

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA I (Common Core)

Tuesday, June 3, 2014 — 9:15 a.m. to 12:15 p.m., only

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School Name: www.jmap.org

The possession or use of any communications device is strictly prohibited when taking this examination. If you have or use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

Print your name and the name of your school on the lines above.

A separate answer sheet for Part I has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet.

This examination has four parts, with a total of 37 questions. You must answer all questions in this examination. Record your answers to the Part I multiple-choice questions on the separate answer sheet. Write your answers to the questions in Parts II, III, and IV directly in this booklet. All work should be written in pen, except graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. The formulas that you may need to answer some questions in this examination are found at the end of the examination. This sheet is perforated so you may remove it from this booklet.

Scrap paper is not permitted for any part of this examination, but you may use the blank spaces in this booklet as scrap paper. A perforated sheet of scrap graph paper is provided at the end of this booklet for any question for which graphing may be helpful but is not required. You may remove this sheet from this booklet. Any work done on this sheet of scrap graph paper will *not* be scored.

When you have completed the examination, you must sign the statement printed at the end of the answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet cannot be accepted if you fail to sign this declaration.

Notice...

A graphing calculator and a straightedge (ruler) must be available for you to use while taking this examination.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each statement or question, choose the word or expression that, of those given, best completes the statement or answers the question. Record your answers on your separate answer sheet. [48]

Use this space for computations.

1 When solving the equation $4(3x^2 + 2) - 9 = 8x^2 + 7$, Emily wrote $4(3x^2 + 2) = 8x^2 + 16$ as her first step. Which property justifies Emily's first step?

- (1) addition property of equality
- (2) commutative property of addition
- (3) multiplication property of equality
- (4) distributive property of multiplication over addition

$$\begin{array}{r} 4(3x^2 + 2) - 9 = 8x^2 + 7 \\ \text{Step 1} \quad \quad \quad + 9 \quad \quad \quad + 9 \\ \hline 4(3x^2 + 2) = 8x^2 + 16 \end{array}$$

2 Officials in a town use a function, C , to analyze traffic patterns. $C(n)$ represents the rate of traffic through an intersection where n is the number of observed vehicles in a specified time interval. What would be the most appropriate domain for the function?

- (1) $\{\dots, -2, -1, 0, 1, 2, 3, \dots\}$
- (2) $\{-2, -1, 0, 1, 2, 3\}$
- (3) $\{0, \frac{1}{2}, 1, 1\frac{1}{2}, 2, 2\frac{1}{2}\}$
- (4) $\{0, 1, 2, 3, \dots\}$

The number of observed vehicles cannot be negative numbers or fractions.

3 If $A = 3x^2 + 5x - 6$ and $B = -2x^2 - 6x + 7$, then $A - B$ equals

- (1) $-5x^2 - 11x + 13$
- (2) $5x^2 + 11x - 13$
- (3) $-5x^2 - x + 1$
- (4) $5x^2 - x + 1$

$$\begin{array}{r} 3x^2 + 5x - 6 \\ \text{subtract } (-2x^2 - 6x + 7) \\ \hline 5x^2 + 11x - 13 \end{array}$$

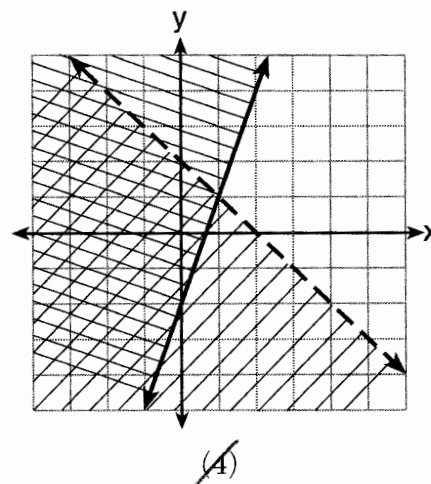
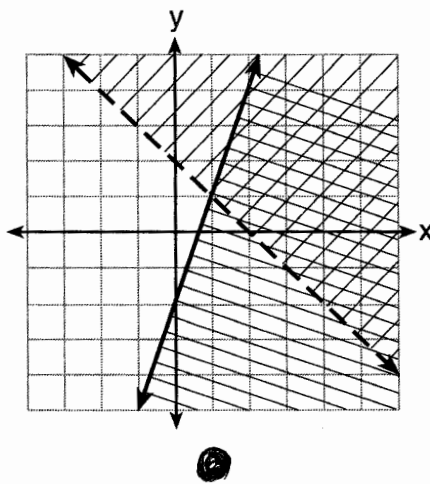
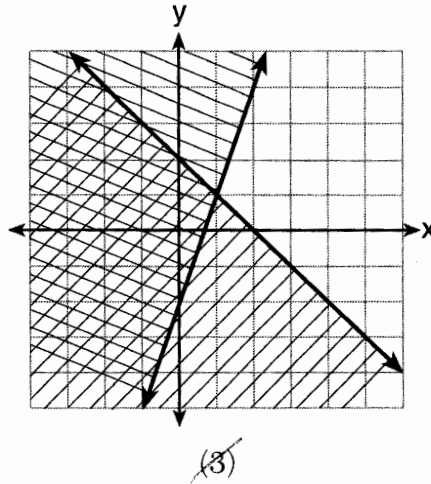
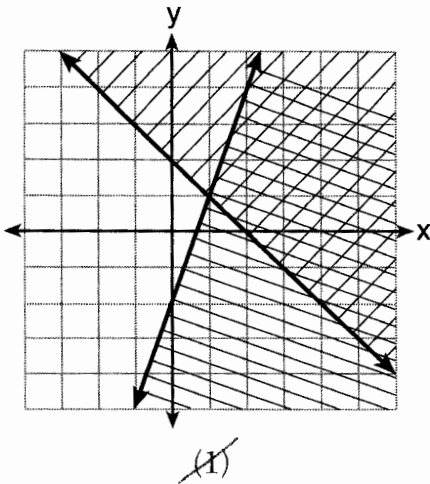
Hint: To subtract, change the signs and add

Answer

4 Given: $y + x > 2$
 $y \leq 3x - 2$

Use this space for computations.

Which graph shows the solution of the given set of inequalities?



