Key

Math 1

Midterm Review

Name_____

1. Mr. McGrath conducts a study to estimate the relationship between the cost of a certain magazine and the number of copies purchased. The table below gives the data he collected.

Cost (in dollars)	0 (free)	1	2	3	4
Number of magazines purchased	67	49	39	30	22

a. Describe the overall pattern relating the cost of the magazine to the number of magazines purchased.

There is a general linear pattern. As the cost increases, the number of magazines purchased decreases.

b. Find the linear regression equation for the data. Let x stand for the cost, and y stand for the number of magazines purchased.

$y = -10.9x + 63.2$

c. Use the linear regression equation to predict how many magazines would sell for a price of $6.

$y = -10.9(6) + 63.2$

$= -65.4 + 63.2$

$y = -2.2$

↓

No magazines would be sold.

d. Use the linear regression equation to predict what the cost must be to sell exactly 1 magazine.

$1 = -10.9x + 63.2$

$-62.2 = -10.9x$

$x \approx \$5.71$

e. What is the correlation coefficient? Use it to describe the strength and direction of the linear model.

$r = -0.985$

There is a strong, negative association between cost of a magazine & the # sold.

f. Mr. Nidy wants to use the equation $y = 65 + 10x$ to estimate the data that Mr. McGrath collected. Would this equation be a good fit for the data? Explain.

This would <u>not</u> be a good fit since this represents an <u>increasing</u> pattern. The equation has a positive slope.

2. The data table below shows the number of hours spent studying for an exam and the resulting grade.

Time studying (Hours)	0	1	2	2.5	3	3.5	4.5	5	6
Grade on Exam (Percent)	60	69	71	73	72	79	84	90	89

Enter the data into your calculator, using time in hours as the independent variable.

a. Find the linear regression equation: (round to three decimal places)

$f(x) = 5.007x + 61.033$

b. Find the equation by hand using the points (1 , 69) and (3 ,72)

$m = \frac{72-69}{3-1} = \frac{3}{2} = 1.5$ $\quad 69 = \frac{3}{2}(1) + b$

$67.5 = b$

$\boxed{Y = 1.5x + 67.5}$

c. Which equation would give a more accurate approximation of the grade based on how long you study? Explain.

The linear regression equation is the line of best fit. It uses all the data in the data set as well instead of just two.

d. Using the regression equation, find the expected grade if you study for 9 hours. (Round to three decimal places)

$f(9) = 5.007(9) + 61.033$

$= \boxed{106.096\%}$

e. Using the more accurate equation, find how long you would need to study to expect a grade of exactly 75%.

$75 = 5.007x + 61.033$

$13.967 = 5.007x$

$\boxed{x \approx 2.789 \text{ hours}}$

3. Is the situation from number 2 an example of causation or correlation? Explain.

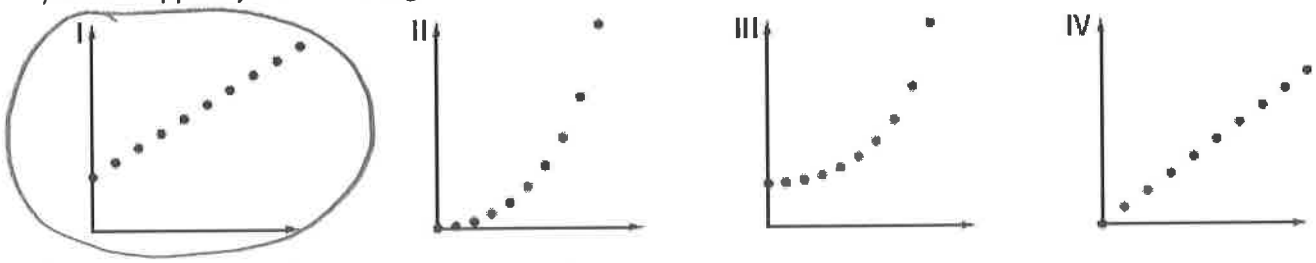
Causation! Studying more (usually) causes you to get better grades.

4. Maria's grandmother gave her a gift of $500 when she was born. Each year on her birthday Maria received $200 from her grandmother.

a. Make a table showing the **total** amount of money Maria has received from her grandmother each year. Round your answer to the nearest dollar.

