ALGEBRA

I

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

ALGEBRA I

Tuesday, August 13, 2019 — 8:30 to 11:30 a.m., only

Student Name _____

School Name _____

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 for graphs and drawings, which should be done in pencil. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale.

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. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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 Bryan's hockey team is purchasing jerseys. The company charges $250 for a onetime set-up fee and $23 for each printed jersey. Which expression represents the total cost of x number of jerseys for the team?

(1) $23x$

(3) $23x + 250$

(2) $23 + 250x$

(4) $23(x + 250)$

2 Which table represents a function?

x	y
2	–3
3	0
4	–3
2	1

(1)

x	y
–3	0
–2	1
–3	2
2	3

(3)

x	y
1	2
1	3
1	4
1	5

(2)

x	y
–2	–4
0	2
2	4
4	6

(4)

3 Which expression is equivalent to $2(x^2 - 1) + 3x(x - 4)$?

(1) $5x^2 - 5$

(3) $5x^2 - 12x - 1$

(2) $5x^2 - 6$

(4) $5x^2 - 12x - 2$

4 The value of x that satisfies the equation $\frac{4}{3} = \frac{x + 10}{15}$ is

(1) -6

(3) 10

(2) 5

(4) 30

5 Josh graphed the function $f(x) = -3(x - 1)^2 + 2$. He then graphed the function $g(x) = -3(x - 1)^2 - 5$ on the same coordinate plane. The vertex of $g(x)$ is

(1) 7 units below the vertex of $f(x)$

(2) 7 units above the vertex of $f(x)$

(3) 7 units to the right of the vertex of $f(x)$

(4) 7 units to the left of the vertex of $f(x)$

6 A survey was given to 12th-grade students of West High School to determine the location for the senior class trip. The results are shown in the table below.

	Niagara Falls	Darien Lake	New York City
Boys	56	74	103
Girls	71	92	88

To the *nearest percent,* what percent of the boys chose Niagara Falls?

(1) 12

(2) 24

(3) 44

(4) 56

7 Which type of function is shown in the graph below?
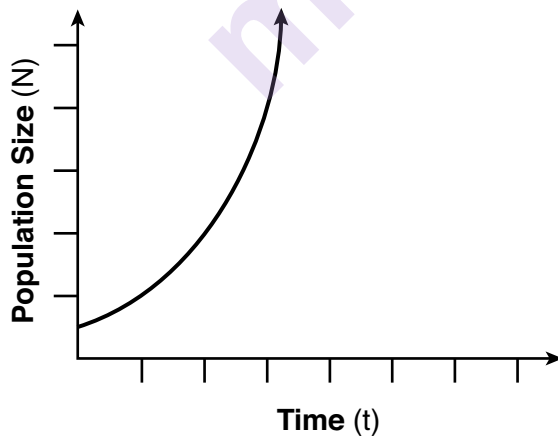

(1) linear

(2) exponential

(3) square root

(4) absolute value

8 The expression $16x^2 - 81$ is equivalent to

(1) $(8x - 9)(8x + 9)$

(3) $(4x - 9)(4x + 9)$

(2) $(8x - 9)(8x - 9)$

(4) $(4x - 9)(4x - 9)$

9 The owner of a landscaping business wants to know how much time, on average, his workers spend mowing one lawn. Which is the most appropriate rate with which to calculate an answer to his question?

(1) lawns per employee

(3) employee per lawns

(2) lawns per day

(4) hours per lawn

10 A ball is thrown into the air from the top of a building. The height, $h(t)$, of the ball above the ground t seconds after it is thrown can be modeled by $h(t) = -16t^2 + 64t + 80$. How many seconds after being thrown will the ball hit the ground?

(1) 5

(3) 80

(2) 2

(4) 144

11 Which equation is equivalent to $y = x^2 + 24x - 18$?

(1) $y = (x + 12)^2 - 162$

(3) $y = (x - 12)^2 - 162$

(2) $y = (x + 12)^2 + 126$

(4) $y = (x - 12)^2 + 126$

12 When $(x)(x - 5)(2x + 3)$ is expressed as a polynomial in standard form, which statement about the resulting polynomial is true?

(1) The constant term is 2.

(2) The leading coefficient is 2.

(3) The degree is 2.

(4) The number of terms is 2.

13 The population of a city can be modeled by $P(t) = 3810(1.0005)^{7t}$, where $P(t)$ is the population after t years. Which function is approximately equivalent to $P(t)$?

