5$

71. (0, 0), (1, −2), (2, −4), (3, −6), (4, −8)

0	0
1	−2
2	−4
3	−6
4	−8

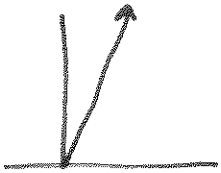
$y = -2x$

72. For each table, determine whether the relationship is a function. Then represent the relationship using words, an equation, and a graph.

x	y
0	0
1	4
2	8
3	12

yes

$y = 4x$



x	y
4	7
2	5
0	3
2	1

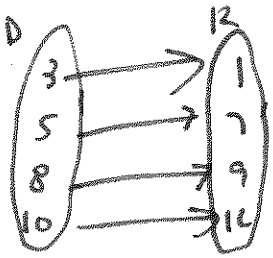
No.

Identify the domain and range of each relation. Use a mapping diagram to determine whether the relation is a function.

73. {(3, 1), (5, 7), (8, 9), (10, 12)}

D: {3, 5, 8, 10}

R: {1, 7, 9, 12}

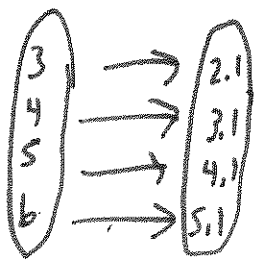


yes it's a function

74. {(3, 2.1), (4, 3.1), (5, 4.1), (6, 5.1)}

D: {3, 4, 5, 6}

R: {2.1, 3.1, 4.1, 5.1}



yes it is a function

Find the range of each function for the given domain.

75. $f(x) = 2x + 2$; $\{-1, 0, 1, 2, 3\}$

x	$2x+2$	$f(x)$
-1	$2(-1)+2$	0
0	$2(0)+2$	2
1	$2(1)+2$	4
2	$2(2)+2$	6
3	$2(3)+2$	8

$R = \{0, 2, 4, 6, 8\}$

76. $f(x) = x^2 + 5$; $\{-3, -1, 0, 2, 4\}$

x	x^2+5	$f(x)$
-3	$(-3)^2+5$	14
-1	$(-1)^2+5$	6
0	$(0)^2+5$	5
2	$(2)^2+5$	9
4	$(4)^2+5$	21

$R = \{5, 6, 9, 14, 21\}$

Tell whether each sequence is arithmetic. Justify your answer. If the sequence is arithmetic, write a function rule to represent it.

77. 5, 10, 15, 20, ...

$+5$

yes

$A(n) = 5 + (n-1)5$

$y = 5x$

78. 200, 100, 50, 25, 12.5, ...

100 50 25

NO

79. $-8.1, -5.8, -3.5, -1.2, \ldots$

2.3 2.3 yes

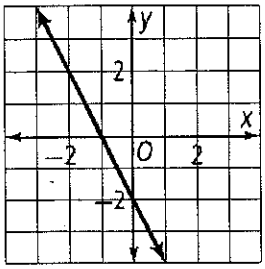
$A(n) = -8.1 + (n-1)2.3$

$y = 2.3x - 10.4$

REVIEW OF LINES:

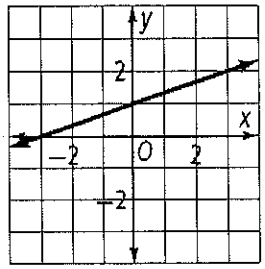
Find the slope of each line.

80



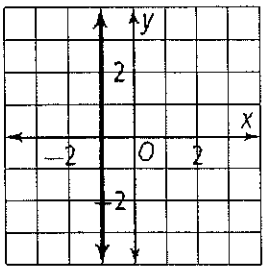
-2

81



$\frac{1}{3}$

82



undefined

Tell whether each equation is a direct variation. If it is, find the constant of variation.

83. $y = 2x - 2$

no

84. $4y = x$

yes $k = \frac{1}{4}$

85. $\frac{y}{x} = 3$

yes $k = 3$

Graph the direct variation that includes the given point. Write the equation of the line.

86. (5, 4) $y = \frac{4}{5}x$

87. (7, 7) $y = x$

* The other pt is always (0, 0)

Find the rate of change for each situation.

88. growing from 1.4 m to 1.6 m in one year .2 m/yr

89. bicycling 3 mi in 15 min and 7 mi in 55 min .1 mi/min

Find the slope and *y*-intercept.

