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

ALGEBRA I

Tuesday, August 16, 2022 — 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 If $f(x) = \frac{3x+4}{2}$, then $f(8)$ is

(1) 21 (3) 14

(2) 16 (4) 4

2 If $x \neq 0$, then the common ratio of the sequence x, $2x^2$, $4x^3$, $8x^4$, $16x^5$, ... is

(1) $2x$ (3) x

(2) 2 (4) $\frac{1}{2}x$

3 The expression $36x^2 - 9$ is equivalent to

(1) $(6x - 3)^2$ (3) $(6x + 3)(6x - 3)$

(2) $(18x - 4.5)^2$ (4) $(18x + 4.5)(18x - 4.5)$

4 Given the relation $R = \{(-4,2), (3,6), (x,8), (-1,4)\}$

Which value of x would make this relation a function?

(1) -4 (3) 3

(2) -1 (4) 0

5 If the point $(K,-5)$ lies on the line whose equation is $3x + y = 7$, then the value of K is

(1) -8 (3) 22

(2) -4 (4) 4

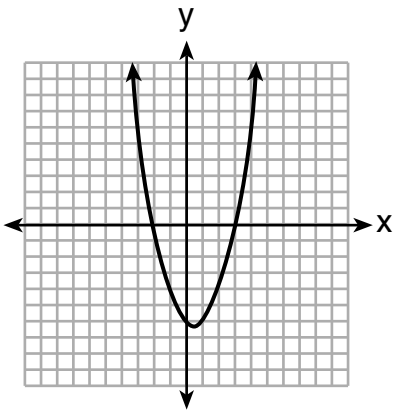
6 The expression $\frac{1}{3}x(6x^2 - 3x + 9)$ is equivalent to

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

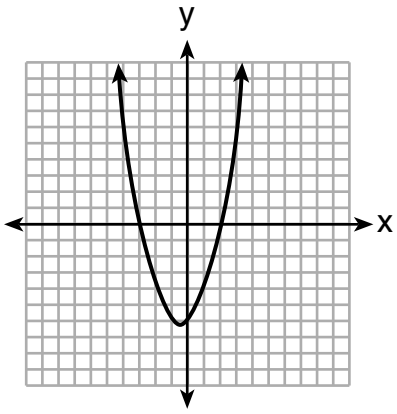
(2) $2x^2 + 3x + 3$ (4) $2x^3 + 3x^2 + 3x$

Use this space for computations.

7 The graphs below represent four polynomial functions. Which of these functions has zeros of 2 and −3?



(1)



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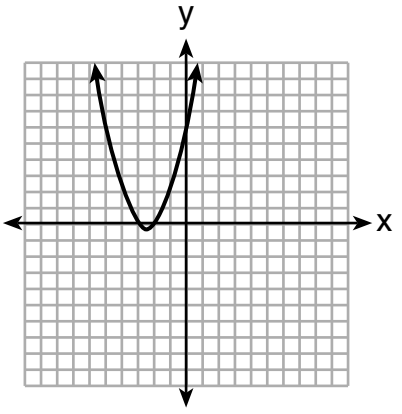

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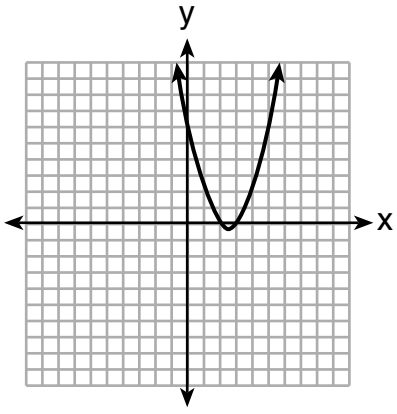


(4)

8 What is the constant term of the polynomial $4d + 6 + 3d^2$?

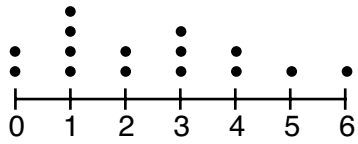
(1) 6
(2) 2
(3) 3
(4) 4

9 Emily was given $600 for her high school graduation. She invested it in an account that earns 2.4% interest per year. If she does *not* make any deposits or withdrawals, which expression can be used to determine the amount of money that will be in the account after 4 years?

