ALGEBRA

I

Large-Type Edition

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

ALGEBRA I

v202

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 A high school club is researching a tour package offered by the Island Kayak Company. The company charges $35 per person and $245 for the tour guide. Which function represents the total cost, $C(x)$, of this kayak tour package for x club members?

(1) $C(x) = 35x$

(2) $C(x) = 35x + 245$

(3) $C(x) = 35(x + 245)$

(4) $C(x) = 35 + (x + 245)$

2 The expression $3(x + 4) - (2x + 7)$ is equivalent to

(1) $x + 5$

(2) $x - 10$

(3) $x - 3$

(4) $x + 11$

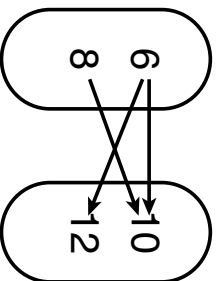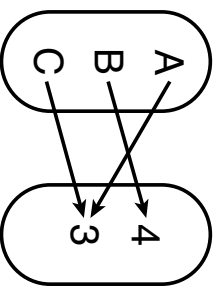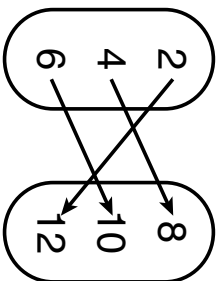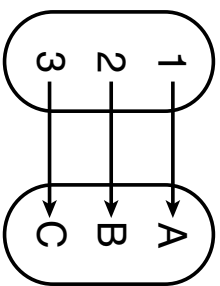3 A function is defined as $K(x) = 2x^2 - 5x + 3$. The value of $K(-3)$ is

(1) 54

(2) 36

(3) 0

(4) -18

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4

4 Which relation is *not* a function?

(1)

(2)

(3)

(4)

5 The value of Tony's investment was $1140 on January 1st. On this date three years later, his investment was worth $1824. The average rate of change for this investment was $19 per

(1) day   (3) quarter

(2) month   (4) year

6 The solution to $3(x - 8) + 4x = 8x + 4$ is

(1) 12   (3) -12

(2) 28   (4) -28

7 An ice cream shop sells ice cream cones, c, and milkshakes, m. Each ice cream cone costs \$1.50 and each milkshake costs \$2.00. Donna has \$19.00 to spend on ice cream cones and milkshakes. If she must buy 5 ice cream cones, which inequality could be used to determine the maximum number of milkshakes she can buy?

(1) $1.50(5) + 2.00m \geq 19.00$ (3) $1.50c + 2.00(5) \geq 19.00$

(2) $1.50(5) + 2.00m \leq 19.00$ (4) $1.50c + 2.00(5) \leq 19.00$

8 When written in standard form, the product of $(3 + x)$ and $(2x - 5)$ is

(1) $3x - 2$ (3) $2x^2 - 11x - 15$

(2) $2x^2 + x - 15$ (4) $6x - 15 + 2x^2 - 5x$

9 If $x = 2$, $y = 3\sqrt{2}$, and $w = 2\sqrt{8}$, which expression results in a rational number?

(1) $x + y$ (3) $(w)(y)$

(2) $y - w$ (4) $y \div x$

10 Which product is equivalent to $4x^2 - 3x - 27$?

(1) $(2x + 9)(2x - 3)$

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

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

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

11 Given: $f(x) = \frac{2}{3}x - 4$ and $g(x) = \frac{1}{4}x + 1$

Four statements about this system are written below.