$y + x > 2$

$y > -x + 2$

slope is -1
y-intercept is 2
shade above the dotted line

This eliminates graphs 1 and 3

$y \leq 3x - 2$

slope is $\frac{3 \text{ rise}}{1 \text{ run}}$
y-intercept is -2
shade below the solid line

This eliminates graph 4

5 Which value of x satisfies the equation $\frac{7}{3}(x + \frac{9}{28}) = 20$?

(1) 8.25

(3) 19.25

(2) 8.89

(4) 44.92

Start $\frac{7}{3}(x + \frac{9}{28}) = 20$

$\frac{7}{3}(x) + \frac{7}{3}(\frac{9}{28}) = 20$

$\frac{7x}{3} + \frac{21}{28} = 20$

$\frac{7x}{3} + \frac{3(3)}{4(3)} = 20$

$\frac{28x}{12} + \frac{9}{12} = 20$

$\frac{28x+9}{12} = 20$

$28x + 9 = 12(20) \rightarrow 28x = 231$

$28x + 9 = 240$

$x = \frac{231}{28}$

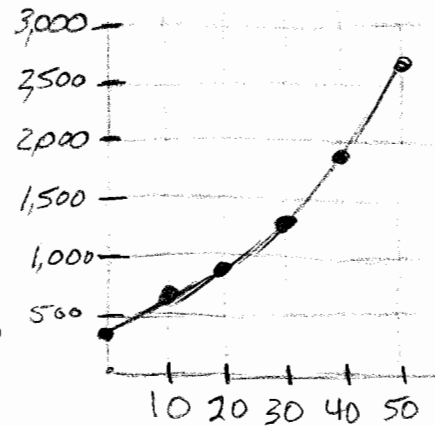
$x = 8.25$

STOP

Use this space for computations.

6 The table below shows the average yearly balance in a savings account where interest is compounded annually. No money is deposited or withdrawn after the initial amount is deposited.

Year	Balance, in Dollars
0	380.00
10	562.49
20	832.63
30	1232.49
40	1824.39
50	2700.54



Which type of function best models the given data?

- (1) ~~linear~~ function with a negative rate of change
- (2) ~~linear~~ function with a positive rate of change
- (3) ~~exponential decay~~ function
- (4) exponential growth function

7 A company that manufactures radios first pays a start-up cost, and then spends a certain amount of money to manufacture each radio. If the cost of manufacturing r radios is given by the function $c(r) = 5.25r + 125$, then the value 5.25 best represents

- (1) the start-up cost
- (2) the profit earned from the sale of one radio
- (3) the amount spent to manufacture each radio
- (4) the average number of radios manufactured

125
 $c(r) = 5.25r + 125$

↑ total cost
 ↑ cost per radio
 ↑ # of radios
 ↑ start up cost

8 Which equation has the same solution as $x^2 - 6x - 12 = 0$?

- (1) $(x + 3)^2 = 21$
- (2) $(x - 3)^2 = 21$
- (3) $(x + 3)^2 = 3$
- (4) $(x - 3)^2 = 3$

Quadratic Formula
 See formula page.
 $a=1$ $b=-6$ $c=-12$

which of these equations has

$$\sqrt{(x-3)^2} = \sqrt{21}$$

$$x-3 = \pm\sqrt{21} \Rightarrow x = 3 \pm \sqrt{21}$$

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

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-12)}}{2(1)}$$

$$x = \frac{6 \pm \sqrt{36 + 48}}{2}$$

$$x = \frac{6 \pm \sqrt{84}}{2}$$

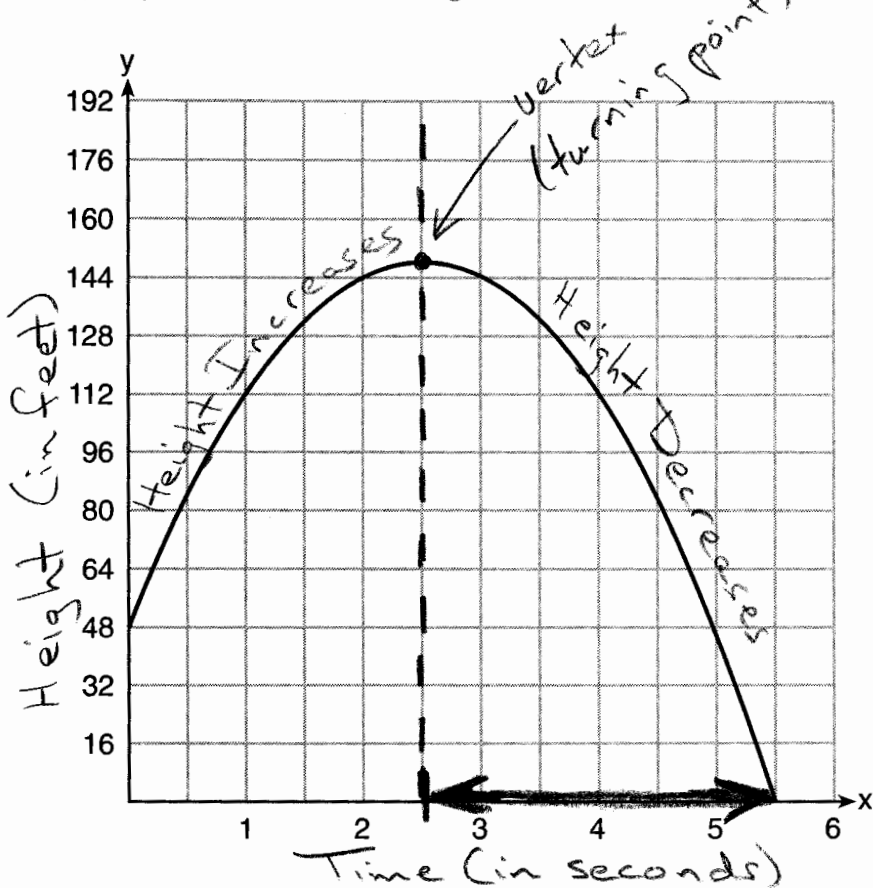
$$x = \frac{6 \pm \sqrt{4 \cdot 21}}{2}$$

$$x = \frac{6 \pm 2\sqrt{21}}{2}$$

this solution $\rightarrow x = 3 \pm \sqrt{21}$ [OVER]

Use this space for computations.

- 9 A ball is thrown into the air from the edge of a 48-foot-high cliff so that it eventually lands on the ground. The graph below shows the height, y , of the ball from the ground after x seconds:



For which interval is the ball's height always decreasing?

