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

ALGEBRA II

Thursday, August 16, 2018 — 12:30 to 3:30 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. 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 of $87e^{0.3x} = 5918$, to the *nearest thousandth*, is

(1) 0.583   (3) 4.220

(2) 1.945   (4) 14.066

2 A researcher randomly divides 50 bean plants into two groups. He puts one group by a window to receive natural light and the second group under artificial light. He records the growth of the plants weekly. Which data collection method is described in this situation?

(1) observational study   (3) survey

(2) controlled experiment   (4) systematic sample

3 If $f(x) = x^2 + 9$ and $g(x) = x + 3$, which operation would *not* result in a polynomial expression?

(1) $f(x) + g(x)$ (3) $f(x) \bullet g(x)$

(2) $f(x) - g(x)$ (4) $f(x) \div g(x)$

4 Consider the function $p(x) = 3x^3 + x^2 - 5x$ and the graph of $y = m(x)$ below.
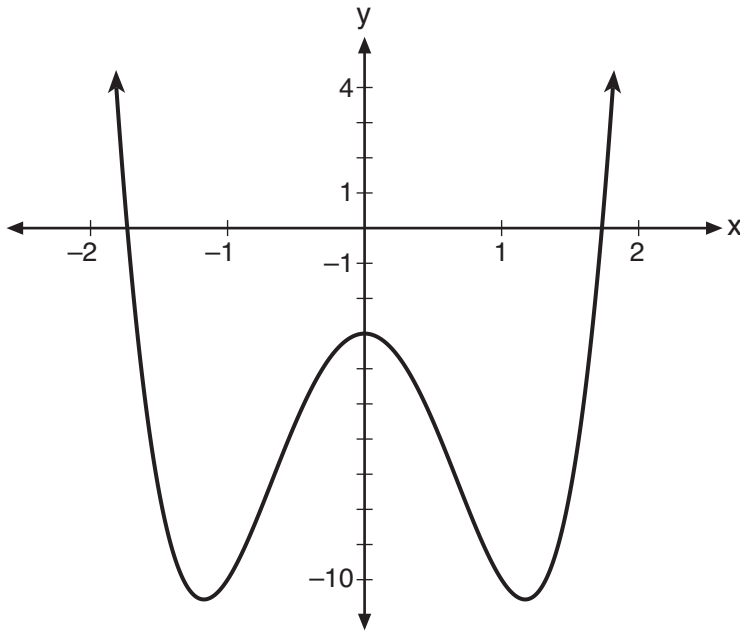
Which statement is true?

(1) $p(x)$ has three real roots and $m(x)$ has two real roots.

(2) $p(x)$ has one real root and $m(x)$ has two real roots.

(3) $p(x)$ has two real roots and $m(x)$ has three real roots.

(4) $p(x)$ has three real roots and $m(x)$ has four real roots.

5 Which expression is equivalent to $\dfrac{2x^4 + 8x^3 - 25x^2 - 6x + 14}{x + 6}$?

(1) $2x^3 + 4x^2 + x - 12 + \dfrac{86}{x + 6}$

(2) $2x^3 - 4x^2 - x + 14$

(3) $2x^3 - 4x^2 - x + \dfrac{14}{x + 6}$

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

6 Given $f(x) = \frac{1}{2}x + 8$, which equation represents the inverse, $g(x)$?

(1) $g(x) = 2x - 8$ (3) $g(x) = -\frac{1}{2}x + 8$

(2) $g(x) = 2x - 16$ (4) $g(x) = -\frac{1}{2}x - 16$

7 The value(s) of x that satisfy $\sqrt{x^2 - 4x - 5} = 2x - 10$ are

(1) $\{5\}$ (3) $\{5, 7\}$

(2) $\{7\}$ (4) $\{3, 5, 7\}$

8 Stephanie found that the number of white-winged crossbills in an area can be represented by the formula $C = 550(1.08)^t$, where t represents the number of years since 2010. Which equation correctly represents the number of white-winged crossbills in terms of the monthly rate of population growth?

(1) $C = 550(1.00643)^t$ (3) $C = 550(1.00643)^{\frac{t}{12}}$

(2) $C = 550(1.00643)^{12t}$ (4) $C = 550(1.00643)^{t + 12}$

9 The roots of the equation $3x^2 + 2x = -7$ are

(1) $-2, -\frac{1}{3}$ (3) $-\frac{1}{3} \pm \frac{2i\sqrt{5}}{3}$

(2) $-\frac{7}{3}, 1$ (4) $-\frac{1}{3} \pm \frac{\sqrt{11}}{3}$

10 The average depreciation rate of a new boat is approximately 8% per year. If a new boat is purchased at a price of \$75,000, which model is a recursive formula representing the value of the boat n years after it was purchased?

(1) $a_n = 75{,}000(0.08)^n$

(3) $a_n = 75{,}000(1.08)^n$

(2) $a_0 = 75{,}000$
$a_n = (0.92)^n$

(4) $a_0 = 75{,}000$
$a_n = 0.92(a_{n-1})$

11 Given $\cos\theta = \frac{7}{25}$, where θ is an angle in standard position terminating in quadrant IV, and $\sin^2\theta + \cos^2\theta = 1$, what is the value of $\tan\theta$?

(1) $-\frac{24}{25}$

(3) $\frac{24}{25}$

(2) $-\frac{24}{7}$

(4) $\frac{24}{7}$

12 For $x > 0$, which expression is equivalent to $\dfrac{\sqrt[3]{x^2} \cdot \sqrt{x^5}}{\sqrt[6]{x}}$?

(1) x

(3) x^3

(2) $x^{\frac{3}{2}}$

(4) x^{10}

13 Jake wants to buy a car and hopes to save at least $5000 for a down payment. The table below summarizes the amount of money he plans to save each week.

Week	1	2	3	4	5
Money Saved, in Dollars	2	5	12.5	31.25	...

Based on this plan, which expression should he use to determine how much he has saved in n weeks?

(1) $\dfrac{2 - 2(2.5^n)}{1 - 2.5}$

(2) $\dfrac{2 - 2(2.5^{n-1})}{1 - 2.5}$

(3) $\dfrac{1 - 2.5^n}{1 - 2.5}$

(4) $\dfrac{1 - 2.5^{n-1}}{1 - 2.5}$

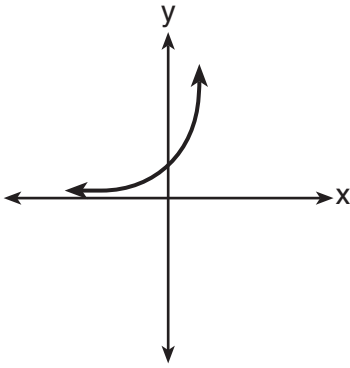**14** Which expression is equivalent to $x^6y^4(x^4 - 16) - 9(x^4 - 16)$?

(1) $x^{10}y^4 - 16x^6y^4 - 9x^4 - 144$

(2) $(x^6y^4 - 9)(x + 2)^3(x - 2)$

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

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

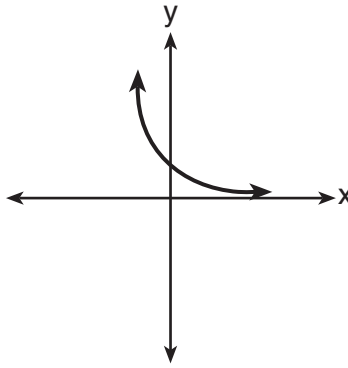**15** If $A = -3 + 5i$, $B = 4 - 2i$, and $C = 1 + 6i$, where i is the imaginary unit, then $A - BC$ equals

(1) $5 - 17i$

(2) $5 + 27i$

(3) $-19 - 17i$

(4) $-19 + 27i$

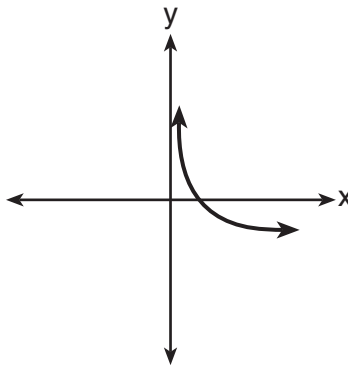**16** Which sketch best represents the graph of $x = 3^y$?