90. $y = 6x + 8$

$m = 6$

$b = 8$

91. $3x + 4y = -24$

$m = \frac{-3}{4}$

$b = -6$

92. $2y = 8$

$m = 0$

$b = 4$

$y = mx + b$

A line passes through the given points. Write an equation for the line in slope-intercept form.

93. (–2, 4) and (3, 9)

$m = \frac{9-4}{3-(-2)} = 1$

$4 = 1(-2) + b$

$y = x + 6$

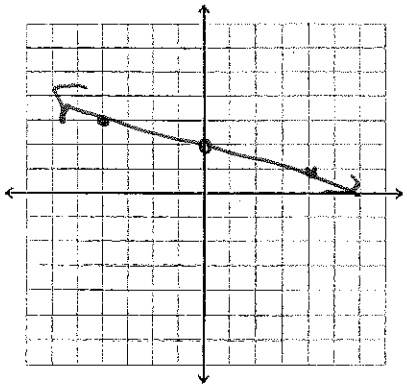
94. (1, 6) and (9, –4)

$m = \frac{-4-6}{9-1} = \frac{-10}{8} = \frac{-5}{4}$

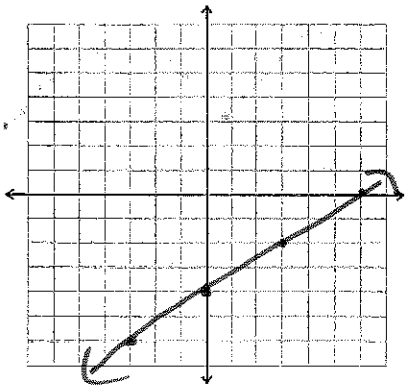
$y = \frac{-5}{4}x + 7\frac{1}{4}$

Graph each equation.

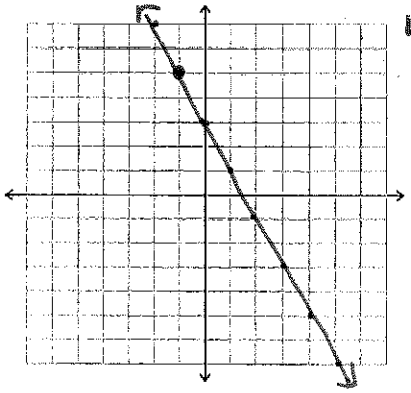
95. $x + 4y = 8$ $y = -\frac{1}{4}x + 2$



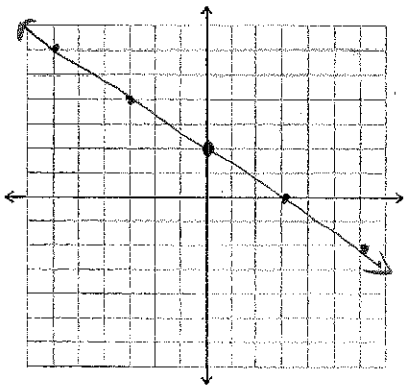
96. $y = \frac{2}{3}x - 4$



97. $y - 5 = -2(x + 1)$ $(-1, 5)$ $m = -2$



98. $2x + 3y = 6$ $y = -\frac{2}{3}x + 2$



$y - y_1 = m(x - x_1)$

Write an equation in point-slope form for the line through the given point with the given slope.

99. (4, 6); $m = -5$ $y - 6 = -5(x - 4)$

100. (3, –1); $m = 1$ $y + 1 = 1(x - 3)$

Write an equation in standard form that satisfies the given conditions.

101. parallel to $y = 4x + 1$; through(0, 0) (same)

$y = 4x + b$

$5 = 4(-3) + b$

$5 = -12 + b$

$17 = b$

$y = 4x + 17$

$4x - y = -17$

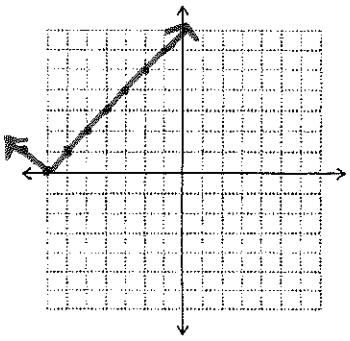
102. perpendicular to $y = -x - 3$, through $(-3, 5)$ (opp recip.)