- (1) $0 \leq x \leq 2.5$ (2) $2.5 < x < 5.5$
 (3) $0 < x < 5.5$ (4) $x \geq 2$

$a=1$ $b=4$ $c=-16$
 $x^2 + 4x - 16 = 0$

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

$$x = \frac{-4 \pm \sqrt{(4)^2 - 4(1)(-16)}}{2(1)}$$

$$x = \frac{-4 \pm \sqrt{16 + 64}}{2}$$

$$x = \frac{-4 \pm \sqrt{80}}{2}$$

$$x = \frac{-4 \pm \sqrt{16} \sqrt{5}}{2}$$

$$x = \frac{-4 \pm 4\sqrt{5}}{2}$$

$$x = -2 \pm 2\sqrt{5}$$

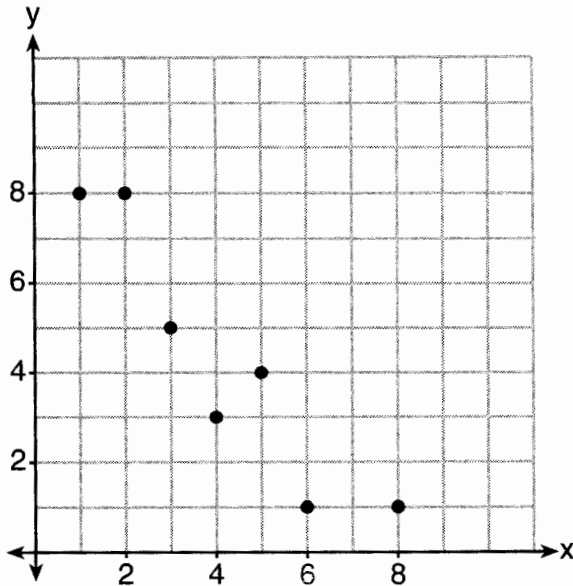
See formula sheet for Quadratic Formula

- 10 What are the roots of the equation $x^2 + 4x - 16 = 0$?

- (1) $2 \pm 2\sqrt{5}$ (3) $2 \pm 4\sqrt{5}$
 (2) $-2 \pm 2\sqrt{5}$ (4) $-2 \pm 4\sqrt{5}$

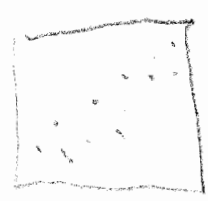
11 What is the correlation coefficient of the linear fit of the data shown below, to the nearest hundredth?

Use this space for computations.

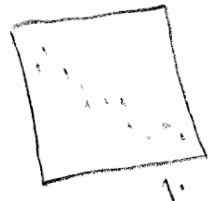


- (1) 1.00
- (2) 0.93

- 0.93
- 1.00



Positive Correlation



Negative Correlation

This data has a negative correlation. Eliminate 1 and 2

Correlations of +1 or -1 are on straight lines. This data does not fall on a straight line. Eliminate 4

12 Keith determines the zeros of the function $f(x)$ to be -6 and 5. What could be Keith's function?

- (1) $f(x) = (x + 5)(x + 6)$
- (2) $f(x) = (x + 5)(x - 6)$
- (3) $f(x) = (x - 5)(x + 6)$
- (4) $f(x) = (x - 5)(x - 6)$

To find the factors of a quadratic, work backwards from the zeros.

If $x = -6$, then $x + 6 = 0$ and $(x + 6)$ is a factor.
If $x = 5$, then $x - 5 = 0$ and $(x - 5)$ is a factor.

13 Given:

- $L = \sqrt{2}$ - irrational
- $M = 3\sqrt{3}$ - irrational
- $N = \sqrt{16} = 4$ - rational
- $P = \sqrt{9} = 3$ - rational

Which expression results in a rational number?

- (1) $L + M$
- (2) $M + N$
- (3) $N + P \Rightarrow 4 + 3 = 7$
- (4) $P + L$

7 is a rational number

Use this space for computations.

14 Which system of equations has the same solution as the system below?

$$\begin{aligned} 2x + 2y &= 16 \\ 3x - y &= 4 \end{aligned}$$

(1) $2x + 2y = 16$ ✓
 $6x - 2y = 4$ ✗

(3) $x + y = 16$ ✗
 $3x - y = 4$ ✓

● $2x + 2y = 16$ ✓
 $6x - 2y = 8$ ✓

(4) $6x + 6y = 48$
 $6x + 2y = 8$

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

If you multiply both sides of an equation by the same value, the relationships between the variables do not change.

15 The table below represents the function F .

x	3	4	6	7	8
$F(x)$	9	17	65	129	257

The equation that represents this function is

(1) $F(x) = 3^x$ ✗

● $F(x) = 2^x + 1$

(2) $F(x) = 3x$

(4) $F(x) = 2x + 3$

$9 = 3(3)$ ✓
 $17 \neq 3(4)$

$9 = 2(3) + 3$ ✓
 $17 \neq 2(4) + 3$

$9 = 2^3 + 1$ ✓
 $17 = 2^4 + 1$ ✓
 $65 = 2^6 + 1$ ✓

16 John has four more nickels than dimes in his pocket, for a total of \$1.25. Which equation could be used to determine the number of dimes, x , in his pocket?

(1) $0.10(x + 4) + 0.05(x) = \1.25

● $0.05(x + 4) + 0.10(x) = \1.25

(3) $0.10(4x) + 0.05(x) = \$1.25$

(4) $0.05(4x) + 0.10(x) = \$1.25$

Let $x = \# \text{ dimes}$

Let $(x+4) = \# \text{ nickles}$

$0.05(\# \text{ nickles}) + 0.10(\# \text{ dimes}) = \1.25
 $\uparrow \qquad \qquad \qquad \uparrow$
 $5\text{¢} \qquad \qquad \qquad 10\text{¢}$

17 If $f(x) = \frac{1}{3}x + 9$, which statement is always true?

(1) $f(x) < 0$

(3) If $x < 0$, then $f(x) < 0$.

(2) $f(x) > 0$

● If $x > 0$, then $f(x) > 0$.

(4) is always true

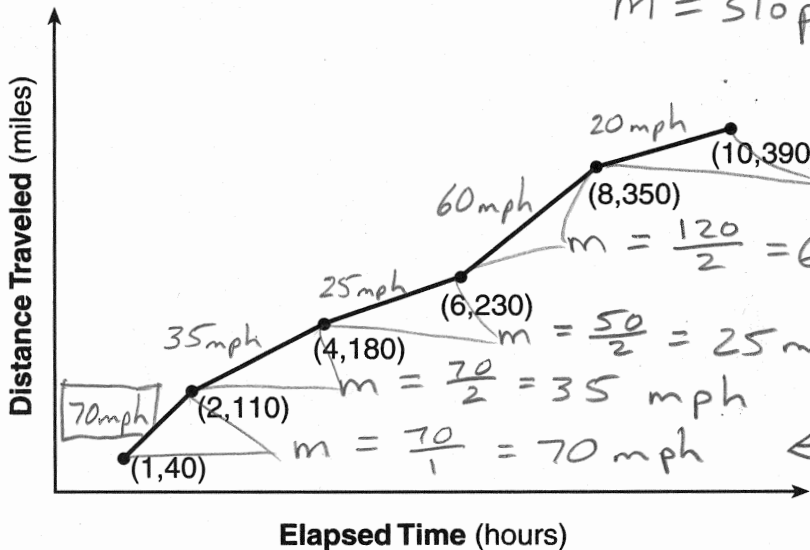
(1) is not true for positive values of x

(2) is not true when $x \leq -27$

(3) is not true for $x = -1$

Use this space for computations.

18 The Jamison family kept a log of the distance they traveled during a trip, as represented by the graph below.



$$m = \text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{miles}}{\text{hour}}$$

greatest average speed is 70 mph

This occurred during the first hour.
 $Q_3 = \frac{91 + 94}{2} = 92.5$

During which interval was their average speed the greatest?