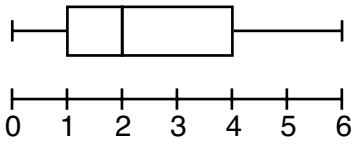
(1) $600(1 + 0.24)^4$
(2) $600(1 - 0.24)^4$
(3) $600(1 + 0.024)^4$
(4) $600(1 - 0.024)^4$

Use this space for computations.

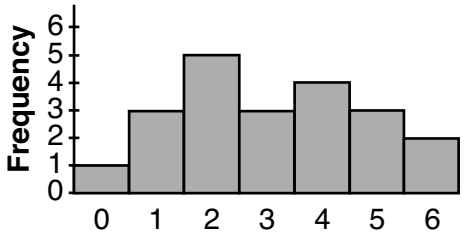
10 Different ways to represent data are shown below.



I



II



III

Which data representations have a median of 2?

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

11 What would be the order of these quadratic functions when they are arranged from the narrowest graph to the widest graph?

$$f(x) = -5x^2 \qquad g(x) = 0.5x^2 \qquad h(x) = 3x^2$$

(1) $f(x), g(x), h(x)$
(2) $g(x), h(x), f(x)$
(3) $h(x), f(x), g(x)$
(4) $f(x), h(x), g(x)$

12 At Berkeley Central High School, a survey was conducted to see if students preferred cheeseburgers, pizza, or hot dogs for lunch. The results of this survey are shown in the table below.

	Cheeseburgers	Pizza	Hot Dogs
Females	32	44	24
Males	36	30	34

Based on this survey, what percent of the students preferred pizza?

(1) 30
(2) 37
(3) 44
(4) 74

Use this space for computations.

13 Which situation could be modeled by a linear function?

(1) The value of a car depreciates by 7% annually.

(2) A gym charges a $50 initial fee and then $30 monthly.

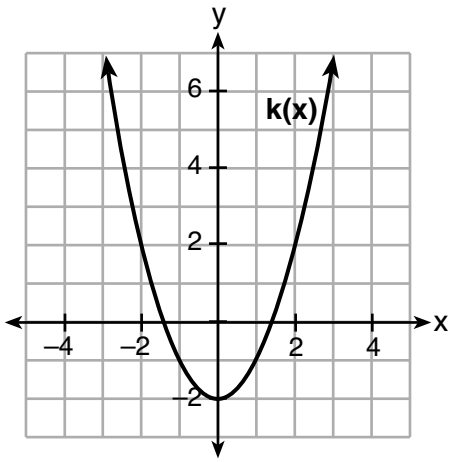
(3) The number of bacteria in a lab doubles weekly.

(4) The amount of money in a bank account increases by 0.1% monthly.

14 Which function has the *smallest* y-intercept value?

x	g(x)
–2	3
0	1
1	0
3	–2

(1)



(3)

$h(x) = \sqrt{x} - 3$

(2)

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

(4)

15 When solving $x^2 - 10x - 13 = 0$ by completing the square, which equation is a step in the process?

(1) $(x - 5)^2 = 38$

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

(3) $(x - 10)^2 = 38$

(4) $(x - 10)^2 = 12$

16 When $3x^2 + 7x - 6 + 2x^3$ is written in standard form, the leading coefficient is

(1) 7

(2) 2

(3) 3

(4) -6

Use this space for computations.

17 Which of the equations below have the same solution?

I. $10(x - 5) = -15$

II. $4 + 2(x - 2) = 9$

III. $\frac{1}{3}x = \frac{3}{2}$

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

18 In an organism, the number of cells, $C(d)$, after d days can be represented by the function $C(d) = 120 \cdot 2^{3d}$. This function can also be expressed as

(1) $C(d) = 240^{3d}$
(2) $C(d) = 960 \cdot 2^{d}$
(3) $C(d) = 120 \cdot 6^{d}$
(4) $C(d) = 120 \cdot 8^{d}$

19 In the process of solving the equation $10x^2 - 12x - 16x = 6$, George wrote $2(5x^2 - 14x) = 2(3)$, followed by $5x^2 - 14x = 3$. Which properties justify George's process?

A. addition property of equality
B. division property of equality
C. commutative property of addition
D. distributive property

(1) *A* and *C*
(2) *A* and *B*
(3) *D* and *C*
(4) *D* and *B*

20 A sequence is defined recursively by

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

What is the value of a_4?

