Helpful Hints

Name: _____   **Date:** _____

Show your work for full credit.

1. The owner of a small computer repair business has one employee, who is paid an hourly rate of \$22. The owner estimates his weekly profit using the function $P(x) = 8600 - 22x$. In this function, x represents the number of

   A. computers repaired per week   B. hours worked per week

   C. customers served per week   D. days worked per week

want: $\dfrac{miles}{hour}$

2. Peyton is a sprinter who can run the 40-yard dash in 4.5 seconds. He converts his speed into miles per hour, as shown below.

Remember: units cancel out diagonally!

$$\frac{40\,\text{yd}}{4.5\,\text{sec}} \cdot \frac{3\,\text{ft}}{1\,\text{yd}} \cdot \frac{5280\,\text{ft}}{1\,\text{mi}} \cdot \frac{60\,\text{sec}}{1\,\text{min}} \cdot \frac{60\,\text{min}}{1\,\text{hr}}$$

use reference sheet for conversions!

   Which ratio is *incorrectly* written to convert his speed?

   A. $\dfrac{3\,\text{ft}}{1\,\text{yd}}$ B. $\dfrac{5280\,\text{ft}}{1\,\text{mi}}$ C. $\dfrac{60\,\text{sec}}{1\,\text{min}}$ D. $\dfrac{60\,\text{min}}{1\,\text{hr}}$

Exponential!

3. Krystal was given \$3000 when she turned 2 years old. Her parents invested it at a 2% interest rate compounded annually. No deposits or withdrawals were made. Which expression can be used to determine how much money Krystal had in the account when she turned 18?

   A. $3000(1 + 0.02)^{16}$ B. $3000(1 - 0.02)^{16}$ C. $3000(1 + 0.02)^{18}$ D. $3000(1 - 0.02)^{18}$

Exponential Growth: $\quad y = a(1 + r)^{t} \leftarrow$ time passed

initial value   *% growth as decimal*

page 1

4. Which table of values represents a linear relationship?

A.
change? *+1, +3, +5, +7*

x	$f(x)$
-1	-3
0	-2
1	1
2	6
3	13

B.
change?

x	$f(x)$
-1	$\frac{1}{2}$
0	1
1	2
2	4
3	8

C.

x	$f(x)$
-1	-3
0	-1
1	1
2	3
3	5

D.

x	$f(x)$
-1	-1
0	0
1	1
2	8
3	27

A linear relationship has a constant rate of change

5. Sue and Kathy were doing their algebra homework. They were asked to write the equation of the line that passes through the points $(-3, 4)$ and $(6, 1)$. Sue wrote $y - 4 = -\frac{1}{3}(x + 3)$ and Kathy wrote $y = -\frac{1}{3}x + 3$. Justify why both students are correct.

Justify means PROVE!
Try "checking" the points

Sue

Kathy

6. Which domain would be the most appropriate set to use for a function that predicts the number of household online-devices in terms of the number of people in the household?

   A. integers

   B. whole numbers

   C. irrational numbers

   D. rational numbers

★ Look up definitions before choosing!

Show all work solving! "Don't Call Me After Midnight"

7. The inequality $7 - \frac{2}{3}x < x - 8$ is equivalent to

   A. $x > 9$
   B. $x > -\frac{3}{5}$
   C. $x < 9$
   D. $x < -\frac{3}{5}$

8. The value in dollars, $v(x)$, of a certain car after x years is represented by the equation $v(x) = 25,000(0.86)^x$. To the *nearest dollar*, how much more is the car worth after 2 years than after 3 years?
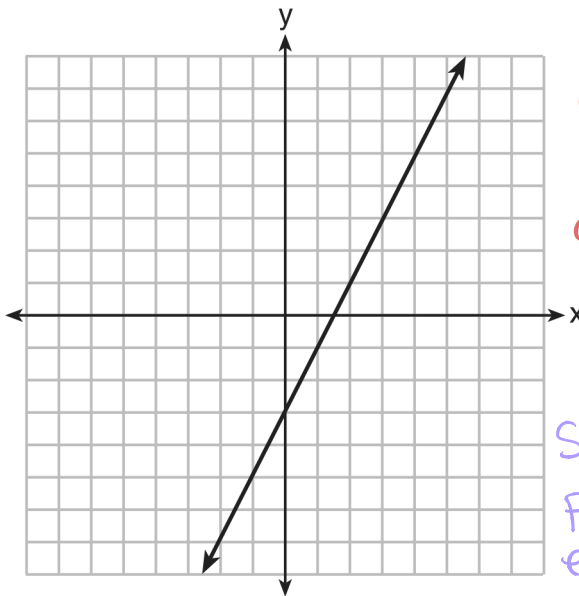
A. 2589　　　　B. 6510　　　　C. 15,901　　　　D. 18,490

use Calculator
$y = 25000(0.86)^x$
Compare at 2 years and 3 years using Table!

years X	$ Y
2	
3	

9. Which function has the same y-intercept as the graph below?

Circle the Y-intercept and label it (,).
x   Y

Substitute this point into each equation to find which "checks".

A. $y = \dfrac{12 - 6x}{4}$　　　B. $27 + 3y = 6x$　　　C. $6y + x = 18$　　　D. $y + 3 = 6x$

OR
change each into
y = mx + b
↑
Y-int.