    I. $f(4) = g(4)$

    II.   When $x = 12$, $f(x) = g(x)$.

    III. The graphs of $f(x)$ and $g(x)$ intersect at $(12,4)$.

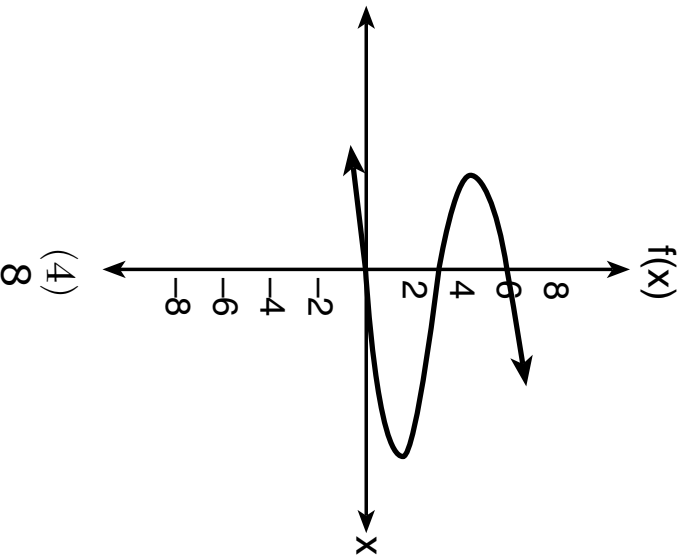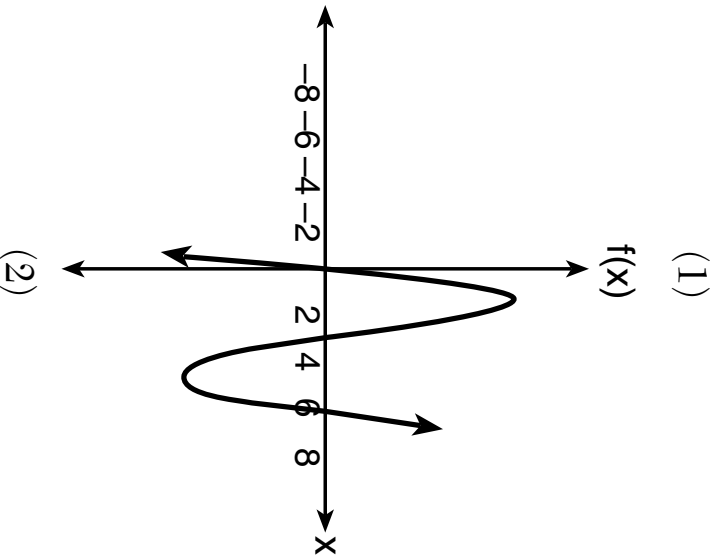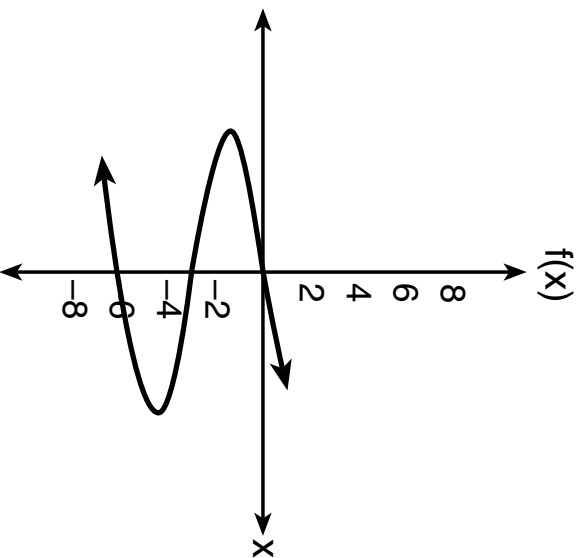   IV. The graphs of $f(x)$ and $g(x)$ intersect at $(4,12)$.
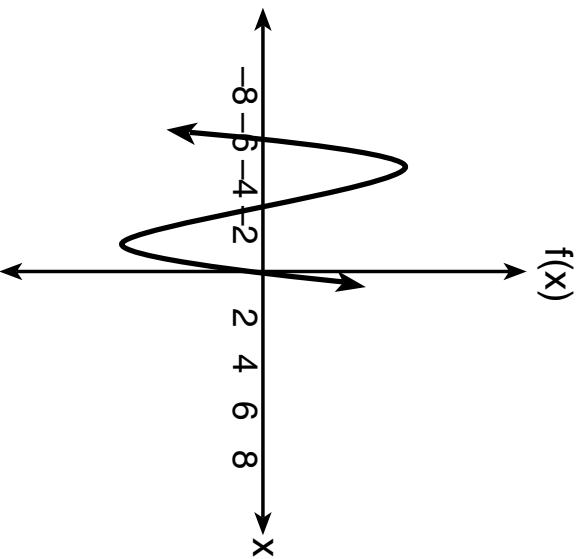
Which statement(s) are true?