$m = 1$

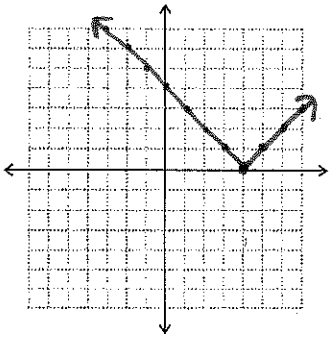
$x - y = 0$

Graph each translation of $y = |x|$. Describe how the graph is related to the graph of $y = |x|$.

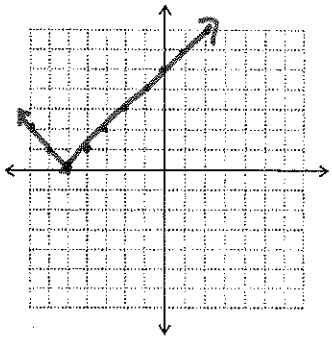
103. $y = |x + 7|$



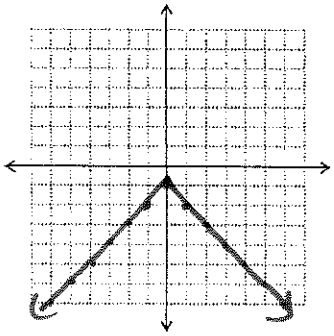
104. $y = |x - 4|$



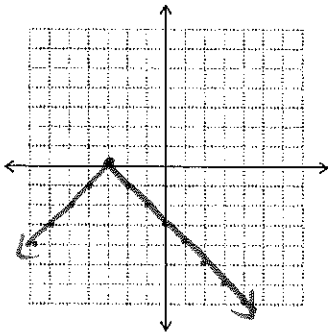
105. $y = |x + 5|$



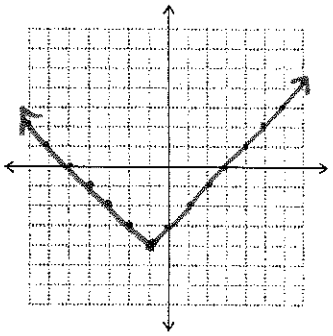
106. $y = -|x| - 1$



107. $y = -|x + 3|$



108. $y = |x + 1| - 4$ (-1, -4)



109 Put the Following data into your calculator and develop an equation that models the data (line of best fit).

$y = -2.1875x + 1678.571429$

# of lobsters traps	Lobsters in the harbor
100	1500
200	1150
300	1050
400	800
500	625
600	400
700	100

a) How many lobsters will be in the harbor if there are 550 traps?

$y = -2.1875(550) + 1678.571429$

$y = 475.45 \approx 475$ lobsters

b) How many traps will it take to get the lobster population to equal zero?

$0 = -2.1875x + 1678.571429$

$-1678.571429 = -2.1875x$ ≈ 767 traps

c) What is the correlation coefficient? $r = -.99$

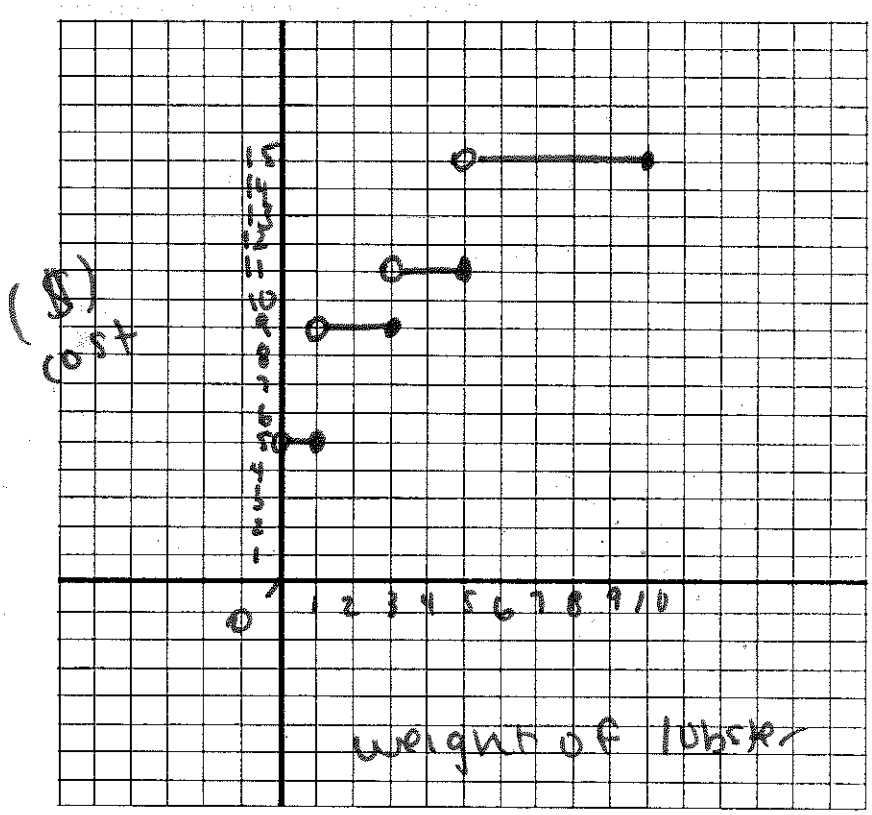
a. What does it tell us about this particular problem

