I

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA I

Tuesday, June 12, 2018 — 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 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 solution to $4p + 2 < 2(p + 5)$ is

(1) $p > -6$ (3) $p > 4$

(2) $p < -6$ (4) $p < 4$

2 If $k(x) = 2x^2 - 3\sqrt{x}$, then $k(9)$ is
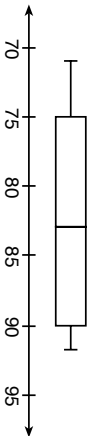
(1) 315   (3) 159

(2) 307   (4) 153

3 The expression $3(x^2 + 2x - 3) - 4(4x^2 - 7x + 5)$ is equivalent to

(1) $-13x - 22x + 11$ (3) $19x^2 - 22x + 11$

(2) $-13x^2 + 34x - 29$ (4) $19x^2 + 34x - 29$

4 The zeros of the function $p(x) = x^2 - 2x - 24$ are

(1) -8 and 3   (3) -4 and 6

(2) -6 and 4   (4) -3 and 8

5 The box plot below summarizes the data for the average monthly high temperatures in degrees Fahrenheit for Orlando, Florida.

The third quartile is

(1) 92   (3) 83

(2) 90   (4) 71

6 Joy wants to buy strawberries and raspberries to bring to a party. Strawberries cost $1.60 per pound and raspberries cost $1.75 per pound. If she only has $10 to spend on berries, which inequality represents the situation where she buys x pounds of strawberries and y pounds of raspberries?

(1) $1.60x + 1.75y \leq 10$ (3) $1.75x + 1.60y \leq 10$

(2) $1.60x + 1.75y \geq 10$ (4) $1.75x + 1.60y \geq 10$

7 On the main floor of the Kodak Hall at the Eastman Theater, the number of seats per row increases at a constant rate. Steven counts 31 seats in row 3 and 37 seats in row 6. How many seats are there in row 20?

(1) 65   (3) 69

(2) 67   (4) 71

8 Which ordered pair below is *not* a solution to $f(x) = x^2 - 3x + 4$?

(1) (0,4)   (3) (5,14)

(2) (1.5,1.75)   (4) (−1,6)

---

9 Students were asked to name their favorite sport from a list of basketball, soccer, or tennis. The results are shown in the table below.

	Basketball	Soccer	Tennis
Girls	42	58	20
Boys	84	41	5

What percentage of the students chose soccer as their favorite sport?

(1) 39.6%   (3) 50.4%

(2) 41.4%   (4) 58.6%

10 The trinomial $x^2 - 14x + 49$ can be expressed as

(1) $(x - 7)^2$ (3) $(x - 7)(x + 7)$

(2) $(x + 7)^2$ (4) $(x - 7)(x + 2)$

11 A function is defined as $\{(0,1), (2,3), (5,8), (7,2)\}$. Isaac is asked to create one more ordered pair for the function. Which ordered pair can he add to the set to keep it a function?

(1) (0,2)   (3) (7,0)

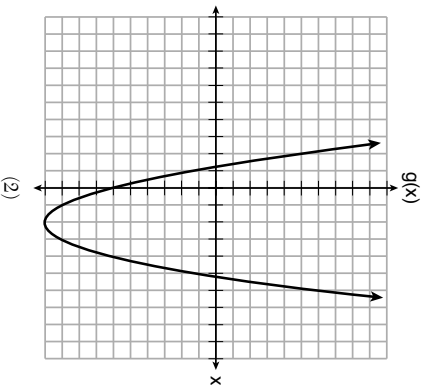(2) (5,3)   (4) (1,3)

12 The quadratic equation $x^2 - 6x = 12$ is rewritten in the form $(x + p)^2 = q$, where q is a constant. What is the value of p?

(1) −12   (3) −3

(2) −9   (4) 9

13 Which of the quadratic functions below has the *smallest* minimum value?

$h(x) = x^2 + 2x - 6$

(1)

$k(x) = (x + 5)(x + 2)$

(3)

(2)

x	f(x)
−1	−2
0	−5
1	−6
2	−5
3	−2

(4)

15 The Utica Boilermaker is a 15-kilometer road race. Sara is signed up to run this race and has done the following training runs:

   I.   10 miles

   II. 44,880 feet

  III. 15,560 yards

Which run(s) are at least 15 kilometers?

