# Midterm Review Sheet

**Directions:** Read each question carefully and show all work for full credit.

*Fill in the table below...*

| Fraction | Decimal | Percent |
|---|---|---|
| $\frac{2}{5}$ | 0.4 | 40% |
| $^8/_{100} = ^2/_{25}$ | 0.08 | 8% |
| $\frac{58}{100} = \frac{29}{50}$ | 0.58 | 58% |
| $\frac{1}{3}$ | $0.\overline{3}$ | 33.3% |
| $^3/_{100}$ | 0.03 | 3% |
| $\frac{781}{1000}$ | 0.781 | 78.1% |
| $\frac{4}{1}$ | 4 | 400% |

**Evaluate.**

1. $\sqrt{81}$ = 9

2. $\sqrt{-36}$ NP

3. $\sqrt[3]{1}$ 1

4. $\sqrt[3]{8}$ 2

5. $-\sqrt{16}$ −4

6. $\sqrt{121}$ 11

7. $\sqrt[3]{-27}$ −3

8. $\sqrt[3]{216}$ 6

9. $\sqrt{9}$ 3

10. $\sqrt[3]{27}$ 3

11. $-\sqrt{225}$ −15

12. $\sqrt{-4}$ NP

13. $\sqrt[3]{-27}$ −3

14. $\sqrt{\frac{4}{16}}$ $\frac{2}{4}$ → $\boxed{\frac{1}{2}}$

15. $\pm\sqrt{\frac{64}{121}}$ $\frac{8}{11}$ , $-\frac{8}{11}$

16. $-\sqrt{\frac{16}{81}}$ $-\frac{4}{9}$

17. $\sqrt{5(4+2) - 10 \div 5 + 7 \cdot 3}$

$\sqrt{5(6) - 10 \div 5 + 7 \cdot 3}$
$\sqrt{30 - 2 + 21}$
$\sqrt{28 + 21}$
$\sqrt{49}$ = $\boxed{7}$

18. $\sqrt{9x6 + 10 \div 5 + 4 \cdot 2}$

$\sqrt{54 + 2 + 8}$
$\sqrt{56+8}$
$\sqrt{64}$ $\boxed{= 8}$

**Estimate each to the nearest tenths place.**

19. $\sqrt{3}$   $\approx 1.7$

20. $\sqrt{110}$   $\approx 10.5$

21. $\sqrt{72}$   $\approx 8.5$

**Order the following from least to greatest.**

22. $\sqrt{2}$, 1.5, 1, 3, $\pi$, $\sqrt{8}$, 2,

1, $\sqrt{2}$, 1.5, 2, $\sqrt{8}$, 3, $\pi$

23. 4.5, $\sqrt{9}$, $\sqrt{6}$, 3, $\pi$, $\sqrt{18}$, 4

$\sqrt{6}$, $\sqrt{9}$ or 3, $\pi$, 4, $\sqrt{18}$, 4.5

**For each of the following state, "rational" or "irrational" and explain why.**

24. $\pi$
Irrational, it doesn't repeat or terminate

25. $\sqrt{100} = 10$
Rational, It terminates.

26. $\sqrt{18}$
Irrational, It doesn't repeat or terminate

27. 19
Rational, It terminates

28. -38.9
Rational, It terminates.

29. 19.168423...
Irrational, It doesn't repeat or terminate

30. 8.16161616...
Rational, It repeats

31. 9.010010001...
Irrational, It doesn't repeat or terminate

**Write each of the following numbers in scientific notation.**

32. 9,260,000,000
$9.26 \times 10^9$

33. 0.00061
$6.1 \times 10^{-4}$

34. 8.7E-9
$8.7 \times 10^{-9}$

35. 65,000
$6.5 \times 10^4$

**Write each of the following numbers in standard notation.**

36. $7.1 \times 10^9$
7,100,000,000

37. $1.75 \times 10^{-3}$
0.00175

38. $4.813 \times 10^{-7}$
0.0000004813

39. $9.432 \times 10^3$
9432

Simplify completely. Where necessary, express your answer using only <u>POSITIVE</u> exponents.

40. $a \cdot a \cdot a \cdot b \cdot b \cdot b \cdot b \cdot b \cdot b$

$a^3 b^6$

41. $a^3 \cdot b^2 \cdot a \cdot b^6$

$a^4 b^8$

42. $x^7 \cdot y^2 \cdot xy^3$

$x^8 y^5$

43. $2x^3 \cdot 3x$

$6x^4$

44. $3^2 \cdot 3^1 = 3^3$

$= 27$

45. $3^2 \cdot 5^2$

$9 \cdot 25 = 225$

46. $x^6 \cdot x^7$

$x^{13}$

47. $x^2 \cdot y^5$

$x^2 y^5$

48. $\frac{6^5}{6^3}$   $6^2 = 36$

49. $\frac{36m^4 n^6}{6m^2 n} = 6m^2 n^5$

50. $\frac{4x^4 y^3 z^5}{40x^9 yz^2}$

$\frac{1}{10} \frac{y^2 z^3}{x^5}$   $\frac{y^2 z^3}{10x^5}$

51. $5ab \quad a^5 \cdot b^2 \quad c^3$

$5ab^3 c^3$

52. $3^0$   $= 1$

53. $k^0$   $= 1$

54. $5x^2 y^0 = 5x^2 \cdot 1$

$= 5x^2$

55. $a^1$   $= a$

56. $(2^3)^2 = 2^6$

$= 64$

57. $(x^5)^4 = x^{20}$

58. $(x^5 y^5)^2$   $= x^{10} y^{10}$

59. $\left(\frac{1}{x^2}\right)^3 = \frac{1}{x^6}$

Write using only positive exponents.