- (1) the first hour to the second hour
- (2) the second hour to the fourth hour
- (3) the sixth hour to the eighth hour
- (4) the eighth hour to the tenth hour

19 Christopher looked at his quiz scores shown below for the first and second semester of his Algebra class.

Semester 1: 78, 91, 88, 83, 94
 Semester 2: 91, 96, 80, 77, 88, 85, 92

$$Q_1 = \frac{78 + 83}{2} = 80.5$$

Semester 1
 78, 83, 88, 91, 94
 ↑ ↑
 Q₁ median Q₃
 mean = $\frac{434}{5} = 86.8$

Which statement about Christopher's performance is correct?

- (1) The interquartile range for semester 1 is greater than the interquartile range for semester 2.
- (2) The median score for semester 1 is greater than the median score for semester 2.
- (3) The mean score for semester 2 is greater than the mean score for semester 1.
 $87 > 86.8$ ✓
- (4) The third quartile for semester 2 is greater than the third quartile for semester 1.

Semester 2
 77, 80, 85, 88, 91, 92, 96
 ↑ ↑ ↑
 Q₁ median Q₃
 mean = $\frac{609}{7} = 87$

Use this space for computations.

22 A cell phone company charges \$60.00 a month for up to 1 gigabyte of data. The cost of additional data is \$0.05 per megabyte. If d represents the number of additional megabytes used and c represents the total charges at the end of the month, which linear equation can be used to determine a user's monthly bill?

- (1) $c = 60 - 0.05d$ (3) $c = 60d - 0.05$
 (2) $c = 60.05d$ (4) $c = 60 + 0.05d$

$\rightarrow 0.05d$

cost = \$60 constant + 0.05d

23 The formula for the volume of a cone is $V = \frac{1}{3}\pi r^2 h$. The radius, r , of the cone may be expressed as

- (1) $\sqrt{\frac{3V}{\pi h}}$ (3) $3\sqrt{\frac{V}{\pi h}}$
 (2) $\sqrt{\frac{V}{3\pi h}}$ (4) $\frac{1}{3}\sqrt{\frac{V}{\pi h}}$

← Isolate r

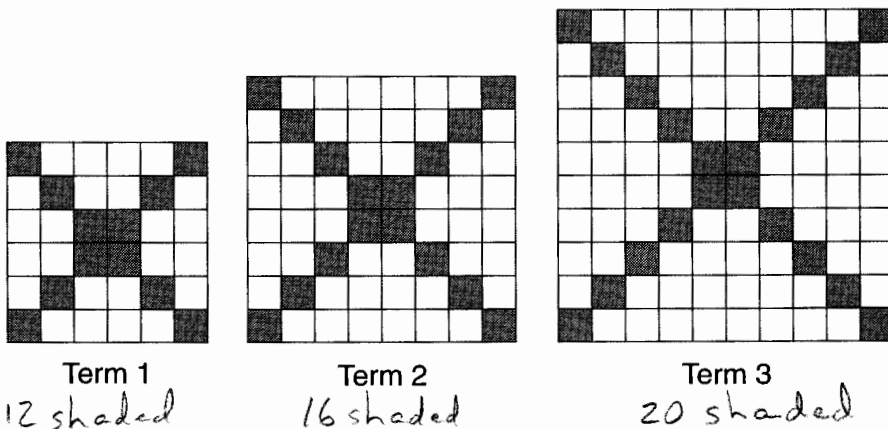
$$V = \frac{1}{3}\pi r^2 h$$

$$\frac{V}{\frac{1}{3}\pi h} = r^2$$

$$\frac{3V}{\pi h} = r^2$$

$$\sqrt{\frac{3V}{\pi h}} = r$$

24 The diagrams below represent the first three terms of a sequence.



Assuming the pattern continues, which formula determines a_n , the number of shaded squares in the n th term?

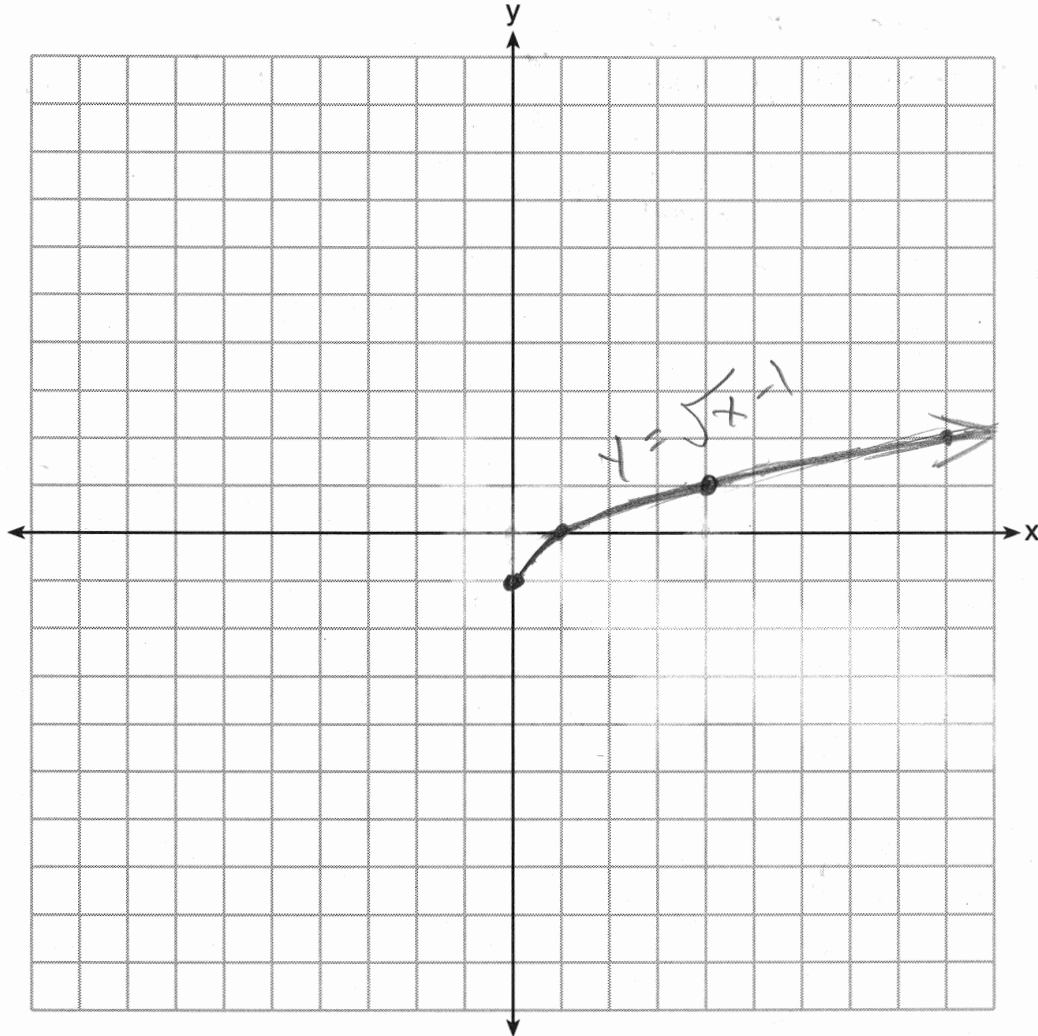
- (1) $a_n = 4n + 12$ (3) $a_n = 4n + 4$
 (2) $a_n = 4n + 8$ (4) $a_n = 4n + 2$