(1)

(3)

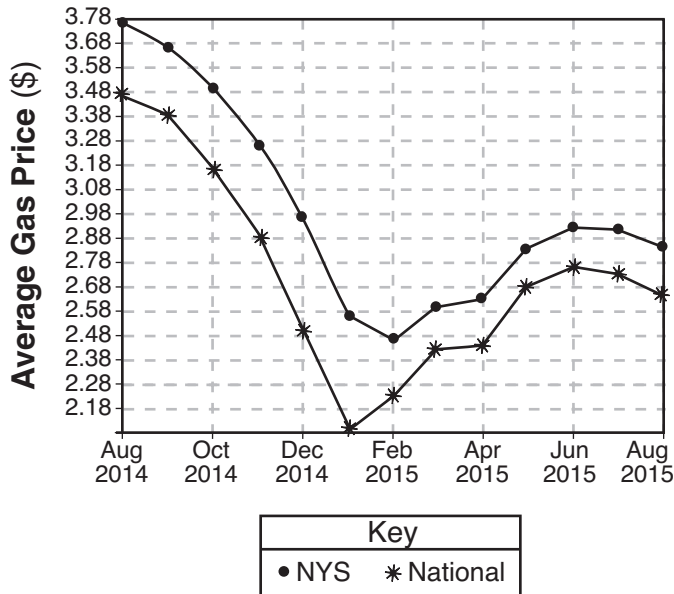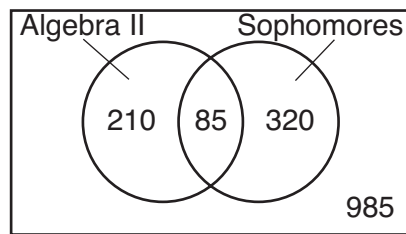(2)

(4)
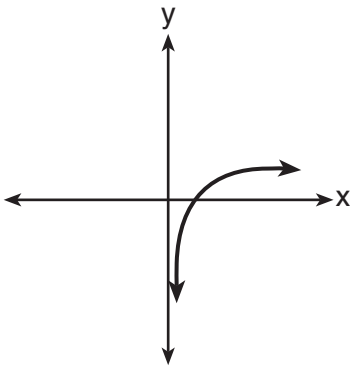
17 The graph below represents national and New York State average gas prices.

If New York State's gas prices are modeled by $G(x)$ and $C > 0$, which expression best approximates the national average x months from August 2014?

(1) $G(x + C)$ (3) $G(x - C)$

(2) $G(x) + C$ (4) $G(x) - C$

18 Data for the students enrolled in a local high school are shown in the Venn diagram below.

If a student from the high school is selected at random, what is the probability that the student is a sophomore given that the student is enrolled in Algebra II?

(1) $\dfrac{85}{210}$ (3) $\dfrac{85}{405}$

(2) $\dfrac{85}{295}$ (4) $\dfrac{85}{1600}$

19 If $p(x) = 2\ln(x) - 1$ and $m(x) = \ln(x + 6)$, then what is the solution for $p(x) = m(x)$?

(1) 1.65   (3) 5.62

(2) 3.14   (4) no solution

20 Which function's graph has a period of 8 and reaches a maximum height of 1 if at least one full period is graphed?

(1) $y = -4\cos\left(\frac{\pi}{4}x\right) - 3$ (3) $y = -4\cos(8x) - 3$

(2) $y = -4\cos\left(\frac{\pi}{4}x\right) + 5$ (4) $y = -4\cos(8x) + 5$

21 Given $c(m) = m^3 - 2m^2 + 4m - 8$, the solution of $c(m) = 0$ is

(1) ± 2 (3) $2i, 2$

(2) 2, only   (4) $\pm 2i, 2$

22 The height above ground for a person riding a Ferris wheel after t seconds is modeled by $h(t) = 150\sin\left(\frac{\pi}{45}t + 67.5\right) + 160$ feet.

How many seconds does it take to go from the bottom of the wheel to the top of the wheel?

(1) 10   (3) 90

(2) 45   (4) 150

23 The parabola described by the equation $y = \frac{1}{12}(x - 2)^2 + 2$ has the directrix at $y = -1$. The focus of the parabola is

(1) $(2,-1)$ (3) $(2,3)$

(2) $(2,2)$ (4) $(2,5)$

24 A fast-food restaurant analyzes data to better serve its customers. After its analysis, it discovers that the events D, that a customer uses the drive-thru, and F, that a customer orders French fries, are independent. The following data are given in a report:

$$P(F) = 0.8$$
$$P(F \cap D) = 0.456$$

Given this information, $P(F|D)$ is

(1) 0.344   (3) 0.57

(2) 0.3648   (4) 0.8

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 Over the set of integers, factor the expression $x^4 - 4x^2 - 12$.

26 Express the fraction $\dfrac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$ in simplest radical form.

27 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function $p(t) = 2560e^{0.017185t}$, where t is time in years after 1950 and $p(t)$ is the population in millions. Determine the average rate of change of $p(t)$ in *millions of people per year*, from $4 \leq t \leq 8$. Round your answer to the *nearest hundredth*.

28 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

29 Algebraically solve for x:

$$\frac{-3}{x + 3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$$

30 Graph $t(x) = 3\sin(2x) + 2$ over the domain $[0,2\pi]$ on the set of axes below.

t(x)

x
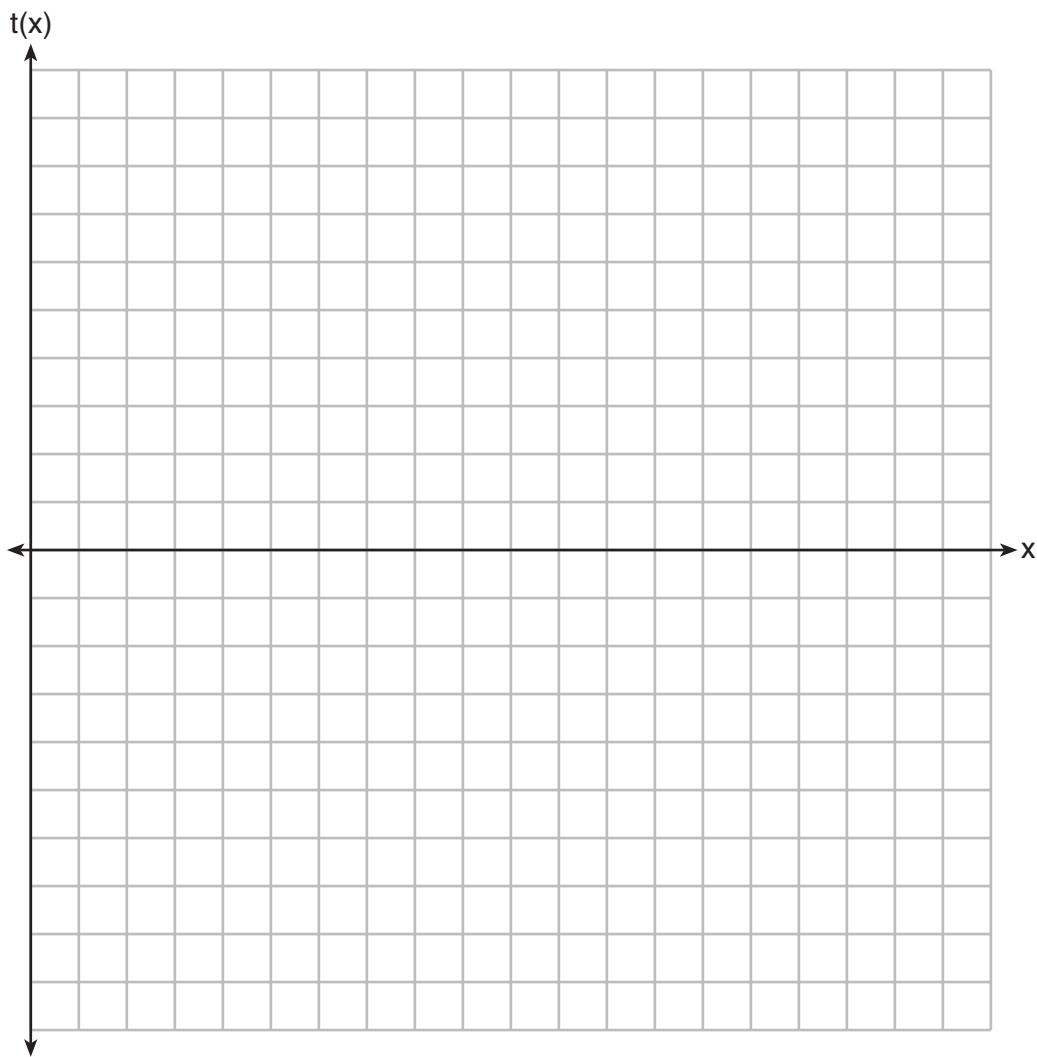
31 Solve the following system of equations algebraically.

$$x^2 + y^2 = 400$$

$$y = x - 28$$

32 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.

