The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA I (Common Core)

Wednesday, August 17, 2016 — 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.

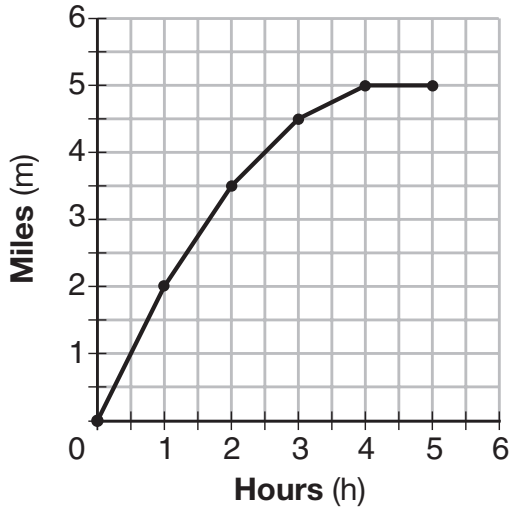
DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

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 The graph below shows the distance in miles, m, hiked from a camp in h hours.



Which hourly interval had the greatest rate of change?

(1) hour 0 to hour 1

(2) hour 1 to hour 2

(3) hour 2 to hour 3

(4) hour 3 to hour 4

2 The solution of an equation with two variables, x and y, is

(1) the set of all x values that make $y = 0$

(2) the set of all y values that make $x = 0$

(3) the set of all ordered pairs, (x,y), that make the equation true

(4) the set of all ordered pairs, (x,y), where the graph of the equation crosses the y-axis

3 Which statistic can *not* be determined from a box plot representing the scores on a math test in Mrs. DeRidder's algebra class?

(1) the lowest score

(2) the median score

(3) the highest score

(4) the score that occurs most frequently

Use this space for computations.

4 Which chart could represent the function $f(x) = -2x + 6$?

x	f(x)
0	6
2	10
4	14
6	18

(1)

x	f(x)
0	8
2	10
4	12
6	14

(3)

x	f(x)
0	4
2	6
4	8
6	10

(2)

x	f(x)
0	6
2	2
4	–2
6	–6

(4)

5 If $f(n) = (n - 1)^2 + 3n$, which statement is true?

(1) $f(3) = -2$

(2) $f(-2) = 3$

(3) $f(-2) = -15$

(4) $f(-15) = -2$

6 The table below shows 6 students' overall averages and their averages in their math class.

Overall Student Average	92	98	84	80	75	82
Math Class Average	91	95	85	85	75	78

If a linear model is applied to these data, which statement best describes the correlation coefficient?

(1) It is close to -1.

(2) It is close to 1.

(3) It is close to 0.

(4) It is close to 0.5.

Use this space for computations.

7 What is the solution to $2h + 8 > 3h - 6$?

(1) $h < 14$

(2) $h < \frac{14}{5}$

(3) $h > 14$

(4) $h > \frac{14}{5}$

8 Which expression is equivalent to $36x^2 - 100$?

(1) $4(3x - 5)(3x - 5)$

(2) $4(3x + 5)(3x - 5)$

(3) $2(9x - 25)(9x - 25)$

(4) $2(9x + 25)(9x - 25)$

9 Patricia is trying to compare the average rainfall of New York to that of Arizona. A comparison between these two states for the months of July through September would be best measured in

(1) feet per hour

(2) inches per hour

(3) inches per month

(4) feet per month

10 Which function defines the sequence $-6, -10, -14, -18, \ldots$, where $f(6) = -26$?

(1) $f(x) = -4x - 2$

(2) $f(x) = 4x - 2$

(3) $f(x) = -x + 32$

(4) $f(x) = x - 26$

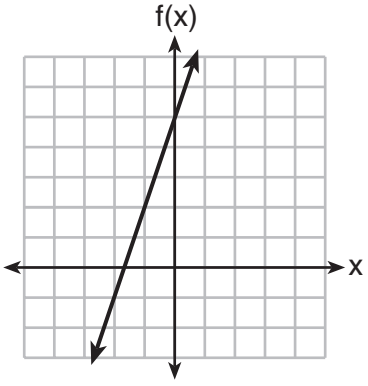
11 Which function has the greatest y-intercept?