10. For a class picnic, two teachers went to the same store to purchase drinks. One teacher purchased 18 juice boxes and 32 bottles of water, and spent $19.92. The other teacher purchased 14 juice boxes and 26 bottles of water, and spent $15.76.

(A) Write a system of equations to represent the costs of a juice box, j, and a bottle of water, w.

(B) Kara said that the juice boxes might have cost 52 cents each and that the bottles of water might have cost 33 cents each. Use your system of equations to justify that Kara's prices are *not* possible.

(C) Solve your system of equations to determine the actual cost, in dollars, of each juice box and each bottle of water.

[handwritten: SOLVE using elimination.]

[handwritten: write 2 equations]
#1: _____
#2: _____

[handwritten: Test Kara's Theory by checking.]

11. Fred is given a rectangular piece of paper. If the length of Fred's. piece of paper is represented by $2x - 6$ and the width is represented by $3x - 5$, then the paper has a total area represented by *[handwritten: multiply]*

A. $5x - 11$ B. $6x^2 - 28x + 30$ C. $10x - 22$ D. $6x^2 - 6x - 11$

[handwritten: L × W]
[handwritten: ( )( )]
[handwritten: Double Distribute]
*[handwritten: *or "matching" game!]*

12. The graph of a linear equation contains the points $(3, 11)$ and $(-2, 1)$. Which point also lies on the graph?

[handwritten: STEPS]
[handwritten: ① Slope]
[handwritten: ② Pick a point]
[handwritten: ③ Plug it in to y=mx+b]
[handwritten: ④ Solve for b]
[handwritten: ⑤ write equation.]

A. $(2, 1)$ B. $(2, 4)$ C. $(2, 6)$ D. $(2, 9)$

[handwritten: Put equation in y= and look for a point.]

13. Connor wants to attend the town carnival. The price of admission to the carnival is $4.50, and each ride costs an additional 79 cents. If he can spend at most $16.00 at the carnival, which inequality can be used to solve for r, the number of rides Connor can go on, and what is the maximum number of rides he can go on?

A. $0.79 + 4.50r \leq 16.00$; 3 rides   B. $0.79 + 4.50r \leq 16.00$; 4 rides

C. $4.50 + 0.79r \leq 16.00$; 14 rides   D. $4.50 + 0.79r \leq 16.00$; 15 rides

14. Some banks charge a fee on savings accounts that are left inactive for an extended period of time. The equation $y = 5000(0.98)^x$ represents the value, y, of one account that was left inactive for a period of x years.

What is the y-intercept of this equation and what does it represent?

Look at notes from question 3.

A. 0.98, the percent of money in the account initially

B. 0.98, the percent of money in the account after x years

C. 5000, the amount of money in the account initially

D. 5000, the amount of money in the account after x years

15. Jacob and Zachary go to the movie theater and purchase refreshments for their friends. Jacob spends a total of $18.25 on two bags of popcorn and three drinks. Zachary spends a total of $27.50 for four bags of popcorn and two drinks.

Write a system of equations that can be used to find the price of one bag of popcorn and the price of one drink. *Let statement*

write 2 Equations

Using these equations, determine and state the price of a bag of popcorn and the price of a drink, to the *nearest cent*.

Solve using elimination. (criss/cross negate)

Jacob: _____

Zach: _____

16. If a sequence is defined recursively by $f(0) = 2$ and $f(n + 1) = \boxed{-2f(n) + 3}$ for $n \geq 0$, then $f(2)$ is equal to

0 term   next term

A. 1   B. −11   C. 5   D. 17

$$-2(n-1)+3$$

previous term

Substitute previous term

$$\frac{2}{0} \quad \frac{}{1} \quad \frac{}{2}$$

term   term   term

17. An astronaut drops a rock off the edge of a cliff on the Moon. The distance, $d(t)$, in meters, the rock travels after t seconds can be modeled by the function $d(t) = 0.8t^2$. What is the average speed, in meters per second, of the rock between 5 and 10 seconds after it was dropped?

A. 12   B. 20   C. 60   D. 80

[Handwritten annotations: Rate of change; $m = \dfrac{y_2 - y_1}{x_2 - x_1}$; use slope formula. $y = 0.8x^2$. Table: $x \mid y$, x_1: 5, x_2: 10, y_1, y_2.]

18. In 2013, the United States Postal Service charged \$0.46 to mail a letter weighing up to 1 oz. and \$0.20 per ounce for each additional ounce. Which function would determine the cost, in dollars, $c(z)$, of mailing a letter weighing z ounces where z is an integer greater than 1?

A. $c(z) = 0.46z + 0.20$

B. $c(z) = 0.20z + 0.46$

C. $c(z) = 0.46(z - 1) + 0.20$

D. $c(z) = 0.20(z - 1) + 0.46$

[Handwritten: $y = mx + b$; Rate of change? starting price?]

19. The cost of airing a commercial on television is modeled by the function $C(n) = 110n + 900$, where n is the number of times the commercial is aired. Based on this model, which statement is true?

