ALGEBRA

I

Large-Type Edition

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. You may remove this sheet 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 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) $23x$

(2) $23 + 250x$

(3) $23x + 250$

(4) $23(x + 250)$

Use this space for computations.

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) $5x^2 - 5$

(2) $5x^2 - 6$

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

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

Use this space for computations.

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

(1) -6

(2) 5

(3) 10

(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

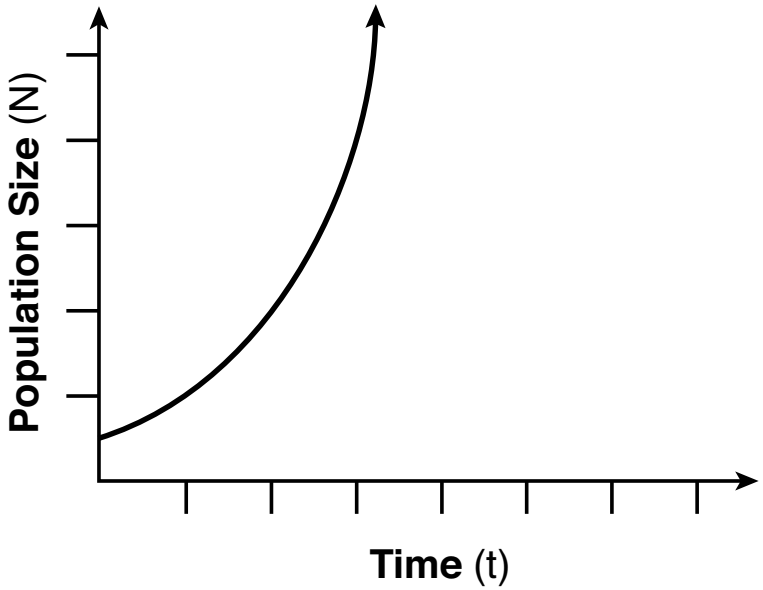
(2) 24

(3) 44

(4) 56

Use this space for computations.

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) $(8x - 9)(8x + 9)$
(2) $(8x - 9)(8x - 9)$
(3) $(4x - 9)(4x + 9)$
(4) $(4x - 9)(4x - 9)$

Use this space for computations.

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

(2) lawns per day

(3) employee per lawns

(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

(2) 2

(3) 80

(4) 144

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

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

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

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

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

Use this space for computations.

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

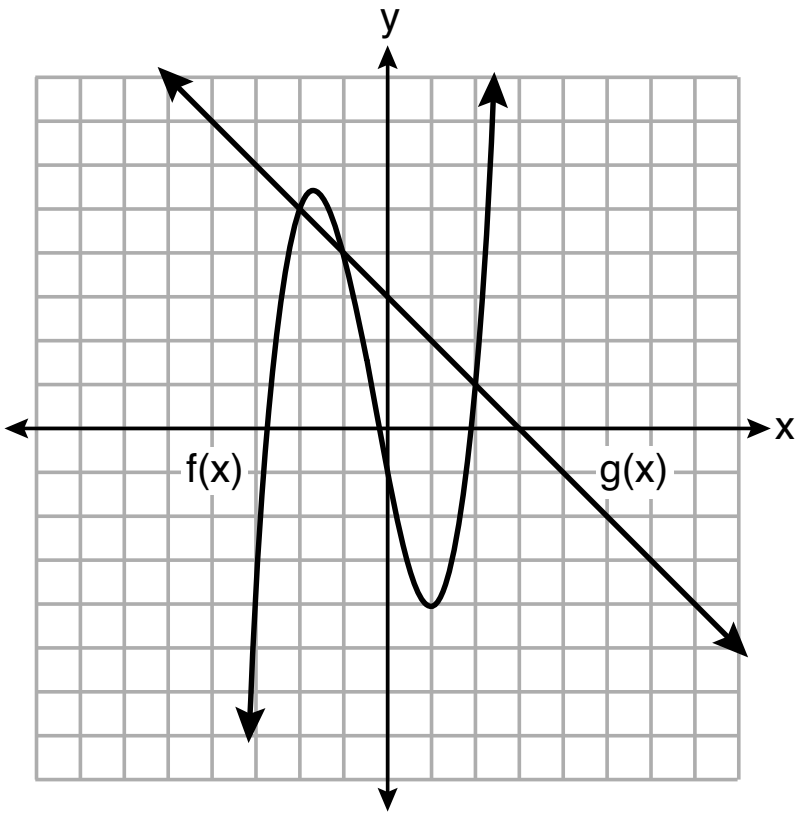
(2) $P(t) = 3810(1.0035)^t$

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

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

Use this space for computations.