Mean = 0.350
SD = 0.042

Proportion of In-App Purchases
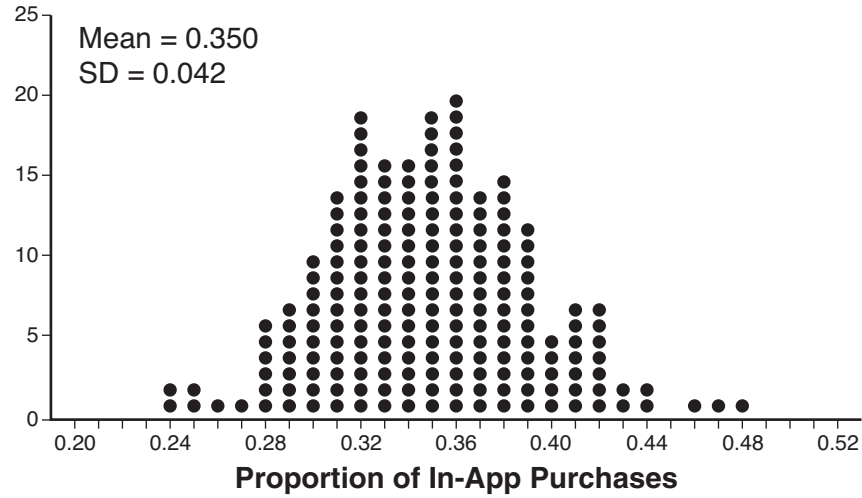
Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.

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 Solve the following system of equations algebraically for all values of x, y, and z.

$$2x + 3y - 4z = -1$$
$$x - 2y + 5z = 3$$
$$-4x + y + z = 16$$

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

Algebraically find the remaining zeros of $j(x)$.

35 Determine, to the *nearest tenth of a year*, how long it would take an investment to double at a $3\frac{3}{4}\%$ interest rate, compounded continuously.

36 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90, 89

Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer.

To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.

Classical vs. Rap
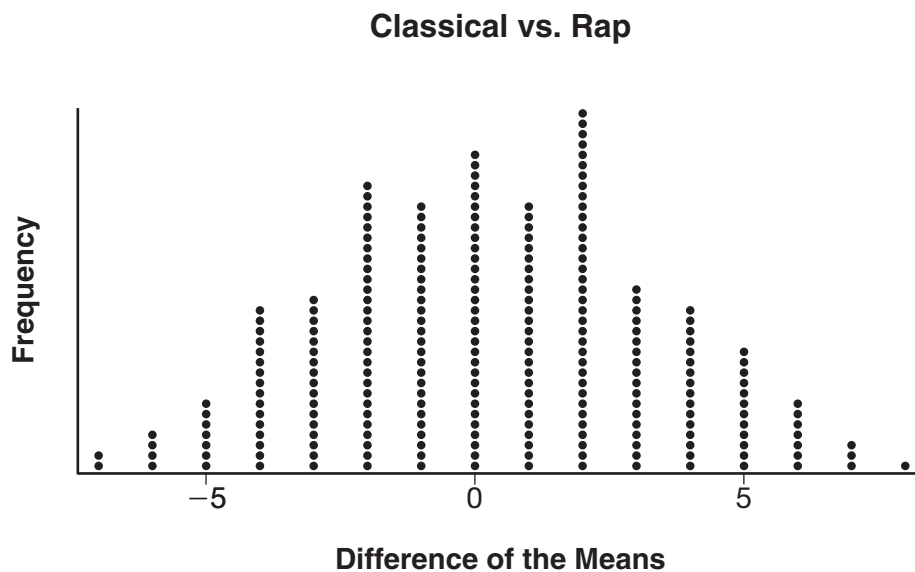
Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

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 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

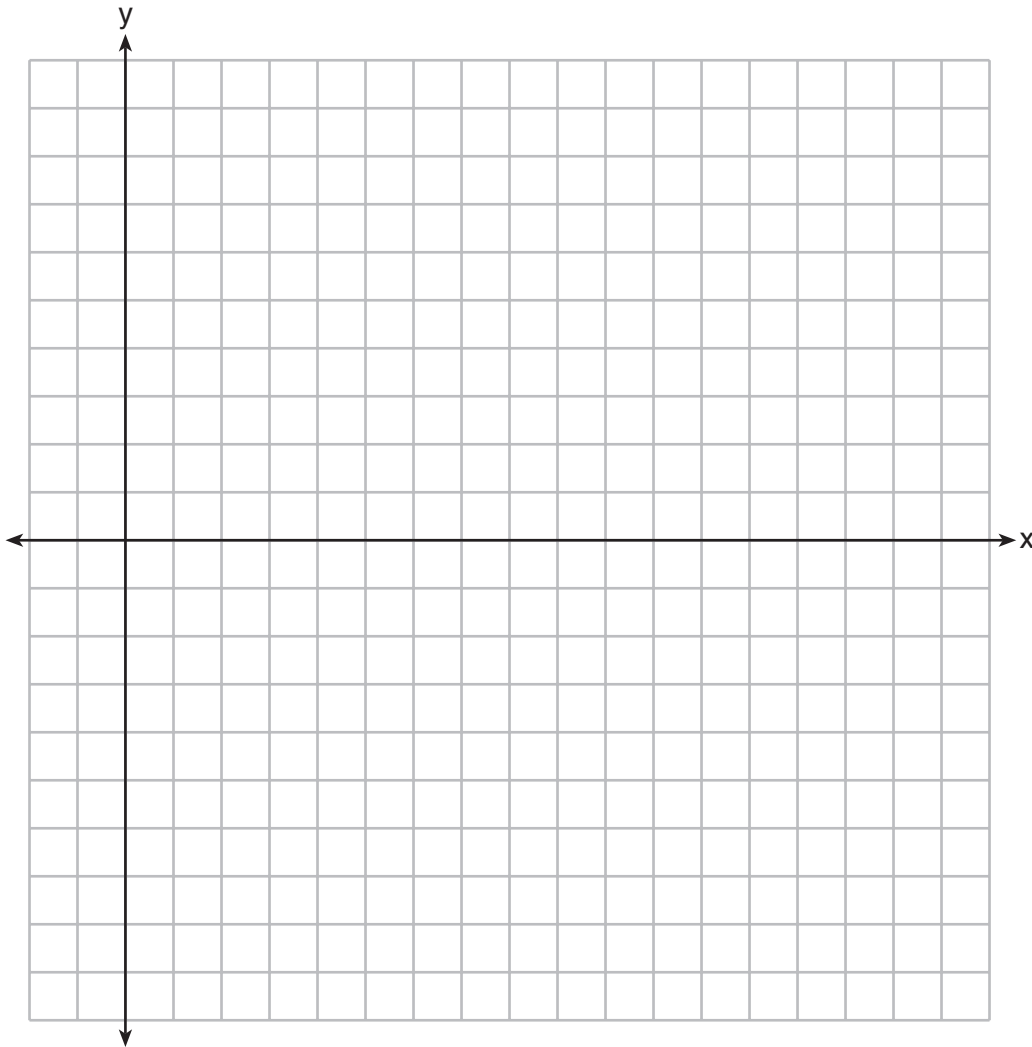$$R(x) = 550x^3 - 12{,}000x^2 + 83{,}000x + 7000$$
$$C(x) = 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.