(1) $P(t) = 3810(0.1427)^t$

(3) $P(t) = 26{,}670(0.1427)^t$

(2) $P(t) = 3810(1.0035)^t$

(4) $P(t) = 26{,}670(1.0035)^t$

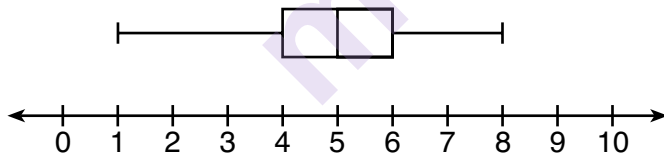**14** The functions $f(x)$ and $g(x)$ are graphed on the set of axes below.
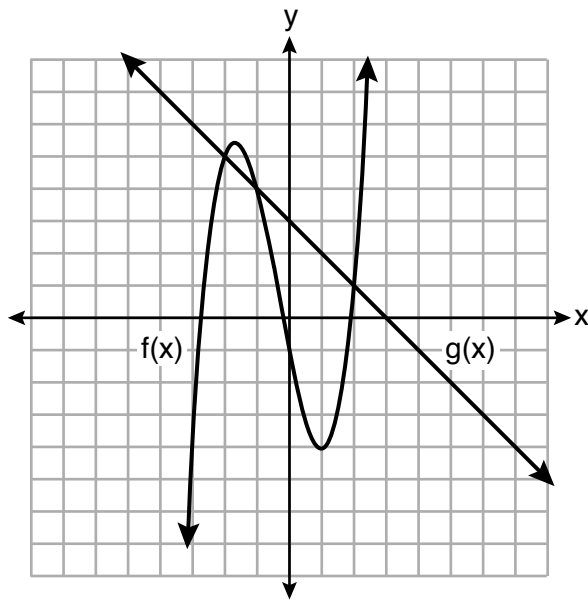
For which value of x is $f(x) \neq g(x)$?

(1) -1 (3) 3

(2) 2   (4) -2

15 What is the range of the box plot shown below?

(1) 7   (3) 3

(2) 2   (4) 4

16 Which expression is *not* equivalent to $2x^2 + 10x + 12$?

(1) $(2x + 4)(x + 3)$ (3) $(2x + 3)(x + 4)$

(2) $(2x + 6)(x + 2)$ (4) $2(x + 3)(x + 2)$

17 The quadratic functions $r(x)$ and $q(x)$ are given below.

x	r(x)
−4	−12
−3	−15
−2	−16
−1	−15
0	−12
1	−7

$q(x) = x^2 + 2x - 8$

The function with the *smallest* minimum value is

(1) $q(x)$, and the value is -9 (3) $r(x)$, and the value is -16

(2) $q(x)$, and the value is -1 (4) $r(x)$, and the value is -2

18 A child is playing outside. The graph below shows the child's distance, $d(t)$, in yards from home over a period of time, t, in seconds.
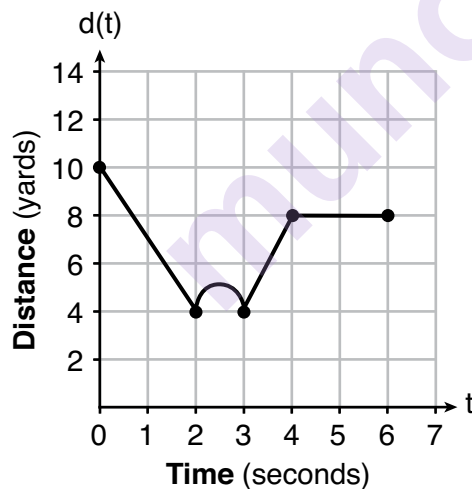
Which interval represents the child constantly moving closer to home?