60. $x^{-2}$   $= \frac{1}{x^2}$

61. $\frac{(a^4 \cdot b)}{(a^2 \cdot b^8)}$

$\frac{a^2}{b^7}$

62. $\frac{(x^4)}{(x^{-3})}$

$x^7$

63. $\frac{(6c^{10} \cdot d^4)}{(3c^{12} \cdot d^{10})}$

$\frac{2}{c^2 d^6}$

Fill in the box.

74. $a^{\boxed{3}} \cdot a^5 = a^8$

75. $n^{\boxed{-5}} = \frac{1}{n^5}$

**Write each answer using scientific notation.**

46. $3.2 \times 10^4 + 1.5 \times 10^6$

$1.5$
$+0.032$
_____
$1.532$

$\boxed{1.532 \times 10^6}$

47. $8.4 \times 10^4 - 5.4 \times 10^3$

$8.4$
$- 0.54$
_____
$7.86$

$\boxed{7.86 \times 10^4}$

48. $6.2 \times 10^6 \div 2.1 \times 10^3$

$2.952$
$2.1\overline{)6.2}$
$-42$
_____
$200$
$-189$
_____
$110$
$-105$
_____
$50$

$\boxed{2.95 \times 10^3}$

49. $7.4 \times 10^9 \cdot 1.4 \times 10^3$

$7.4$
$\times 1.4$
_____
$296$
$740$
_____
$10.36$

$\boxed{10.36 \times 10^{12}}$

**Circle the appropriate unit of measure for each of the following...**

50. The average length of a newborn is 43.2      mm   / (cm) / m.

51. An average weight of a newborn is 3.2      mg / g / (kg)

52. Find the slope for each of the following.

a. $y = 2x - 7$

$\boxed{2}$

b. $y = -\dfrac{2}{3}x - 6$

$\boxed{-\dfrac{2}{3}}$

c.

| x | y |
|---|---|
| 2 | 4 |
| 4 | 2 |
| 6 | 0 |
| 8 | -2 |

$2 <$ table $> -2$

$\dfrac{-2}{2} \boxed{-1}$

d.

| x | y |
|---|---|
| -12 | 10 |
| -9 | 1 |
| -6 | -8 |
| -3 | -17 |

$3 <$ table $> -9$

$\dfrac{-9}{3} \boxed{-3}$

e.



$\dfrac{1}{2}$

f.



$\dfrac{-4}{1} = -4$

$\boxed{-4}$
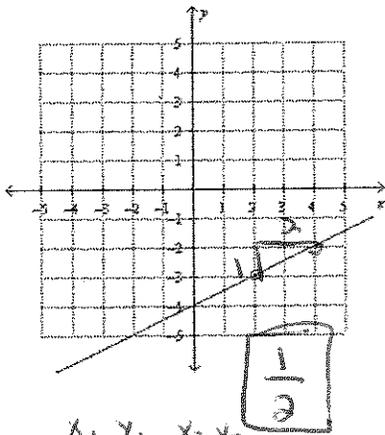
g. $\overset{x_1 \; y_1 \quad x_2 \; y_2}{(2,\,-1) \quad (8,\,4)}$

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{4 - -1}{8 - 2} = \boxed{\dfrac{5}{6}}$
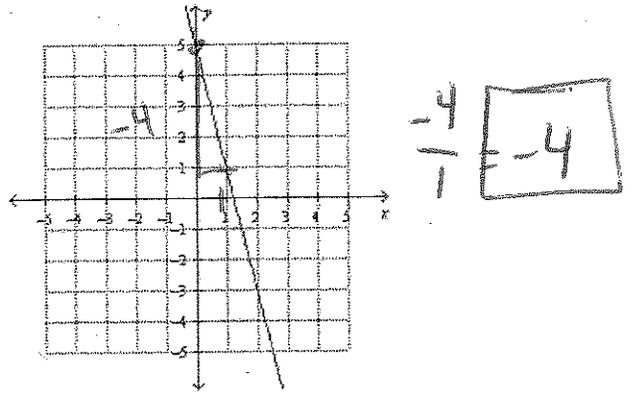
h. $\overset{x_1 \; y_1 \quad x_2 \; y_2}{(4,\,10) \quad (10,\,12)}$

$\dfrac{12 - 10}{10 - 4} = \dfrac{2}{6} = \boxed{\dfrac{1}{3}}$

i. $\overset{x_1 \; y_1 \quad x_2 \; y_2}{(-6,\,-4) \quad (6,\,1)}$

$\dfrac{1 - -4}{6 - -6} = \boxed{\dfrac{5}{12}}$

## 53. Write a linear equation for each of the following...

a.



$\dfrac{2}{1} = 2$

$\boxed{Y = 2x + 1}$

b.



