

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

ALGEBRA I (Common Core)

Monday, January 26, 2015 — 1:15 to 4:15 p.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 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 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

- (1) computers repaired per week
- (2) hours worked per week
- (3) customers served per week
- (4) days worked per week

- 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.

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

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

- (1) $\frac{3 \text{ ft}}{1 \text{ yd}}$
- (2) $\frac{5280 \text{ ft}}{1 \text{ mi}}$
- (3) $\frac{60 \text{ sec}}{1 \text{ min}}$
- (4) $\frac{60 \text{ min}}{1 \text{ hr}}$

- 3 Which equation has the same solutions as $2x^2 + x - 3 = 0$?

- (1) $(2x - 1)(x + 3) = 0$
- (2) $(2x + 1)(x - 3) = 0$
- (3) $(2x - 3)(x + 1) = 0$
- (4) $(2x + 3)(x - 1) = 0$

**Use this space for
computations.**

- 4 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?

- (1) $3000(1 + 0.02)^{16}$ (3) $3000(1 + 0.02)^{18}$
(2) $3000(1 - 0.02)^{16}$ (4) $3000(1 - 0.02)^{18}$

- 5 Which table of values represents a linear relationship?

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

(1)

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

(3)

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

(2)

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

(4)

- 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?

- (1) integers (3) irrational numbers
(2) whole numbers (4) rational numbers

Use this space for
computations.

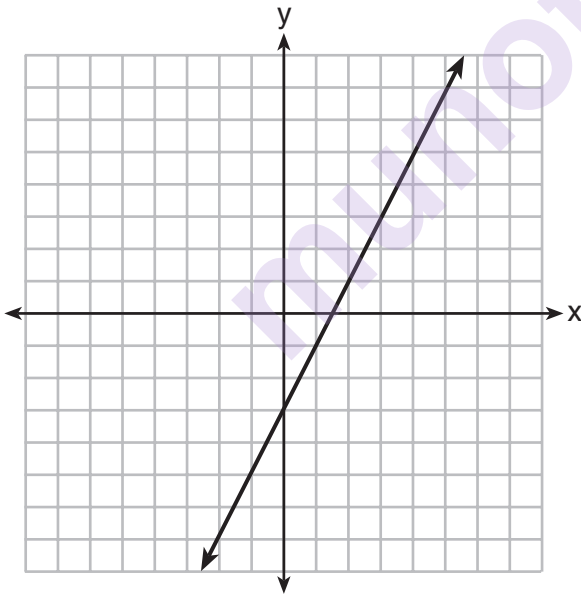
7 The inequality $7 - \frac{2}{3}x < x - 8$ is equivalent to

- (1) $x > 9$ (3) $x < 9$
(2) $x > -\frac{3}{5}$ (4) $x < -\frac{3}{5}$

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?

- (1) 2589 (3) 15,901
(2) 6510 (4) 18,490

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



- (1) $y = \frac{12 - 6x}{4}$ (3) $6y + x = 18$
(2) $27 + 3y = 6x$ (4) $y + 3 = 6x$

- 10** 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

(1) $5x - 11$ (3) $10x - 22$
(2) $6x^2 - 28x + 30$ (4) $6x^2 - 6x - 11$

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

(1) $(2,1)$ (3) $(2,6)$
(2) $(2,4)$ (4) $(2,9)$

- 12** How does the graph of $f(x) = 3(x - 2)^2 + 1$ compare to the graph of $g(x) = x^2$?