(1) II, only

(2) IV, only

(3) I and IV

(4) II and III

12 Which sketch represents the polynomial function

$$f(x) = x(x + 6)(x + 3)?$$

(1)

(2)

(3)

(4)

Use this space for computations.

Use this space for computations.

13 If the parent function of $f(x)$ is $p(x) = x^2$, then the graph of the function $f(x) = (x - k)^2 + 5$, where $k > 0$, would be a shift of

(1) k units to the left and a move of 5 units up

(2) k units to the left and a move of 5 units down

(3) k units to the right and a move of 5 units up

(4) k units to the right and a move of 5 units down

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

(1) $-12x^6$

(2) $-12x^5$

(3) $-64x^6$

(4) $-64x^5$

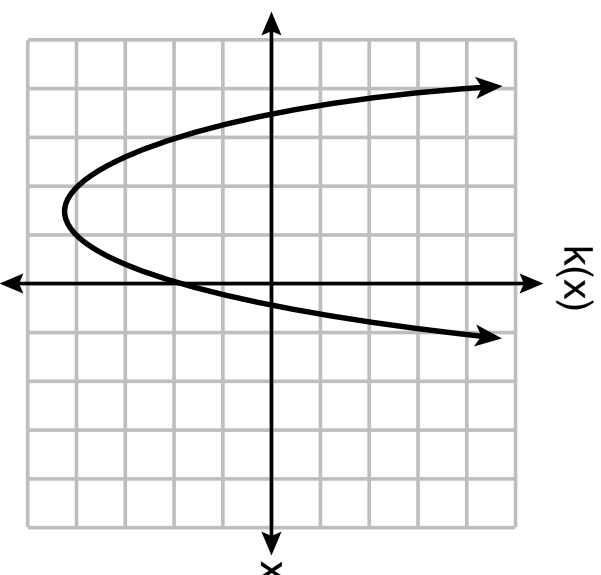**15** Which function has the *smallest y-intercept?*

$g(x) = 2x - 6$

(1)

$f(x) = \sqrt{x} - 2$

(3)

x	h(x)
–2	$\frac{1}{4}$
–1	$\frac{1}{2}$
0	1
1	2
2	4

(2)

k(x)

x

(4)

16 Which domain would be the most appropriate to use for a function that compares the number of emails sent (x) to the amount of data used for a cell phone plan (y)?

(1) integers

(3) rational numbers

(2) whole numbers

(4) irrational numbers

Use this space for computations.

17 Eric deposits \$500 in a bank account that pays 3.5% interest, compounded yearly. Which type of function should he use to determine how much money he will have in the account at the end of 10 years?

(1) linear

(2) quadratic

(3) absolute value

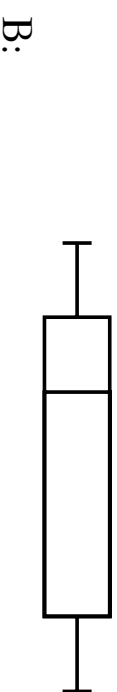(4) exponential

18 Given: the sequence 4, 7, 10, 13,...

When using the arithmetic sequence formula $a_n = a_1 + (n - 1)d$ to determine the 10th term, which variable would be replaced with the number 3?

(1) a_1

(2) n

(3) a_n

(4) d

Use this space for computations.

19 Below are two representations of data.

A: 2, 5, 5, 6, 6, 6, 7, 8, 9

B:

Which statement about A and B is true?