$a_{(1)} = 4(1) + 8 = 12 \checkmark$
 $a_{(2)} = 4(2) + 8 = 16 \checkmark$
 $a_{(3)} = 4(3) + 8 = 20 \checkmark$

Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

25 Draw the graph of $y = \sqrt{x} - 1$ on the set of axes below.



$y = \sqrt{x} - 1$

x	f(x)
1	0
4	1
9	2
0	-1

26 The breakdown of a sample of a chemical compound is represented by the function $p(t) = 300(0.5)^t$, where $p(t)$ represents the number of milligrams of the substance and t represents the time, in years. In the function $p(t)$, explain what 0.5 and 300 represent.

$t \rightarrow$ time, in years

$$p(t) = 300(0.5)^t$$

#milligrams of substance after "t" years

#milligrams of substance at start of "breakdown"

the rate of "breakdown" (decay) in each year

Answer

Answer

27 Given $2x + ax - 7 > -12$, determine the largest integer value of a when $x = -1$.

$$2x + ax - 7 > -12$$

$$2(-1) + a(-1) - 7 > -12$$

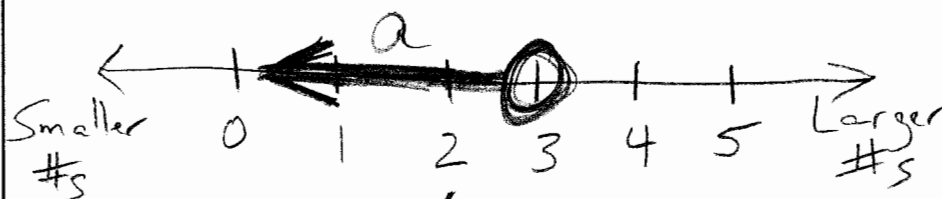
$$-2 - a - 7 > -12$$

$$-a - 9 > -12$$

$$-a > -3$$

$$a < 3$$

Note the change in direction of inequality symbol. (Caused by dividing or multiplying by a negative value)



largest integer value of $a = \boxed{2}$

Answer

28 The vertex of the parabola represented by $f(x) = x^2 - 4x + 3$ has coordinates $(2, -1)$. Find the coordinates of the vertex of the parabola defined by $g(x) = f(x - 2)$. Explain how you arrived at your answer.

[The use of the set of axes below is optional.]