(1) -41
(2) -14
(3) 22
(4) 67

Use this space for computations.

21 A swimmer set a world record in the women's 1500-meter freestyle, finishing the race in 15.42 minutes. If 1 meter is approximately 3.281 feet, which set of calculations could be used to convert her speed to miles per hour?

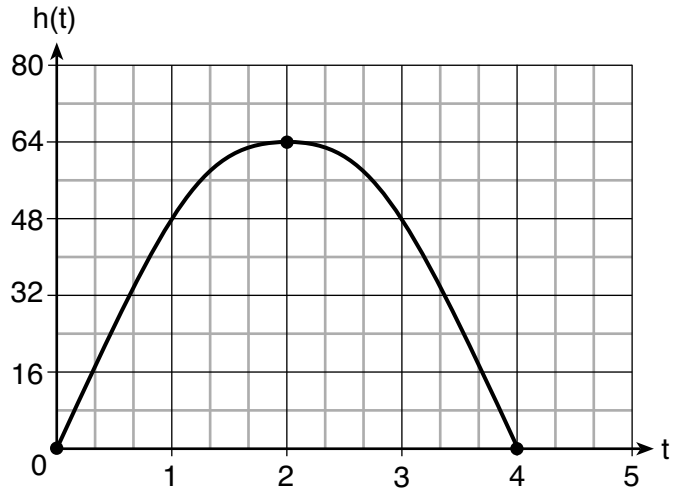
(1) $\frac{1500\,\text{meters}}{15.42\,\text{min}} \bullet \frac{60\,\text{min}}{1\,\text{hour}} \bullet \frac{1\,\text{meter}}{3.281\,\text{feet}} \bullet \frac{1\,\text{mile}}{5280\,\text{feet}}$

(2) $\frac{1500\,\text{meters}}{15.42\,\text{min}} \bullet \frac{60\,\text{min}}{1\,\text{hour}} \bullet \frac{3.281\,\text{feet}}{1\,\text{meter}} \bullet \frac{1\,\text{mile}}{5280\,\text{feet}}$

(3) $\frac{1500\,\text{meters}}{15.42\,\text{min}} \bullet \frac{3.281\,\text{feet}}{1\,\text{meter}} \bullet \frac{1\,\text{mile}}{5280\,\text{feet}}$

(4) $\frac{1500\,\text{meters}}{15.42\,\text{min}} \bullet \frac{60\,\text{min}}{1\,\text{hour}} \bullet \frac{1\,\text{mile}}{5280\,\text{feet}}$

22 The diagram below shows the graph of $h(t)$, which models the height, in feet, of a rocket t seconds after it was shot into the air.



The domain of $h(t)$ is

(1) (0,4)

(2) [0,4]

(3) (0,64)

(4) [0,64]

Use this space for computations.

23 The table below shows the time, in hours, spent by students on electronic devices and their math test scores. The data collected model a linear regression.

Time Spent on an Electronic Device (hours)	**Math Test Score**
3	85
1	99
4	81
0	98
3	90
7	65
5	78
2	90

What is the correlation coefficient, to the *nearest hundredth*, for these data?

(1) -0.98

(2) -0.95

(3) 0.98

(4) 0.95

24 The volume of a trapezoidal prism can be found using the formula $V = \frac{1}{2}a(b + c)h$. Which equation is correctly solved for b?