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

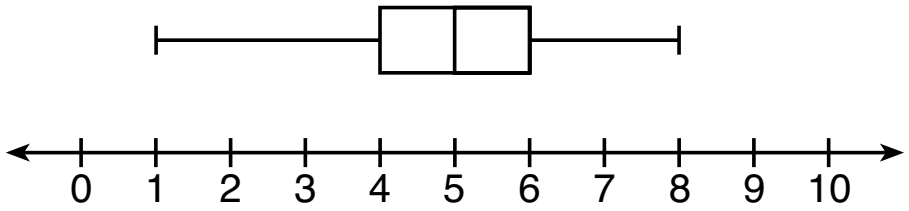
(2) 2

(3) 3

(4) -2

Use this space for computations.

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



(1) 7

(2) 2

(3) 3

(4) 4

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

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

(2) $(2x + 6)(x + 2)$

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

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

Use this space for computations.

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

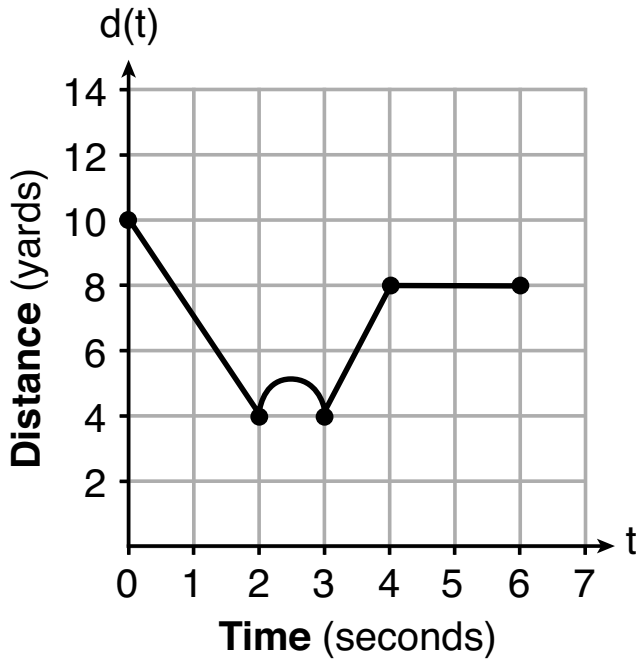
(2) $q(x)$, and the value is -1

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

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

Use this space for computations.

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) $0 \leq t \leq 2$

(2) $2 \leq t \leq 3$

(3) $3 \leq t \leq 4$

(4) $4 \leq t \leq 6$

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

(1) 75

(2) 147

(3) 180

(4) 900

Use this space for computations.

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) $A(w) = w + 7$

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

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

(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

(2) positive integers

(3) real numbers

(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) $5x = 10$
$x + y = 5$

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

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

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

Use this space for computations.

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

(1) $(0.5,\infty)$

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

(3) $[0.5,\infty)$

(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

(2) 49

(3) 120

(4) 240

GO RIGHT ON TO THE NEXT PAGE ➡

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. 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 $g(-2)$.

Work space for question 25 is continued on the next page.

Question 25 continued

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.