(1) $f(x) = 3x$

(2) $2x + 3y = 12$

(3) the line that has a slope of 2 and passes through $(1,-4)$

(4)



Use this space for computations.

12 What is the product of $2x + 3$ and $4x^2 - 5x + 6$?

(1) $8x^3 - 2x^2 + 3x + 18$ (3) $8x^3 + 2x^2 - 3x + 18$

(2) $8x^3 - 2x^2 - 3x + 18$ (4) $8x^3 + 2x^2 + 3x + 18$

13 The height of a rocket, at selected times, is shown in the table below.

Time (sec)	0	1	2	3	4	5	6	7
Height (ft)	180	260	308	324	308	260	180	68

Based on these data, which statement is *not* a valid conclusion?

(1) The rocket was launched from a height of 180 feet.

(2) The maximum height of the rocket occurred 3 seconds after launch.

(3) The rocket was in the air approximately 6 seconds before hitting the ground.

(4) The rocket was above 300 feet for approximately 2 seconds.

14 A parking garage charges a base rate of $3.50 for up to 2 hours, and an hourly rate for each additional hour. The sign below gives the prices for up to 5 hours of parking.

Parking Rates	
2 hours	$3.50
3 hours	$9.00
4 hours	$14.50
5 hours	$20.00

Which linear equation can be used to find x, the additional hourly parking rate?

(1) $9.00 + 3x = 20.00$ (3) $2x + 3.50 = 14.50$

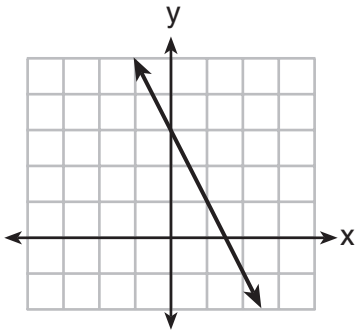
(2) $9.00 + 3.50x = 20.00$ (4) $2x + 9.00 = 14.50$

Use this space for computations.

15 Which function has a constant rate of change equal to -3?

x	y
0	2
1	5
2	8
3	11

(1)



(3)

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

(2)

$2y = -6x + 10$

(4)

16 Kendal bought x boxes of cookies to bring to a party. Each box contains 12 cookies. She decides to keep two boxes for herself. She brings 60 cookies to the party. Which equation can be used to find the number of boxes, x, Kendal bought?

(1) $2x - 12 = 60$

(2) $12x - 2 = 60$

(3) $12x - 24 = 60$

(4) $24 - 12x = 60$

17 The table below shows the temperature, $T(m)$, of a cup of hot chocolate that is allowed to chill over several minutes, m.

Time, m (minutes)	0	2	4	6	8
Temperature, T(m) (°F)	150	108	78	56	41

Which expression best fits the data for $T(m)$?

(1) $150(0.85)^m$

(2) $150(1.15)^m$

(3) $150(0.85)^{m-1}$

(4) $150(1.15)^{m-1}$

Use this space for computations.

18 As x increases beyond 25, which function will have the largest value?

(1) $f(x) = 1.5^x$

(2) $g(x) = 1.5x + 3$

(3) $h(x) = 1.5x^2$

(4) $k(x) = 1.5x^3 + 1.5x^2$

19 What are the solutions to the equation $3x^2 + 10x = 8$?

(1) $\frac{2}{3}$ and -4

(2) $-\frac{2}{3}$ and 4

(3) $\frac{4}{3}$ and -2

(4) $-\frac{4}{3}$ and 2

20 An online company lets you download songs for \$0.99 each after you have paid a \$5 membership fee. Which domain would be most appropriate to calculate the cost to download songs?

(1) rational numbers greater than zero

(2) whole numbers greater than or equal to one

(3) integers less than or equal to zero

(4) whole numbers less than or equal to one

21 The function $f(x) = 3x^2 + 12x + 11$ can be written in vertex form as

(1) $f(x) = (3x + 6)^2 - 25$

(2) $f(x) = 3(x + 6)^2 - 25$

(3) $f(x) = 3(x + 2)^2 - 1$

(4) $f(x) = 3(x + 2)^2 + 7$

22 A system of equations is given below.

$$x + 2y = 5$$
$$2x + y = 4$$

Which system of equations does *not* have the same solution?