Strong negative correlation

The more traps the less lobsters.

110. Graph the following data:

Weight of lobster	Cost
$0 < w \leq 1$	$5
$1 < w \leq 3$	$9
$3 < w \leq 5$	$11
$5 < w \leq 10$	$15



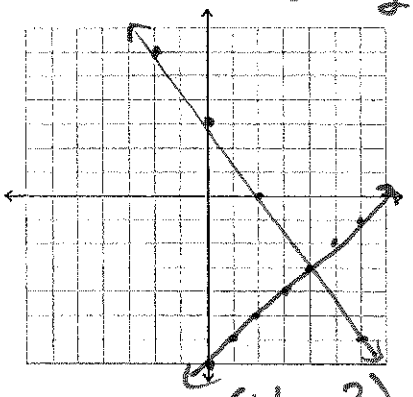
REVIEW OF SYSTEMS OF LINEAR EQUATIONS AND INEQUALITIES:

Solve each system by graphing.

111. $x - y = 7$
$3x + 2y = 6$

$y = x - 7$

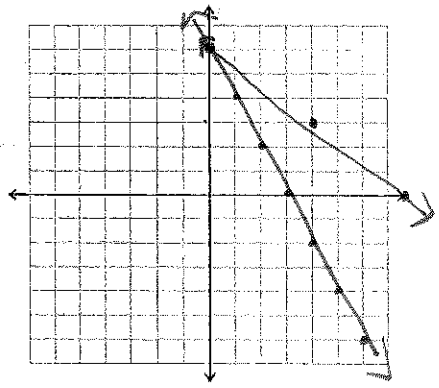
$y = -\frac{3}{2}x + 3$



(4, -3)

112. $y = -2x + 6$
$3x + 4y = 24$

$y = -\frac{3}{4}x + 6$



(0, 6)

Solve each system by using substitution.

113. $x - y = 13$
$y - x = -13$

$x = y + 13$

$y - (y + 13) = -13$

$-13 = -13$

∞ many (same line)

114. $3x - y = 4$
$x + 5y = -4$

$y = 3x - 4$

$x + 5(3x - 4) = -4$

$x + 15x - 20 = -4$

$16x = +16$

$x = 1$

$y = 3(1) - 4 = -1$

(1, -1)

115. $x + y = 4$
$y = 7x + 4$

$x + 7x + 4 = 4$

$8x = 0$

$x = 0$

$0 + y = 4$

(0, 4)

Solve each system by elimination.

116. $x + y = 19$
$x - y = -7$

$2x = 12$

$x = 6$

$6 - y = -7$

$-y = -13$

$y = 13$

(6, 13)

117. $-3x + 4y = 29$
$3x + 2y = -17$

$6y = 12$

$y = 2$

$3x + 2(2) = -17$

$3x = -21$

$x = -7$

(-7, 2)

118. $3x + y = 3$
$-3x + 2y = -30$

$3y = -27$

$y = -9$

$3x - 9 = 3$

$3x = 12$

$x = 4$

(4, -9)

119. $6x + y = 13$
$y - x = -8$

(3, -5)

$6x + y = 13$
$+x + y = +8$
$7x = 21$
$x = 3$
$y = -5$

120. $4x - 9y = 61$
$3(10x + 3y = 25)$

(4, -5)

$4x - 9y = 61$
$30x + 9y = 75$
$34x = 136$
$x = 4$
$y = -5$

121. $4x - y = 105$
$x + 7y = -10$

$28x - 7y = 735$
$x + 7y = -10$
$29x = 725$
$x = 25$
$y = -5$

(25, -5)

Write and solve a system of equations.