(1) median of A > median of B

(2) range of A < range of B

(3) upper quartile of A < upper quartile of B

(4) lower quartile of A > lower quartile of B

20 Which system has the same solution as the system below?

$$x + 3y = 10$$
$$-2x - 2y = 4$$

(1) $-x + y = 6$
    $2x + 6y = 20$

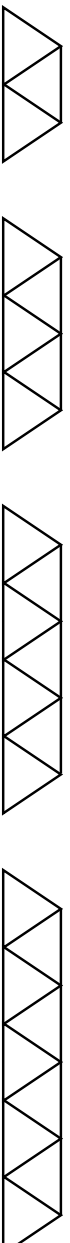(2) $-x + y = 14$
    $2x + 6y = 20$

(3) $x + y = 6$
    $2x + 6y = 20$

(4) $x + y = 14$
    $2x + 6y = 20$

21 Given the pattern below, which recursive formula represents the number of triangles in this sequence?

(1) $y = 2x + 3$

(2) $y = 3x + 2$

(3) $a_1 = 2$, $a_n = a_{n-1} + 3$

(4) $a_1 = 3$, $a_n = a_{n-1} + 2$

Use this space for computations.

22 Students were asked to write an expression which had a leading coefficient of 3 and a constant term of -4. Which response is correct?

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

(2) $7x^3 - 3x^5 - 4$

(3) $4 - 7x + 3x^3$

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

23 Sarah travels on her bicycle at a speed of 22.7 miles per hour. What is Sarah's approximate speed, in kilometers per minute?

(1) 0.2

(2) 0.6

(3) 36.5

(4) 36.6

24 Which ordered pair does *not* fall on the line formed by the other three?

(1) (16,18)

(2) (12,12)

(3) (9,10)

(4) (3,6)

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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]

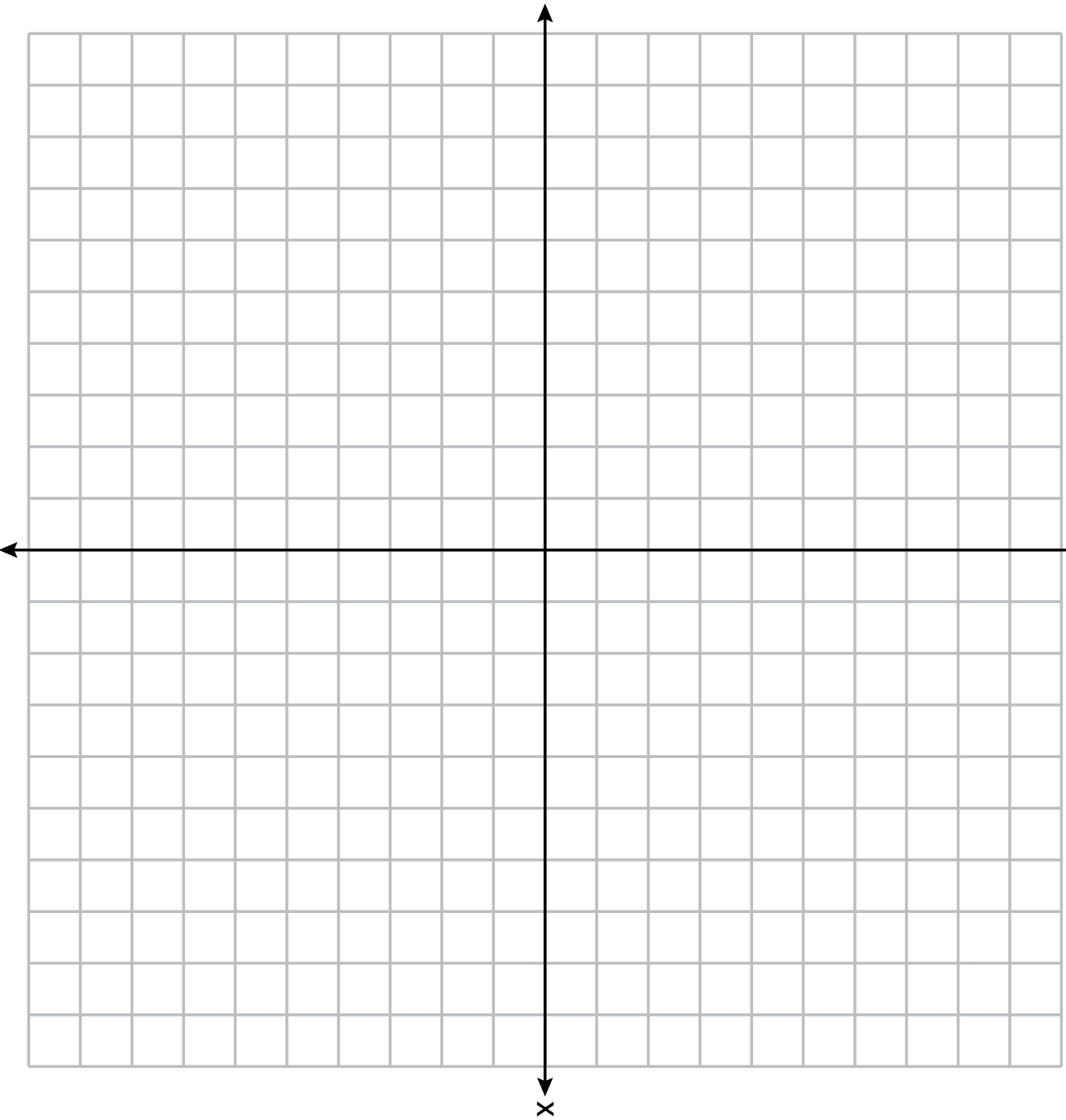**25** Solve algebraically for y:

$$4(y - 3) \leq 4(2y + 1)$$

26 Graph the function $f(x) = \left| \frac{1}{2}x + 3 \right|$ over the interval $-8 \leq x \leq 0$.

The set of axes for question 26 is on the next page.

y

x

27 The table below shows the height in feet, $h(t)$, of a hot-air balloon and the number of minutes, t, the balloon is in the air.

Time (min)	2	5	7	10	12
Height (ft)	64	168	222	318	369

The function $h(t) = 30.5t + 8.7$ can be used to model this data table.

Explain the meaning of the slope in the context of the problem.

Explain the meaning of the y-intercept in the context of the problem.

28 Factor $x^4 - 16$ completely.

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

29 Mike knows that (3,6.5) and (4,17.55) are points on the graph of an exponential function, $g(x)$, and he wants to find another point on the graph of this function.

First, he subtracts 6.5 from 17.55 to get 11.05.

Next, he adds 11.05 and 17.55 to get 28.6.

He states that (5,28.6) is a point on $g(x)$.

Is he correct? Explain your reasoning.

30 Use the method of completing the square to determine the vertex of $f(x) = x^2 - 14x - 15$. State the coordinates of the vertex.

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

31 The temperature inside a cooling unit is measured in degrees Celsius, C. Josh wants to find out how cold it is in degrees Fahrenheit, F.

Solve the formula $C = \frac{5}{9}(F - 32)$ for F so that Josh can convert Celsius to Fahrenheit.

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

32 Solve $4w^2 + 12w - 44 = 0$ algebraically for w, to the *nearest hundredth*.

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 Joey recorded his heart rate, in beats per minute (bpm), after doing different numbers of jumping jacks. His results are shown in the table below.

Number of Jumping Jacks x	Heart Rate (bpm) y
0	68
10	84
15	104
20	100
30	120

Question 33 continued

State the linear regression equation that estimates the heart rate per number of jumping jacks.

State the correlation coefficient of the linear regression equation, rounded to the *nearest hundredth*.

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

34 Hannah went to the school store to buy supplies and spent $16. She bought four more pencils than pens and two fewer erasers than pens. Pens cost $1.25 each, pencils cost $0.55 each, and erasers cost $0.75 each.

If x represents the number of pens Hannah bought, write an equation in terms of x that can be used to find how many of each item she bought.