(1) $3x + 6y = 15$
$2x + y = 4$

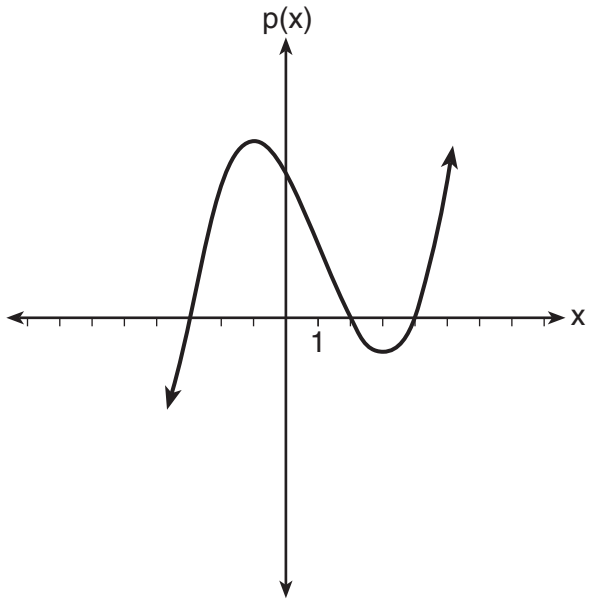
(2) $4x + 8y = 20$
$2x + y = 4$

(3) $x + 2y = 5$
$6x + 3y = 12$

(4) $x + 2y = 5$
$4x + 2y = 12$

Use this space for computations.

23 Based on the graph below, which expression is a possible factorization of $p(x)$?



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

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

(3) $(x + 3)(x - 5)(x - 2)(x - 4)$

(4) $(x - 3)(x + 5)(x + 2)(x + 4)$

24 Milton has his money invested in a stock portfolio. The value, $v(x)$, of his portfolio can be modeled with the function $v(x) = 30{,}000(0.78)^x$, where x is the number of years since he made his investment. Which statement describes the rate of change of the value of his portfolio?

(1) It decreases 78% per year.

(2) It decreases 22% per year.

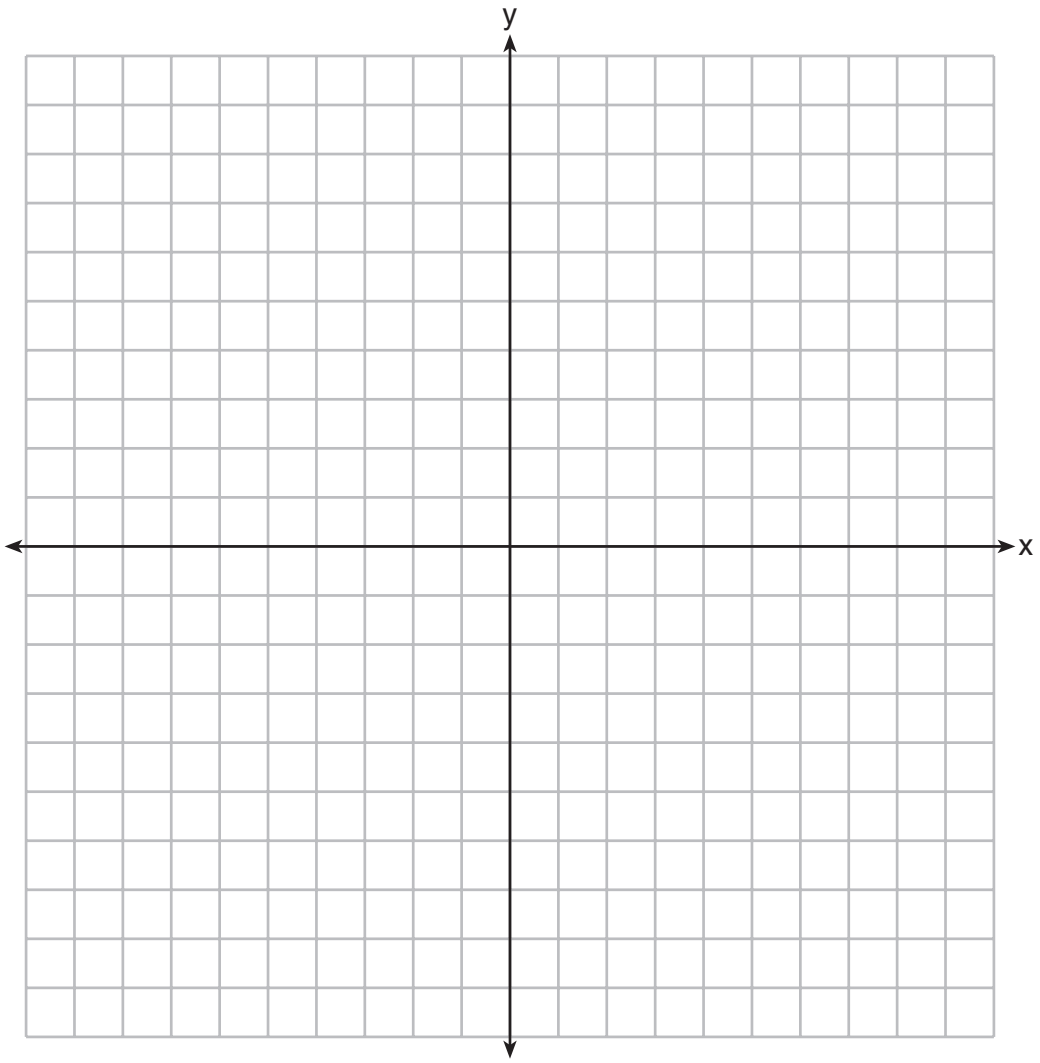
(3) It increases 78% per year.