$\dfrac{-1}{4}$

$\boxed{Y = -\dfrac{1}{4}x + 3}$
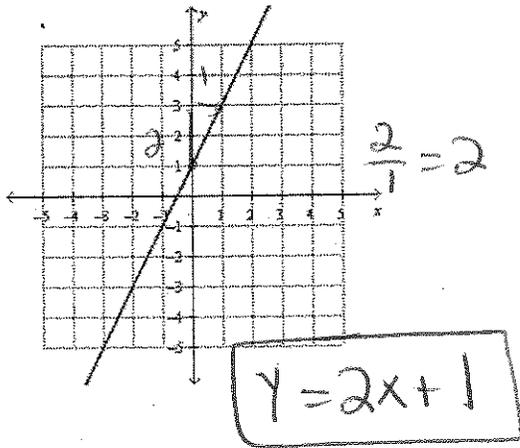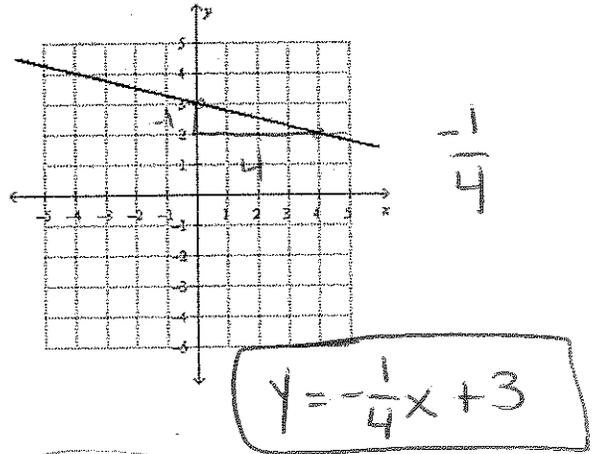
c.

| x | y |
|---|---|
| -3 | 12 |
| 0 | 24 |
| 3 | 36 |
| 6 | 48 |
| 9 | 60 |

$3 < \quad > 12$

$\dfrac{12}{3} = 4$

$\boxed{Y = 4x + 24}$

d. ⟨0  24⟩

| x | y |
|---|---|
| 2 | 16 |
| 4 | 8 |
| 6 | 0 |
| 8 | -8 |
| 10 | -16 |

$2 < \quad > -8$

$\dfrac{-8}{2} = -4$

$\boxed{Y = -4x + 24}$

54. Graph each of the following lines...

a. $y = 3x - 5$
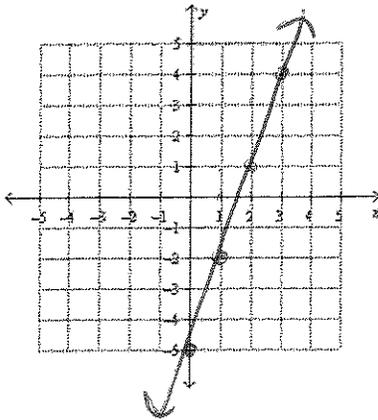
b. $y = \frac{1}{4}x + 2$
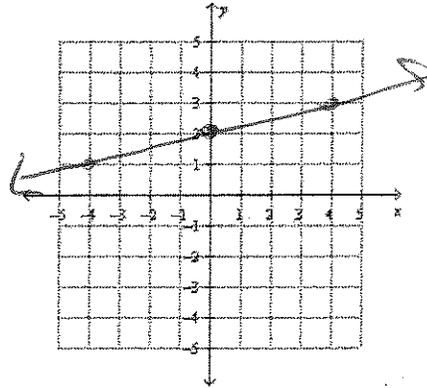
55. The golf club is looking for new members. There are currently 6 students in the club, but every day three more people sign up.

a. Identify the input and the output for the situation and create a table.

Input: _# of days_        Output: _# of people in the club_

| Input: days | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Output: people | 6 | 9 | 12 | 15 | 18 |

b. Draw a graph of the situation. Be sure to label each axis.

# of people

20

15

10

5

1   2   3   4

# of days
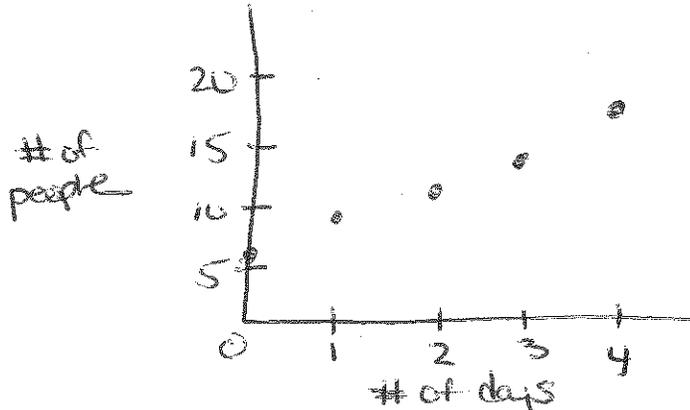
c. Write a linear equation that represents the situation.   _$y = 3x + 6$_

d. **Use the equation** you wrote in part c to answer each of the following...

i. How many students are in the club after ⟨4 days?⟩

$y = 3x + 6$
$y = 3(4) + 6$
$y = 12 + 6$

$\boxed{y = 18 \text{ people}}$

ii. If there are 27 people in the club, how many days have gone by?

$y = 3x + 6$
$27 = 3x + 6$
$\underline{-6 \qquad -6}$
$\dfrac{21}{3} = \dfrac{3x}{3}$

$\boxed{x = 7 \text{ days}}$

e. What is the *slope* of this situation? What is the *y-intercept* of this situation?

The slope is 3 and the y-intercept is 6.