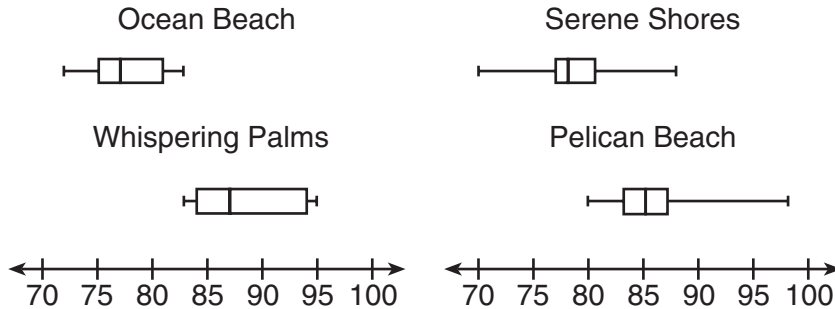
(1) The graph of $f(x)$ is wider than the graph of $g(x)$, and its vertex is moved to the left 2 units and up 1 unit.
(2) The graph of $f(x)$ is narrower than the graph of $g(x)$, and its vertex is moved to the right 2 units and up 1 unit.
(3) The graph of $f(x)$ is narrower than the graph of $g(x)$, and its vertex is moved to the left 2 units and up 1 unit.
(4) The graph of $f(x)$ is wider than the graph of $g(x)$, and its vertex is moved to the right 2 units and up 1 unit.

- 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?

(1) $0.79 + 4.50r \leq 16.00$; 3 rides
(2) $0.79 + 4.50r \leq 16.00$; 4 rides
(3) $4.50 + 0.79r \leq 16.00$; 14 rides
(4) $4.50 + 0.79r \leq 16.00$; 15 rides

**Use this space for
computations.**

- 14** Corinne is planning a beach vacation in July and is analyzing the daily high temperatures for her potential destination. She would like to choose a destination with a high median temperature and a small interquartile range. She constructed box plots shown in the diagram below.



Which destination has a median temperature above 80 degrees and the smallest interquartile range?

- | | |
|----------------------|-------------------|
| (1) Ocean Beach | (3) Serene Shores |
| (2) Whispering Palms | (4) Pelican Beach |
- 15** 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?

- | |
|---|
| (1) 0.98, the percent of money in the account initially |
| (2) 0.98, the percent of money in the account after x years |
| (3) 5000, the amount of money in the account initially |
| (4) 5000, the amount of money in the account after x years |

**Use this space for
computations.**

- 16** The equation for the volume of a cylinder is $V = \pi r^2 h$. The positive value of r , in terms of h and V , is

(1) $r = \sqrt{\frac{V}{\pi h}}$

(3) $r = 2V\pi h$

(2) $r = \sqrt{V\pi h}$

(4) $r = \frac{V}{2\pi}$

- 17** Which equation has the same solutions as $x^2 + 6x - 7 = 0$?

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

(3) $(x - 3)^2 = 16$

(2) $(x - 3)^2 = 2$

(4) $(x + 3)^2 = 16$

- 18** Two functions, $y = |x - 3|$ and $3x + 3y = 27$, are graphed on the same set of axes. Which statement is true about the solution to the system of equations?

(1) $(3,0)$ is the solution to the system because it satisfies the equation $y = |x - 3|$.

(2) $(9,0)$ is the solution to the system because it satisfies the equation $3x + 3y = 27$.

(3) $(6,3)$ is the solution to the system because it satisfies both equations.

(4) $(3,0)$, $(9,0)$, and $(6,3)$ are the solutions to the system of equations because they all satisfy at least one of the equations.

- 19** Miriam and Jessica are growing bacteria in a laboratory. Miriam uses the growth function $f(t) = n^{2t}$ while Jessica uses the function $g(t) = n^{4t}$, where n represents the initial number of bacteria and t is the time, in hours. If Miriam starts with 16 bacteria, how many bacteria should Jessica start with to achieve the same growth over time?

- (1) 32 (3) 8
(2) 16 (4) 4

- 20** If a sequence is defined recursively by $f(0) = 2$ and $f(n + 1) = -2f(n) + 3$ for $n \geq 0$, then $f(2)$ is equal to

- (1) 1 (3) 5
(2) -11 (4) 17

- 21** 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?