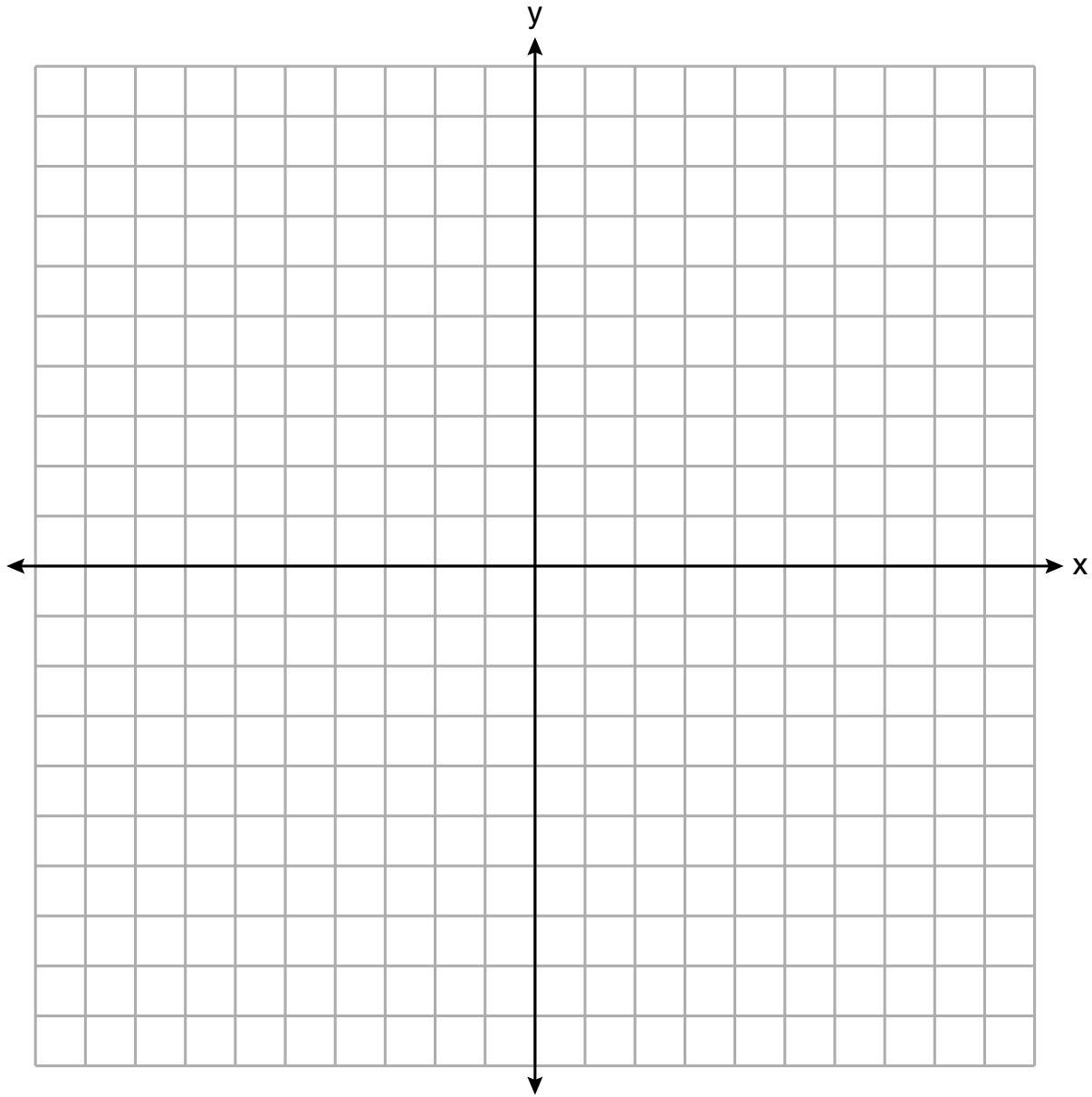
Work space for question 26 is continued on the next page.

Question 26 continued

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

The set of axes for question 27 is on the next page.

Question 27 continued



Question 27 is continued on the next page.

Question 27 continued

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

GO RIGHT ON TO THE NEXT PAGE ➡

28 The formula $a = \frac{v_f - v_i}{t}$ 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.

Work space for question 28 is continued on the next page.

Question 28 continued

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

Work space for question 29 is continued on the next page.

Question 29 continued

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

Work space for question 30 is continued on the next page.