56. Write the *equation* for the line that goes through each pair of points listed below...

a. (9, 10) and (3, -2)

$$\frac{-2-10}{3-9} = \frac{-12}{-6} = 2$$

$$y = Mx + b$$
$$10 = 2(9) + b$$
$$10 = 18 + b$$
$$\frac{-18 \quad -18}{-8 = b}$$

$$\boxed{y = 2x - 8}$$

b. (-1, -5) and (6, -10)

$$\frac{-10+5}{6+1} = \frac{-5}{7}$$

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

$$y = Mx + b$$
$$-10 = -\frac{5}{7}(6) + b$$
$$-10 = \frac{-30}{7} + b$$
$$-10 = -4\frac{2}{7} + b$$
$$\frac{+4\frac{2}{7} \qquad +4\frac{2}{7}}{-5\frac{5}{7} = b}$$

57. Two men are climbing a mountain.

Ted:

| Minutes | Height (ft) |
|---------|-------------|
| 0 | 200 |
| 5 | 240 |
| 10 | 280 |
| 15 | 320 |

40

$$\frac{40}{5} = \frac{8ft}{min}$$
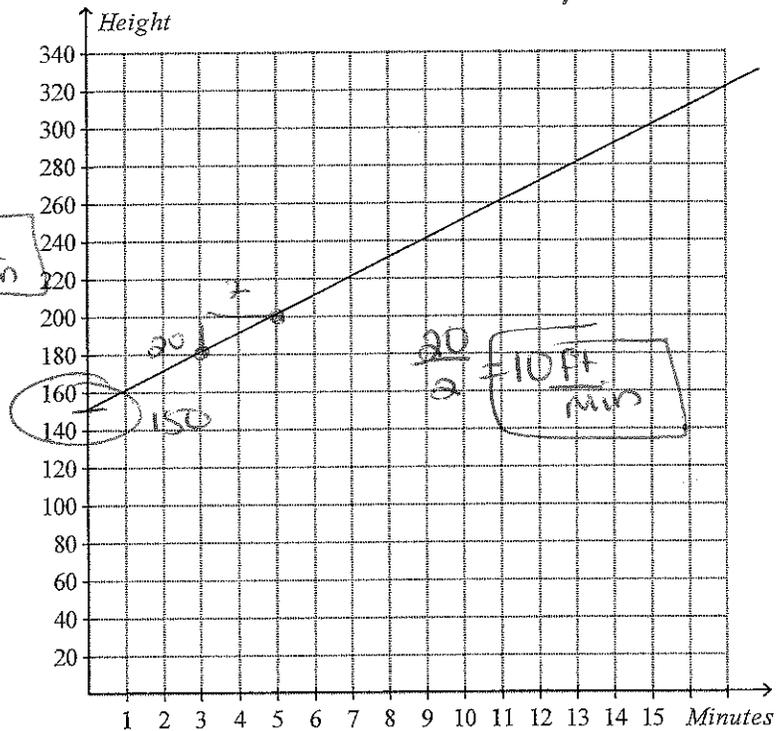
a. Who is climbing faster?

Ross

b. Who starts out higher on the mountain?

Ted

Ross:



$$\frac{20}{2} = \frac{10 ft}{min}$$

150

c. Write an equation for each climber.

i. Ted: $y = 8x + 200$

ii. Ross: $y = 10x + 150$

58. Solve the equations...

a. $x - 2 = 12$
$+2 \quad +2$
$x = 14$

b. $-3.7 + x = 8$
$+3.7 \quad +3.7$
$\boxed{x = 11.7}$

c. $\dfrac{-3x}{-3} = \dfrac{27}{-3}$
$\boxed{x = -9}$

d. $\dfrac{x}{6} = -9 \cdot 6$
$\boxed{x = -54}$

e. $4x - 9 = 19$
$+9 \quad +9$
$\dfrac{4x}{4} = \dfrac{28}{4}$
$\boxed{x = 7}$

f. $3 - \dfrac{3}{4}x = 43$
$-3 \qquad -3$
$\dfrac{-4}{3} \cdot \dfrac{3}{4}x = 40 \cdot \dfrac{-4}{3}$
$x = -160$

$\begin{array}{r} 53.3 \\ 3\overline{)160} \\ 15 \\ \overline{\phantom{0}10} \\ \phantom{0}9 \\ \overline{\phantom{00}10} \end{array}$
$\boxed{x = 53.3}$

g. $\dfrac{x}{5} - 2 = 3$
$+2 \quad +2$
$\dfrac{x}{5} = 5.5$
$\boxed{x = 25}$

h. $\dfrac{x}{-4} + 2 = 7$
$-2 \quad -2$
$\dfrac{x}{-4} = 5 \cdot -4$
$\boxed{x = -20}$

i. $3(x - 6) = 8$
$3x - 18 = 8$
$+18 \quad +18$
$\dfrac{3x}{3} = \dfrac{26}{3}$
$\boxed{x = 8\tfrac{2}{3}}$

j. $-\dfrac{1}{2}(4x + 8) = 9$
$-2x - 4 = 9$
$+4 \quad +4$
$\dfrac{-2x}{-2} = \dfrac{13}{-2}$
$\boxed{x = -6\tfrac{1}{2}}$

k. $4x + 5x = 18$
$\dfrac{9x}{9} = \dfrac{18}{9}$
$\boxed{x = 2}$

l. $6x - 8.2 - 3x = 2$
$3x - 8.2 = 2$
$+8.2 \quad +8.2$
$3x = 10.2$

$\begin{array}{r} 3.4 \\ 3\overline{)10.2} \end{array}$
$3x = 10.2$
$\boxed{x = 3.4}$