- (1) 12 (3) 60
(2) 20 (4) 80

- 22** When factored completely, the expression $p^4 - 81$ is equivalent to

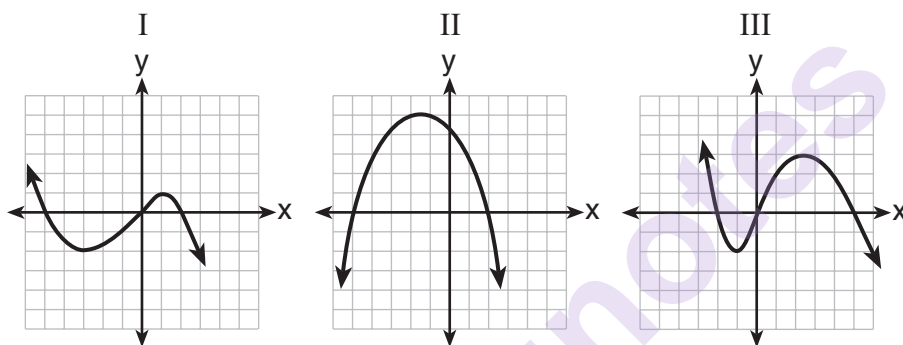
- (1) $(p^2 + 9)(p^2 - 9)$
(2) $(p^2 - 9)(p^2 - 9)$
(3) $(p^2 + 9)(p + 3)(p - 3)$
(4) $(p + 3)(p - 3)(p + 3)(p - 3)$

**Use this space for
computations.**

- 23** 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?

- (1) $c(z) = 0.46z + 0.20$ (3) $c(z) = 0.46(z - 1) + 0.20$
(2) $c(z) = 0.20z + 0.46$ (4) $c(z) = 0.20(z - 1) + 0.46$

- 24** A polynomial function contains the factors x , $x - 2$, and $x + 5$. Which graph(s) below could represent the graph of this function?



- (1) I, only (3) I and III
(2) II, only (4) I, II, and III

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 Ms. Fox asked her class “Is the sum of 4.2 and $\sqrt{2}$ rational or irrational?” Patrick answered that the sum would be irrational.

State whether Patrick is correct or incorrect. Justify your reasoning.

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- 26** The school newspaper surveyed the student body for an article about club membership. The table below shows the number of students in each grade level who belong to one or more clubs.

	1 Club	2 Clubs	3 or More Clubs
9 th	90	33	12
10 th	125	12	15
11 th	87	22	18
12 th	75	27	23

If there are 180 students in ninth grade, what percentage of the ninth grade students belong to more than one club?

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27 A function is shown in the table below.

x	f(x)
-4	2
-1	-4
0	-2
3	16

If included in the table, which ordered pair, $(-4, 1)$ or $(1, -4)$, would result in a relation that is no longer a function? Explain your answer.