Year	0	1	2	3	4	5	6
Total Amount	500	700	900	1100	1300	1500	1700

b. Which of the following scatterplots could be a plot of the (*year, total amount*) data for the first few years? **Support your reasoning.**



Support your reasoning:

Constant increase of $200 per year + starts with $500.

c. Write a recursive rule that could be used to calculate the total amount in any year from the value in the previous year.

$$\begin{cases} a_1 = ? \\ a_n = a_{n-1} + ? \end{cases} \qquad \begin{cases} a_1 = 500 \\ a_n = a_{n-1} + 200 \end{cases}$$

d. Write a "y = ..." rule that could be used to calculate the total amount for any number of years *x*.

$y = 500 + 200x$ or $y = 200x + 500$

e. What is the total amount of Maria's account after 11 years? **Show your work!!**

$y = 500 + 200(11)$

$y = \$2{,}700$

f. Maria wants to have $4,000 in her account in order to buy a car. How old, to the nearest year, would she be when she is able to buy a car? **Show work or explain how you got your answer.**

$4000 = 500 + 200x$

$3500 = 200x$

$x = 17.5$

She will be about 18 years old.

ARITHMETIC SEQUENCES: *Recursive:* $\begin{cases} a_1 = ? \\ a_n = a_{n-1} + d \end{cases}$ *Explicit:* $a_n = a_1 + d(n-1)$ $d = -5$

5. Write the recursive and explicit formula for the following arithmetic sequence: 19, 14, 9, 4…

$a_1 = 19$
$a_n = a_{n-1} - 5$

Recursive Formula

$a_n = 19 + (n-1)(-5)$

Explicit Formula

6. Find the missing terms of the following arithmetic sequence. **You must show work.**

-5, 1, 7, 13, 19, 25

$-5 + 5d = 25$
$5d = 30$
$d = 6$

Two formulas are given for the same arithmetic sequence. Use them for number 7 and 8.

$\begin{cases} a_1 = 12 \\ a_n = a_{n-1} - 5 \end{cases}$ $a_n = 12 - 5(n-1)$

7. Find a_{30}.

$a_{30} = 12 - 5(30-1)$
$= -133$

The 30th term is -133.

8. If the sequence continued, which term would -208 be?

a_n

$-208 = 12 - 5(n-1)$
$-220 = -5(n-1)$
$44 = n-1$
$45 = n$

-208 is the 45th term.

Solve the following systems of equations.

9. $\begin{cases} y = 5x - 7 \\ -3x - 2y = -12 \end{cases}$ **(2, 3)**

$-3x - 2(5x - 7) = -12$

$-3x - 10x + 14 = -12$

$-14 \quad -14$

$-13x = -26$

$x = 2$

$y = 5(2) - 7$

$= 3$

10. $\begin{cases} -4x + y = 6 \\ -5x - y = 21 \end{cases}$ **(-3, -6)**

$-9x = 27$

$x = -3$

$-4(-3) + y = 6$

$12 + y = 6$

$y = -6$

11. $\begin{cases} -5x + y = -3 \\ 3x - 8y = 24 \end{cases}$ $8 \rightarrow -40x + 8y = -24$

$3x - 8y = 24$

(0, -3)

$-37x = 0$

$x = 0$

$-5(0) + y = -3$

$y = -3$

12. $\begin{cases} -3x + 3y = 4 \\ -x + y = 3 \end{cases}$ $-3 \rightarrow 3x - 3y = -9$

$0 = -5$

No solution

13. $\begin{cases} -2x + 6y = 6 \\ -7x + 8y = -5 \end{cases}$ $7 \rightarrow -14x + 42y = 42$

$-2 \rightarrow 14x - 16y = 10$

(3, 2)

$26y = 52$

$y = 2$

$-2x + 6(2) = 6$

$-2x = -6$

$x = 3$

14. $\begin{cases} y = -1 - x \\ y = x - 1 \end{cases}$ **(0, -1)**

$-1 - x = x - 1$

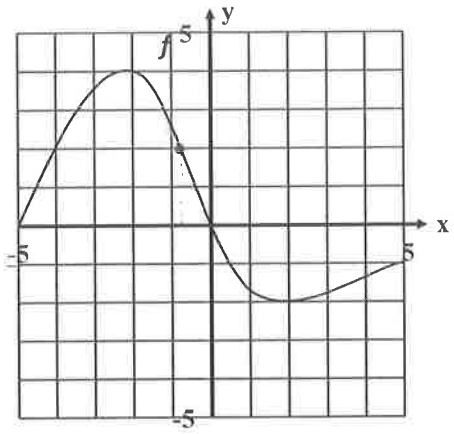
$0 = 2x$

$x = 0$

$y = 0 - 1$

$y = -1$

Given this graph of the function $f(x)$:



15. Find:

a. $f(-4) =$ 2 (x = -4) b. $f(0) =$ 0 c. $f(3) =$ -1.8 d. $f(-5) =$ 0

e. x when $f(x) = 2$

$x = -4$ or $x = -0.8$

f. x when $f(x) = 0$

$x = -5$ or $x = 0$

16. Find an equation of a linear function given $h(1) = 6$ and $h(4) = -3$.
(NOTE: This is the same question as "write the equation of the line given two points…")

(1, 6) & (4, -3)

$\frac{6 - -3}{1 - 4} = \frac{9}{-3} = -3$

$6 = -3(1) + b$

$6 = -3 + b$

$9 = b$

$h(x) = -3x + 9$

17. Which of the following expressions is equivalent to $4x - 3(x - 5)$? $= 4x - 3x + 15$

A) $x - 15$ B) $x + 15$ C) $x - 5$ D) $x + 5$

18. The slope and the y-intercept of the line with the rule $y = -2x + 9$ are

A) The slope is 9 and the y-intercept is (0, -2)
B) The slope is -2 and the y-intercept is (0, 9)
C) The slope is $-2x$ and the y-intercept is (0, 9)
D) The slope is -9 and the y-intercept is (0, 2)

19. Given the line with slope 4 and containing point (6, -8), find the equation in *point-slope* form.

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

A) $y = 4x - 8$
B) $y + 8 = 4(x - 6)$
C) $y - 6 = 4(x + 8)$
D) $y - 8 = x + 6$

In problems 20-23, use the following situation:

The hockey coach at Mayfield High School wants to purchase jerseys for his players. The local sporting goods store will charge $50 per jersey plus a one-time fee of $15 to set up the design to be printed on each jersey.

20. What will it cost to purchase a jersey for each of the 20 players? $50 \cdot 20 + 15$

A) $1,000 B) $350 C) $1,015 D) $65

21. If the two coaches also wanted a jersey, what would the total cost be for them and the team? $1015 + 100$

A) $750 B) $1,115 C) $115 D) $380

22. Using C for the total cost and J for the jerseys ordered, which formula below could be used to determine the cost of an order of jerseys?

A) C = 15J + 50 B) J = 15C + 50

C) J = 50C + 15 D) C = 50J + 15

23. How many jerseys could be purchased with $1,665?

A) 33 B) 50 C) 18 D) 23

$1665 = 50J + 15$

$1650 = 50J$

$J = 33$ jerseys

24. What is the slope of the line that passes through the points (-4, 5) and (8, -1)? $m = \frac{5-(-1)}{-4-8} = \frac{6}{-12}$

A) $\frac{1}{2}$ B) $-\frac{1}{2}$ C) -2 D) 1

25. Write the equation of the line in *point-slope* form passing through the points (-4, 5) and (8, -1). $m = -\frac{1}{2}$

A) $y+1=-\frac{1}{2}(x+8)$ B) $y-5=-\frac{1}{2}(x-8)$

C) $y-5=-\frac{1}{2}(x+4)$ D) $y+5=-\frac{1}{2}(x-4)$

26. Apply the distributive property to expand the following expression $-4(7x+2)$

A) $11x+6$ B) $3x-2$ C) $-28x-8$ D) $-28x+8$

27. Which of the following is an example of a linear function?

A) $y=5(0.2)^x$ B) $y=5-2x$ C) $y=5(2)^x$ D) $y=5x^2$

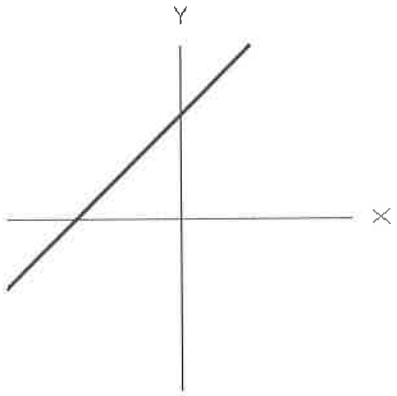
28. Taylor took a monthly plan from a mobile company that offered her 400 minutes free calling for $39.99 per month plus $0.25 per minute for any extra call. Write a rule that shows how the total monthly bill is related to the number of calls. C = Cost of the bill m = minutes used.