m. $7x - 2 + 3x + 6 = 84$
$10x + 4 = 84$
$-4 \quad -4$
$\dfrac{10x}{10} = \dfrac{80}{10}$
$\boxed{x = 8}$

n. $4(x - 2) + 3x = 14$
$4x - 8 + 3x = 14$
$7x - 8 = 14$
$+8 \quad +8$
$\dfrac{7x}{7} = \dfrac{22}{7}$
$\boxed{x = 3\tfrac{1}{7}}$

o. $2x - 8 = 5x + 8$
 $-2x \quad -2x$

 $-8 = 3x + 8$
 $-8 \quad -8$
 $\dfrac{-16}{3} = \dfrac{3x}{3}$

 $\boxed{x = -5\frac{1}{3}}$

p. $14.5x + 2 = 4.5x + 18$
 $-4.5x \quad -4.5x$

 $10x + 2 = 18$
 $-2 \quad -2$

 $\dfrac{10x}{10} = \dfrac{16}{10}$

 $x = 1\frac{6}{10} = \boxed{1\frac{3}{5}}$

q. $6x - 6 = 2x - 8$
 $-2x \quad -2x$

 $4x - 6 = -8$
 $+6 \quad +6$

 $\dfrac{4x}{4} = \dfrac{-2}{4}$

 $\boxed{x = -\frac{1}{2}}$

r. $3\frac{1}{2}x - 2 + \frac{1}{2}x = 5x$

 $4x - 2 = 5x$
 $-4x \qquad -4x$

 $-2 = 1x$

 $\boxed{x = -2}$

s. $3(x - 4) = 5x$

 $3x - 12 = 5x$
 $-3x \qquad -3x$

 $\dfrac{-12}{2} = \dfrac{2x}{2}$

 $\boxed{-6 = x}$

t. $4x - 1 + 3x = 6x - 3x$

 $7x - 1 = 3x$
 $-7x \qquad -7x$

 $\dfrac{-1}{-4} = \dfrac{-4x}{-4}$

 $\boxed{x = \frac{1}{4}}$

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59. For a-f, identify if the scatter plot has a positive association, negative association, or no association.

a.  positive

b.  positive

c.  NO

d.  negative

e.  negative

f.  NO

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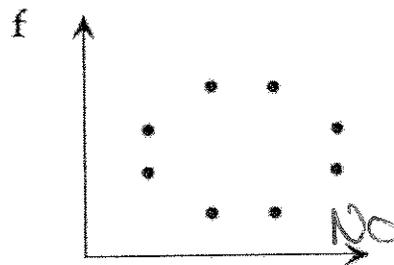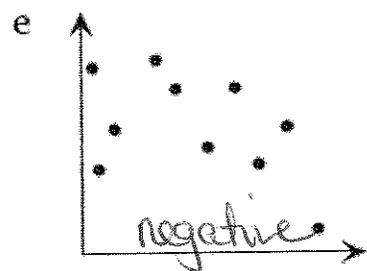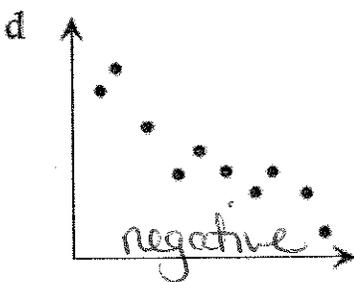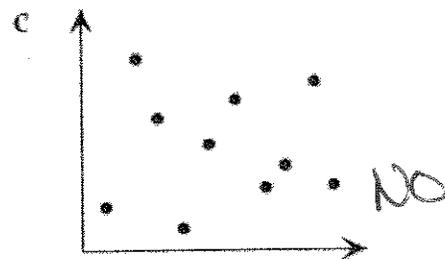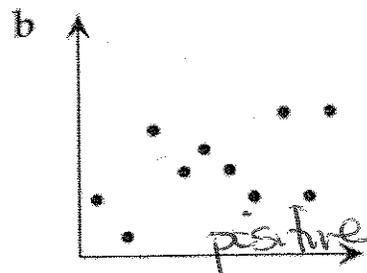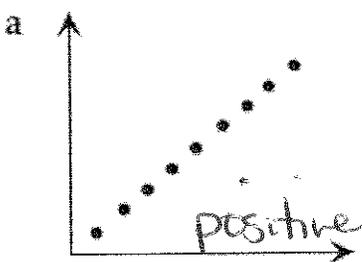
60. What is an outlier? Include a sketch of a graph to help illustrate your explanation.

An outlier is a data point that is far away from the other data points.

outlier

For 61-68, use the table below. The table represents an item that is sold at the local store. It compares the price of the item and how many items were sold when it was listed at that price.

| Price | Quantity Sold |
|-------|---------------|
| 1 | 68 |
| 1.20 | 68 |
| 5.10 | 10 |
| 4 | 26 |
| 3 | 41 |
| 4 | 26 |
| 2.10 | 56 |
| 1.40 | 49 |
| 4.50 | 11 |
| 2.70 | 60 |

Label: Quantity Sold.