Question 30 continued

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

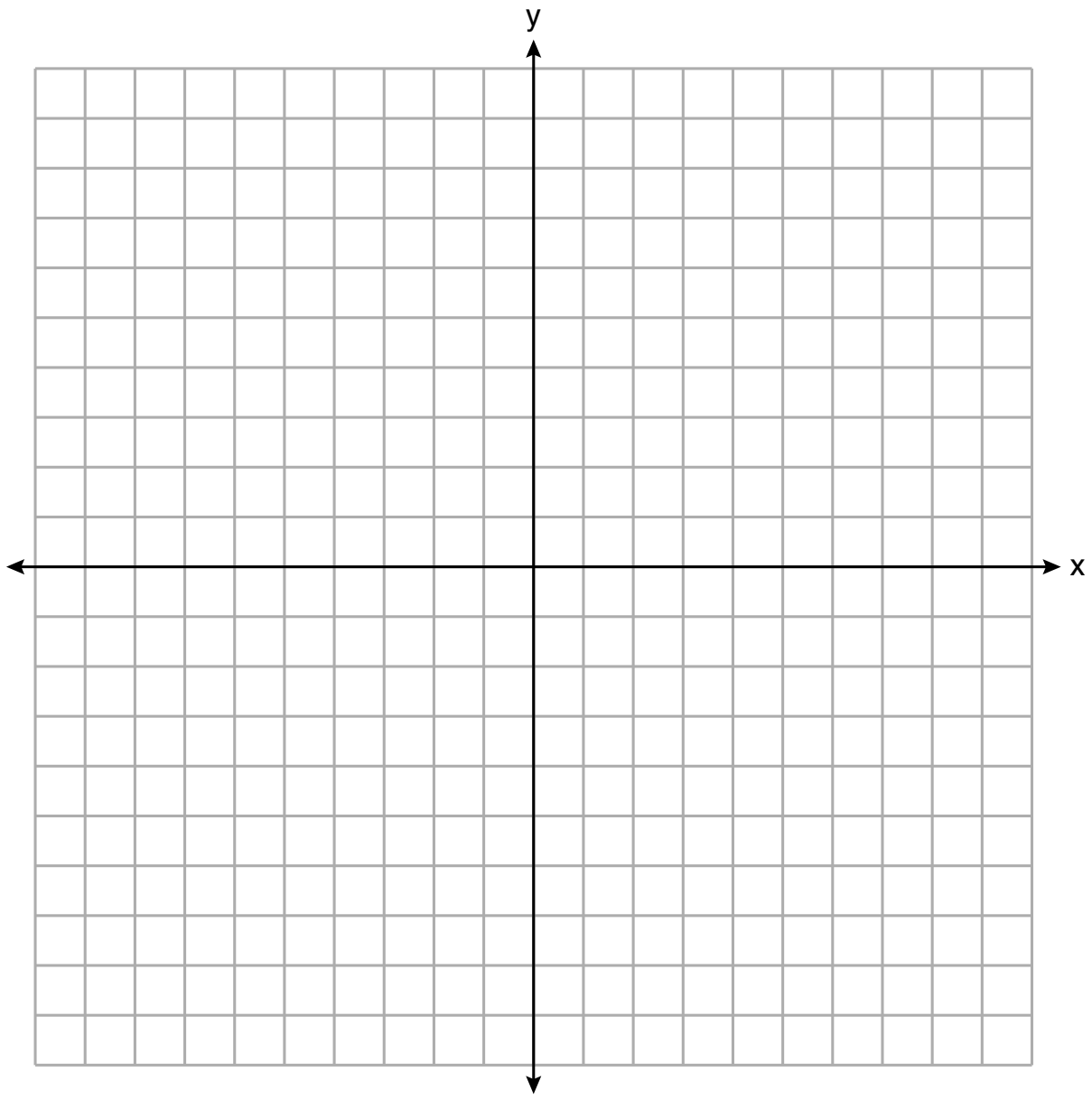
Work space for question 31 is continued on the next page.

Question 31 continued

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

The set of axes for question 32 is on the next page.