$$f(x) = x^2 - 4x + 3$$

$$g(x) = f(x-2)$$

$$\therefore g(x) = (x-2)^2 - 4(x-2) + 3$$

$$g(x) = (x-2)(x-2) - 4(x-2) + 3$$

$$g(x) = x^2 - 2x - 2x + 4 - 4x - 8 + 3$$

$$g(x) = x^2 - 8x + 15$$

$$a=1 \quad b=-8 \quad c=15$$

axis of symmetry

$$x = \frac{-b}{2a}$$

$$x = \frac{-(-8)}{2(1)} = \frac{8}{2} = 4$$

$$g(x) = x^2 - 8x + 15$$

$$g(4) = 4^2 - 8(4) + 15$$

$$g(4) = 16 - 32 + 15$$

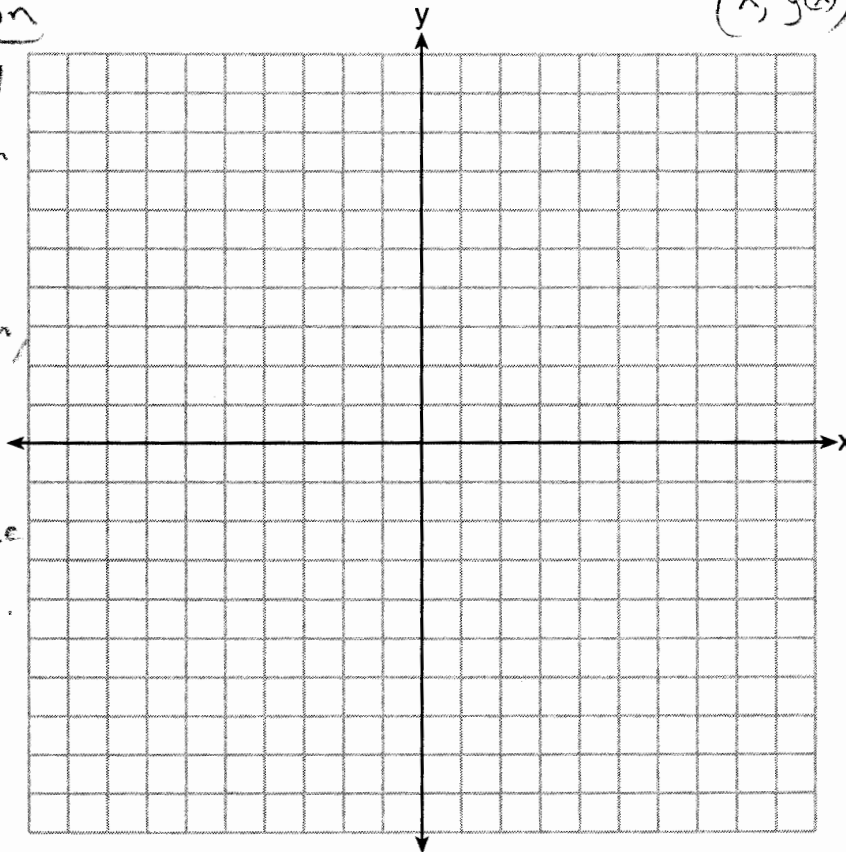
$$g(4) = -1$$

$$(x, g(x)) = \boxed{4, -1}$$

Answer

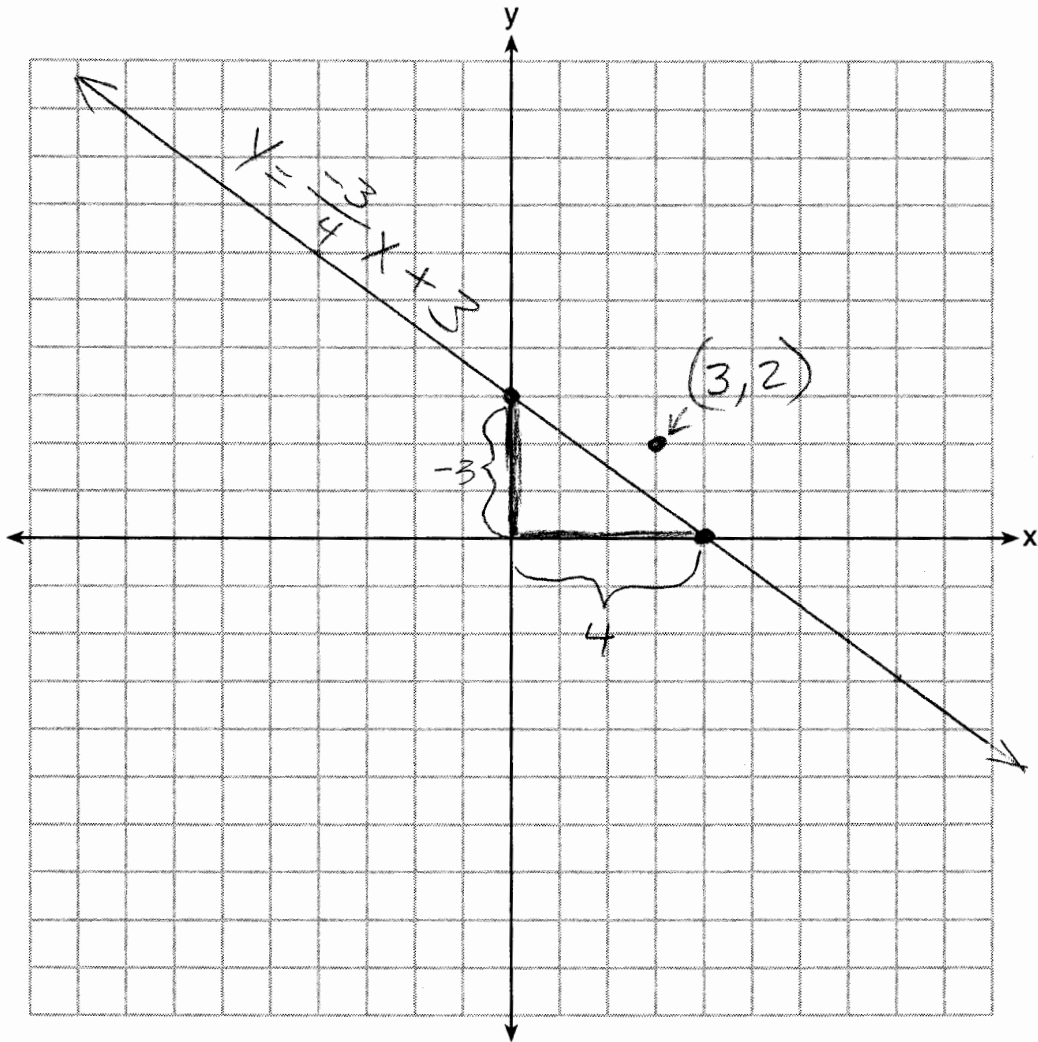
Explanation

I substituted one function into another, wrote a new function, then solved for the vertex of the new function.



29 On the set of axes below, draw the graph of the equation $y = -\frac{3}{4}x + 3$. ← y-intercept

$$\uparrow \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{-3}{4}$$



Is the point $(3, 2)$ a solution to the equation? Explain your answer based on the graph drawn.

No $(3, 2)$ is not on the graph of the equation $y = -\frac{3}{4}x + 3$

30 The function f has a domain of $\{1, 3, 5, 7\}$ and a range of $\{2, 4, 6\}$.

Could f be represented by $\{(1,2), (3,4), (5,6), (7,2)\}$?

Justify your answer.

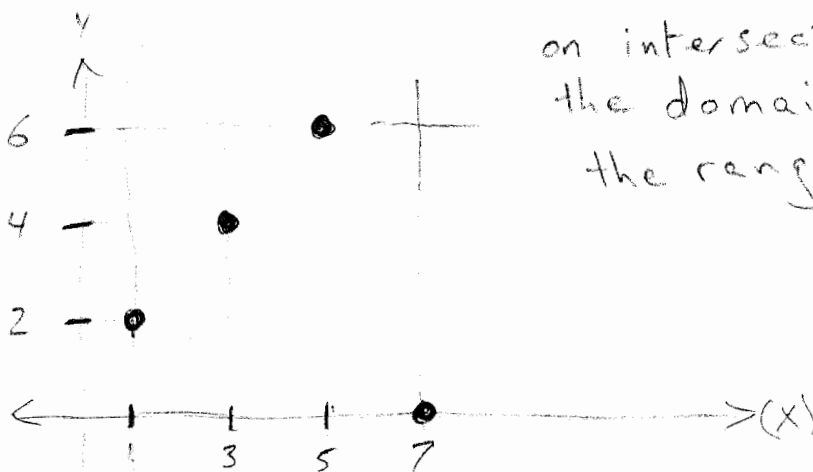
YES The coordinates of function f are all on intersections of the domain and the range.

The range is on the horizontal lines

$$y=2$$

$$y=4$$

$$y=6$$



The domain is on the vertical lines

$$x=1$$

$$x=3$$

$$x=5$$

$$x=7$$

31 Factor the expression $x^4 + 6x^2 - 7$ completely.

$$x^4 + 6x^2 - 7$$

$$(x^2 + 7)(x^2 - 1)$$

This is a difference of perfect squares
 $a^2 - b^2 = (a+b)(a-b)$

These two terms must multiply to -7 and add to 6

Answer

$$(x^2 + 7)(x + 1)(x - 1)$$

Check

$$(x^2 + 7)(x^2 - 1)$$

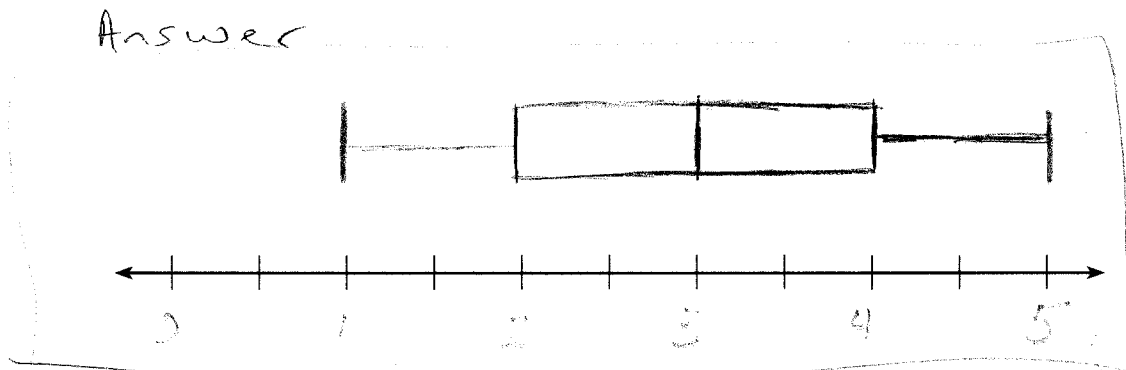
$$x^4 - x^2 + 7x^2 - 7$$

$$x^4 + 6x^2 - 7 \checkmark$$

32 Robin collected data on the number of hours she watched television on Sunday through Thursday nights for a period of 3 weeks. The data are shown in the table below.