122. Two groups of people order food at a restaurant. One group orders 4 hamburgers and 7 chicken sandwiches for $34.50. The other group orders 8 hamburgers and 3 chicken sandwiches for $30.50. Find the cost of each item.

x y

$4x + 7y = 34.5$
$8x + 3y = 30.5$

$2.50 per hamburger
$3.50 per chicken sandwich

123. You have a total of 21 coins, all nickels and dimes. The total value is $1.70. How many nickels and how many dimes do you have?

x y

$n = .05$
$d = .1$

8 nickels
13 dimes

$x + y = 21$
$5x + 10y = 170$

$5x + 10(21 - x) = 170$
$5x + 210 - 10x = 170$
$-5x = -40$
$x = 8$

124. The sum of two numbers is 25. Their difference is 9. What are the two numbers?

$x + y = 25$
$x - y = 9$

17, 8

Determine whether the ordered pair is a solution of the linear inequality.

125. $y > x - 7$; (2, 5)

$5 ? 2 - 7$
$5 > -5$ ✓

yes

126. $x \leq 3$; (–2, 6)

$-2 \leq 3$ ✓

yes

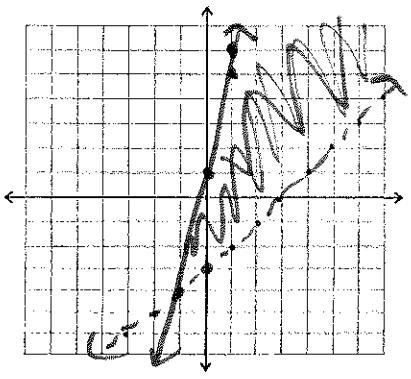
127. $y \geq 4x + 3$; (3, 9)

$9 \geq 4(3) + 3$
$9 \geq 15$ ✗

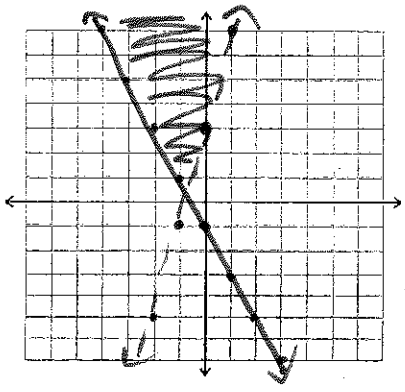
no.

Solve each system by graphing.

128. $y \leq 5x + 1$
$y > x - 3$



129. $y > 4x + 3$
$y \geq -2x - 1$



Useful Formulas

Percents:

$$\frac{is}{of} = \frac{x}{100}$$

Percent Increase/ Decrease

$$\%\, increase = \frac{new\, amount - original\, amount}{original\, amount}$$

$$\%\ decrease = \frac{original\, amount - new\, amount}{original\, amount}$$

Simple Interest:

$I = \Pr t$

Relative Error/ Percent Error

$$relative\, error = \frac{|measured\ or\ estimated\ value - actual\ value|}{actual\ value}$$

Arithmetic Sequences:

$A(n) = A(1) + (n-1)d$

Area:

Rectangle $A = b \cdot h$

Triangle $A = \frac{1}{2} \cdot b \cdot h$

Trapezoid $A = \frac{1}{2} \cdot h \cdot (b_1 + b_2)$

Circle $A = \Pi r^2$

Volume of a Rectangular Prism:

$V = l \cdot w \cdot h$

Circle Circumference :

$C = 2\Pi r \ \ or \ \ \Pi D$

Conversions:

$1km = .621miles$

$12in = 1ft$

$1yd = 3ft$

Lines:

Slope: $m = \frac{y_2 - y_1}{x_2 - x_1}$

Direct Variation: $y = kx$

Standard Form: $Ax + By = C$

Point-Slope: $y - y_1 = m(x - x_1)$

Slope-Intercept: $y = mx + b$