Question 32 continued



Part III

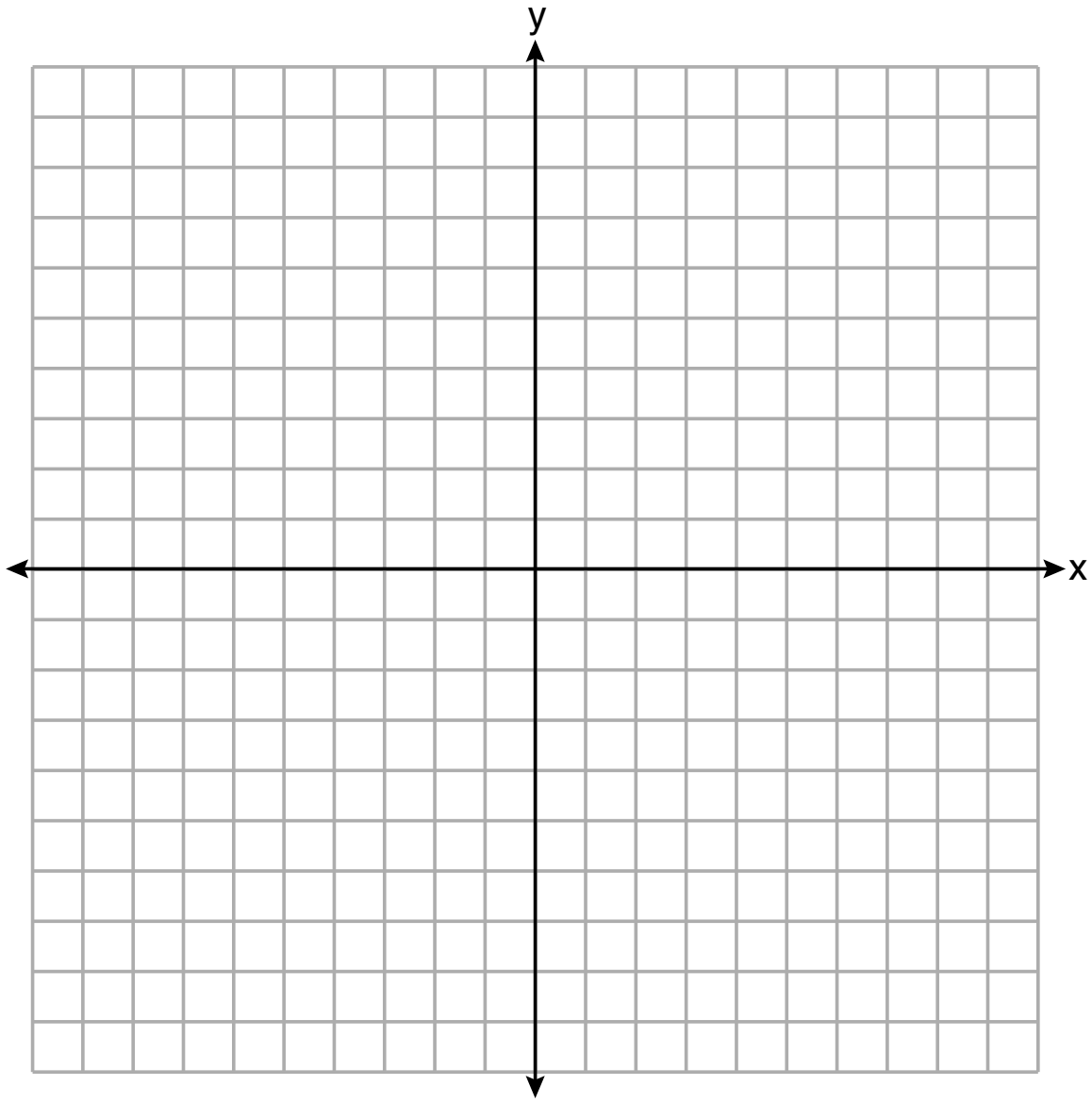
Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided for each question to determine your answer. Note that diagrams are not necessarily 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 on the next page, graph the following system of inequalities:

$$2x + y \geq 8$$
$$y - 5 < 3x$$

The set of axes for question 33 is on the next page.

Question 33 continued



Question 33 is continued on the next page.

Question 33 continued

Determine if the point (1,8) is in the solution set. Explain your answer.

GO RIGHT ON TO THE NEXT PAGE ➡

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.

Work space for question 34 is continued on the next page.

Question 34 continued

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*.

Question 35 is continued on the next page.

Question 35 continued

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.