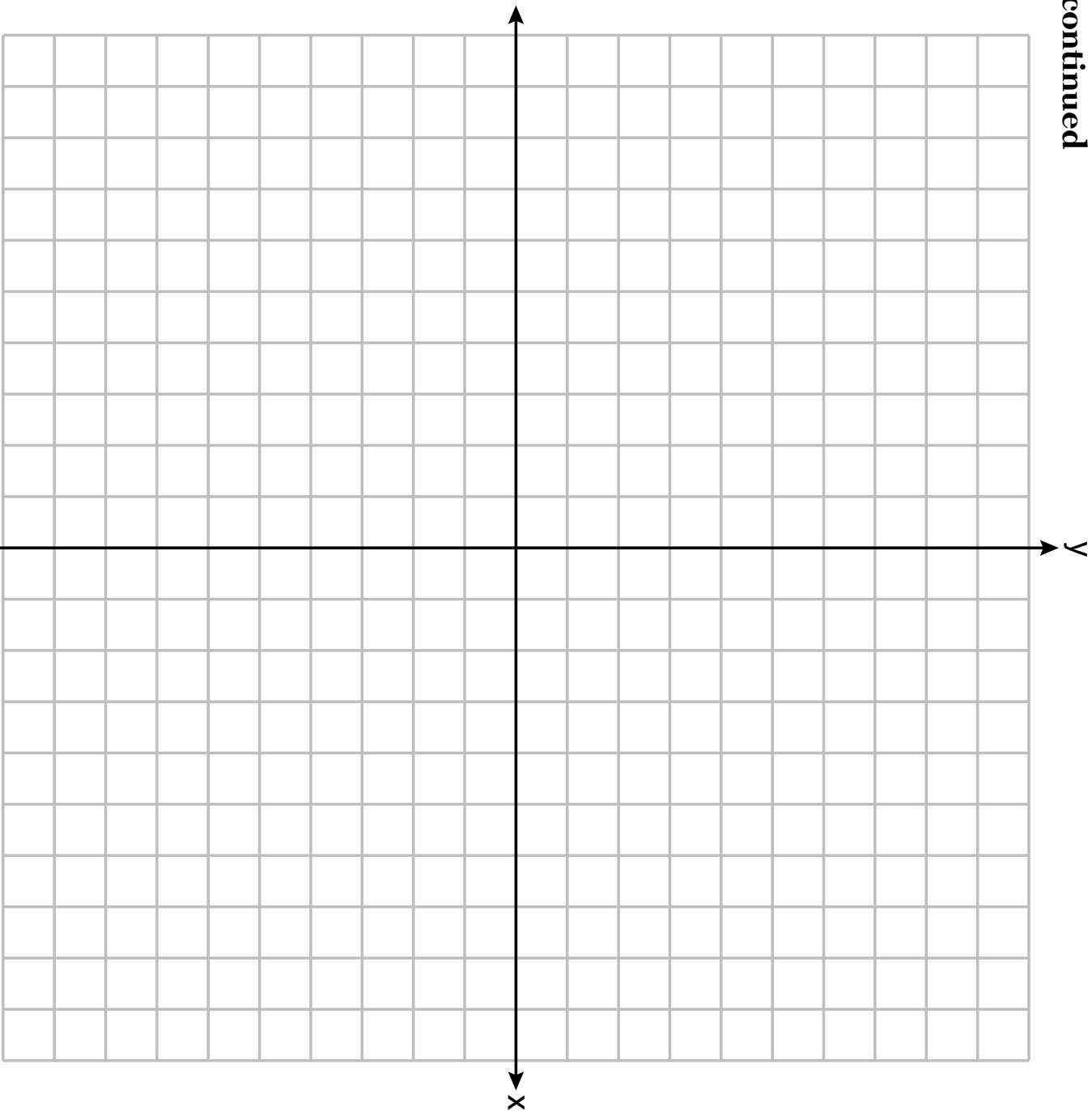Use your equation to determine algebraically how many pens Hannah bought.

35 Graph the system of inequalities on the set of axes on the next page.

$$y \le -\frac{3}{4}x + 5$$

$$3x - 2y > 4$$

The set of axes for question 35 is on the next page.

y

x

Question 35 is continued on the next page.

Question 35 continued

Is (6,3) a solution to the system of inequalities? Explain your answer.

GO RIGHT ON TO THE NEXT PAGE ➡

36 A ball is projected up into the air from the surface of a platform to the ground below. The height of the ball above the ground, in feet, is modeled by the function $f(t) = -16t^2 + 96t + 112$, where t is the time, in seconds, after the ball is projected.

State the height of the platform, in feet.

State the coordinates of the vertex. Explain what it means in the context of the problem.

Question 36 continued

State the entire interval over which the ball's height is *decreasing*.

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 At a local garden shop, the price of plants includes sales tax.

The cost of 4 large plants and 8 medium plants is $28.