(1) I, only   (3) I and III

(2) II, only   (4) II and III

16 If $f(x) = x^2 + 2$, which interval describes the range of this function?

(1) $(-\infty, \infty)$ (3) $[2, \infty)$

(2) $[0, \infty)$ (4) $(-\infty, 2]$

17 The amount Mike gets paid weekly can be represented by the expression $2.50a + 290$, where a is the number of cell phone accessories he sells that week. What is the constant term in this expression and what does it represent?

(1) $2.50a$, the amount he is guaranteed to be paid each week

(2) $2.50a$, the amount he earns when he sells a accessories

(3) 290, the amount he is guaranteed to be paid each week

(4) 290, the amount he earns when he sells a accessories

14 Which situation is *not* a linear function?

(1) A gym charges a membership fee of $10.00 down and $10.00 per month.

(2) A cab company charges $2.50 initially and $3.00 per mile.

(3) A restaurant employee earns $12.50 per hour.

(4) A $12,000 car depreciates 15% per year.

18 A cubic function is graphed on the set of axes below.
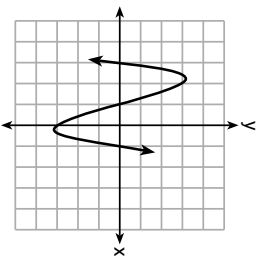
Which function could represent this graph?

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

(2) $g(x) = (x + 3)(x + 1)(x - 1)$

(3) $h(x) = (x - 3)(x - 1)(x + 3)$

(4) $k(x) = (x + 3)(x + 1)(x - 3)$

Use this space for computations.

19 Mrs. Allard asked her students to identify which of the polynomials below are in standard form and explain why.
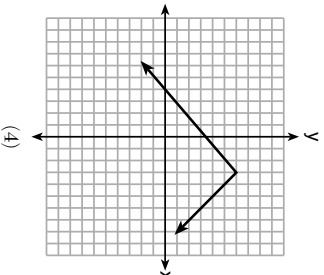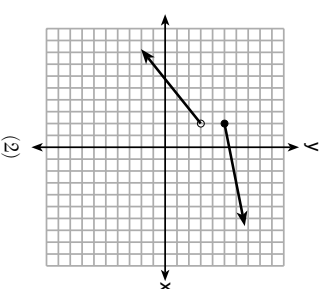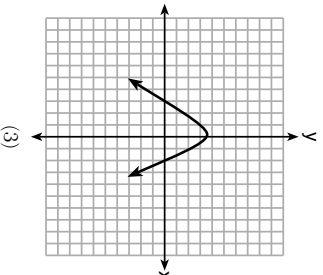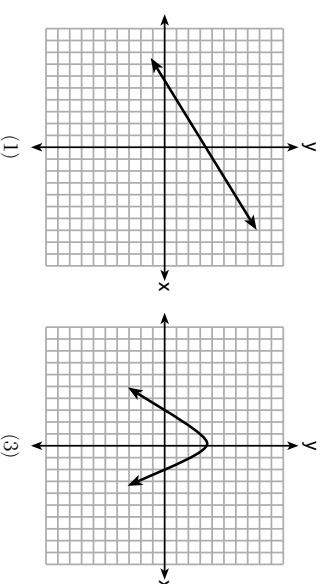
   I. $15x^4 - 6x + 3x^2 - 1$

   II. $12x^3 + 8x + 4$

   III. $2x^5 + 8x^2 + 10x$

Which student's response is correct?

(1) Tyler said I and II because the coefficients are decreasing.

(2) Susan said only II because all the numbers are decreasing.

(3) Fred said II and III because the exponents are decreasing.

(4) Alyssa said II and III because they each have three terms.

20 Which graph does *not* represent a function that is always increasing over the entire interval $-2 < x < 2$?

(1)

(3)

(2)

(4)

Use this space for computations.