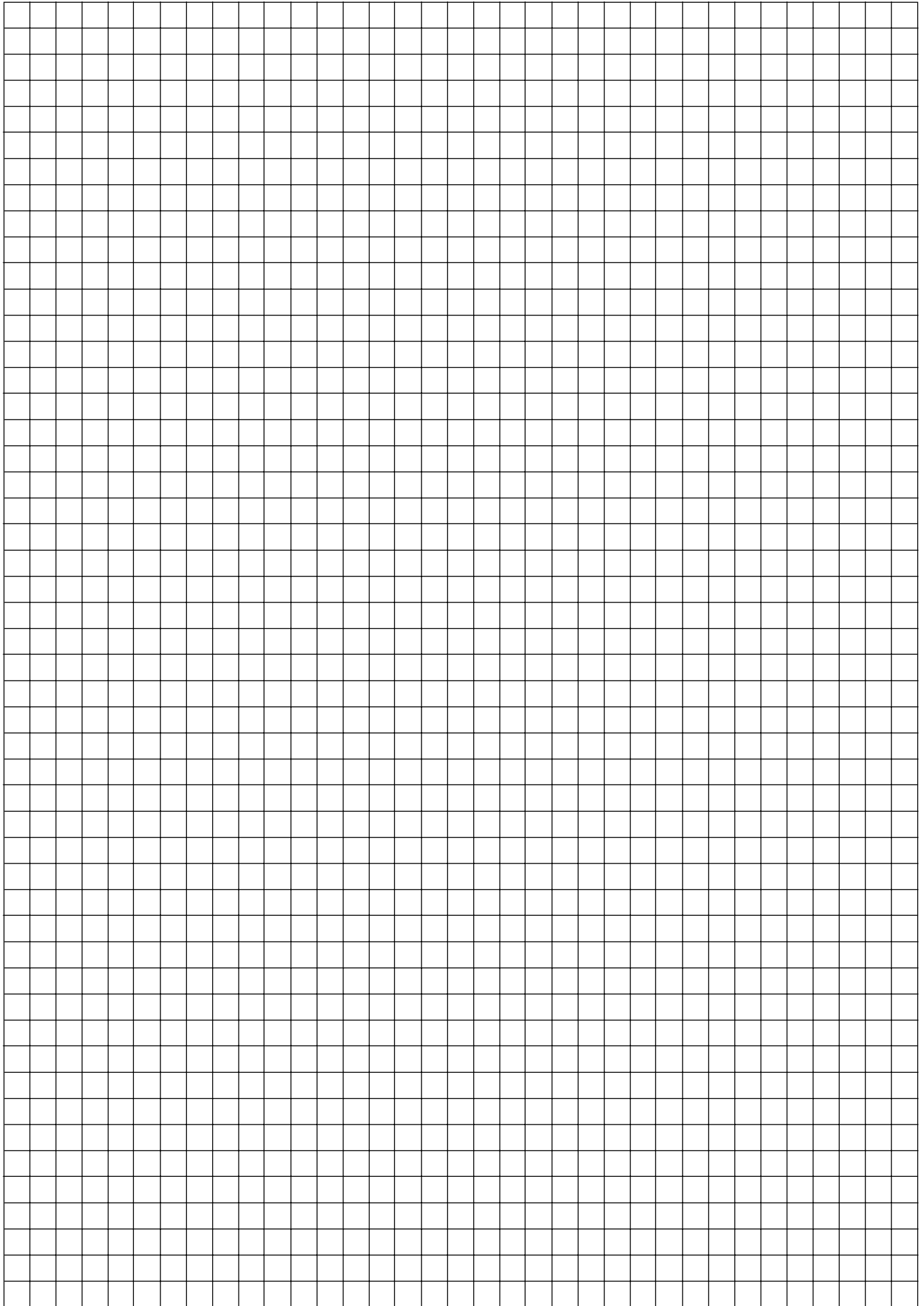**Question 37 is continued on the next page.**

Question 37 continued

Graph $y = P(x)$ on the set of axes below over the domain $2 \leq x \leq 16$.

Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined 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	$A = \frac{1}{2}bh$	Pythagorean Theorem	$a^2 + b^2 = c^2$
Parallelogram	$A = bh$	Quadratic Formula	$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Circle	$A = \pi r^2$	Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Circle	$C = \pi d$ or $C = 2\pi r$	Geometric Sequence	$a_n = a_1 r^{n-1}$
General Prisms	$V = Bh$	Geometric Series	$S_n = \dfrac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Cylinder	$V = \pi r^2 h$	Radians	1 radian = $\dfrac{180}{\pi}$ degrees
Sphere	$V = \frac{4}{3}\pi r^3$	Degrees	1 degree = $\dfrac{\pi}{180}$ radians
Cone	$V = \frac{1}{3}\pi r^2 h$	Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$
Pyramid	$V = \frac{1}{3}Bh$		

FOR TEACHERS ONLY

ALGEBRA II

Thursday, August 16, 2018 — 12:30 to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

Mechanics of Rating

The following procedures are to be followed for scoring student answer papers for the Regents Examination in Algebra II. More detailed information about scoring is provided in the publication *Information Booklet for Scoring the Regents Examination in Algebra II*.

Do *not* attempt to correct the student's work by making insertions or changes of any kind. In scoring the constructed-response questions, use check marks to indicate student errors. Unless otherwise specified, mathematically correct variations in the answers will be allowed. Units need not be given when the wording of the questions allows such omissions.

Each student's answer paper is to be scored by a minimum of three mathematics teachers. No one teacher is to score more than approximately one-third of the constructed-response questions on a student's paper. Teachers may not score their own students' answer papers. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Raters should record the student's scores for all questions and the total raw score on the student's separate answer sheet. Then the student's total raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ by Thursday, August 16, 2018. Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that, for each administration, the conversion chart provided for that administration be used to determine the student's final score. The student's scale score should be entered in the box provided on the student's separate answer sheet. The scale score is the student's final examination score.

If the student's responses for the multiple-choice questions are being hand scored prior to being scanned, the scorer must be careful not to make any marks on the answer sheet except to record the scores in the designated score boxes. Marks elsewhere on the answer sheet will interfere with the accuracy of the scanning.

Part I

Allow a total of 48 credits, 2 credits for each of the following.

(1). 4	(9). 3	(17). . . . . 4 . . . . .
(2). 2	(10). 4	(18). . . . . 2 . . . . .
(3). 4	(11). 2	(19). . . . . 3 . . . . .
(4). 1	(12). 3	(20). . . . . 1 . . . . .
(5). 3	(13). 1	(21). . . . . 4 . . . . .
(6). 2	(14). 4	(22). . . . . 2 . . . . .
(7). 3	(15). 3	(23). . . . . 4 . . . . .
(8). 2	(16). 2	(24). . . . . 4 . . . . .

General Rules for Applying Mathematics Rubrics

I. General Principles for Rating

The rubrics for the constructed-response questions on the Regents Examination in Algebra II are designed to provide a systematic, consistent method for awarding credit. The rubrics are not to be considered all-inclusive; it is impossible to anticipate all the different methods that students might use to solve a given problem. Each response must be rated carefully using the teacher's professional judgment and knowledge of mathematics; all calculations must be checked. The specific rubrics for each question must be applied consistently to all responses. In cases that are not specifically addressed in the rubrics, raters must follow the general rating guidelines in the publication *Information Booklet for Scoring the Regents Examination in Algebra II*, use their own professional judgment, confer with other mathematics teachers, and/or contact the State Education Department for guidance. During each Regents Examination administration period, rating questions may be referred directly to the Education Department. The contact numbers are sent to all schools before each administration period.

II. Full-Credit Responses

A full-credit response provides a complete and correct answer to all parts of the question. Sufficient work is shown to enable the rater to determine how the student arrived at the correct answer.

When the rubric for the full-credit response includes one or more examples of an acceptable method for solving the question (usually introduced by the phrase "such as"), it does not mean that there are no additional acceptable methods of arriving at the correct answer. Unless otherwise specified, mathematically correct alternative solutions should be awarded credit. The only exceptions are those questions that specify the type of solution that must be used; e.g., an algebraic solution or a graphic solution. A correct solution using a method other than the one specified is awarded half the credit of a correct solution using the specified method.

III. Appropriate Work

Full-Credit Responses: The directions in the examination booklet for all the constructed-response questions state: "Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc." The student has the responsibility of providing the correct answer ***and*** showing how that answer was obtained. The student must "construct" the response; the teacher should not have to search through a group of seemingly random calculations scribbled on the student paper to ascertain what method the student may have used.

Responses With Errors: Rubrics that state "Appropriate work is shown, but…" are intended to be used with solutions that show an essentially complete response to the question but contain certain types of errors, whether computational, rounding, graphing, or conceptual. If the response is incomplete; i.e., an equation is written but not solved or an equation is solved but not all of the parts of the question are answered, appropriate work has ***not*** been shown. Other rubrics address incomplete responses.

IV. Multiple Errors

Computational Errors, Graphing Errors, and Rounding Errors: Each of these types of errors results in a 1-credit deduction. Any combination of two of these types of errors results in a 2-credit deduction. No more than 2 credits should be deducted for such mechanical errors in a 4-credit question and no more than 3 credits should be deducted in a 6-credit question. The teacher must carefully review the student's work to determine what errors were made and what type of errors they were.