(1) $b = \frac{V}{2ah} + c$

(2) $b = \frac{V}{2ah} - c$

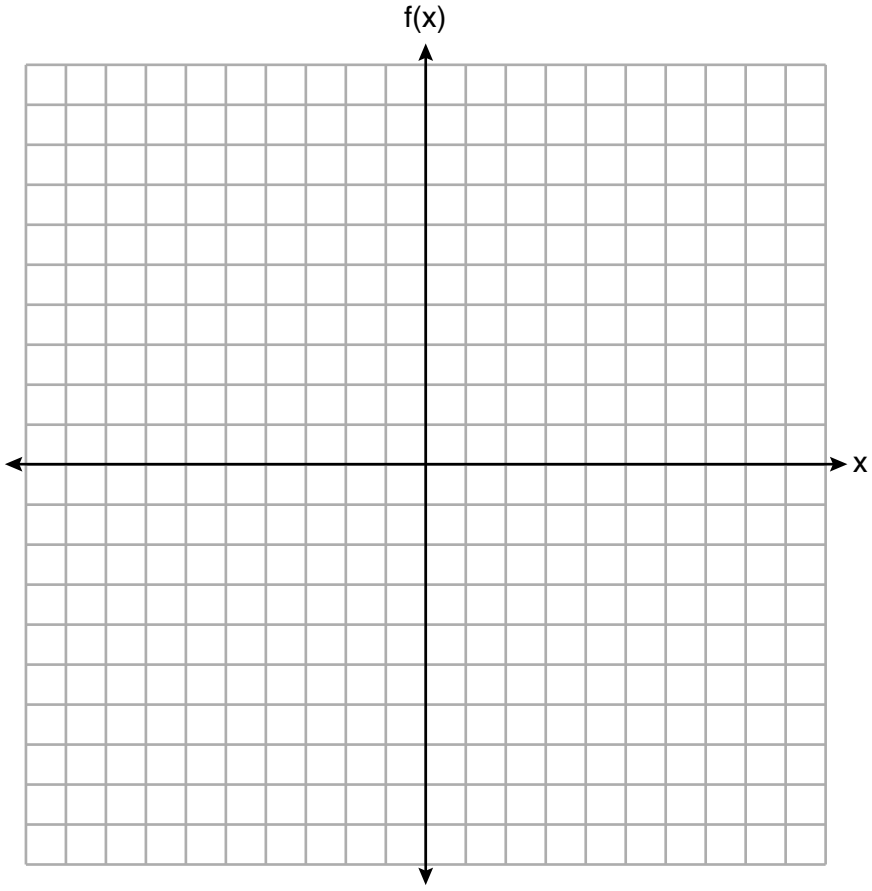
(3) $b = \frac{2V}{ah} + c$

(4) $b = \frac{2V}{ah} - c$

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 $f(x) = |x + 1|$ on the set of axes below.



26 The table below shows the value of a particular car over time.

Time (years)	**Value** (dollars)
0	20,000
5	10,550
10	5570
15	2940
20	1550

Determine whether a linear or exponential function is more appropriate for modeling this data. Explain your choice.

27 Is the product of $\sqrt{8}$ and $\sqrt{98}$ rational or irrational? Justify your answer.

28 The ages of the last 16 United States presidents on their first inauguration day are shown in the table below.

51	54	51	60
62	43	55	56
61	52	69	64
46	54	47	70

Determine the interquartile range for this set of data.

29 The cost of one pound of grapes, g, is 15 cents more than one pound of apples, a.

The cost of one pound of bananas, b, is twice as much as one pound of grapes.

Write an equation that represents the cost of one pound of bananas in terms of the cost of one pound of apples.

30 A student is given the functions $f(x) = (x + 1)^2$ and $g(x) = (x + 3)^2$.

Describe the transformation that maps $f(x)$ onto $g(x)$.

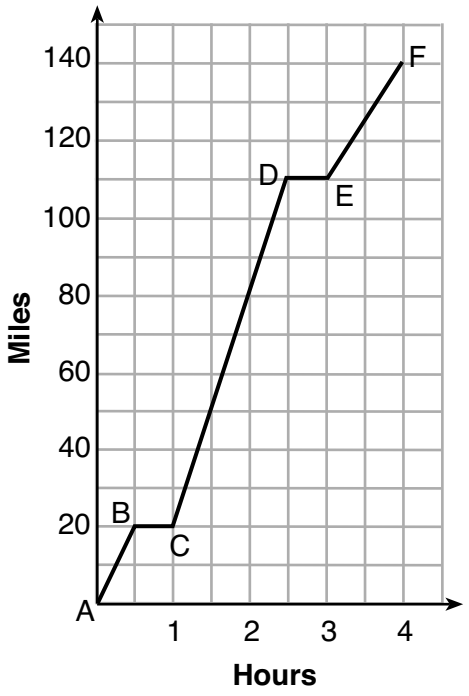
31 Solve $3x^2 - 5x - 7 = 0$ algebraically for all values of x, rounding to the *nearest tenth*.

32 Factor completely: $3y^2 - 12y - 288$

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 Thomas took a 140-mile bus trip to visit his grandparents. His trip is outlined on the graph below.