21 At an ice cream shop, the profit, $P(c)$, is modeled by the function $P(c) = 0.87c$, where c represents the number of ice cream cones sold. An appropriate domain for this function is

(1) an integer ≤ 0 (3) a rational number ≤ 0

(2) an integer ≥ 0 (4) a rational number ≥ 0

22 How many real-number solutions does $4x^2 + 2x + 5 = 0$ have?

(1) one (3) zero

(2) two (4) infinitely many

23 Students were asked to write a formula for the length of a rectangle by using the formula for its perimeter, $p = 2\ell + 2w$. Three of their responses are shown below.

I. $\ell = \frac{1}{2}p - w$

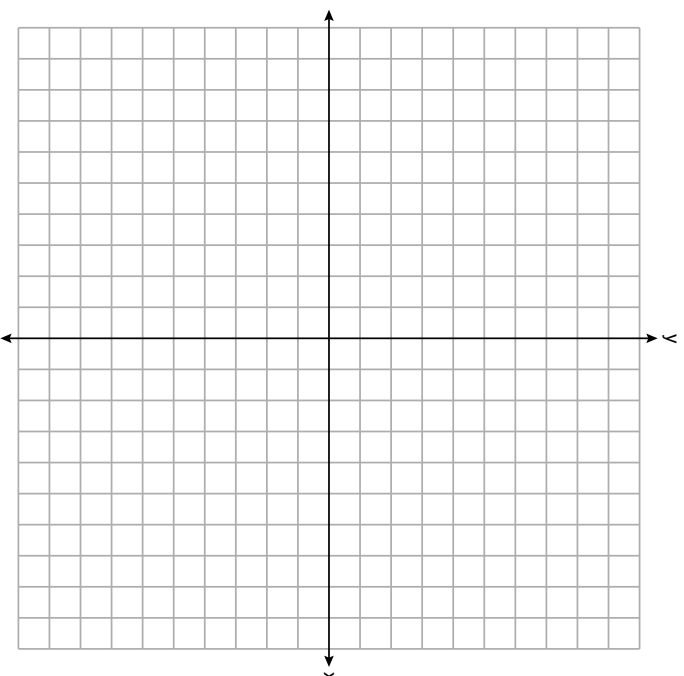II. $\ell = \frac{1}{2}(p - 2w)$

III. $\ell = \dfrac{p - 2w}{2}$

Which responses are correct?

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

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

24 If $a_n = n(a_{n-1})$ and $a_1 = 1$, what is the value of a_5?

(1) 5 (3) 120

(2) 20 (4) 720

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 $f(x) = \sqrt{x+2}$ over the domain $-2 \leq x \leq 7$.

26 Caleb claims that the ordered pairs shown in the table below are from a nonlinear function.

x	f(x)
0	2
1	4
2	8
3	16

State if Caleb is correct. Explain your reasoning.

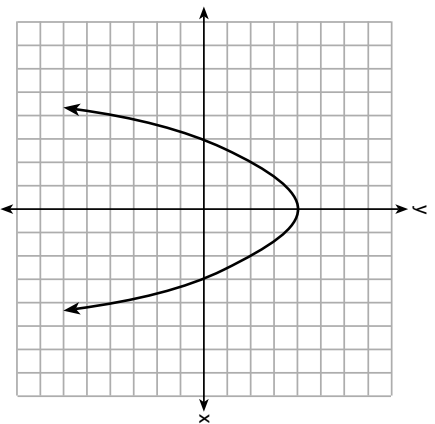**27** Solve for x to the *nearest tenth*: $x^2 + x - 5 = 0$.

28 The graph of the function $p(x)$ is represented below. On the same set of axes, sketch the function $p(x + 2)$.

29 When an apple is dropped from a tower 256 feet high, the function $h(t) = -16t^2 + 256$ models the height of the apple, in feet, after t seconds. Determine, algebraically, the number of seconds it takes the apple to hit the ground.