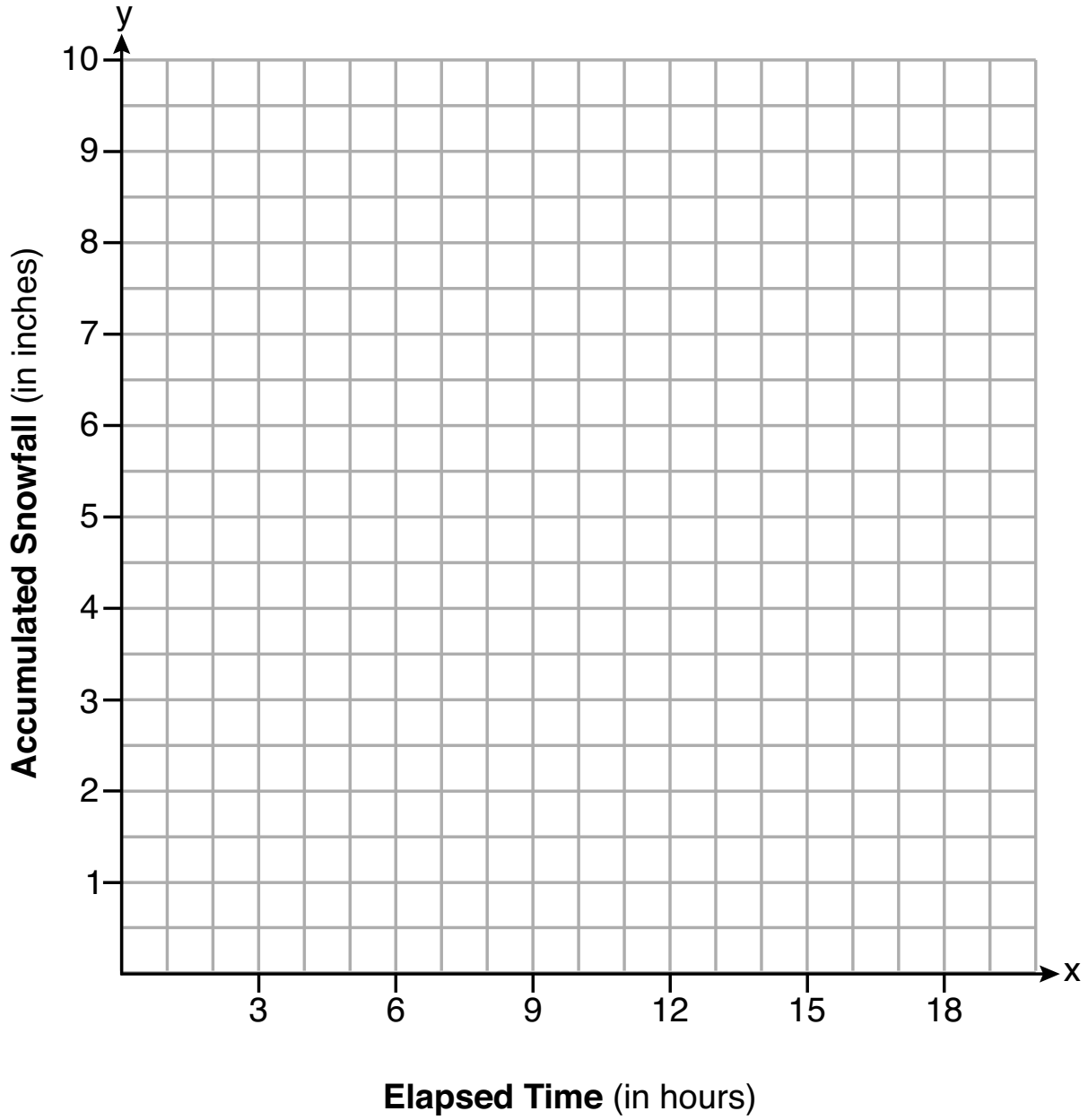
Then it stopped snowing for 3 hours.

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 on the next page, graph the amount of snow accumulated over the time interval of the storm.

The set of axes for question 36 is on the next page.

Question 36 continued



Question 36 is continued on the next page.

Question 36 continued

Determine the average rate of snowfall over the length of the storm. State the rate, to the *nearest hundredth of an inch per hour*.

GO RIGHT ON TO THE NEXT PAGE ➡

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. 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.