(1) $0 \le t \le 2$ (3) $3 \le t \le 4$

(2) $2 \le t \le 3$ (4) $4 \le t \le 6$

19 If $a_1 = 6$ and $a_n = 3 + 2(a_{n-1})^2$, then a_2 equals

(1) 75   (3) 180

(2) 147   (4) 900

20 The length of a rectangular patio is 7 feet more than its width, w. The area of a patio, $A(w)$, can be represented by the function

(1) $A(w) = w + 7$ (3) $A(w) = 4w + 14$

(2) $A(w) = w^2 + 7w$ (4) $A(w) = 4w^2 + 28w$

21 A dolphin jumps out of the water and then back into the water. His jump could be graphed on a set of axes where x represents time and y represents distance above or below sea level. The domain for this graph is best represented using a set of

(1) integers   (3) real numbers

(2) positive integers   (4) positive real numbers

22 Which system of linear equations has the same solution as the one shown below?

$$x - 4y = -10$$
$$x + y = 5$$

(1) $5x = 10$ (3) $-3x = -30$
   $x + y = 5$ $x + y = 5$

(2) $-5y = -5$ (4) $-5y = -5$
   $x + y = 5$ $x - 4y = -10$

23 Which interval represents the range of the function $h(x) = 2x^2 - 2x - 4$?

(1) $(0.5, \infty)$ (3) $[0.5, \infty)$

(2) $(-4.5, \infty)$ (4) $[-4.5, \infty)$

24 What is a common ratio of the geometric sequence whose first term is 5 and third term is 245?

(1) 7   (3) 120

(2) 49   (4) 240

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. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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 If $g(x) = -4x^2 - 3x + 2$, determine $g(-2)$.

26 A student is in the process of solving an equation. The original equation and the first step are shown below.
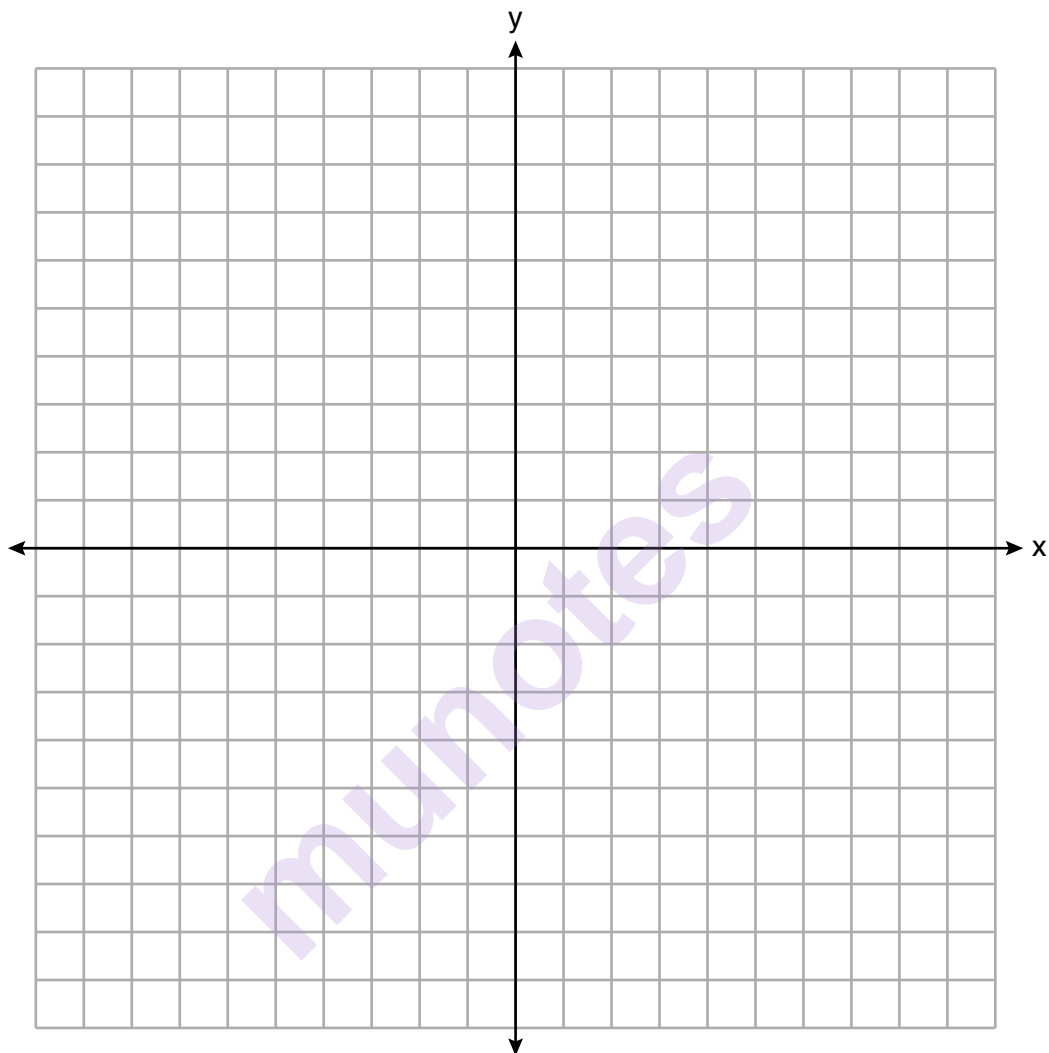
Original: $3a + 6 = 2 - 5a + 7$
Step one: $3a + 6 = 2 + 7 - 5a$

Which property did the student use for the first step? Explain why this property is correct.