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

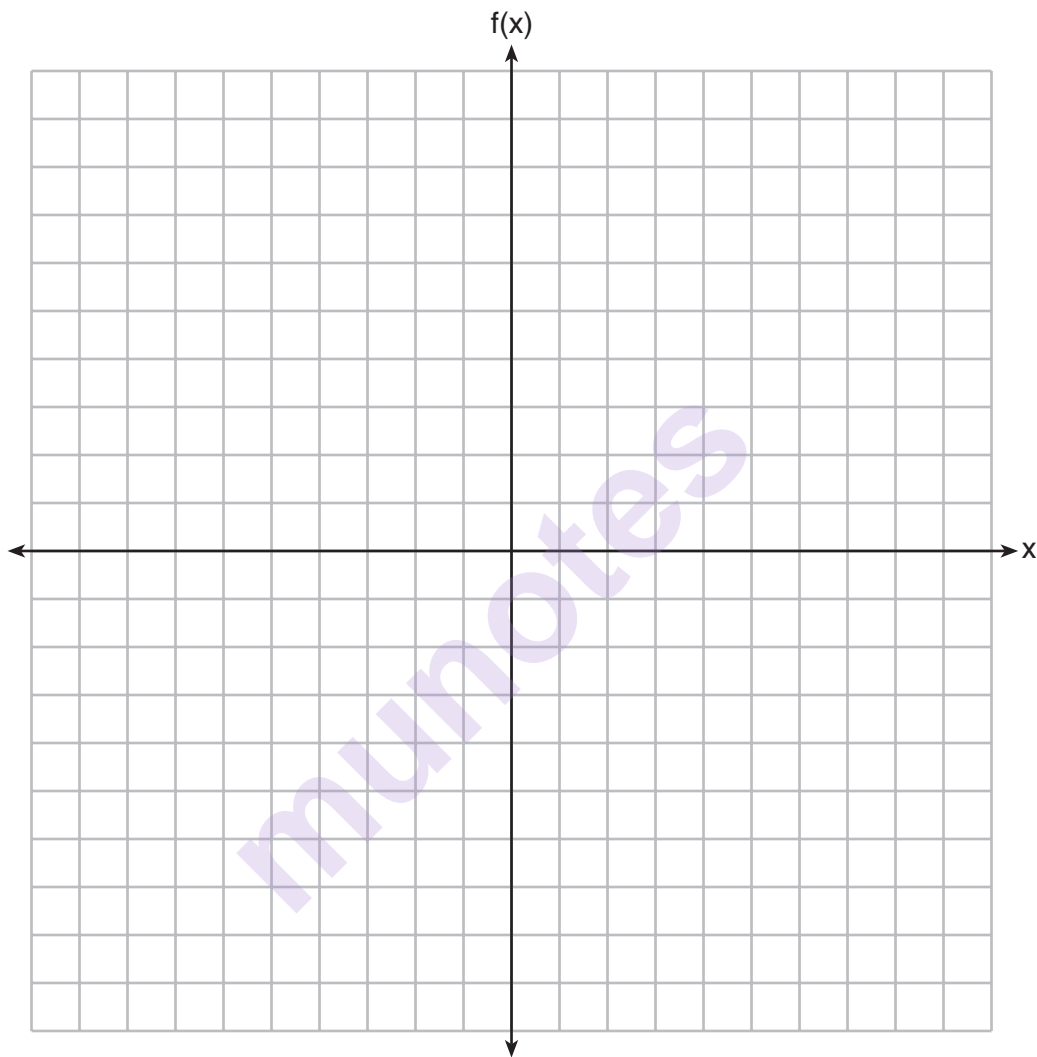
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29 Solve the equation $4x^2 - 12x = 7$ algebraically for x .

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

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



31 A gardener is planting two types of trees:

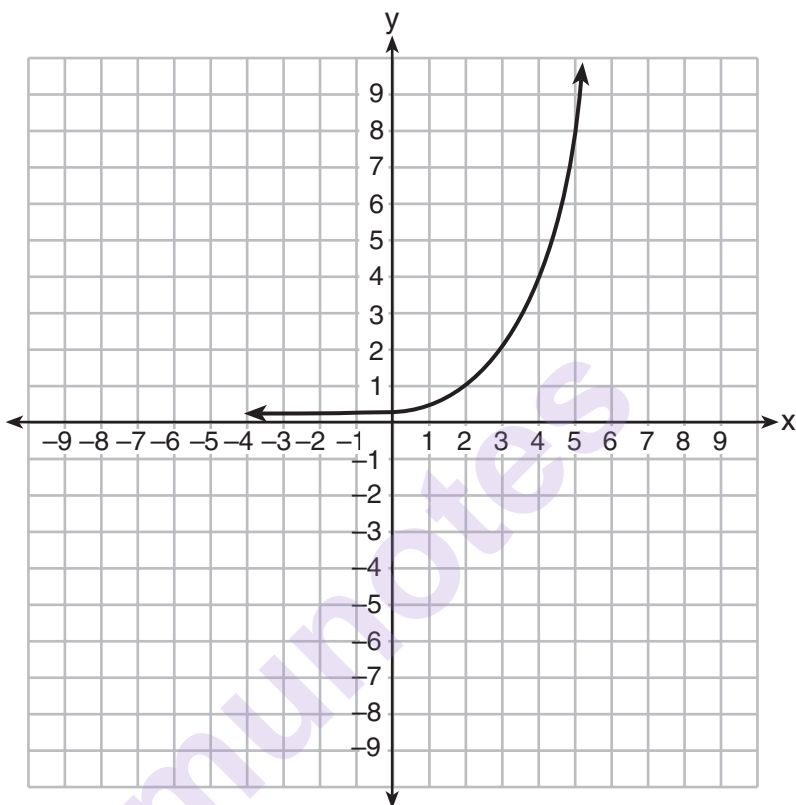
Type *A* is three feet tall and grows at a rate of 15 inches per year.