Label: price
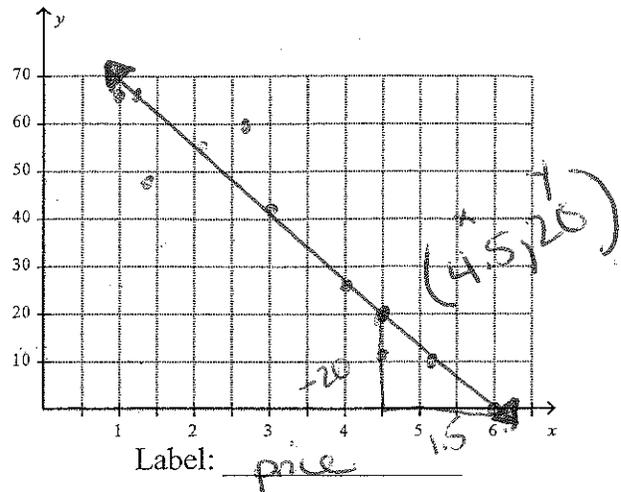
61. Make a scatter plot of the data. Label both the x–axis and the y–axis.
62. Describe the type of the association between the price of an item and the quantity sold.

The higher the price of an item, the less items will be sold.

63. Draw a trend line that best fits the scatter plot. *Make sure you have arrows on your line.*

64. Write an equation for the line of best fit in Slope–Intercept form (y = mx + b). Show your work for full credit.

$M = \frac{rise}{run} = \frac{-20}{1.5} = \boxed{-13.3}$

$Y = Mx + b$
$20 = -13.3(4.5) + b$
$20 = -60 + b$
$+60 \quad +60$
$\boxed{80 = b}$

$\boxed{Y = -13.3x + 80}$

65. In the equation you wrote in #64, the slope, or m = $-13.3$
In the context of the price/quantity situation, this means that...

For every $1 the price is increased, 13.3 less people will buy the item.

66. In the equation you wrote in #64, the y-intercept, or b = $80$.
In the context of the price/quantity situation, this means that...

Theoretically if the price was $0, 80 people would buy it.

67. Using the equation to #64, if 42 customers buy the item, what was it priced at? Show your work for full credit.

$$y = -13.\overline{3}x + 80$$
$$42 = -13.\overline{3}x + 80$$
$$-80 \qquad\qquad -80$$
$$\frac{-38}{-13.\overline{3}} = \frac{-13.\overline{3}x}{-13.\overline{3}}$$

$$\boxed{\$2.85 = x}$$

68. Using the equation to #64, if an item costs $6, how many customers will buy it? Show your work for full credit.

$$y = -13.\overline{3}x + 80$$
$$y = -13.\overline{3}(6) + 80$$

$$\boxed{y = \overline{0} \text{ people}}$$

69. Solve by graphing.

$$y = \frac{4}{3} \cdot x - 2 \quad \text{and} \quad y = \frac{2}{3} \cdot x$$



(3, 2)
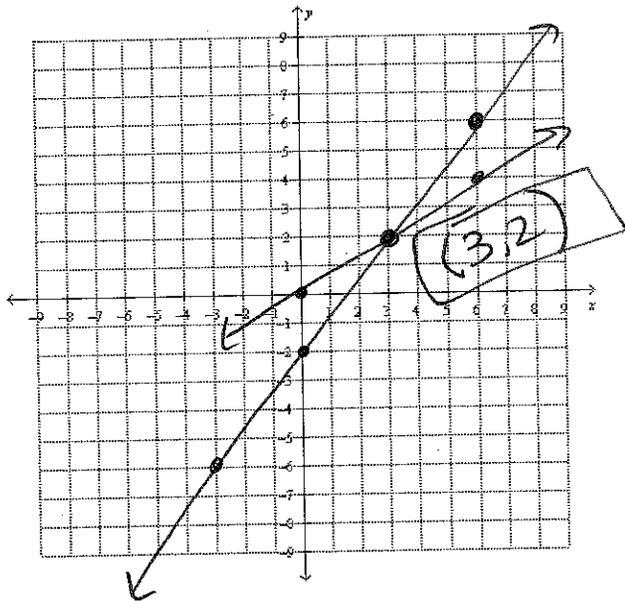
70. Solve by substitution.

$$y = 2x + 5$$
$$y = 6x + 1$$

$$2x + 5 = 6x + 1$$
$$-2x \qquad -2x$$
$$5 = 4x + 1$$
$$-1 \qquad -1$$
$$\frac{4}{4} = \frac{4x}{4}$$
$$1 = x$$

$$y = 2x + 5$$
$$y = 2(1) + 5$$
$$y = 2 + 5$$
$$y = 7$$

$$(1, 7)$$

/1. Solve by elimination.

$2x + 3y = 11$
$+ -2x + 9y = 1$
_____

$\dfrac{12y}{12} = \dfrac{12}{12}$

$y = 1$

$2x + 3y = 11$

$2x + 3(1) = 11$

$2x + 3 = 11$
$\phantom{2x} -3 \quad -3$

$\dfrac{2x}{2} = \dfrac{8}{2}$

$x = 4$

$( 4 , 1 )$

For numbers 72-79, circle the method that you used. Try to use each method at least once. (Note: You only need to use the graphing grids for the problems that you choose to solve by graphing.)