Conceptual Errors: A conceptual error involves a more serious lack of knowledge or procedure. Examples of conceptual errors include using the incorrect formula for the area of a figure, choosing the incorrect trigonometric function, or multiplying the exponents instead of adding them when multiplying terms with exponents.

If a response shows repeated occurrences of the same conceptual error, the student should not be penalized twice. If the same conceptual error is repeated in responses to other questions, credit should be deducted in each response.

For 4- and 6-credit questions, if a response shows one conceptual error and one computational, graphing, or rounding error, the teacher must award credit that takes into account both errors. Refer to the rubric for specific scoring guidelines.

Part II

For each question, use the specific criteria to award a maximum of 2 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(25)   **[2]** $(x^2 - 6)(x^2 + 2)$

        [1] One computational or factoring error is made.

or

        [1] One conceptual error is made.

        [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(26)   **[2]** $\sqrt{x}$ and correct work is shown.

        [1] Appropriate work is shown, but one computational or simplification error is made.

or

        [1] Appropriate work is shown, but one conceptual error is made.

or

        [1] Appropriate work is shown, but the solution is stated as $x^{\frac{1}{2}}$.

or

        [1] $\sqrt{x}$, but no work is shown.

        [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(27)   **[2]** 48.78, and correct work is shown.

        [1] Appropriate work is shown, but one computational or rounding error is made.

or

        [1] Appropriate work is shown, but one conceptual error is made.

or

        [1] 48.78, but no work is shown.

        [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(28)   **[2]** 941, and correct work is shown.

     [1] Appropriate work is shown, but one computational or rounding error is made.

or

     [1] Appropriate work is shown, but one conceptual error is made.

or

     [1] A correct normal distribution probability is determined, but no further correct work is shown.

or

     [1] 941, but no work is shown.

     [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(29)   **[2]** 0, 3 and correct algebraic work is shown.

     [1] Appropriate work is shown, but one computational error is made.

or

     [1] Appropriate work is shown, but one conceptual error is made.

or

     [1] 0, 3, but a method other than algebraic is used.

or

     [1] 0, 3, but no work is shown.

     [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(30)   **[2]** A correct graph on [0,2π] is drawn.

       [1] One graphing or labeling error is made.

<div align="center">*or*</div>

       [1] One conceptual error is made.

       [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(31)   **[2]** $(12, -16)$, $(16, -12)$ and correct algebraic work is shown.

       [1] Appropriate work is shown, but one computational, factoring, or simplification error is made.

<div align="center">*or*</div>

       [1] Appropriate work is shown, but one conceptual error is made.

<div align="center">*or*</div>

       [1] Appropriate work is shown to find the values of one variable.

<div align="center">*or*</div>

       [1] Appropriate work is shown to find $(12, -16)$ or $(16, -12)$.

<div align="center">*or*</div>

       [1] $(12, -16)$ and $(16, -12)$, but a method other than algebraic is used.

<div align="center">*or*</div>

       [1] $(12, -16)$ and $(16, -12)$, but no work is shown.

       [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(32)   **[2]** A correct margin of error is written, such as 0.08, and a correct explanation is written.

       [1] Appropriate work is shown, but one computational or rounding error is made.

<div align="center">*or*</div>

       [1] Appropriate work is shown, but one conceptual error is made.

<div align="center">*or*</div>

       [1] 0.08, but the explanation is incomplete, incorrect, or missing.

       [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Part III

For each question, use the specific criteria to award a maximum of 4 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(33)   **[4]** $x = -2$, $y = 5$, $z = 3$, and correct algebraic work is shown.

[3] Appropriate work is shown, but one computational error is made.

or

[3] Appropriate work is shown to find two of the solutions, but no further correct work is shown.

[2] Appropriate work is shown, but two or more computational errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] Appropriate work is shown to find one of the solutions, but no further correct work is shown.

or

[2] $x = -2$, $y = 5$, $z = 3$, but a method other than algebraic is used.

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

or

[1] Appropriate work is shown to eliminate one variable to create a system of two equations, but no further correct work is shown.

or

[1] $x = -2$, $y = 5$, $z = 3$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(34)   **[4]** 0, a correct explanation is written, $-4, \frac{3}{2}, 4$ and correct algebraic work is shown.

[3] Appropriate work is shown, but one computational or factoring error is made.

or

[3] 0, a correct explanation is written, and $-4, \frac{3}{2}, 4$, but a method other than algebraic is used.

[2] Appropriate work is shown, but two or more computational or factoring errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] Appropriate work is shown to find $-4, \frac{3}{2}, 4$, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or factoring error are made.

or

[1] 0, but no further correct work is shown.

or

[1] A correct explanation is written, but no further correct work is shown.

or

[1] $-4, \frac{3}{2}, 4$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(35)　　**[4]** 18.5, and correct work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

or

[3] A correct equation and 18.5, but no work is shown.

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or

[2] A correct equation is written, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or

[1] 18.5, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

(36)   **[4]** A correct justification, yes, and a correct explanation is given.

[3] Appropriate work is shown, but one computational error is made.

[2] Appropriate work is shown, but two or more computational errors are made.

or

[2] Appropriate work is shown, but one conceptual error is made.

or

[2] A correct justification is given, but no further correct work is shown.

or

[2] Yes, and a correct explanation is written, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

or

[1] A correct justification of 7 is given, but no further correct work is shown.

[0] Yes, but no work is shown.

or

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

Part IV

For each question, use the specific criteria to award a maximum of 6 credits. Unless otherwise specified, mathematically correct alternative solutions should be awarded appropriate credit.

(37)   **[6]** $P(x) = -330x^3 + 9000x^2 - 67,000x + 167,000$, a correct graph is drawn over $2 \leq x \leq 16$, 5 and 13, and a correct explanation is written.

[5] Appropriate work is shown, but one computational, graphing, labeling, simplification, or rounding error is made.

or

[5] $P(x) = -330x^3 + 9000x^2 - 67,000x + 167,000$, a correct graph is drawn, 5 or 13, and a correct explanation is made.

[4] Appropriate work is shown, but two computational, graphing, labeling, simplification, or rounding errors are made.

or

[4] Appropriate work is shown, but one conceptual error is made.

or

[4] $P(x) = -330x^3 + 9000x^2 - 67,000x + 167,000$, 5 and 13, and a correct explanation is written, but no further correct work is shown.

[3] Appropriate work is shown, but three or more computational, graphing, labeling, simplification, or rounding errors are made.

or

[3] Appropriate work is shown, but one conceptual error and one computational, graphing, labeling, simplification, or rounding error are made.

or

[3] 5 and 13, and a correct explanation is written, but no further correct work is shown.

[2] Appropriate work is shown, but two conceptual errors are made.

or

[2] A correct graph is drawn, but no further correct work is shown.

[1] Appropriate work is shown, but two conceptual errors and one computational, graphing, labeling, simplification, or rounding error are made.

or

[1] $P(x) = -330x^3 + 9000x^2 - 67,000x + 167,000$, but no further correct work is shown.

or

[1] 5 or 13, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

———————————————————————

Map to the Learning Standards
Algebra II
August 2018

Question	Type	Credits	Cluster
1	Multiple Choice	2	F-LE.A
2	Multiple Choice	2	S-IC.B
3	Multiple Choice	2	F-BF.A
4	Multiple Choice	2	F-IF.C
5	Multiple Choice	2	A-APR.D
6	Multiple Choice	2	F-BF.B
7	Multiple Choice	2	A-REI.A
8	Multiple Choice	2	A-SSE.B
9	Multiple Choice	2	A-REI.B
10	Multiple Choice	2	F-BF.A
11	Multiple Choice	2	F-TF.C
12	Multiple Choice	2	N-RN.A
13	Multiple Choice	2	A-SSE.B
14	Multiple Choice	2	A-SSE.A
15	Multiple Choice	2	N-CN.A
16	Multiple Choice	2	F-IF.C
17	Multiple Choice	2	F-BF.B
18	Multiple Choice	2	S-CP.B
19	Multiple Choice	2	A-REI.D
20	Multiple Choice	2	F-IF.C

21	Multiple Choice	2	A-APR.B
22	Multiple Choice	2	F-IF.B
23	Multiple Choice	2	G-GPE.A
24	Multiple Choice	2	S-CP.A
25	Constructed Response	2	A-SSE.A
26	Constructed Response	2	N-RN.A
27	Constructed Response	2	F-IF.B
28	Constructed Response	2	S-ID.A
29	Constructed Response	2	A-REI.A
30	Constructed Response	2	F-IF.C
31	Constructed Response	2	A-REI.C
32	Constructed Response	2	S-IC.B
33	Constructed Response	4	A-REI.C
34	Constructed Response	4	A-APR.B
35	Constructed Response	4	F-LE.A
36	Constructed Response	4	S-IC.B
37	Constructed Response	6	F-BF.A

Regents Examination in Algebra II
August 2018
Chart for Converting Total Test Raw Scores to
Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the August 2018 Regents Examination in Algebra II* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ by Thursday, August 16, 2018. Conversion charts provided for previous administrations of the Regents Examination in Algebra II must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm.