Type *B* is four feet tall and grows at a rate of 10 inches per year.

Algebraically determine exactly how many years it will take for these trees to be the same height.

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32 Write an exponential equation for the graph shown below.



Explain how you determined the equation.

Part III

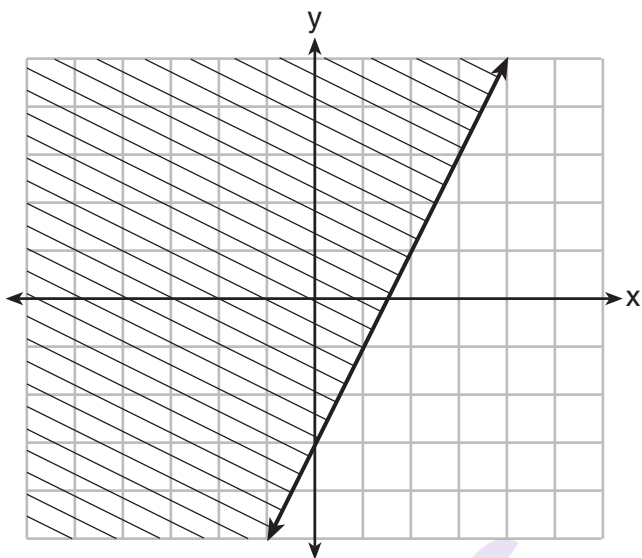
Answer all 4 questions in this part. Each correct answer will receive 4 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit.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

- 33 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.

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

34 The graph of an inequality is shown below.



- a) Write the inequality represented by the graph.
- b) On the same set of axes, graph the inequality $x + 2y < 4$.
- c) The two inequalities graphed on the set of axes form a system. Oscar thinks that the point (2,1) is in the solution set for this system of inequalities. Determine and state whether you agree with Oscar. Explain your reasoning.

- 35** A nutritionist collected information about different brands of beef hot dogs. She made a table showing the number of Calories and the amount of sodium in each hot dog.

Calories per Beef Hot Dog	Milligrams of Sodium per Beef Hot Dog
186	495
181	477
176	425
149	322
184	482
190	587
158	370
139	322

- a) Write the correlation coefficient for the line of best fit. Round your answer to the *nearest hundredth*.
- b) Explain what the correlation coefficient suggests in the context of this problem.

36 a) Given the function $f(x) = -x^2 + 8x + 9$, state whether the vertex represents a maximum or minimum point for the function. Explain your answer.

b) Rewrite $f(x)$ in vertex form by completing the square.

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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. All answers should be written in pen, except for graphs and drawings, which should be written in pencil. [6]

- 37** New Clarendon Park is undergoing renovations to its gardens. One garden that was originally a square is being adjusted so that one side is doubled in length, while the other side is decreased by three meters.