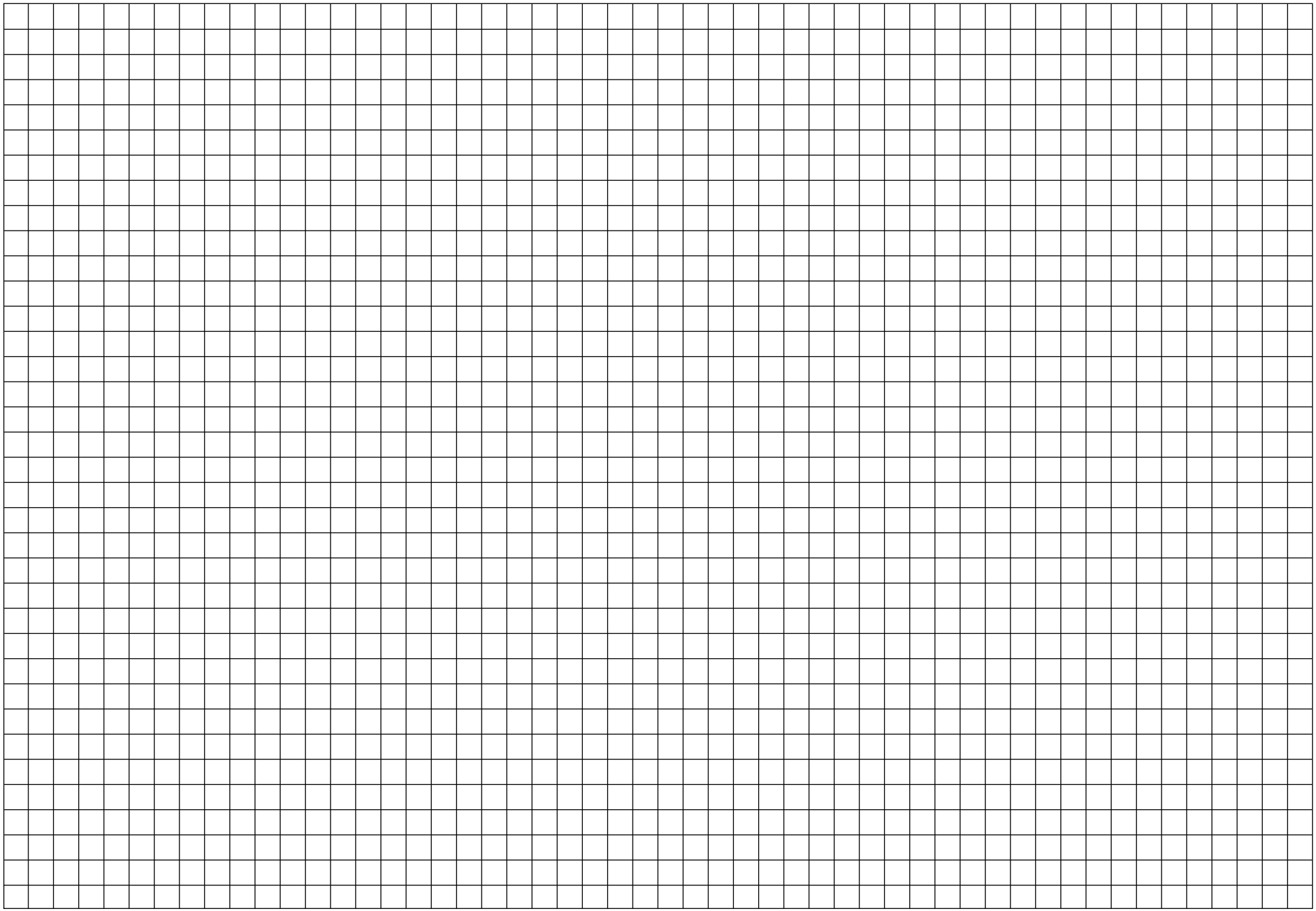
Determine algebraically how many of each type of chicken Allysa purchased.

Question 37 is continued on the next page.