(4) It increases 22% per year.

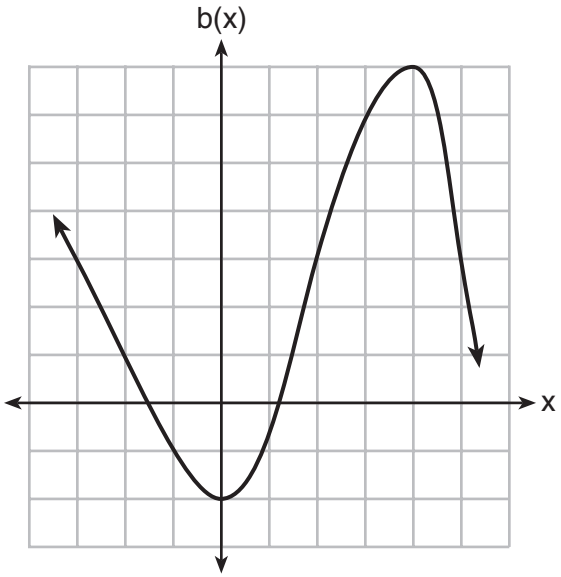
Part II

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 Graph the function $y = -\sqrt{x+3}$ on the set of axes below.



26 Richard is asked to transform the graph of $b(x)$ below.



The graph of $b(x)$ is transformed using the equation $h(x) = b(x - 2) - 3$. Describe how the graph of $b(x)$ changed to form the graph of $h(x)$.

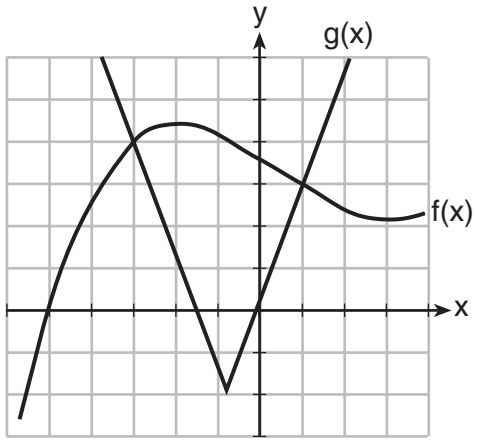
27 Consider the pattern of squares shown below:

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

28 When multiplying polynomials for a math assignment, Pat found the product to be $-4x + 8x^2 - 2x^3 + 5$. He then had to state the leading coefficient of this polynomial. Pat wrote down -4. Do you agree with Pat's answer? Explain your reasoning.