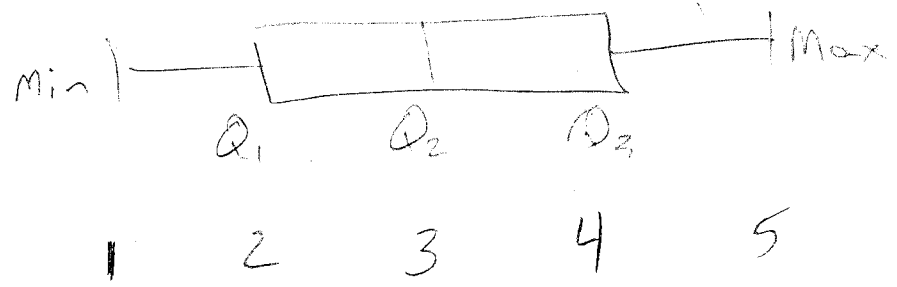
	Sun	Mon	Tues	Wed	Thurs
Week 1	4	3	3.5	2	2
Week 2	4.5	5	2.5	3	1.5
Week 3	4	3	1	1.5	2.5

Using an appropriate scale on the number line below, construct a box plot for the 15 values.



1, 1.5, 1.5, $\boxed{2}$, 2, 2.5, 2.5, $\boxed{3}$, 3, 3, 3.5, $\boxed{4}$, 4, 4.5, 5
 Q_1 Q_2 Q_3

x	#
1	1
1.5	2
2	2
2.5	2
3	3
3.5	1
4	1
4.5	1
5	1
	15



Part III

Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [16]

33 Write an equation that defines $m(x)$ as a trinomial where $m(x) = (3x - 1)(3 - x) + 4x^2 + 19$.

$$m(x) = (3x-1)(3-x) + 4x^2 + 19$$

$$m(x) = 9x - 3x^2 - 3 + x + 4x^2 + 19$$

$$m(x) = -3x^2 + 4x^2 + 9x + x - 3 + 19$$

$$m(x) = x^2 + 10x + 16$$

trinomial

Solve for x when $m(x) = 0$.

$$m(x) = x^2 + 10x + 16$$

$$0 = x^2 + 10x + 16$$

$$0 = (x + 8)(x + 2)$$

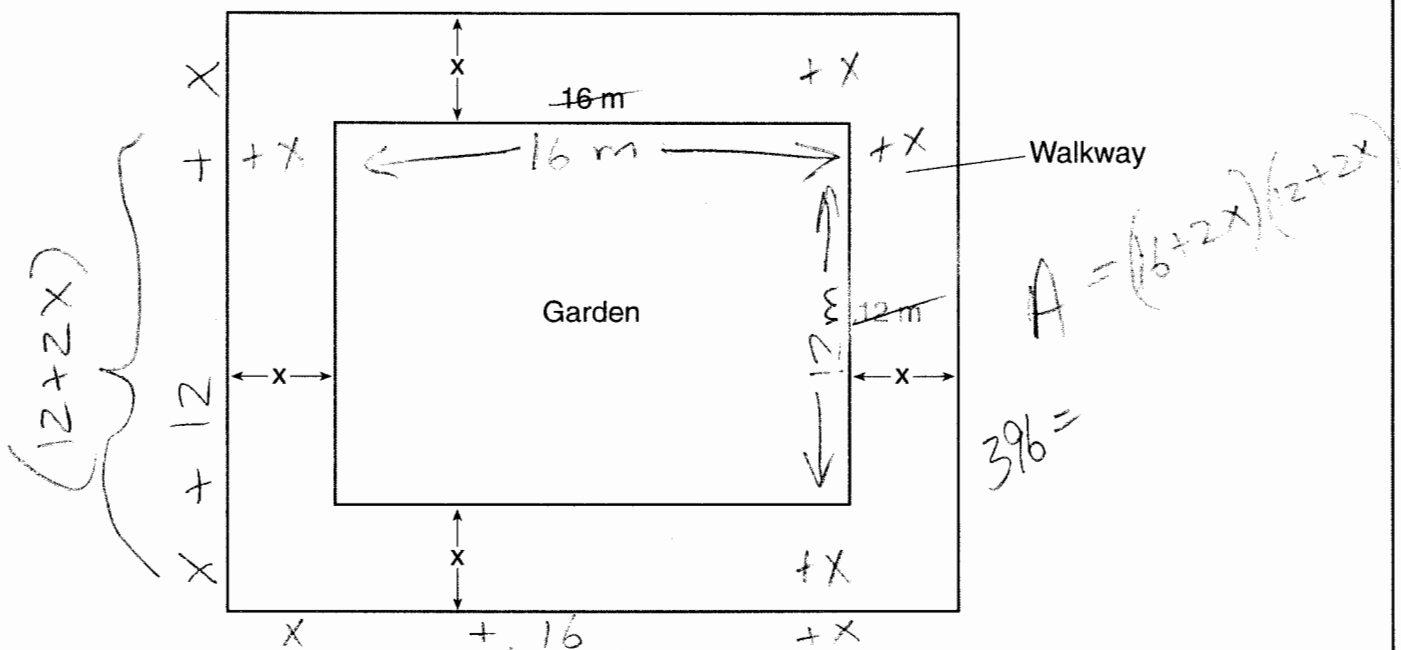
$$x + 8 = 0 \text{ or } x + 2 = 0$$

$$x = -8$$

$$x = -2$$

Answers

- 34 A rectangular garden measuring 12 meters by 16 meters is to have a walkway installed around it with a width of x meters, as shown in the diagram below. Together, the walkway and the garden have an area of 396 square meters.



Write an equation that can be used to find x , the width of the walkway.

$$\begin{aligned} \text{Area (rectangle)} &= (\text{Length}) (\text{Width}) \\ 396 &= (16 + 2x)(12 + 2x) \end{aligned}$$

Describe how your equation models the situation.

The garden and walk make a rectangle with area of 396 sq. meters. The garden is 16 meters plus two walkways (x) long, hence the expression $16 + 2x$ for length. The garden is $(12 + 2x)$ wide.