30 Solve the equation below algebraically for the exact value of x.

$$6 - \frac{2}{3}(x+5) = 4x$$

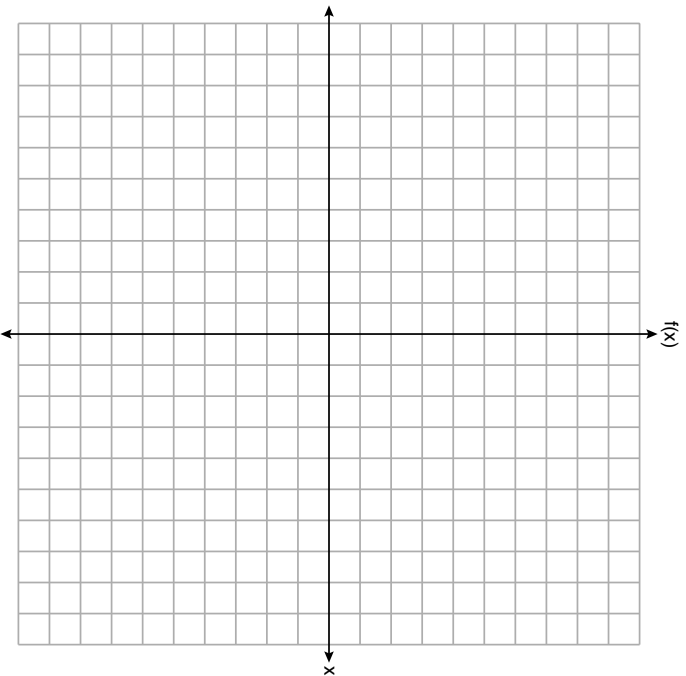**31** Is the product of $\sqrt{16}$ and $\frac{4}{7}$ rational or irrational? Explain your reasoning.

32 On the set of axes below, graph the piecewise function:

$$f(x) = \begin{cases} -\dfrac{1}{2}x, & x < 2 \\ x, & x \geq 2 \end{cases}$$

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 A population of rabbits in a lab, $p(x)$, can be modeled by the function $p(x) = 20(1.014)^x$, where x represents the number of days since the population was first counted.

Explain what 20 and 1.014 represent in the context of the problem.

Determine, to the *nearest tenth*, the average rate of change from day 50 to day 100.

34 There are two parking garages in Beacon Falls. Garage *A* charges $7.00 to park for the first 2 hours, and each additional hour costs $3.00. Garage *B* charges $3.25 per hour to park.

When a person parks for at least 2 hours, write equations to model the cost of parking for a total of *x* hours in Garage *A* and Garage *B*.

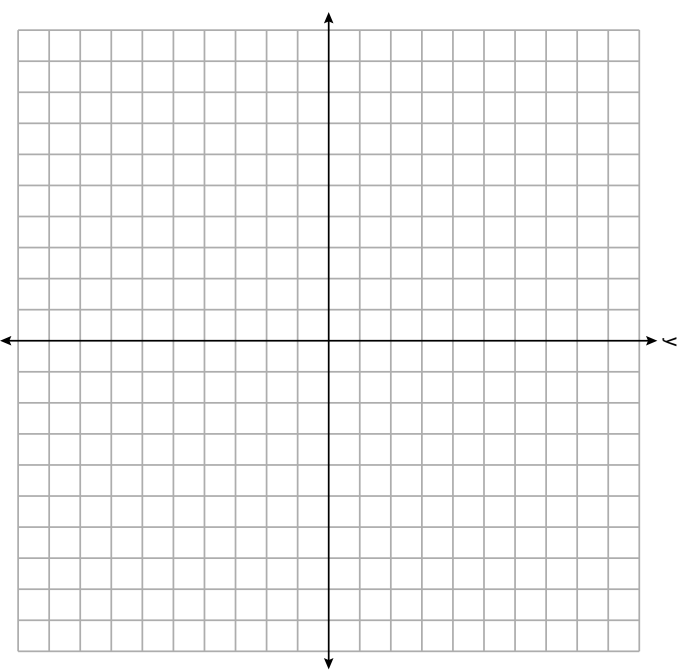Determine algebraically the number of hours when the cost of parking at both garages will be the same.

35 On the set of axes below, graph the following system of inequalities:

$$2y + 3x \leq 14$$
$$4x - y < 2$$

Determine if the point (1,2) is in the solution set. Explain your answer.

36 The percentage of students scoring 85 or better on a mathematics final exam and an English final exam during a recent school year for seven schools is shown in the table below.