27 On the set of axes below, graph the line whose equation is $2y = -3x - 2$.

This linear equation contains the point $(2,k)$. State the value of k.

28 The formula $a = \dfrac{v_f - v_i}{t}$ is used to calculate acceleration as the change in velocity over the period of time.

Solve the formula for the final velocity, v_f, in terms of initial velocity, v_i, acceleration, a, and time, t.

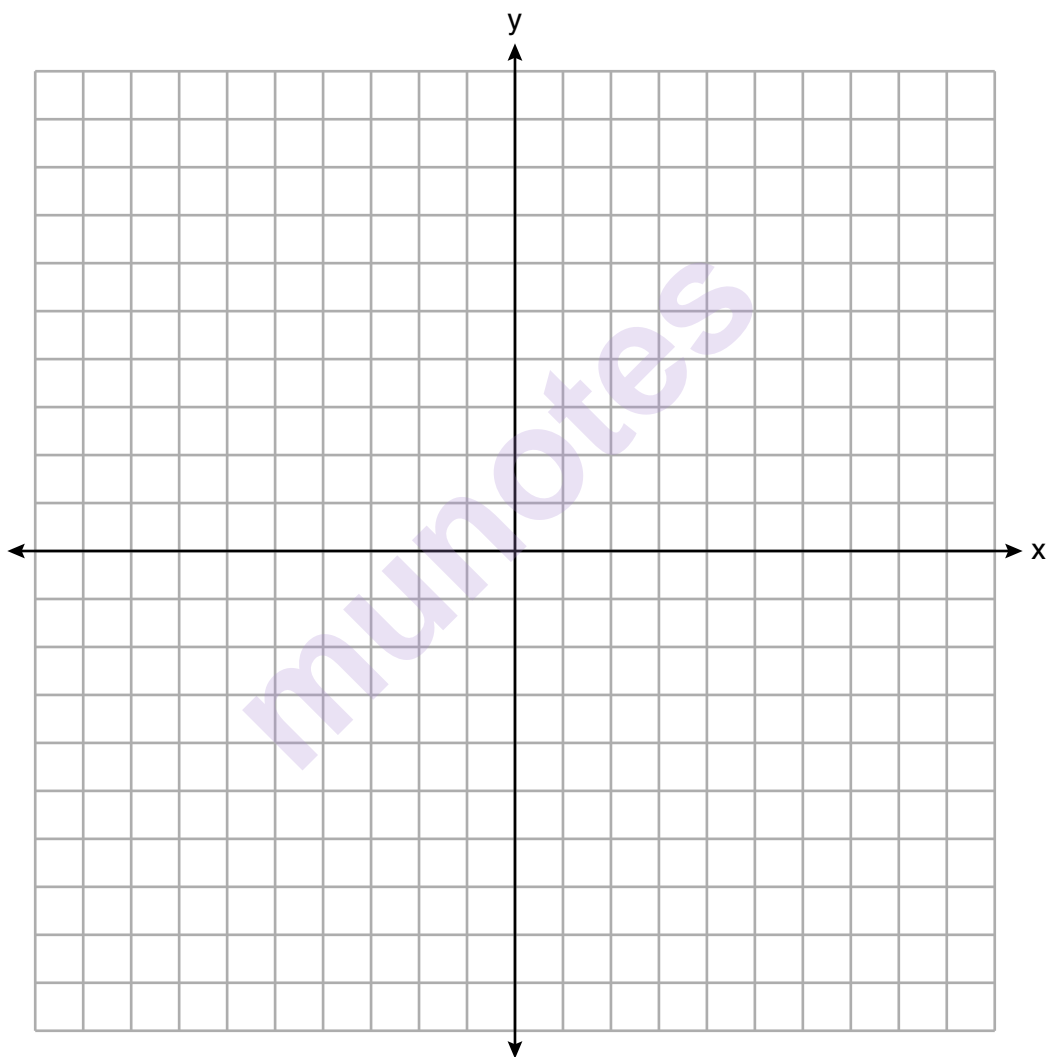**29** Solve $\frac{3}{5}x + \frac{1}{3} < \frac{4}{5}x - \frac{1}{3}$ for x.