Determine and state the width of the walkway, in meters.

$$396 = (16 + 2x)(12 + 2x)$$

$$396 = 192 + 32x + 24x + 4x^2$$

$$396 = 192 + 56x + 4x^2$$

$$0 = -204 + 56x + 4x^2$$

$$4x^2 + 56x - 204 = 0$$

a b c

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ x &= \frac{-56 \pm \sqrt{56^2 - 4(4)(-204)}}{2(4)} \\ x &= \frac{-56 \pm \sqrt{3136 + 3264}}{8} \\ x &= \frac{-56 \pm \sqrt{6400}}{8} \\ x &= \frac{-56 \pm 80}{8} \end{aligned}$$

$$x = \frac{24}{8} = \boxed{3} \quad \text{[OVER]}$$

35 Caitlin has a movie rental card worth \$175. After she rents the first movie, the card's value is \$172.25. After she rents the second movie, its value is \$169.50. After she rents the third movie, the card is worth \$166.75.

$$172.25 + x = 175$$

$$x = 2.75$$

$$169.50 + x = 172.25$$

$$x = 2.75$$

$$166.75 + x = 172.25$$

$$x = 2.75$$

Assuming the pattern continues, write an equation to define $A(n)$, the amount of money on the rental card after n rentals.

$$A(n) = 175 - 2.75(n)$$

Caitlin rents a movie every Friday night. How many weeks in a row can she afford to rent a movie, using her rental card only? Explain how you arrived at your answer.

$$0 \leq 175 - 2.75(n)$$

$$-175 \leq -2.75(n)$$

$$\frac{-175}{-2.75} \geq (n)$$

$$63.63 \geq n$$

63
Answer

direction changes when dividing or multiplying by a negative value.

I used my equation and made it an inequality. The right expression must always be greater than or equal to zero, else Caitlin's movie rental card is worthless. If Caitlin rents more than 63 movies, her movie rental card will be worthless.

36 An animal shelter spends \$2.35 per day to care for each cat and \$5.50 per day to care for each dog. Pat noticed that the shelter spent \$89.50 caring for cats and dogs on Wednesday.

Let $(c) = \# \text{ cats}$ Let $(d) = \# \text{ dogs}$

Write an equation to represent the possible numbers of cats and dogs that could have been at the shelter on Wednesday.

$$2.35(c) + 5.50(d) = 89.50$$

Pat said that there might have been 8 cats and 14 dogs at the shelter on Wednesday. Are Pat's numbers possible? Use your equation to justify your answer.

$$\begin{array}{r} 2.35(8) + 5.50(14) \stackrel{?}{=} 89.50 \\ 18.80 + 77.00 \stackrel{?}{=} 95.80 \\ 95.80 \neq 89.50 \end{array}$$

Pat's numbers are not possible

Later, Pat found a record showing that there were a total of 22 cats and dogs at the shelter on Wednesday. How many cats were at the shelter on Wednesday?

$$c + d = 22$$

Use System of Equations to Solve

$$2.35c + 5.50d = 89.50$$

$$c + d = 22 \Rightarrow d = 22 - c$$

$$2.35c + 5.50(22 - c) = 89.50$$

$$2.35c + 121 - 5.5c = 89.50$$

$$-3.15c + 121 = 89.50$$

$$-3.15c = -31.50$$

$$c = \frac{-31.50}{-3.15}$$

$$c = 10$$

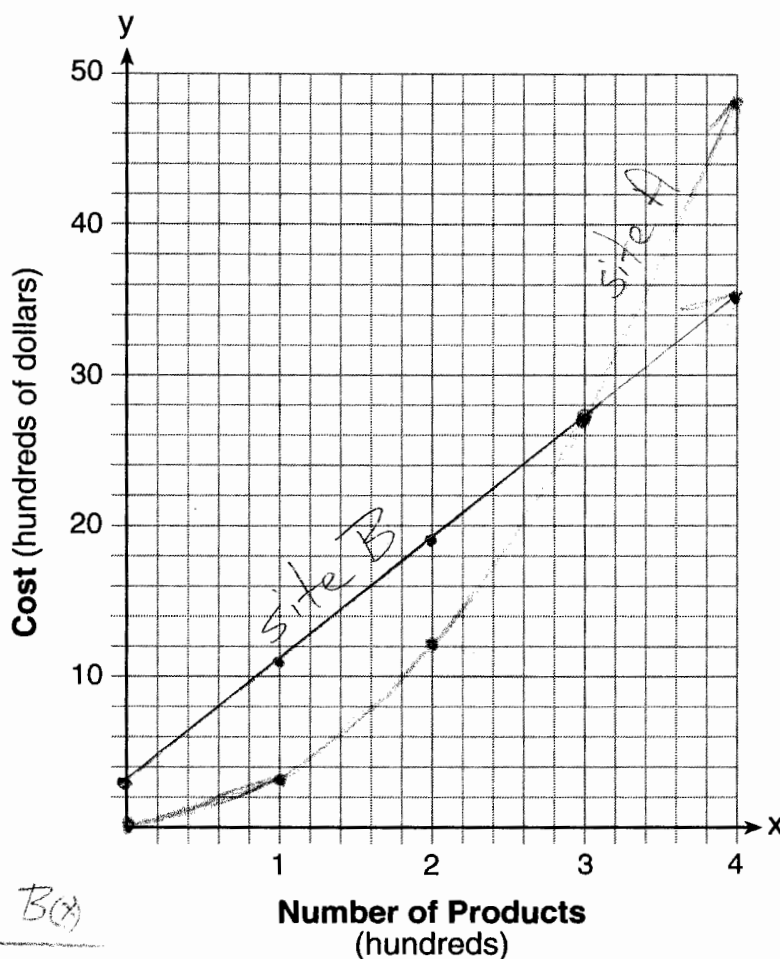
There were 10 cats.

Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. A correct numerical answer with no work shown will receive only 1 credit. The answer should be written in pen. [6]

37 A company is considering building a manufacturing plant. They determine the weekly production cost at site A to be $A(x) = 3x^2$ while the production cost at site B is $B(x) = 8x + 3$, where x represents the number of products, in hundreds, and $A(x)$ and $B(x)$ are the production costs, in hundreds of dollars.

Graph the production cost functions on the set of axes below and label them site A and site B.



x	$A(x)$	$B(x)$
0	0	3
1	3	11
2	12	19
3	27	27
4	48	35

← From graphing calculator

Question 37 is continued on the next page.

Question 37 continued

State the positive value(s) of x for which the production costs at the two sites are equal.
Explain how you determined your answer.

$x = 3$ - which represents 300 products. When $x = 3$, the graphs of $A(x)$ and $B(x)$ intersect, and both sites have the same costs.

If the company plans on manufacturing 200 products per week, which site should they use? Justify your answer.

The company should use $\boxed{\text{site A}}$ because the cost of producing 200 products at site A are \$7,000 lower than producing 200 products at site B.

Tear Here

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	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian = $\frac{180}{\pi}$ degrees
Degrees	1 degree = $\frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

tear here