Explain what might have happened in the interval between *D* and *E*.

State the interval in which the bus traveled the fastest.

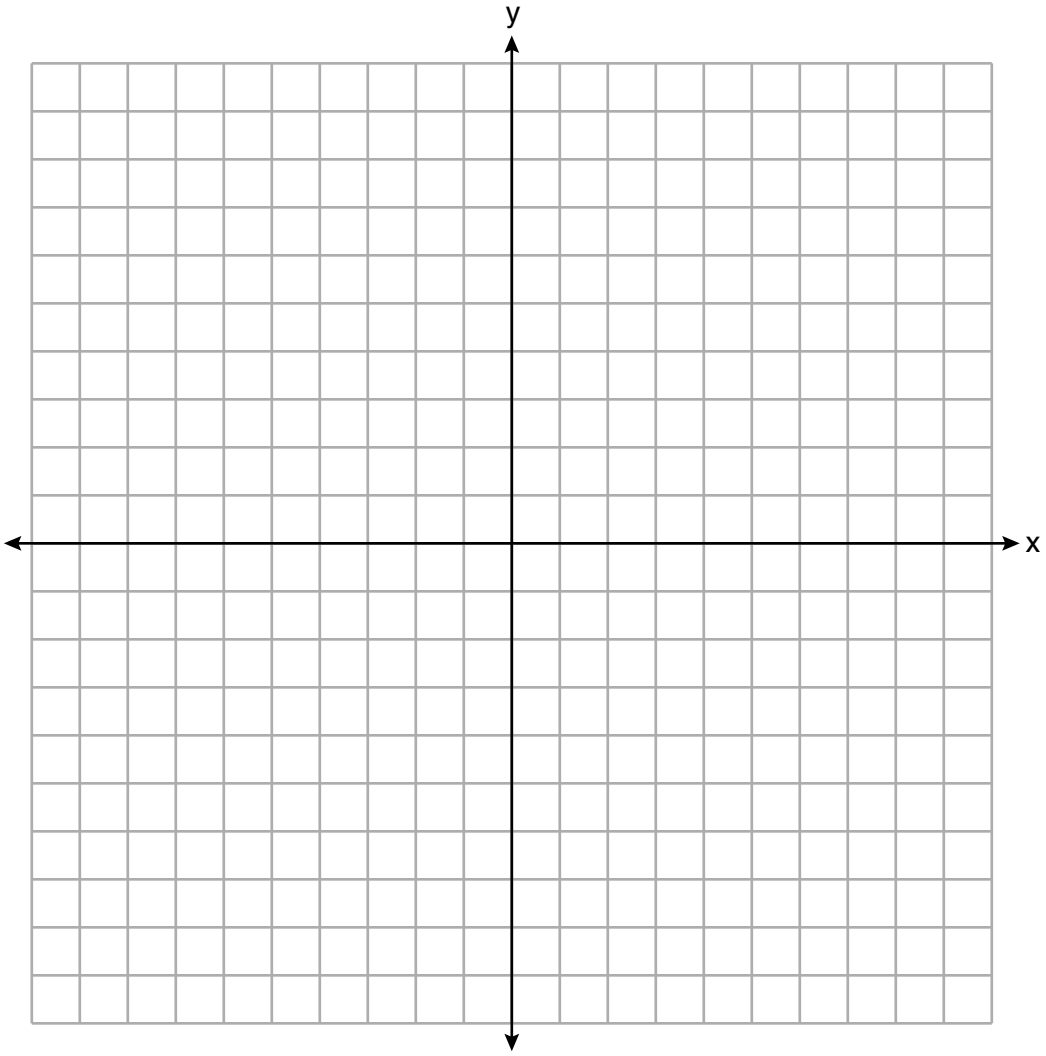
State how many miles per hour the bus was traveling during this interval.

What was the average rate of speed, in miles per hour, for Thomas's entire bus trip?

34 Graph $f(x)$ and $g(x)$ on the set of axes below.

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

$$g(x) = \frac{1}{2}x + 1$$



Based on your graph, state *one* value of x that satisfies $f(x) = g(x)$. Explain your reasoning.

35 A store sells grapes for \$1.99 per pound, strawberries for \$2.50 per pound, and pineapples for \$2.99 each. Jonathan has \$25 to buy fruit.