30 Is the product of two irrational numbers always irrational? Justify your answer.

31 Solve $6x^2 - 42 = 0$ for the exact values of x.

**32** Graph the function: $h(x) = \begin{cases} 2x - 3, & x < 0 \\ x^2 - 4x - 5, & 0 \le x \le 5 \end{cases}$

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. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily drawn to scale. 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 On the set of axes below, graph the following system of inequalities:

$$2x + y \geq 8$$
$$y - 5 < 3x$$
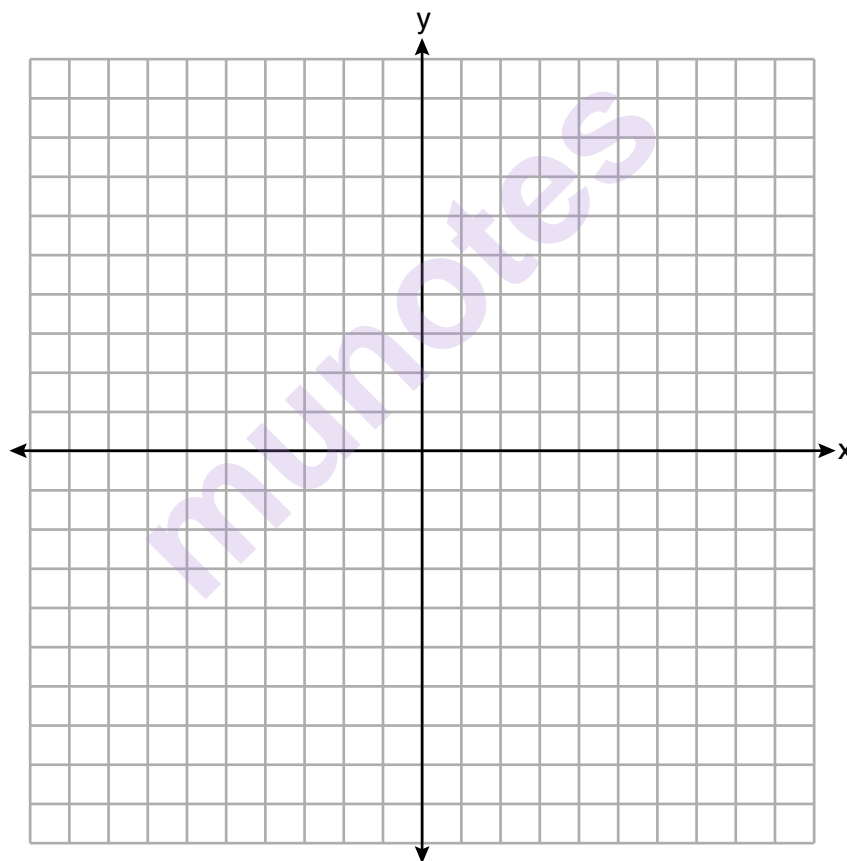
Determine if the point (1,8) is in the solution set. Explain your answer.

34 On the day Alexander was born, his father invested $5000 in an account with a 1.2% annual growth rate. Write a function, $A(t)$, that represents the value of this investment t years after Alexander's birth.

Determine, to the *nearest dollar*, how much more the investment will be worth when Alexander turns 32 than when he turns 17.

35 Stephen collected data from a travel website. The data included a hotel's distance from Times Square in Manhattan and the cost of a room for one weekend night in August. A table containing these data appears below.

Distance From Times Square (city blocks) (x)	0	0	1	1	3	4	7	11	14	19
Cost of a Room (dollars) (y)	293	263	244	224	185	170	219	153	136	111

Write the linear regression equation for this data set. Round all values to the *nearest hundredth*.

State the correlation coefficient for this data set, to the *nearest hundredth*.

Explain what the sign of the correlation coefficient suggests in the context of the problem.

36 A snowstorm started at midnight. For the first 4 hours, it snowed at an average rate of one-half inch per hour.

The snow then started to fall at an average rate of one inch per hour for the next 6 hours.