A. The commercial costs \$0 to produce and \$110 per airing up to \$900.

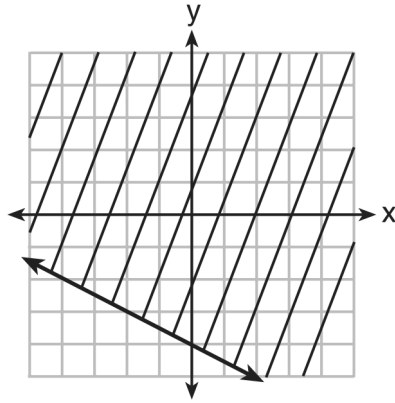B. The commercial costs \$110 to produce and \$900 each time it is aired.

C. The commercial costs \$900 to produce and \$110 each time it is aired.

D. The commercial costs \$1010 to produce and can air an unlimited number of times.

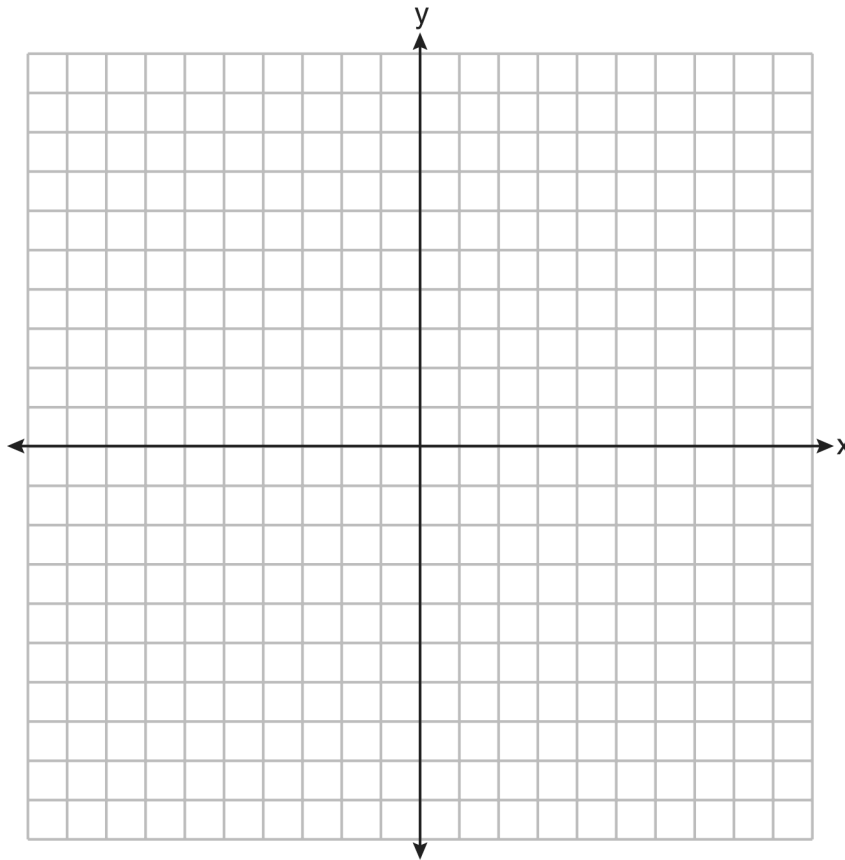20. Shawn incorrectly graphed the inequality $-x - 2y \geq 8$ as shown below.

Explain Shawn's mistake.

Graph the inequality correctly on the set of axes below.

(handwritten annotations in blue:)
when ÷ by negative, FLIP the inequality!

(handwritten annotations in red:)
→ Solve to get y alone! (y = mx + b)
• Then m = ___ b = ___
• graph below

(handwritten annotations in blue at bottom:)
Arrows?
Label?
Dash or Solid Line?
Shade up or down?

21. The graph below represents a jogger's speed during her 20-minute jog around her neighborhood.
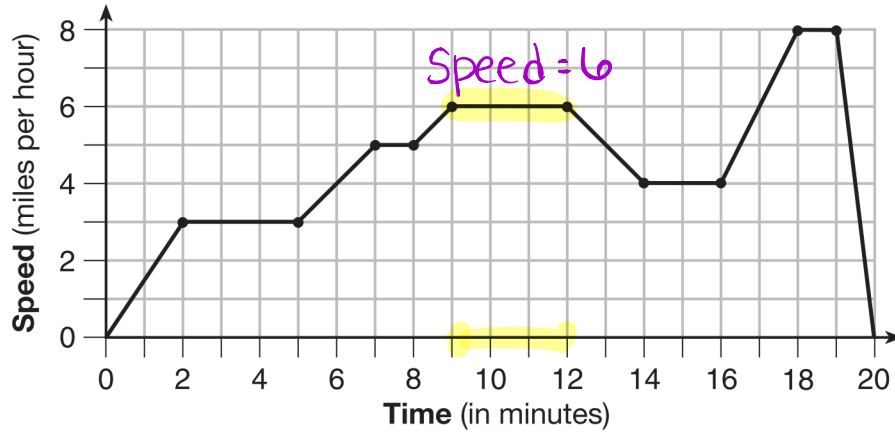
Speed = 6

Which statement best describes what the jogger was doing during the 9–12 minute interval of her jog?