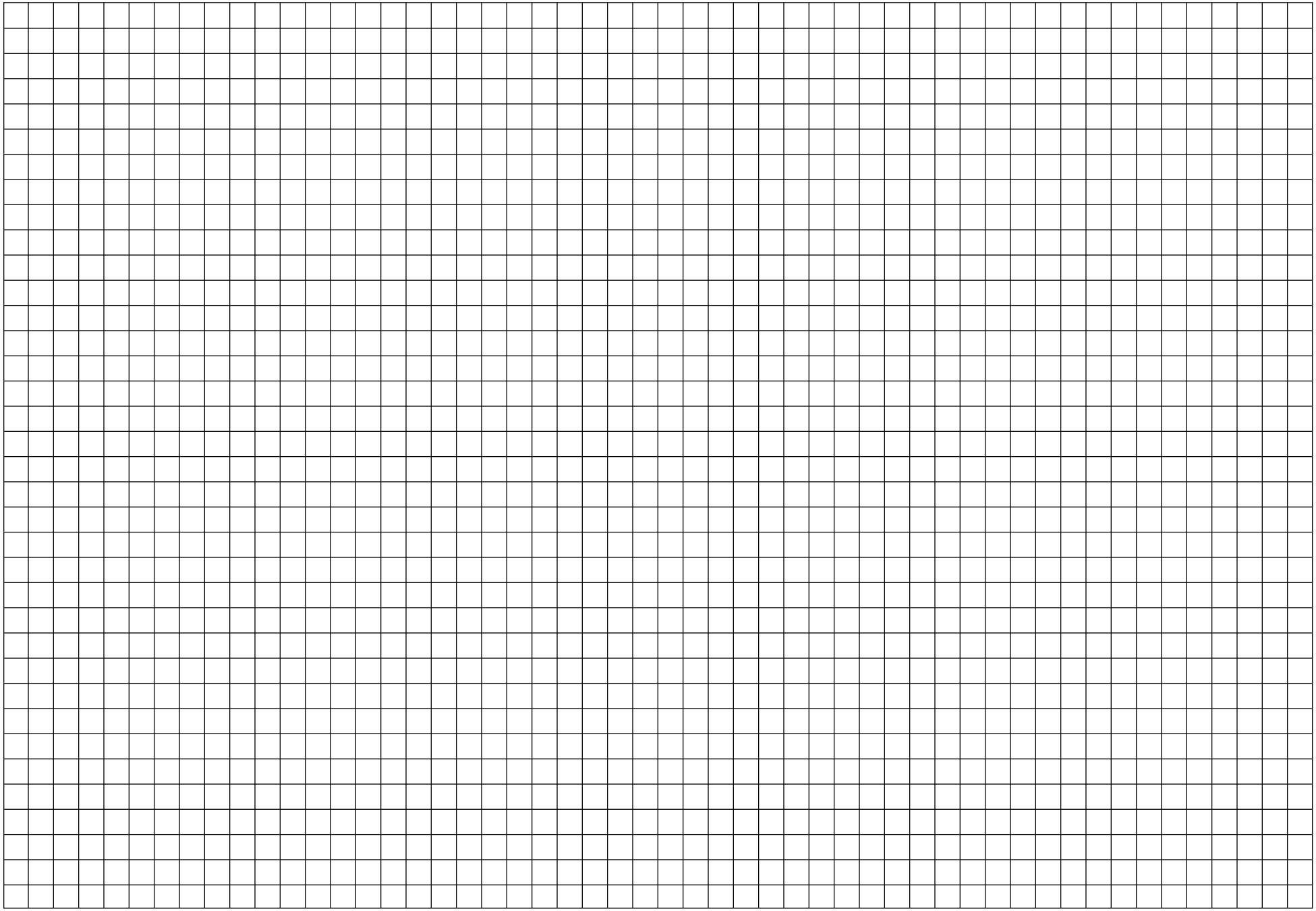
Question 37 continued

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.

Scrap Graph Paper — this sheet will *not* be scored.



Scrap Graph Paper — this sheet will *not* be scored.



High School Math Reference Sheet

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 5280 feet
1 mile = 1760 yards
1 mile = 1.609 kilometers

1 kilometer = 0.62 mile
1 pound = 16 ounces
1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds
1 ton = 2000 pounds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
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	$V = Bh$

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 $r \neq 1$

The Reference Sheet is continued on the next page.

Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Radians	1 radian $= \frac{180}{\pi}$ degrees
Degrees	1 degree $= \frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$