Percentage of Students Scoring 85 or Better	
Mathematics, x	English, y
27	46
12	28
13	45
10	34
30	56
45	67
20	42

Write the linear regression equation for these data, rounding all values to the *nearest hundredth*.

State the correlation coefficient of the linear regression equation, to the *nearest hundredth*. Explain the meaning of this value in the context of these data.

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 Dylan has a bank that sorts coins as they are dropped into it. A panel on the front displays the total number of coins inside as well as the total value of these coins. The panel shows 90 coins with a value of $17.55 inside of the bank.

If Dylan only collects dimes and quarters, write a system of equations in two variables or an equation in one variable that could be used to model this situation.

Using your equation or system of equations, algebraically determine the number of quarters Dylan has in his bank.
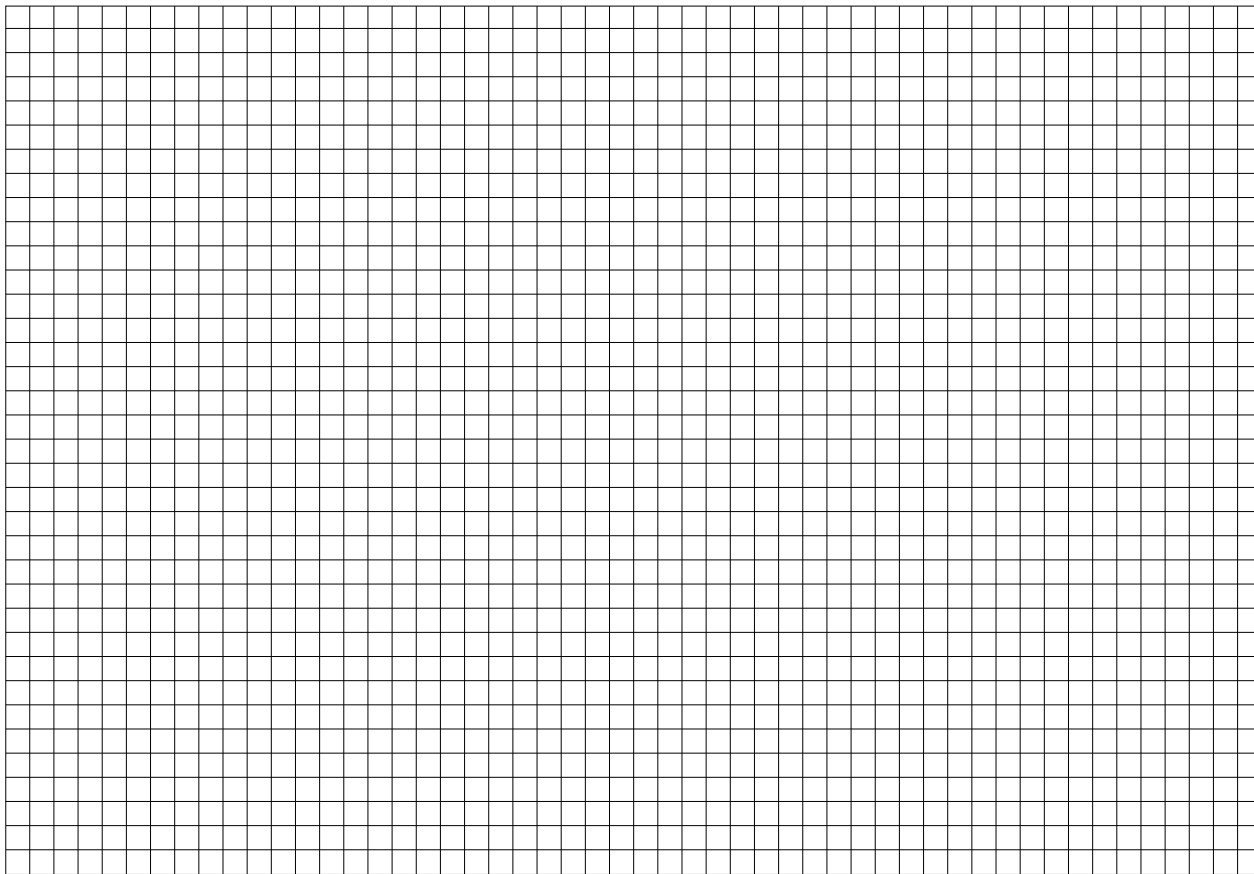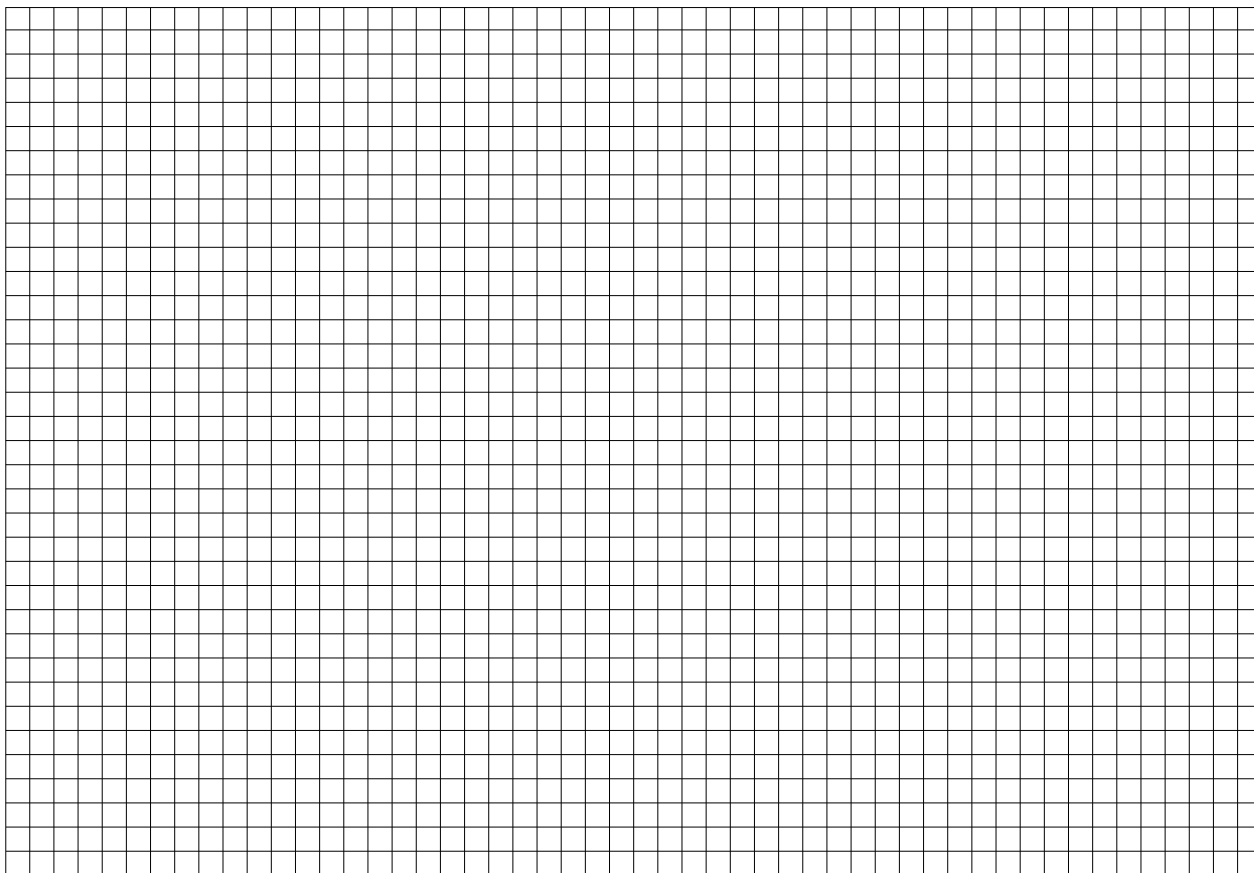
Question 37 continued

Dylan's mom told him that she would replace each one of his dimes with a quarter. If he uses all of his coins, determine if Dylan would then have enough money to buy a game priced at $20.98 if he must also pay an 8% sales tax. Justify your answer.

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	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
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 $r \neq 1$
Radians	$1 \text{ radian} = \dfrac{180}{\pi}$ degrees
Degrees	$1 \text{ degree} = \dfrac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

Tear Here