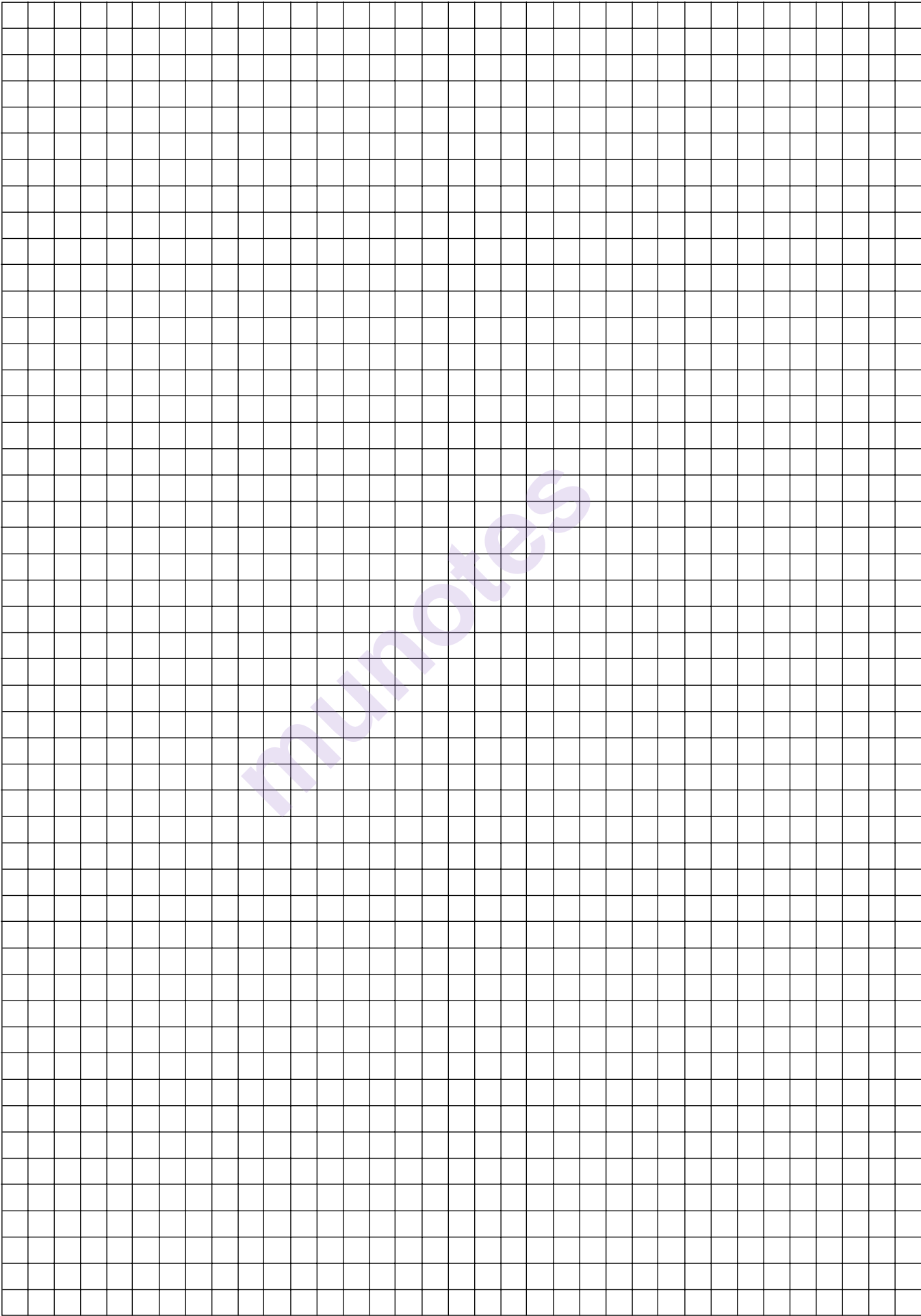
The new rectangular garden will have an area that is 25% more than the original square garden. Write an equation that could be used to determine the length of a side of the original square garden.