A. She was standing still.

B. She was increasing her speed.

C. She was decreasing her speed.

D. She was jogging at a constant rate.

the "factors"

22. If the area of a rectangle is expressed as $x^4 - 9y^2$, then the product of the length and the width of the rectangle could be expressed as

A. $(x - 3y)(x + 3y)$ B. $(x^2 - 3y)(x^2 + 3y)$ C. $(x^2 - 3y)(x^2 - 3y)$ D. $(x^4 + y)(x - 9y)$

Factor this!
GCF?
✱DOTS?
Trinomial?

23. Which table represents a function?

A.

x	2	4	2	4
$f(x)$	3	5	7	9

B.

x	0	−1	0	1
$f(x)$	0	1	−1	0

C.

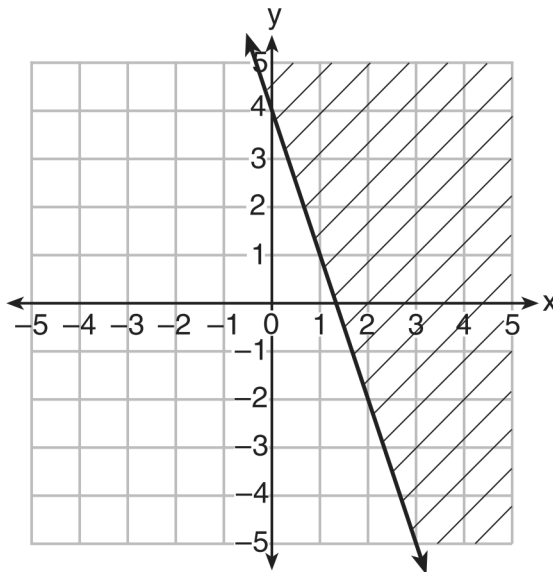| x	3	5	7	9
$f(x)$	2	4	2	4

D.

x	0	1	−1	0
$f(x)$	0	−1	0	1

what is definition of "function"? (Look it up!)

24. Which inequality is represented in the graph below?

graph each answer and compare to this →

A. $y \geq -3x + 4$ B. $y \leq -3x + 4$ C. $y \geq -4x - 3$ D. $y \leq -4x - 3$

what type of line? where would it be shaded?

25. A drama club is selling tickets to the spring musical. The auditorium holds 200 people. Tickets cost $12 at the door and $8.50 if purchased in advance. The drama club has a goal of selling at least $1000 worth of tickets to Saturday's show.

Write a system of inequalities that can be used to model this scenario.

If 50 tickets are sold in advance, what is the minimum number of tickets that must be sold at the door so that the club meets its goal? Justify your answer.
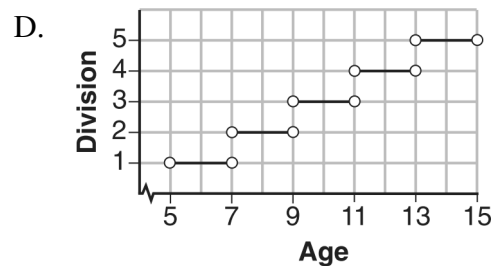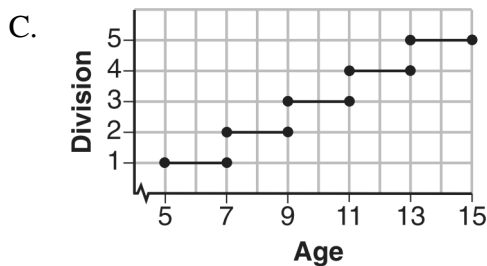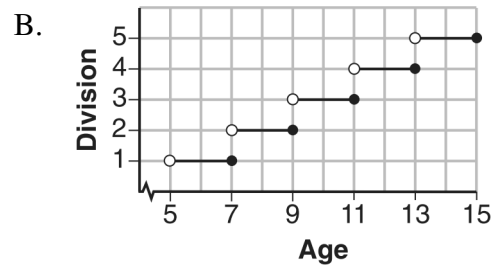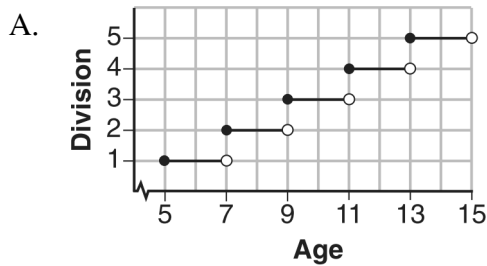
let statement.
Write 2 inequalities.
 # people →
$ →

26. *● at (5, 1)*
Morgan can start wrestling at age 5 in Division 1. He remains in that division until his next odd birthday when he is required to move up to the next division level. Which graph correctly represents this information? *● at (7, 2)*

A.

Division vs Age

B.

Division vs Age

C.

Division vs Age

D.

Division vs Age

27. Joey enlarged a 3-inch by 5-inch photograph on a copy machine. He enlarged it four times. The table below shows the area of the photograph after each enlargement.

orig

Enlargement	0	1	2	3	4
Area (sq in)	15	18.8	23.4	29.3	36.6

SLOPE

What is the average rate of change of the area from the original photograph to the fourth enlargement, to the *nearest tenth*?