2. Select the test title.

3. Complete the required demographic fields.

4. Complete each evaluation question and provide comments in the space provided.

5. Click the SUBMIT button at the bottom of the page to submit the completed form.

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

ALGEBRA II

Thursday, August 16, 2018 — 12:30 to 3:30 p.m., only

MODEL RESPONSE SET

Table of Contents

25 Over the set of integers, factor the expression $x^4 - 4x^2 - 12$.

Grouping method

$$x^4 - 4x^2 - 12$$

$-12 x^4$

$-6x^2 \qquad 2x^2$

$(x^4 - 6x^2) + (2x^2 - 12)$

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

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

↓

answer

Score 2: The student gave a complete and correct response.

25 Over the set of integers, factor the expression $x^4 - 4x^2 - 12$.

$$x^4 - 4x^2 - 12$$
$$(x^2 - 6)(x^2 + 2)$$

Score 2: The student gave a complete and correct response.

25 Over the set of integers, factor the expression $x^4 - 4x^2 - 12$.

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

$$x^2 = 6 \qquad x^2 = -2$$
$$x = \pm\sqrt{6} \qquad x = \pm i\sqrt{2}$$

$$\left\{ \pm\sqrt{6}, \ \pm i\sqrt{2} \right\}$$

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

$$x^4 - 6x^2 + 2x^2 - 12$$

$$x^4 - 4x^2 - 12$$

Score 1: The student factored correctly, but then went on to solve an equation.

25 Over the set of integers, factor the expression $x^4 - 4x^2 - 12$.

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

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

Score 1: The student initially factored correctly, but showed incorrect work beyond the correct answer.

25 Over the set of integers, factor the expression $x^4 - 4x^2 - 12$.

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

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

$$x = 3, x = -2, x = -2, x = -1$$

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

Score 0: The student did not do enough correct work to receive any credit.

26 Express the fraction $\dfrac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$ in simplest radical form.

$$\frac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$$

$$\frac{2\sqrt[3]{x^3}}{\sqrt[4]{16x^4}}$$

$$\frac{2x\sqrt{x}}{2x}$$

$$\boxed{\sqrt{x}}$$

Score 2   The student gave a complete and correct response.

26 Express the fraction $\dfrac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$ in simplest radical form.

$16^{1/4} = 2$ $\qquad$ $\dfrac{2\,x^{3/2}}{2x} = \dfrac{x^{3/2}}{x} = \boxed{\sqrt{x}}$

Score 2: The student gave a complete and correct response.

26 Express the fraction $\dfrac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$ in simplest radical form.

$$\frac{2\left(\sqrt{x}\right)^3}{4\sqrt{16}\left(x\right)}$$

$$\frac{\cancel{2}\left(\sqrt{x}\right)^3}{\cancel{2}x}$$

$$\boxed{\frac{\left(\sqrt{x}\right)^3}{x}}$$

Score 1:   The student did not simplify completely.

---

26 Express the fraction $\dfrac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$ in simplest radical form.

$$\frac{\left(2\sqrt{2x}\right)^3}{\left(\sqrt[4]{16x^4}\right)}$$

$$\frac{\sqrt{2x}^3}{2x}$$

$$\frac{2x\sqrt{2x}}{2x}$$

$$\boxed{\sqrt{2x}}$$

$$2^{\frac{1}{2}} \quad 4^{\uparrow 2}_{8}$$

Score 1: The student applied the exponent to $2x$ instead of x.

26 Express the fraction $\dfrac{2x^{\frac{3}{2}}}{\left(16x^4\right)^{\frac{1}{4}}}$ in simplest radical form.

$$\dfrac{\sqrt[3]{2x^3}}{2x}$$

$$\sqrt[2]{x^2}$$

$$x$$

Score 0: The student made multiple errors applying exponent rules.

27 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function $p(t) = 2560e^{0.017185t}$, where t is time in years after 1950 and $p(t)$ is the population in millions. Determine the average rate of change of $p(t)$ in *millions of people per year*, from $4 \leq t \leq 8$. Round your answer to the *nearest hundredth*.

$$p(4) = 2560e^{0.017185(4)} \qquad p(8) = 2560e^{0.017185(8)}$$

$$p(4) = 2742.16364 \qquad p(8) = 2937.289621$$

$$8 - 4 = 4$$

$$2937.289621 - 2742.16364$$

$$= 195.125981$$

$$\frac{195.125981}{4} = 48.78149525$$

$$\approx 48.78$$

Score 2:   The student gave a complete and correct response.

27 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function $p(t) = 2560e^{0.017185t}$, where t is time in years after 1950 and $p(t)$ is the population in millions. Determine the average rate of change of $p(t)$ in *millions of people per year*, from $4 \le t \le 8$. Round your answer to the *nearest hundredth*.

$$1950 - 2560$$
$$1960 - 3040$$

$$p(t) = 2560 \, e^{0.017185t}$$

$$p(4) = 2560 \, e^{0.017185(4)}$$

$$2560 \, e^{.06874}$$

$$p(4) = 2742.16364$$

$$\frac{Y_2 - Y_1}{X_2 - X_1} \qquad \frac{8-4}{2937.3 - 2742.2}$$

$$p(8) = 2560 e^{.017185(8)}$$

$$p(8) = 2937.289621 \quad^{.13748}$$

$$\frac{4}{195.1} = \boxed{.02}$$

rate of change

Score 1:   The student made a substitution error when finding the average rate of change.

27 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function $p(t) = 2560e^{0.017185t}$, where t is time in years after 1950 and $p(t)$ is the population in millions. Determine the average rate of change of $p(t)$ in *millions of people per year*, from $4 \leq t \leq 8$. Round your answer to the *nearest hundredth*.

$$p(4) = 2560e^{0.017185(4)}$$
$$= 2742.1636$$

$$p(8) = 2560e^{0.017185(8)}$$
$$= 2937.2896$$

$$\begin{array}{r} 2937.2896 \\ - 2742.1636 \\ \hline 195.126 \end{array}$$

The population changed by 195.13.

Score 1: The student failed to divide by four before rounding.

27 The world population was 2560 million people in 1950 and 3040 million in 1960 and can be modeled by the function $p(t) = 2560e^{0.017185t}$, where t is time in years after 1950 and $p(t)$ is the population in millions. Determine the average rate of change of $p(t)$ in *millions of people per year*, from $4 \leq t \leq 8$. Round your answer to the *nearest hundredth*.

$$f(4) = 2560e^{0.017185\,t} = 2742.2$$

$$f(8) = 2560e^{0.017185\,t} = 2988.2$$

$$\frac{2988.2 - 2742.2}{8-4} = \frac{246}{4} = 61.5$$

Average rate of change is 62 Million People every Year

Score 0: The student made an error evaluating $p(8)$ and rounded incorrectly.

28 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

normalcdf (200, 245, 225, 18) = .7843
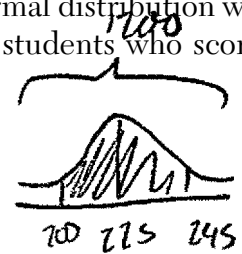
.7843 × 1200 = 941

941 students

Score 2: The student gave a complete and correct response.

28 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

$$1200 \, (.784) = \boxed{941 \; students}$$

Score 2: The student gave a complete and correct response.

28 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

1200 students

mean - 225

S.D - 18

btw : 200 - 245

Normal cdf (200, 245, 225, 18) = .7843063697

z-score

$$\frac{200 - 245}{18} = 186.3\overline{8}$$

78.4% is expected to score btw 200 and 245

Score 1: The student failed to determine the number of students.