Then it stopped snowing for 3 hours.

Then it started snowing again at an average rate of one-half inch per hour for the next 4 hours until the storm was over.

On the set of axes below, graph the amount of snow accumulated over the time interval of the storm.

Accumulated Snowfall (in inches)

Elapsed Time (in hours)
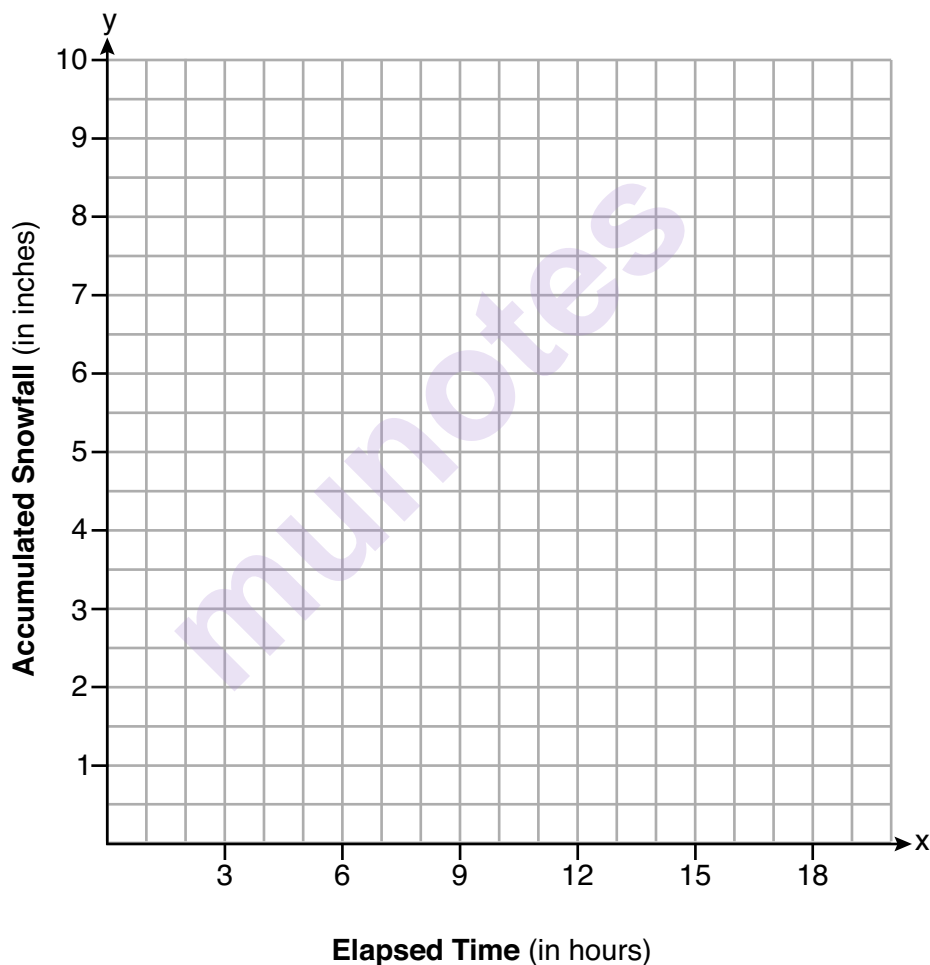
Determine the average rate of snowfall over the length of the storm. State the rate, to the *nearest hundredth of an inch per hour*.

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. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. 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. [6]

37 Allysa spent \$35 to purchase 12 chickens. She bought two different types of chickens. Americana chickens cost \$3.75 each and Delaware chickens cost \$2.50 each.

Write a system of equations that can be used to determine the number of Americana chickens, A, and the number of Delaware chickens, D, she purchased.

Determine algebraically how many of each type of chicken Allysa purchased.

Each Americana chicken lays 2 eggs per day and each Delaware chicken lays 1 egg per day. Allysa only sells eggs by the full dozen for \$2.50. Determine how much money she expects to take in at the end of the first week with her 12 chickens.

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 radian = $\dfrac{180}{\pi}$ degrees
Sphere	$V = \frac{4}{3}\pi r^3$		Degrees	1 degree = $\dfrac{\pi}{180}$ radians
Cone	$V = \frac{1}{3}\pi r^2 h$		Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$
Pyramid	$V = \frac{1}{3}Bh$			