A. 4.3   B. 4.5   C. 5.4   D. 6.0

28. A laboratory technician studied the population growth of a colony of bacteria. He recorded the number of bacteria every other day, as shown in the partial table below.

t (time, in days)	0	2	4
$f(t)$ (bacteria)	25	15,625	9,765,625

Which function would accurately model the technician's data?

A. $f(t) = 25^t$ B. $f(t) = 25^{t+1}$ C. $f(t) = 25t$ D. $f(t) = 25(t + 1)$
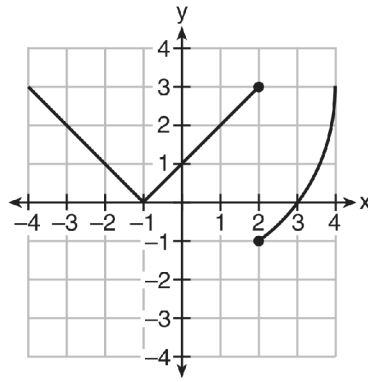
Matching Game on calc! Want →

x	y
0	25
2	15625

29. If $f(x) = 3^x$ and $g(x) = 2x + 5$, at which value of x is $f(x) < g(x)$?

$y_1 =$ $y_2 =$

A. −1   B. 2   C. −3   D. 4

put in $y_1 =$
and $y_2 =$
Compare on table.

30. Marcel claims that the graph below represents a function.

what does it mean to be a function on a graph? (a special "test")

State whether Marcel is correct. Justify your answer.

31. The function $V(t) = 1350(1.017)^t$ represents the value $V(t)$, in dollars, of a comic book t years after its purchase. The yearly rate of appreciation of the comic book is
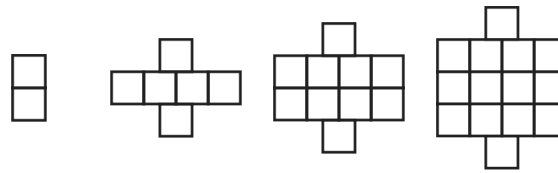
A. 17%   B. 1.7%   C. 1.017%   D. 0.017%

what % growth over 100%?

32. A pattern of blocks is shown below.

[handwritten: what kind of sequence?]

Term 1   Term 2   Term 3   Term 4

If the pattern of blocks continues, which formula(s) could be used to determine the number of blocks in the nth term?

I	II	III
$a_n = n + 4$	$a_1 = 2$ $a_n = a_{n-1} + 4$	$a_n = 4n - 2$

A. I and II   B. I and III   C. II and III   D. III, only

33. Natasha is planning a school celebration and wants to have live music and food for everyone who attends. She has found a band that will charge her $750 and a caterer who will provide snacks and drinks for $2.25 per person. If her goal is to keep the average cost per person between $2.75 and $3.25, how many people, p, must attend?

A. $225 < p < 325$ B. $325 < p < 750$ C. $500 < p < 1000$ D. $750 < p < 1500$
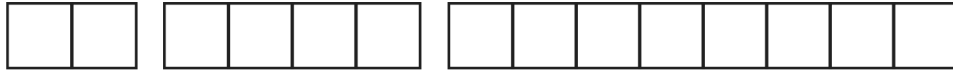
[handwritten: write equation. plug in each. find 2 answers.]

34. Given the graph of the line represented by the equation $f(x) = -2x + b$, if b is increased by 4 units, the graph of the new line would be shifted 4 units

A. right   B. up   C. left   D. down

[handwritten: what does "b" represent?]

35. Consider the pattern of squares shown below:

Which type of model, linear or exponential, should be used to determine how many squares are in the *n*th pattern? Explain your answer.

Linear: + or −

Exp: × ÷ or %

36. Rowan has $50 in a savings jar and is putting in $5 every week. Jonah has $10 in his own jar and is putting in $15 every week. Each of them plots his progress on a graph with time on the horizontal axis and amount in the jar on the vertical axis. Which statement about their graphs is true?

write 2 equations

y = mx + b.

A. Rowan's graph has a steeper slope than Jonah's.

B. Rowan's graph always lies above Jonah's.

C. Jonah's graph has a steeper slope than Rowan's.

D. Jonah's graph always lies above Rowan's.

37. To watch a varsity basketball game, spectators must buy a ticket at the door. The cost of an adult ticket is $3.00 and the cost of a student ticket is $1.50. If the number of adult tickets sold is represented by *a* and student tickets sold by *s*, which expression represents the amount of money collected at the door from the ticket sales?