29 Is the sum of $3\sqrt{2}$ and $4\sqrt{2}$ rational or irrational? Explain your answer.

30 The graph below shows two functions, $f(x)$ and $g(x)$. State all the values of x for which $f(x) = g(x)$.



31 Find the zeros of $f(x) = (x - 3)^2 - 49$, algebraically.

32 Solve the equation below for x in terms of a.

$$4(ax + 3) - 3ax = 25 + 3a$$

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]

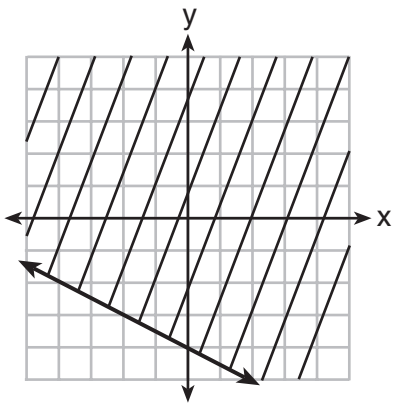
33 The data table below shows the median diameter of grains of sand and the slope of the beach for 9 naturally occurring ocean beaches.

Median Diameter of Grains of Sand, in Millimeters (x)	0.17	0.19	0.22	0.235	0.235	0.3	0.35	0.42	0.85
Slope of Beach, in Degrees (y)	0.63	0.7	0.82	0.88	1.15	1.5	4.4	7.3	11.3

Write the linear regression equation for this set of data, rounding all values to the *nearest thousandth*.

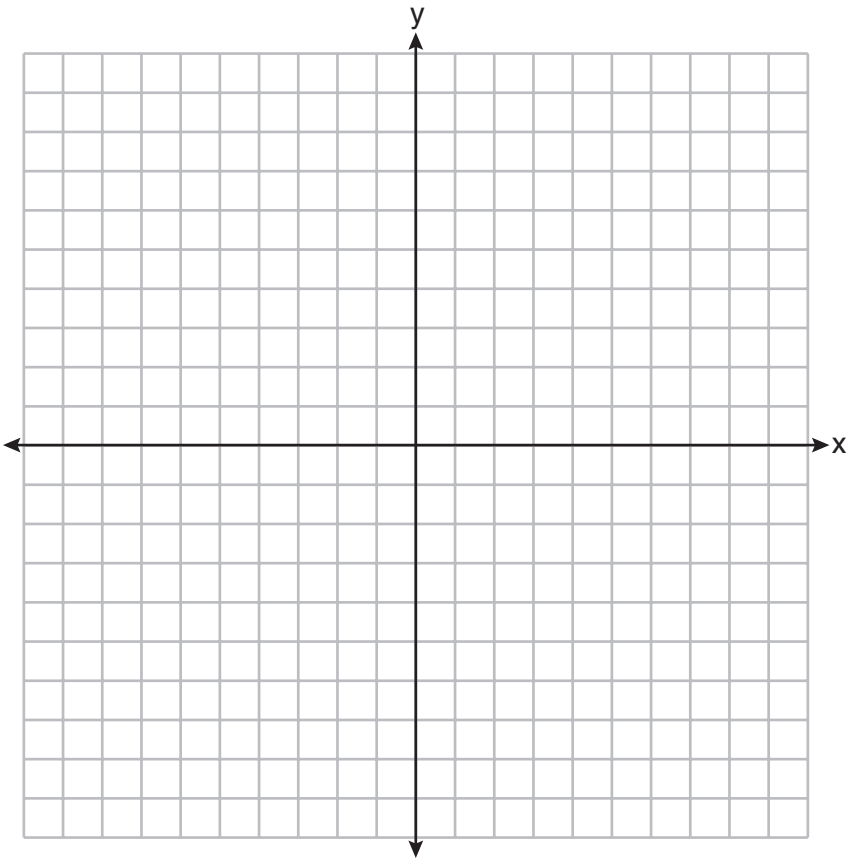
Using this equation, predict the slope of a beach, to the *nearest tenth of a degree,* on a beach with grains of sand having a median diameter of 0.65 mm.

34 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.



35 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.