He plans to buy 2 more pounds of strawberries than grapes. He also plans to buy 2 pineapples.

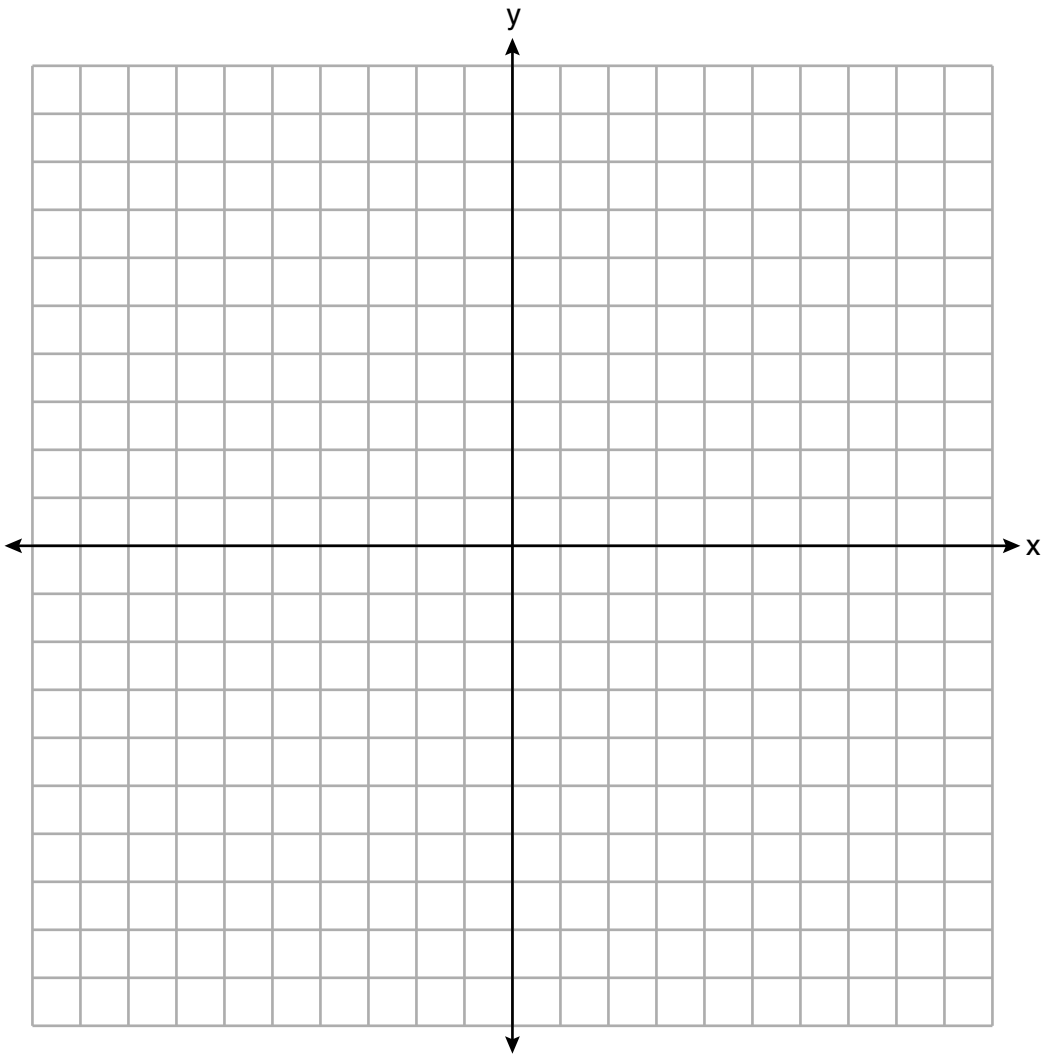
If x represents the number of pounds of grapes, write an inequality in one variable that models this scenario.

Determine algebraically the maximum number of whole pounds of grapes he can buy.

36 Solve the system of inequalities graphically on the set of axes below.

Label the solution set S.

$$y + 3x < 5$$
$$1 \geq 2x - y$$



Is the point $(-5,0)$ in the solution set? Explain your answer.

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 An ice cream shop sells small and large sundaes. One day, 30 small sundaes and 50 large sundaes were sold for \$420. Another day, 15 small sundaes and 35 large sundaes were sold for \$270. Sales tax is included in all prices.