A. $4.50as$ B. $4.50(a + s)$ C. $(3.00a)(1.50s)$ D. $3.00a + 1.50s$

38. The cost of a pack of chewing gum in a vending machine is $0.75. The cost of a bottle of juice in the same machine is $1.25. Julia has $22.00 to spend on chewing gum and bottles of juice for her team and she must buy seven packs of chewing gum. If b represents the number of bottles of juice, which inequality represents the maximum number of bottles she can buy?
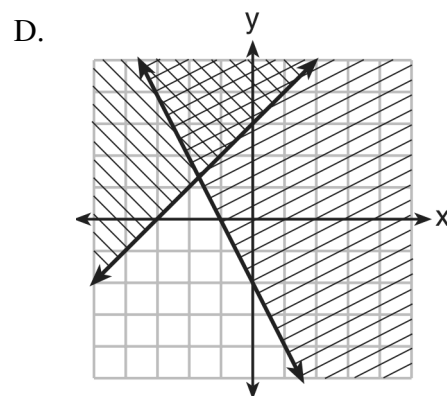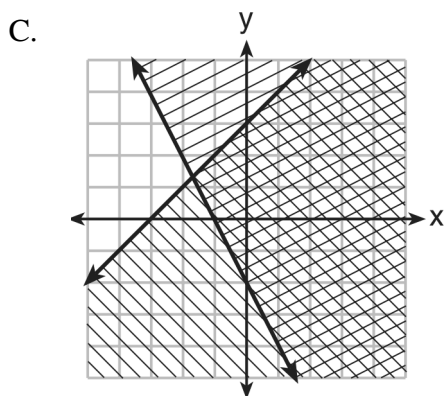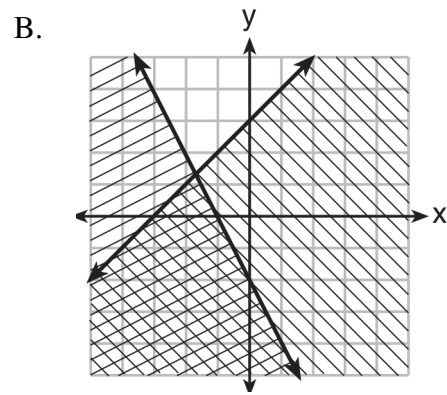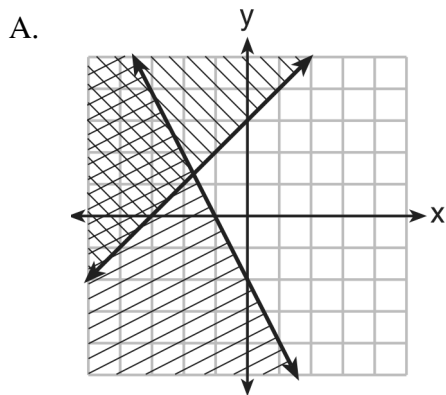
A. $0.75b + 1.25(7) \geq 22$

B. $0.75b + 1.25(7) \leq 22$

C. $0.75(7) + 1.25b \geq 22$
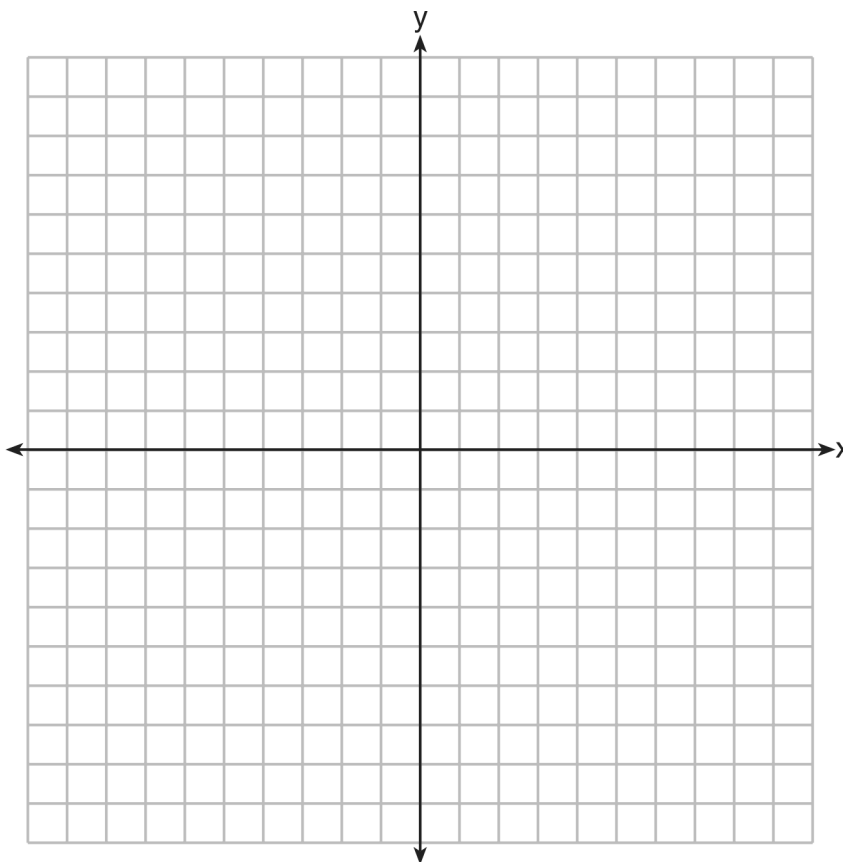
D. $0.75(7) + 1.25b \leq 22$

check shading for each!

39. Which graph represents the solution of $y \leq x + 3$ and $y \geq -2x - 2$?

A.

B.

C.

D.

40. Graph the function $y = |x - 3|$ on the set of axes below.

Table.

Find the "turning point"
(where pattern repeats)

Graph
— arrows
— label

Explain how the graph of $y = |x - 3|$ has changed from the related graph $y = |x|$.