36 Janice is asked to solve $0 = 64x^2 + 16x - 3$. She begins the problem by writing the following steps:

Line 1 $\quad 0 = 64x^2 + 16x - 3$
Line 2 $\quad 0 = B^2 + 2B - 3$
Line 3 $\quad 0 = (B + 3)(B - 1)$

Use Janice's procedure to solve the equation for x.

Explain the method Janice used to solve the quadratic equation.

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 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.

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

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.

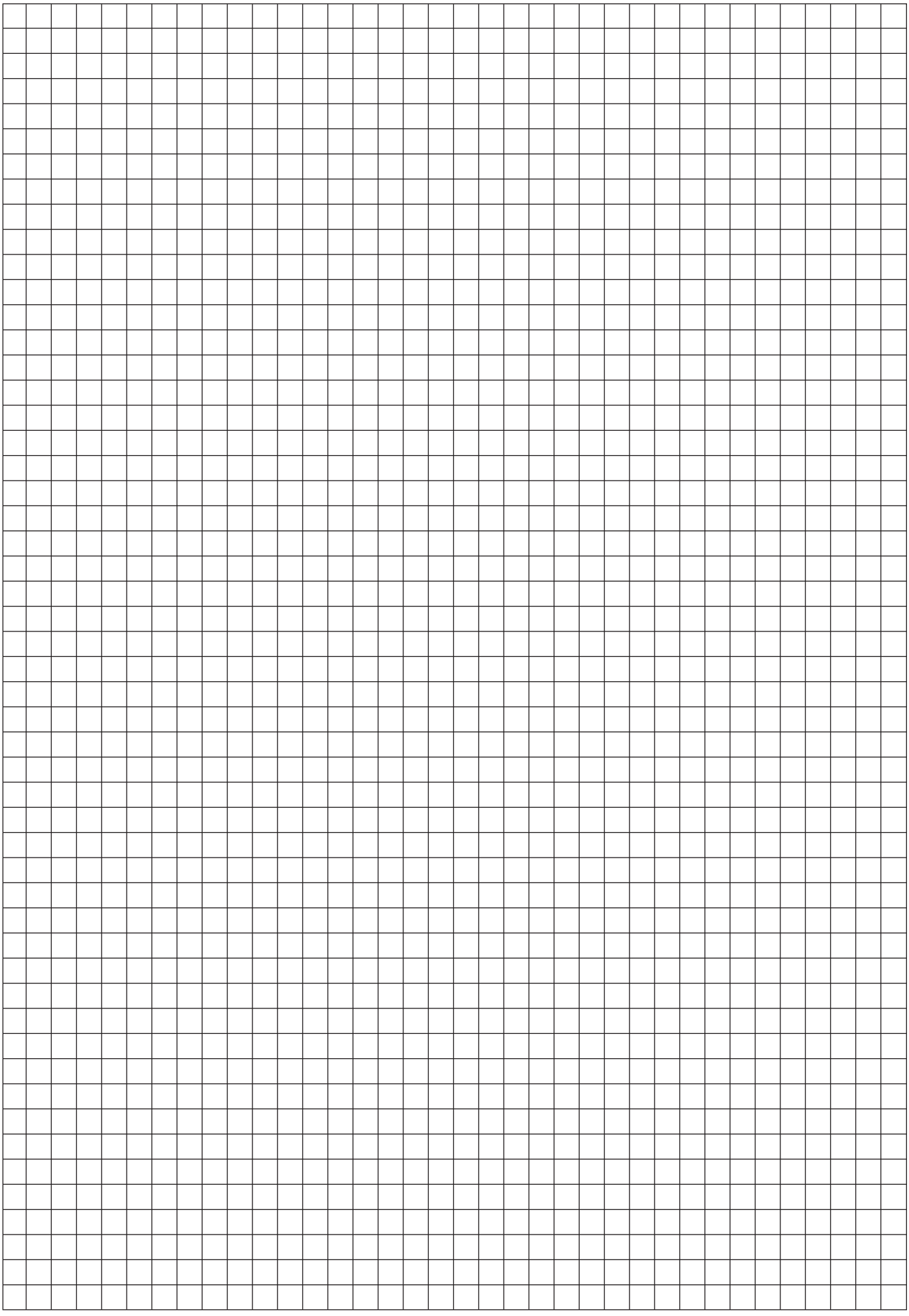
Question 37 is continued on the next page.