72. graphing        substitution        (elimination)

$7x + 2y = 10$
$7x + y = -16$

$\dfrac{3y}{3} = \dfrac{-6}{3}$

$y = -2$

$7x + 2y = 10$

$7x + 2(-2) = 10$

$7x + -4 = 10$
$\phantom{7x} +4 \quad +4$

$\dfrac{7x}{7} = \dfrac{14}{7}$

$x = 2$

$( 2 , -2 )$
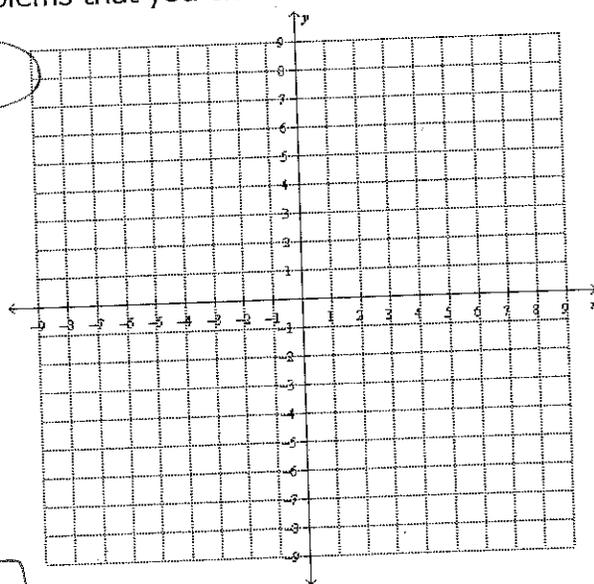
73. graphing        (substitution)        elimination

$5x + 2y = -9$
$y = -4x - 12$

$5x + 2(-4x - 12) = -9$
$5x + -8x - 24 = -9$
$-3x - 24 = -9$
$\phantom{-3x} +24 \quad +24$

$\dfrac{-3x}{-3} = \dfrac{15}{-3}$

$x = -5$

$y = -4x - 12$
$y = -4(-5) - 12$
$y = 20 - 12$
$y = 8$

$( -5 , 8 )$
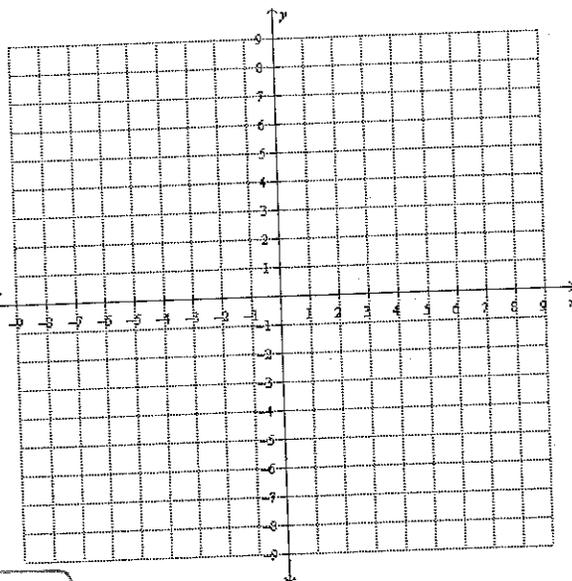
4. graphing    substitution    (elimination)

$2(3x + y = 4)$
$\quad 6x + 2y = 8$
$- \ 6x + 2y = 8$

$0x = 0$
$0 = 0 \rightarrow$ True!

Infinitely Many
Solutions!
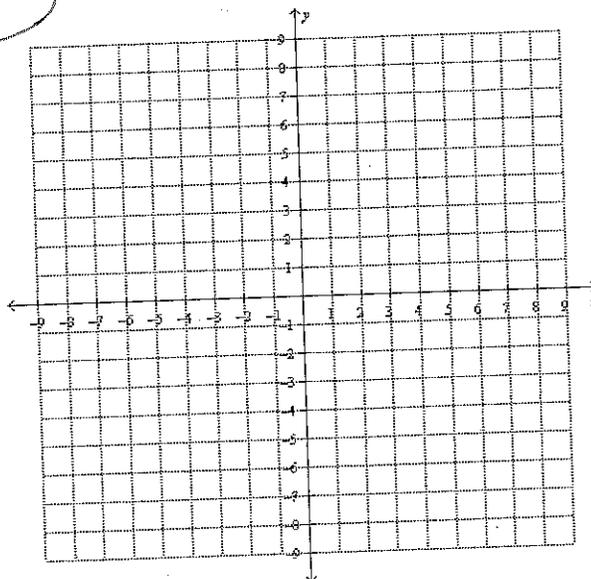
75. (graphing)    substitution    elimination

$y = -2x - 3$
$y = -2x + 3$
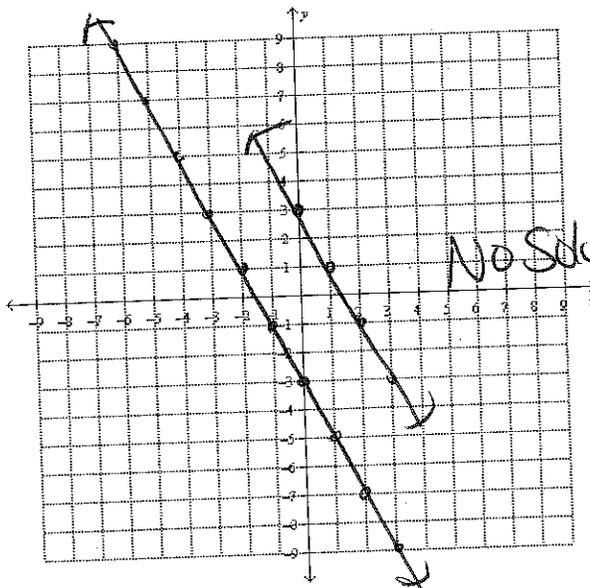
No Solution!