28 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.
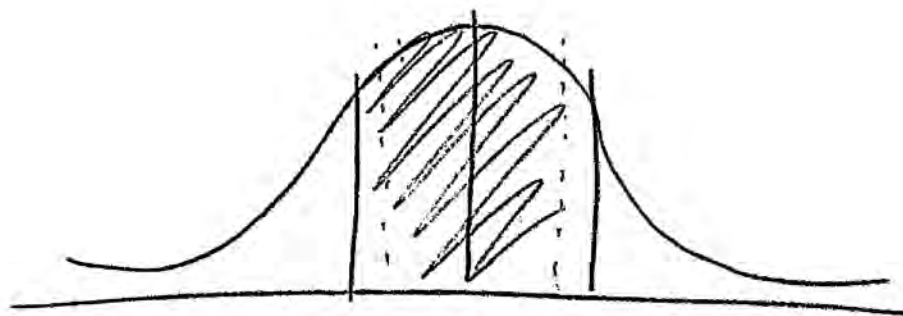
941 students

Score 1: The student did not show enough work to determine the number of students.

28 The scores of a recent test taken by 1200 students had an approximately normal distribution with a mean of 225 and a standard deviation of 18. Determine the number of students who scored between 200 and 245.

1200 students   mean = 225 $\sigma = 18$

between 200 and 245

$t\text{-score} = \dfrac{x - \bar{x}}{2} = \dfrac{200 - 225}{2} = -12.5 = -.125$

$z\text{-score} = \dfrac{x - \bar{x}}{2} = \dfrac{245 - 225}{2} = 10 = 10$

$.0895 66162 \approx .0896 \approx 9.0\%$

$\dfrac{x}{1200} = \dfrac{9}{100}$

$100x = 10\,800$

$\boxed{x = 108 \text{ students}}$

Score 0: The student did not show enough correct work to receive any credit.

29 Algebraically solve for x:

$$\frac{-3}{x+3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$$

$$+\frac{1}{2} \qquad +\frac{1}{2}$$

$$\frac{-3}{x+3} + 1 = \frac{x}{6}$$

$$\frac{-3}{x+3}(x+3)(6) + \frac{1}{1}(x+3)(6) = \frac{x}{6}(x+3)(6)$$

$$-18 + (x+3)(6) = x(x+3)$$

$$-18 + 6x + 18 = x^2 + 3x$$

$$6x = x^2 + 3x$$

$$0 = x^2 - 3x$$

$$0 = x(x-3)$$

$$\boxed{x = 0, \ x = 3}$$

Score 2: The student gave a complete and correct response.

29 Algebraically solve for x:

$$\frac{-3}{x+3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$$

$LCD = 6(x+3)$

$6(x+3)$

$\frac{-3}{x+3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$

$-18 + 3x + 9 = x^2 + 3x - 3x - 9$

$3x - 9 = x^2 - 9$

$0 = x^2 - 3x$

$0 = x(x-3)$

$\boxed{\begin{array}{l} x = 0 \\ x = 3 \end{array}}$

Score 2:   The student gave a complete and correct response.

29 Algebraically solve for x:

$$\frac{-3}{x+3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$$

$$\frac{-3}{x+3} + \frac{3}{6} = \frac{x}{6} - \frac{3}{6}$$

$$-3(6) + 3(x+3) = x(x+3) - 3(x+3)$$

$$-18 + 3x + 3 = x^2 + 3x - 3x - 9$$

$$3x - 15 = x^2 - 9$$

$$x^2 - 3x + 6 = 0$$

$$\frac{3 \pm \sqrt{9 - 4(1)(6)}}{2(1)} = \frac{3 \pm \sqrt{-15}}{2}$$

$$x = \frac{3 \pm i\sqrt{15}}{2}$$

Score 1: The student failed to properly distribute the three.

29 Algebraically solve for x:

$$\frac{-3}{x+3} + \frac{1}{2} = \frac{x}{6} - \frac{1}{2}$$

$$\frac{-18}{6x+18} + \frac{3x+9}{6x+18} = \frac{x^2+3x}{6x+18} - \frac{3x+9}{6x+18}$$

$$-18 + 3x + 9 = x^2 + 3x - 3x - 9$$

$$-18 + 6x + 18 = x^2 + 3x$$

$$\frac{3x}{x} = \frac{x^2}{x}$$

$$\boxed{3 = x}$$

Score 1: The student lost a solution by dividing by x.

29 Algebraically solve for x:

$$\left(\frac{2}{2}\right)\frac{-3}{x+3}\left(\frac{x+1}{x+2}\right) = \frac{x}{6} - \frac{1}{2}\left(\frac{3}{3}\right)$$

$$\frac{-6}{2x+6} + \frac{x+3}{2x+6} = \frac{x}{6} - \frac{3}{6}$$

$$-6 + x+3 = x-3$$
$$\qquad +3 \qquad +3$$
$$\overline{\qquad\qquad\qquad}$$
$$-6+x+6 = x$$
$$x=0$$

Score 0: The student did not show enough correct work to receive any credit.

30 Graph $t(x) = 3\sin(2x) + 2$ over the domain $[0,2\pi]$ on the set of axes below.

Score 2: The student gave a complete and correct response.