41. Four expressions are shown below.

✗ Simplify each. (Distribute, CLT)

   I. $2(2x^2 - 2x - 60)$
   II. $4(x^2 - x - 30)$
   III. $4(x + 6)(x - 5)$
   IV. $4x(x - 1) - 120$

or
Matching Game!

The expression $4x^2 - 4x - 120$ is equivalent to

A. I and II, only   B. II and IV, only   C. I, II, and IV   D. II, III, and IV

42. Last week, a candle store received $355.60 for selling 20 candles. Small candles sell for $10.98 and large candles sell for $27.98. How many large candles did the store sell?

   A. 6   B. 8   C. 10   D. 12

43. Which representations are functions?

I

x	y
2	6
3	−12
4	7
5	5
2	−6

II $\{(1, 1),\ (2, 1),\ (3, 2),\ (4, 3),\ (5, 5),\ (6, 8),\ (7, 13)\}$

III
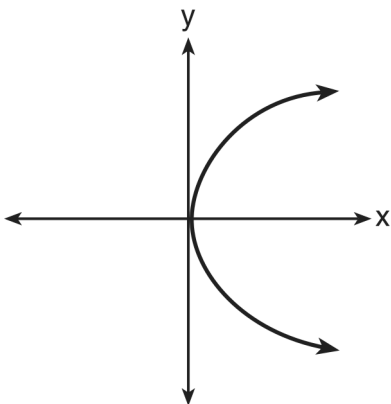
IV $y = 2x + 1$

   A. I and II   B. II and IV   C. III, only   D. IV, only

f(1) =

44. Which recursively defined function has a first term equal to 10 and a common difference of 4?

    A. $f(1) = 10$
         $f(x) = f(x-1) + 4$

    B. $f(1) = 4$
         $f(x) = f(x-1) + 10$

    C. $f(1) = 10$
         $f(x) = 4f(x-1)$

    D. $f(1) = 4$
         $f(x) = 10f(x-1)$

45. Solve for *x* algebraically: $7x - 3(4x - 8) < 6x + 12 - 9x$

If *x* is a number in the interval $[4, 8]$, state all integers that satisfy the given inequality. Explain how you determined these values.

Show all work!

46. Firing a piece of pottery in a kiln takes place at different temperatures for different amounts of time. The graph below shows the temperatures in a kiln while firing a piece of pottery after the kiln is preheated to 200°F.
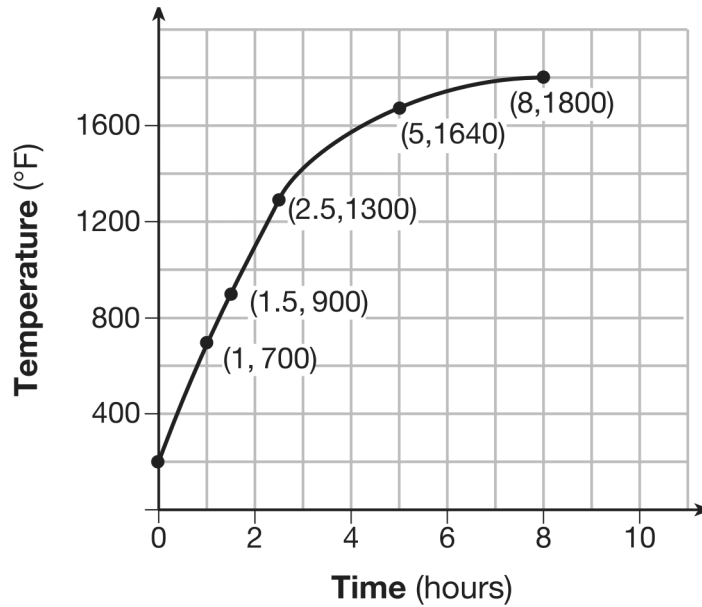
Steepest slope.

During which time interval did the temperature in the kiln show the greatest average rate of change?

A. 0 to 1 hour

B. 1 hour to 1.5 hours

C. 2.5 hours to 5 hours

D. 5 hours to 8 hours

47. Alicia has invented a new app for smart phones that two companies are interested in purchasing for a 2-year contract.

Company *A* is offering her $10,000 for the first month and will increase the amount each month by $5000.

Company *B* is offering $500 for the first month and will double their payment each month from the previous month.

Monthly payments are made at the end of each month. For which monthly payment will company *B*'s payment first exceed company *A*'s payment?

    A. 6   B. 7   C. 8   D. 9

Simplify! (or matching game!)