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

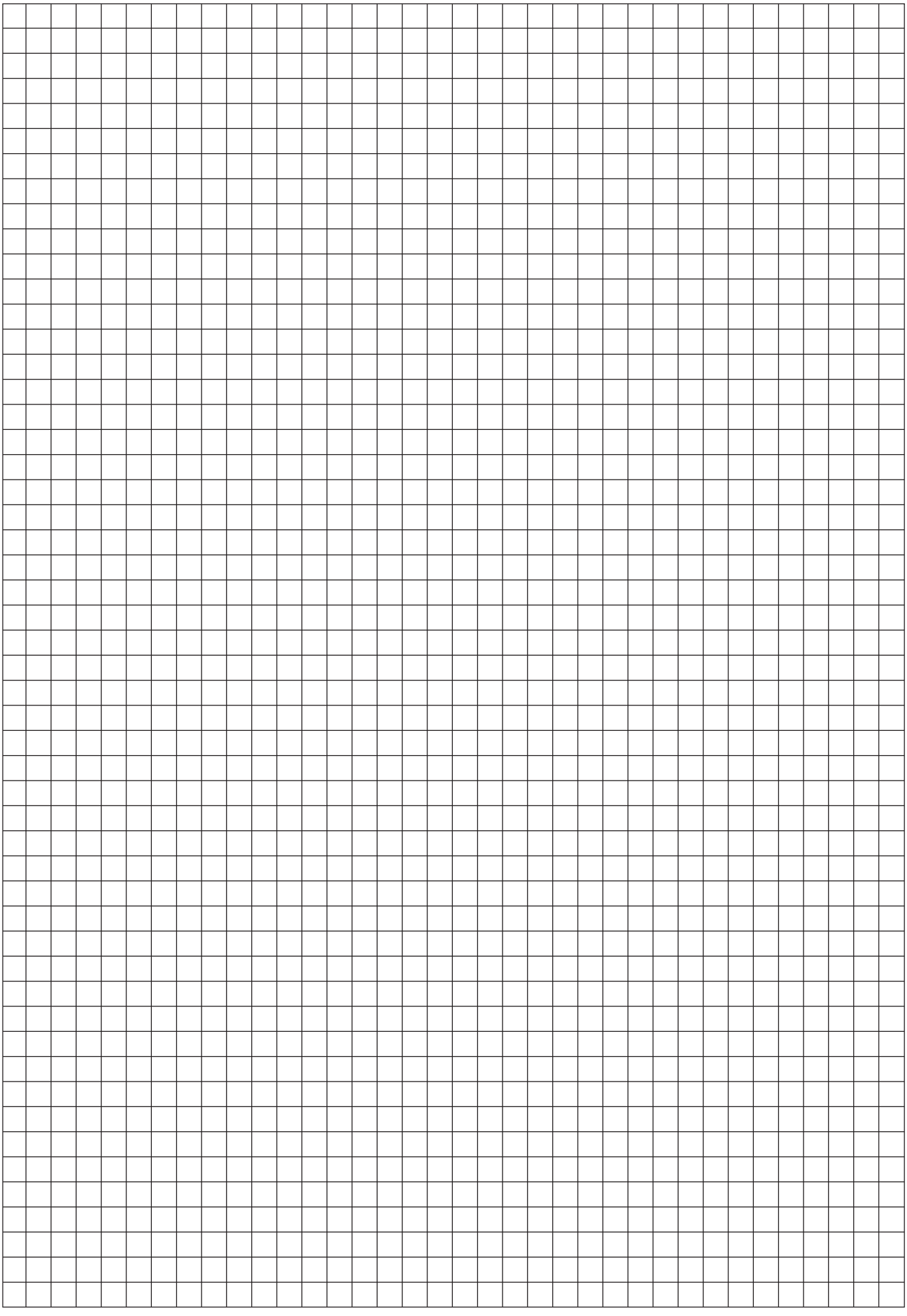
Tear Here

Tear Here

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



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



Tear Here

Tear Here

Tear Here

Tear Here

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	$V = Bh$
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	$A = A_0 e^{k(t - t_0)} + B_0$

ALGEBRA I (COMMON CORE)