76. (graphing)    substitution    elimination

$y = -0.5x - 6$
$y = -6 - \frac{1}{2}x$
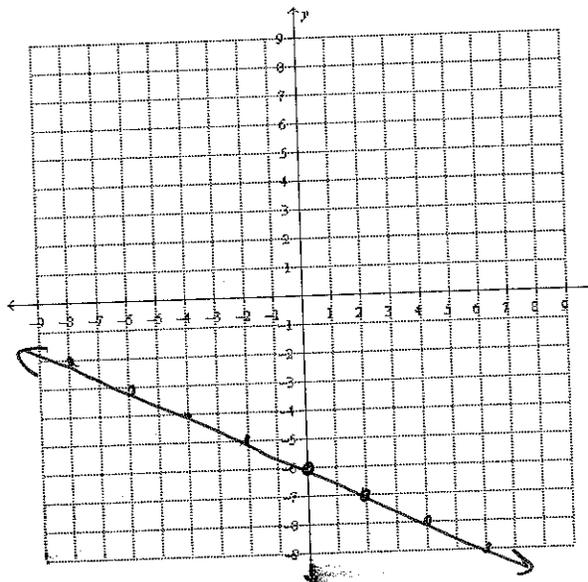
Infinitely
Many
Solutions!

77. graphing    (substitution)    elimination

$y = 3x - 4$
$-6x + 2y = -8$

$-6x + 2(3x-4) = -8$

$-6x + 6x - 8 = -8$

$\phantom{-6x} 0x - 8 = -8$

$\phantom{-6x0x}+8 \quad +8$

$\phantom{-6x0x} 0 = 0 \text{ True!}$

infinitely Many
solutions !
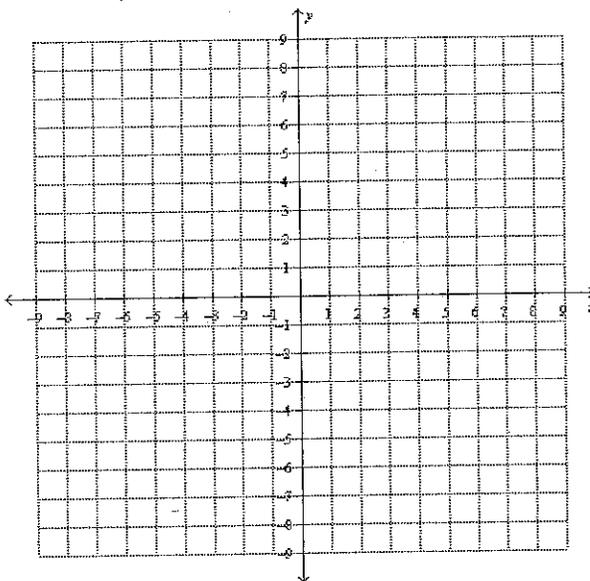


78. The student council is planning an ice skating trip. Ice World charges a $150 fee to rent the rink and then they charge an additional $5 for each student that comes. Rink-a-Rama charges a $300 fee to rent the rink and then an additional $2 for each student that comes. For what number of students, would the rinks cost the same price?

    a. Write a system of linear equations.

         Ice world    $y = 5x + 150$

         Rink a Rama   $y = 2x + 300$

    b. Solve the system to answer the question.

$y = 5x + 150$
$y = 2x + 300$

$2x + 300 = 5x + 150$
$-2x \phantom{+300=5x} -2x$
$\phantom{2x+} 300 = 3x + 150$
$\phantom{2x+} -150 \phantom{=3x} -150$

$\dfrac{150}{3} = \dfrac{3x}{3}$

$50 = x$

$y = 5(50) + 150$
$y = 250 + 150$
$y = 400$
$(50, 400)$

    c. My solution means that...

If 50 people attend the event, the total cost would be $400 at either rink.

**79.** There are 340 animals on a Bill's farm. Some are sheep and some are chickens. If there are a total of 940 legs among the animals, how many of the animals are sheep and how many are chickens?

    a. Write a system of linear equations.

$C = \text{chickens}$          $c + S = 340$

$S = \text{sheep}$            $2c + 4S = 940$

    b. Solve the system to answer the question.

$2(c+s) = 340$          $c + S = 340$

$2c + 4S = 940$        $c + 130 = 340$

$-2c + {}^-2S = -680$      $-130 \quad -130$

$\dfrac{2S = 260}{2 \qquad 2}$           $C = 210$

$S = 130$

> **130 sheep**
> **210 chickens**

    c. My solution means that...

There are 130 sheep and 210 chickens on the farm.

**80.** For each of the following, determine how many solutions the system will have, without graphing or solving. Explain how you know.

    a. $y = \frac{1}{2}x - 3$
        $y = 0.5x - 4$

No solution because the slopes are the same, but the y-intercepts are different.

    b. $-3x + y = 8$
        $y = 4 + 8x$

$-3x + y = 8$
$+3x \qquad +3x$
$y = 8 + 3x$

one solution because the slopes are different.

    c. $2x + y = 7$
        $y = -2x + 7$

$2x + y = 7$
$-2x \qquad -2x$
$y = 7 - 2x$

infinitely Many Solutions because the slopes & y-intercepts are the same.

    d. $6x + 3y = 12$
        $y = -2x + 2$

$6x + 3y = 12$
$-6x \qquad -6x$
$3y = 12 - 6x$

$\dfrac{3y = 12 - 6x}{3 \qquad 3}$
$y = 4 - 2x$

No solution because the slopes are the same but the y-intercepts are different.