The cost of 4 large plants and 8 medium plants is $40. The cost of 5 large plants and 2 medium plants is $40. The cost of 5 large plants and 2 medium plants is $40. The cost of 5 large plants and 2 medium plants is $40.

If l is the cost of a large plant and m is the cost of a medium plant, write a system of equations that models this situation.
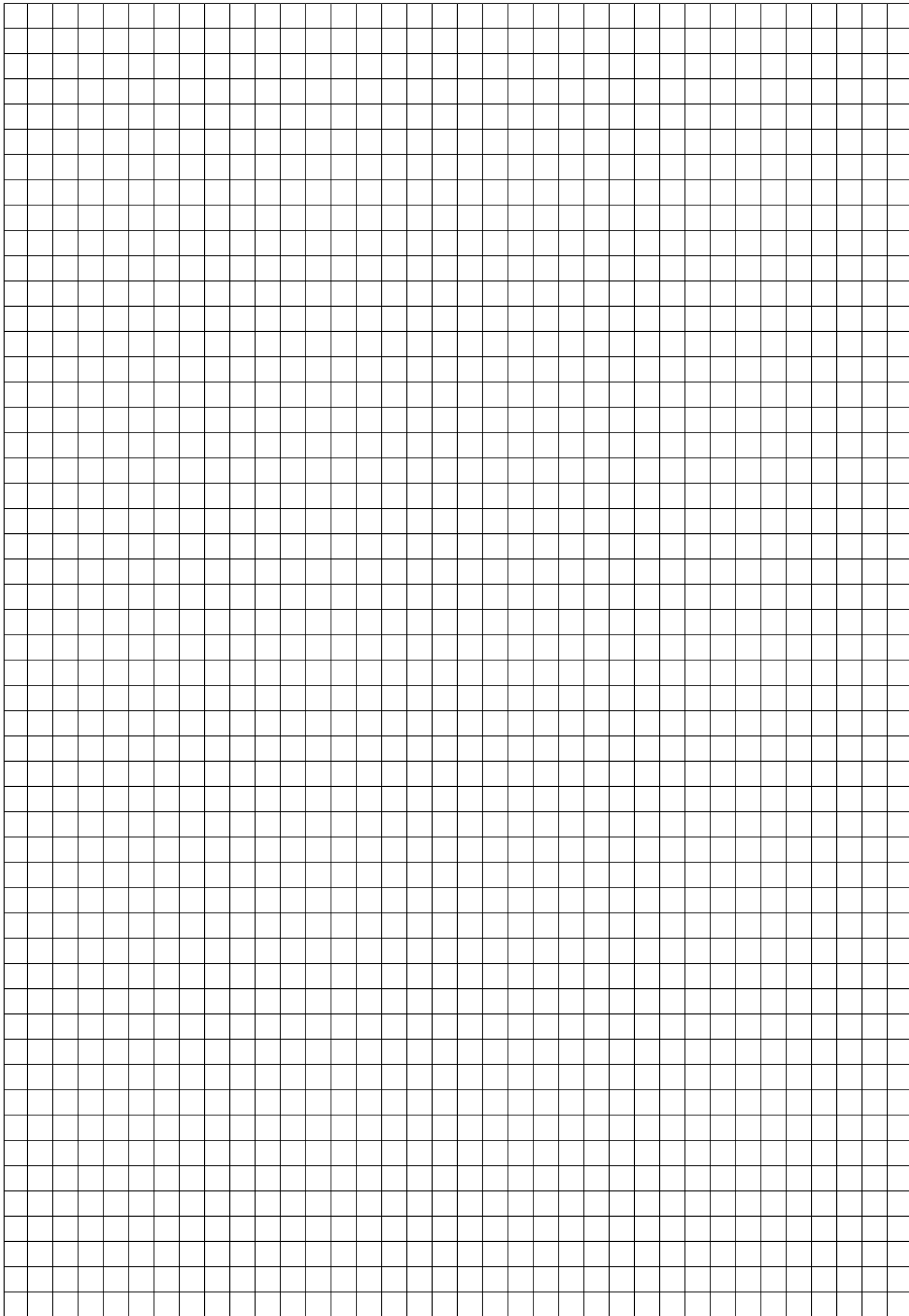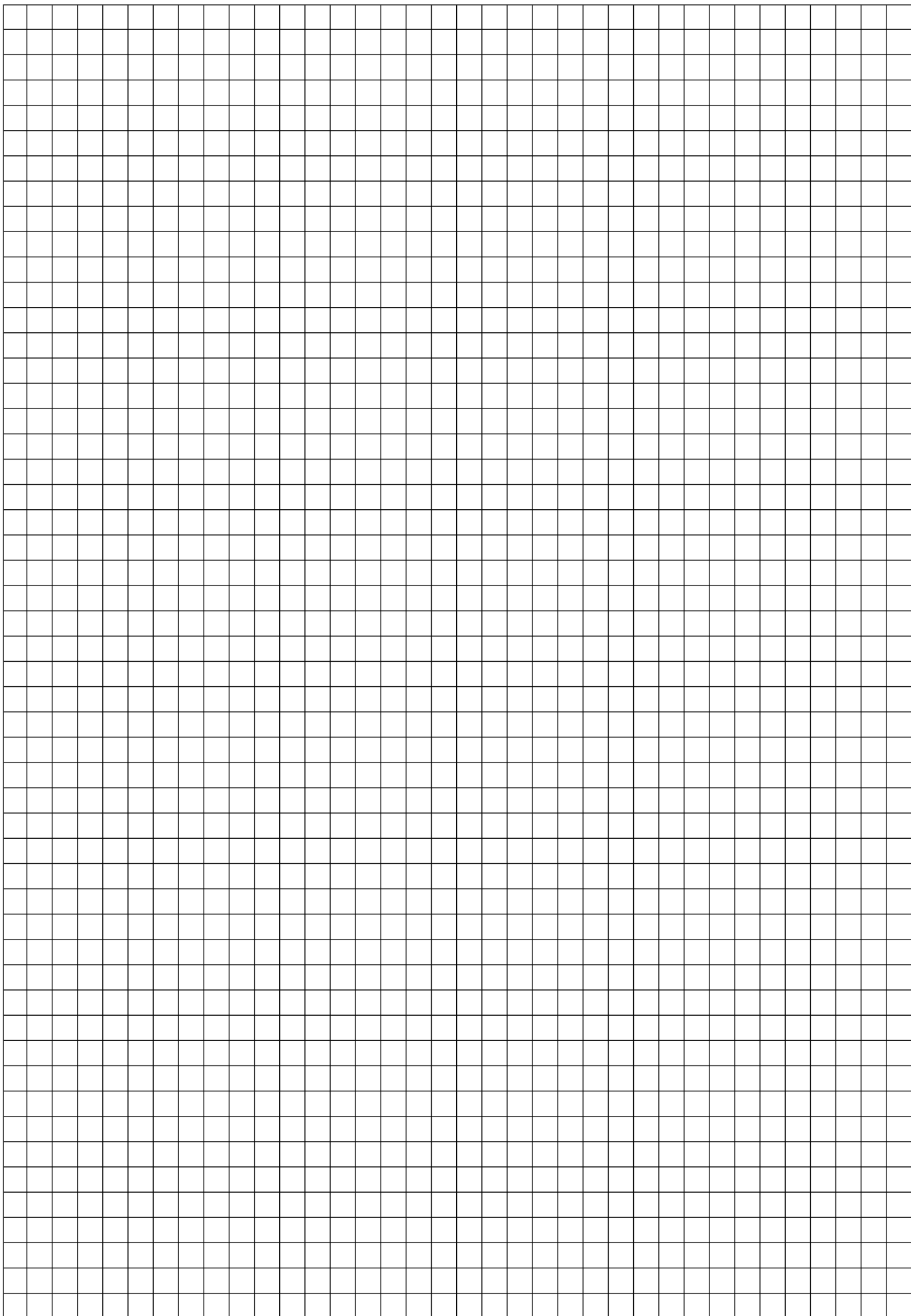
Question 37 continued

Could the cost of one large plant be $5.50 and the cost of one medium plant be $2.25? Justify your answer.

Determine algebraically both the cost of a large plant and the cost of a medium plant.

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	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \dfrac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$

The Reference Sheet is continued on the next page.

Reference Sheet — concluded

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