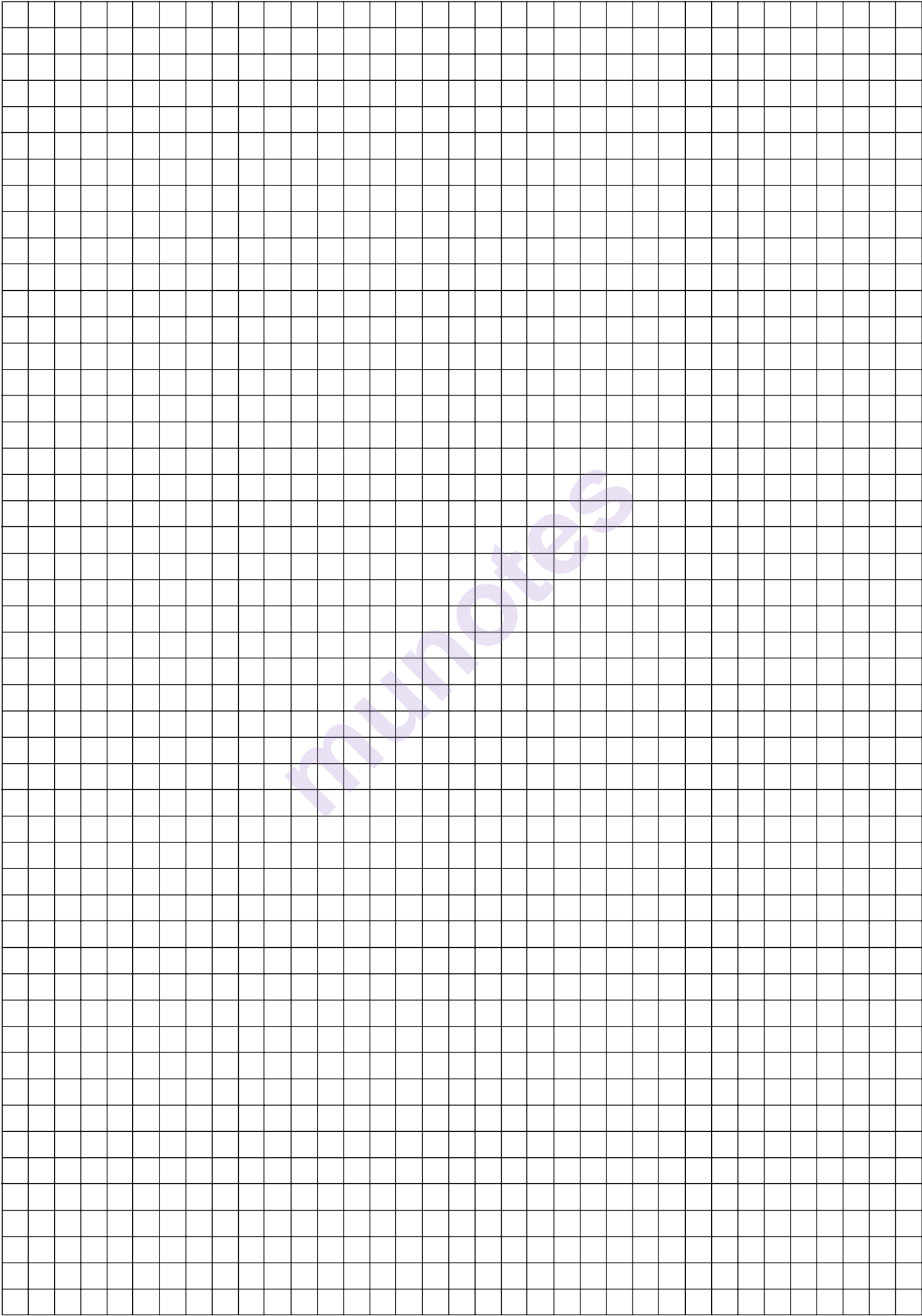
Explain how your equation models the situation.

Determine the area, in square meters, of the new rectangular garden.

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

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