If x is the cost of a small sundae and y is the cost of a large sundae, write a system of equations to represent this situation.

Peyton thinks that small sundaes cost \$2.75 and large sundaes cost \$6.75. Is Peyton correct? Justify your answer.

Using your equations, determine algebraically the cost of one small sundae and the cost of one large sundae.

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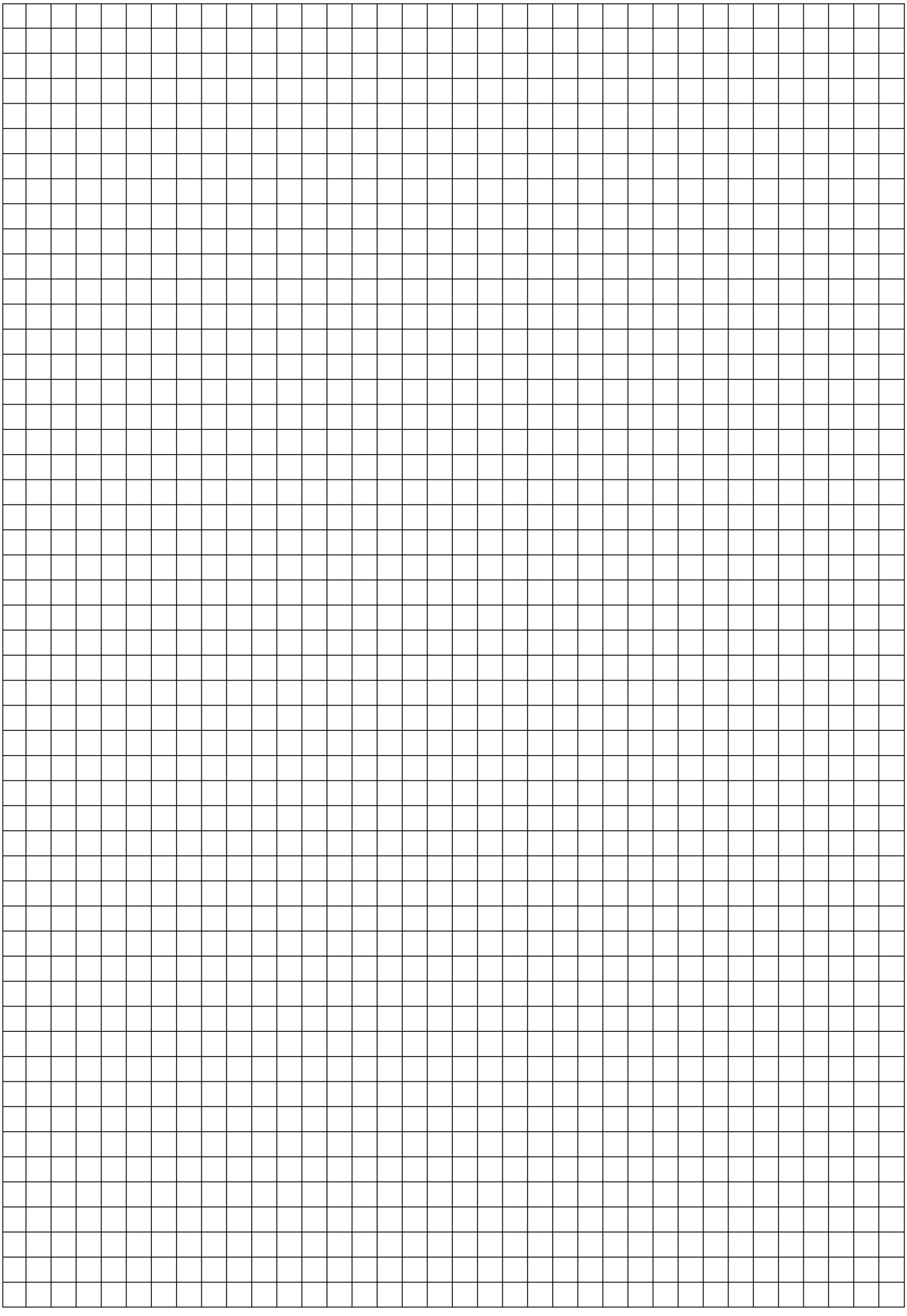

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High School Math Reference Sheet

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

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