A) $C = 39.99 + 0.25(m - 400)$ B) $C = 39.99 + 0.25m$

C) $C = 0.25m$ D) $C = 39.99m + 0.25m$

No extra charge until 401 minutes are used.

29. Which equation would give the graph pictured at the right? (a is a positive constant)



A) $y = ax + 5$ B) $y = \frac{a}{x}$

Positive y-intercept

C) $y = ax - 5$ D) $y = ax^2$

Use the following information to answer questions **30-32**.

Boston Mills charges $43 for each ticket to ski at their resort. Boston Mills has daily operating expenses of $3546.

30. Which symbolic rule showing how daily profit ***P*** for Boston Mills depends on the number of tickets ***t*** sold?

A) $P = 3546 + 43t$ B) $P = -3546 + 43t$ Same as $P = 43t - 3546$

C) $P = -3546t + 43$ D) $P = 3546t + 43$

31. What is the profit on a day when 100 tickets are sold? $P = -3546 + 43(100)$

A) $4300 B) $354600 C) $754 D) $7846

32. How many tickets need to be sold for a $6817 profit? $6817 = -3546 + 43t$

A) 159 B) 241 C) 76 D) 3271

33. Which of the following is a coordinate that would be on the line $y - 5 = -3(x + 6)$? → point-slope form

A) $(6, -5)$ B) $(-3, -5)$ C) $(3, 5)$ D) $(-6, 5)$

34. Which of the following is the slope of the line $y - 5 = -3(x + 6)$?

A) 3 B) -3 C) -18 D) 5

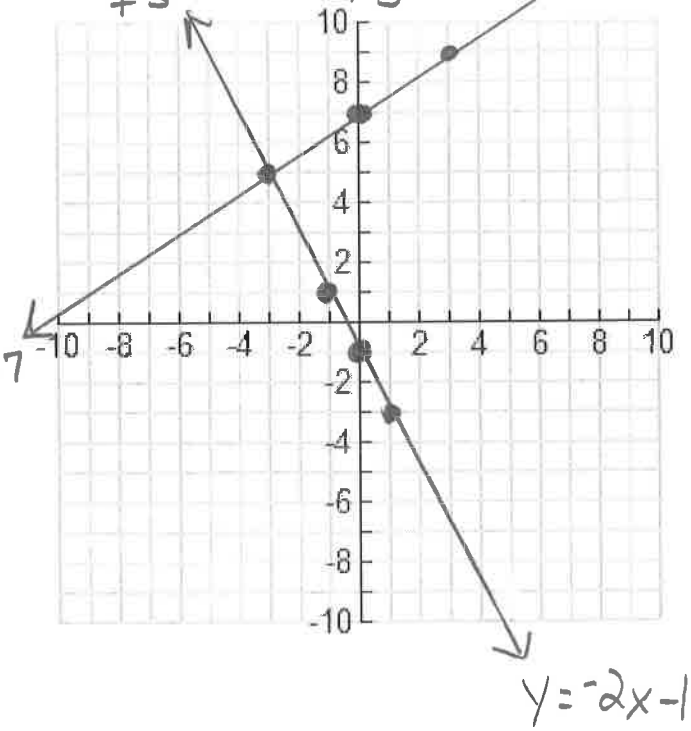
35. Which of the following is the equation of the line $y-5=-3(x+6)$ in slope-intercept form?

A) $y=-3x-13$ B) $y=-3x-18$ C) $y=-3x+23$ D) $y=-3x+11$

36. Solve the following system by graphing.

$$\begin{cases} y=\frac{2}{3}x+7 \\ y=-2x-1 \end{cases}$$

$Y-5=-3x-18$
$+5 \quad +5$



$Y=\frac{2}{3}x+7$

$Y=-2x-1$

Solution: $(-3, 5)$

*******Don't forget to study the other methods for solving systems of equations (substitution and elimination) as well as systems of linear inequalities and linear programming! Also, in addition to completing this packet, it's a great idea to look over your old tests and quizzes as a way to study. Answers for this packet are posted on my website!!*******