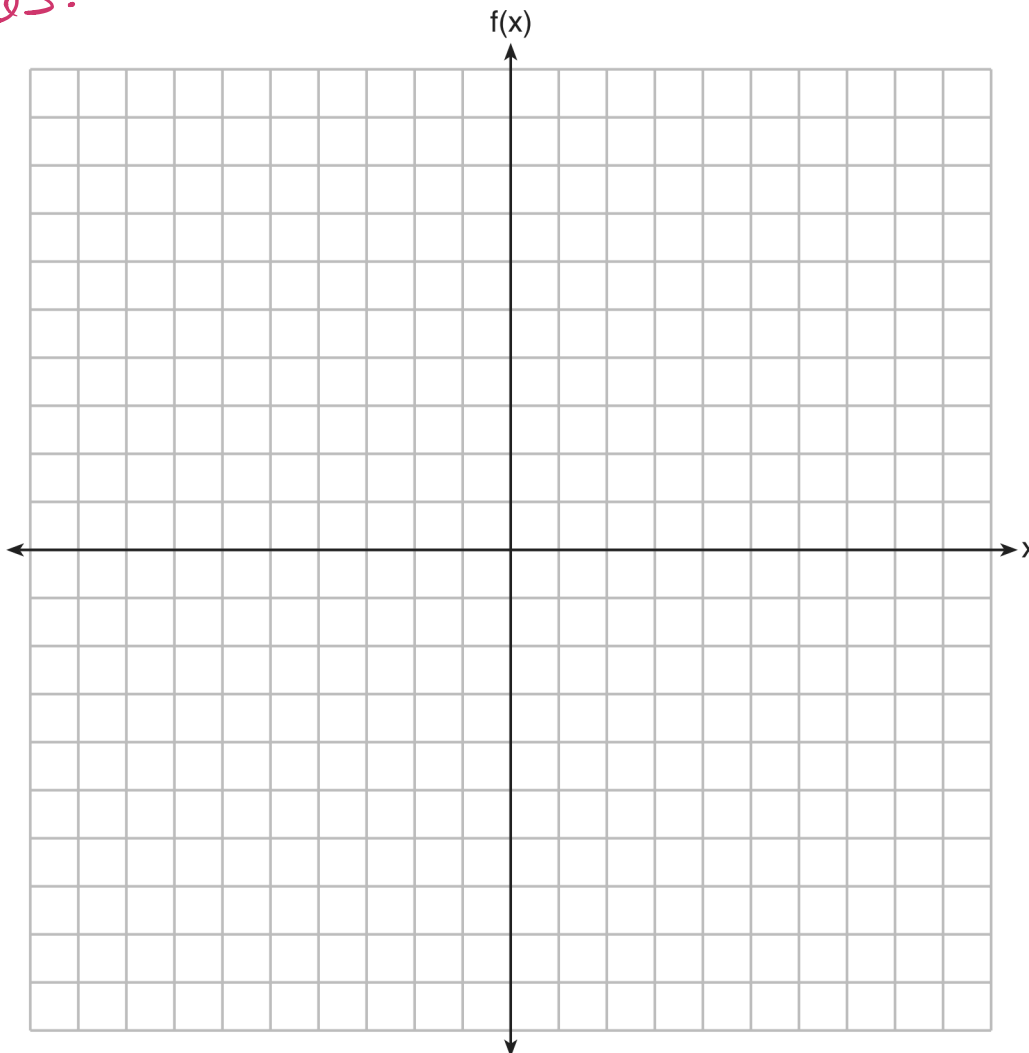48. Which trinomial is equivalent to $3(x-2)^2 - 2(x-1)$?

    A. $3x^2 - 2x - 10$ B. $3x^2 - 2x - 14$ C. $3x^2 - 14x + 10$ D. $3x^2 - 14x + 14$

49. Graph the following function on the set of axes below.

$$f(x) = \begin{cases} |x|, & -3 \le x < 1 \\ 4, & 1 \le x \le 8 \end{cases}$$

Two
pieces!
Two tables.

$|x|$

x	y
-3	
-2	
-1	
0	
1	

4

x	y
1	
2	
3	
4	
5	
6	
7	
8	

f(x)

50. Subtract $5x^2 + 2x - 11$ from $3x^2 + 8x - 7$. Express the result as a trinomial.

From
comes

(   ) − (   ).

High School Math Reference Sheet

1 inch = 2.54 centimeters   1 kilometer = 0.62 mile   1 cup = 8 fluid ounces
1 meter = 39.37 inches   1 pound = 16 ounces   1 pint = 2 cups
1 mile = 5280 feet   1 pound = 0.454 kilogram   1 quart = 2 pints
1 mile = 1760 yards   1 kilogram = 2.2 pounds   1 gallon = 4 quarts
1 mile = 1.609 kilometers   1 ton = 2000 pounds   1 gallon = 3.785 liters
                                                1 liter = 0.264 gallon
                                                1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$	Pythagorean Theorem	$a^2 + b^2 = c^2$	
Parallelogram	$A = bh$	Quadratic Formula	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
Circle	$A = \pi r^2$	Arithmetic Sequence	$a_n = a_1 + (n - 1)d$	
Circle	$C = \pi d$ or $C = 2\pi r$	Geometric Sequence	$a_n = a_1 r^{n-1}$	
General Prisms	$V = Bh$	Geometric Series	$S_n = \dfrac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$	
Cylinder	$V = \pi r^2 h$	Radians	$1 \text{ radian} = \dfrac{180}{\pi} \text{ degrees}$	
Sphere	$V = \frac{4}{3}\pi r^3$	Degrees	$1 \text{ degree} = \dfrac{\pi}{180} \text{ radians}$	
Cone	$V = \frac{1}{3}\pi r^2 h$	Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$	
Pyramid	$V = \frac{1}{3}Bh$			

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