30 Graph $t(x) = 3\sin(2x) + 2$ over the domain $[0, 2\pi]$ on the set of axes below.

$a \sin(bx) + c$

$a = $ amplitude $= 3$
$c = $ midline $= 2$
$P = \frac{2\pi}{b} = \frac{8\pi}{8} = \pi$
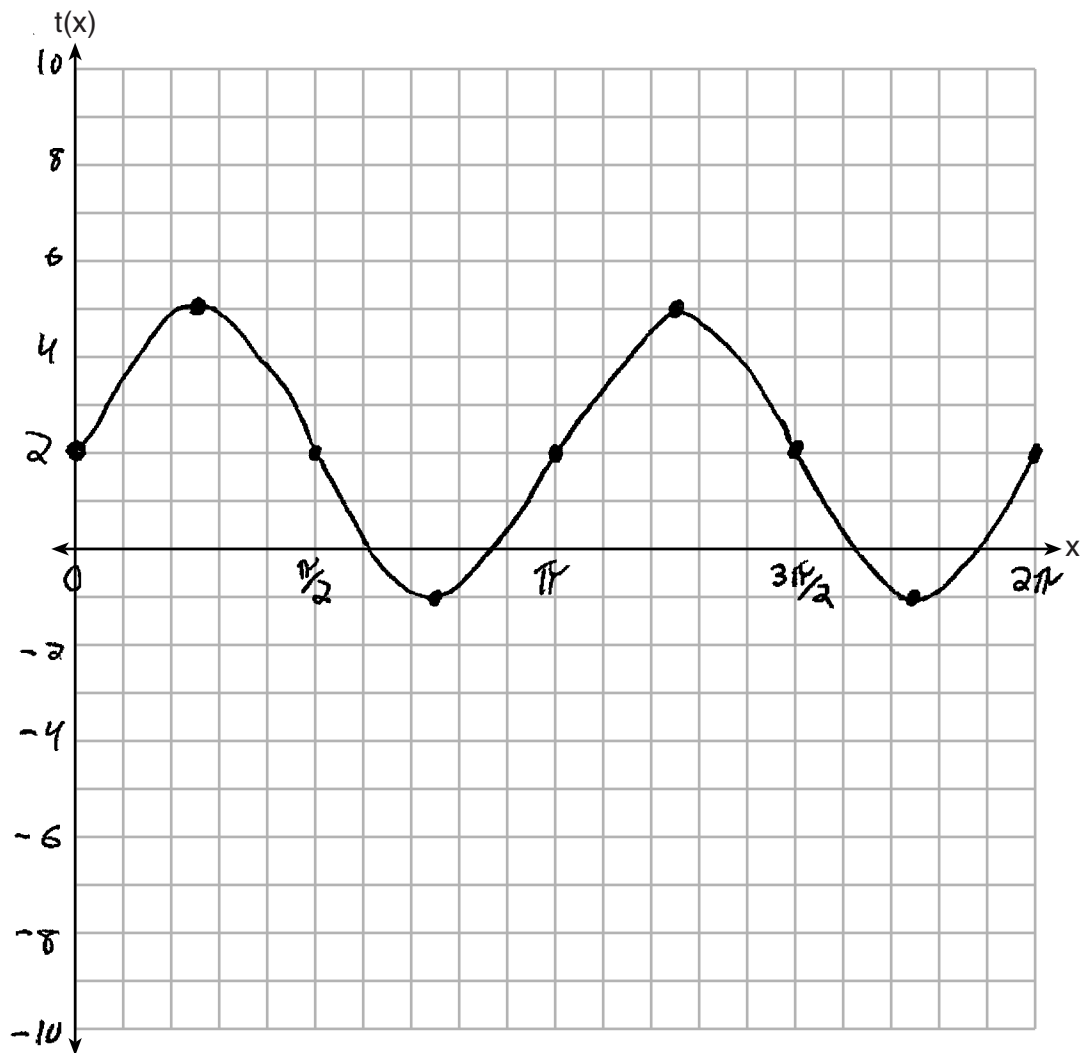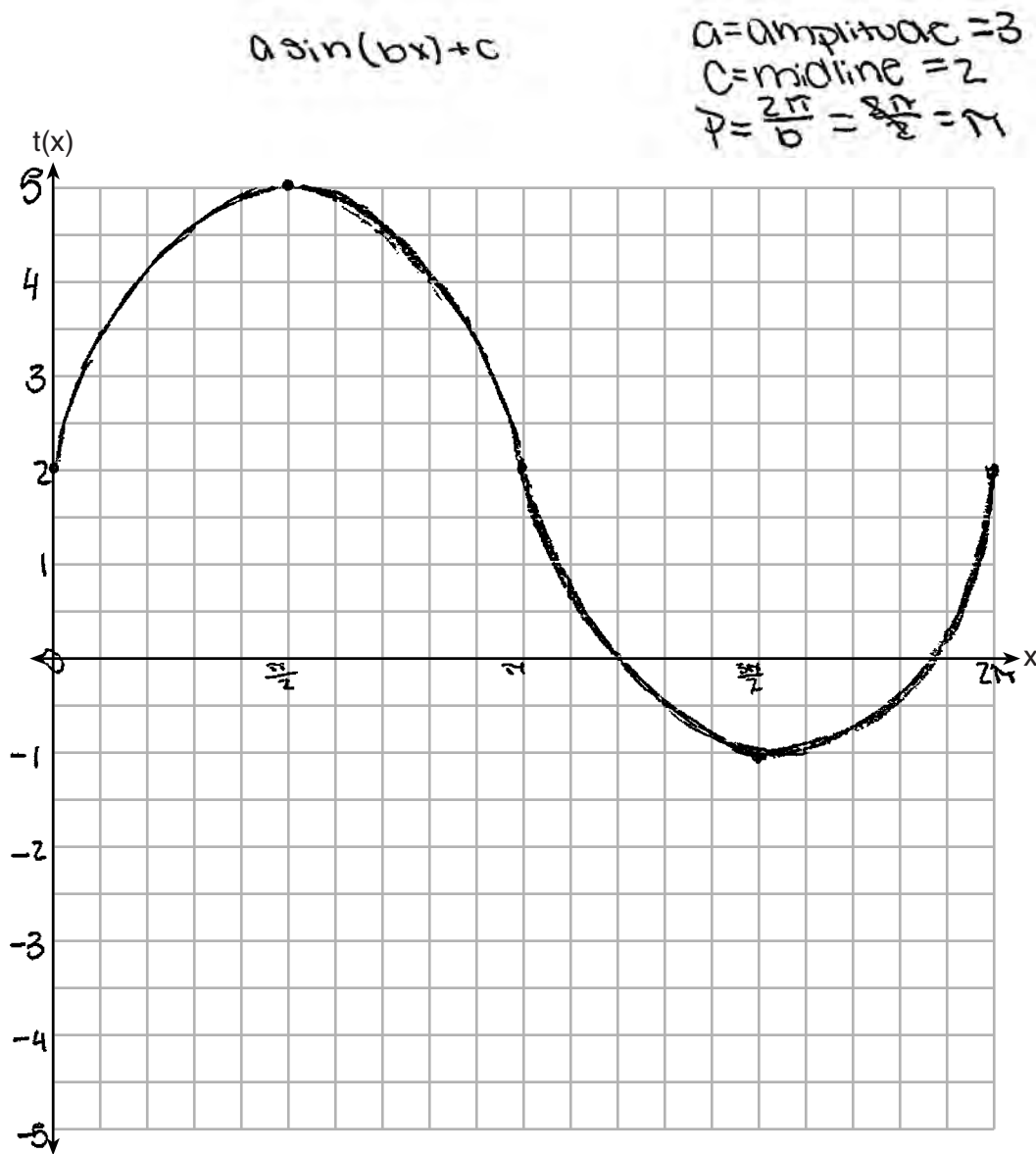
Score 1: The student made a graphing error.
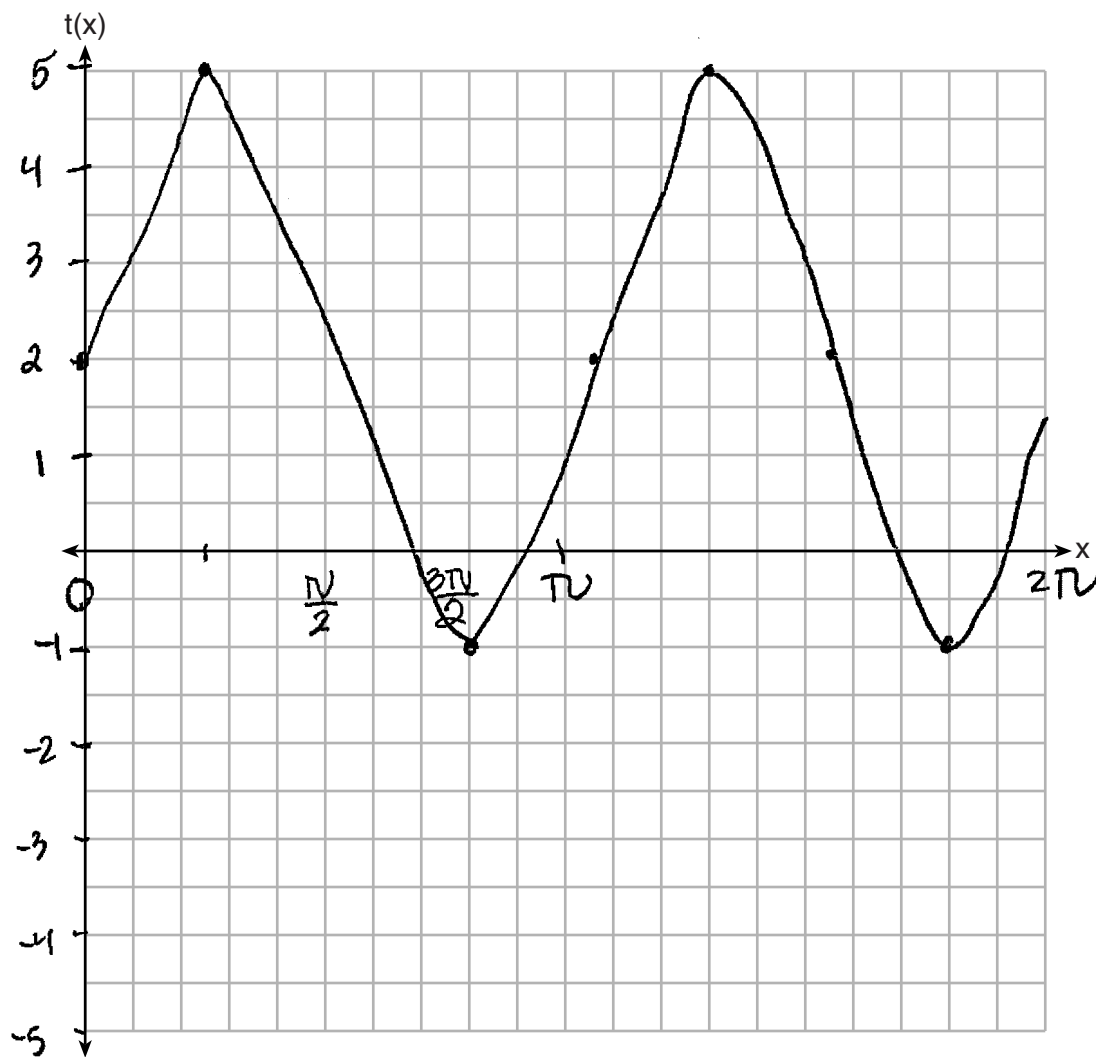
30 Graph $t(x) = 3\sin(2x) + 2$ over the domain $[0,2\pi]$ on the set of axes below.

Score 0: The student made multiple graphing errors.

30 Graph $t(x) = 3\sin(2x) + 2$ over the domain $[0,2\pi]$ on the set of axes below.
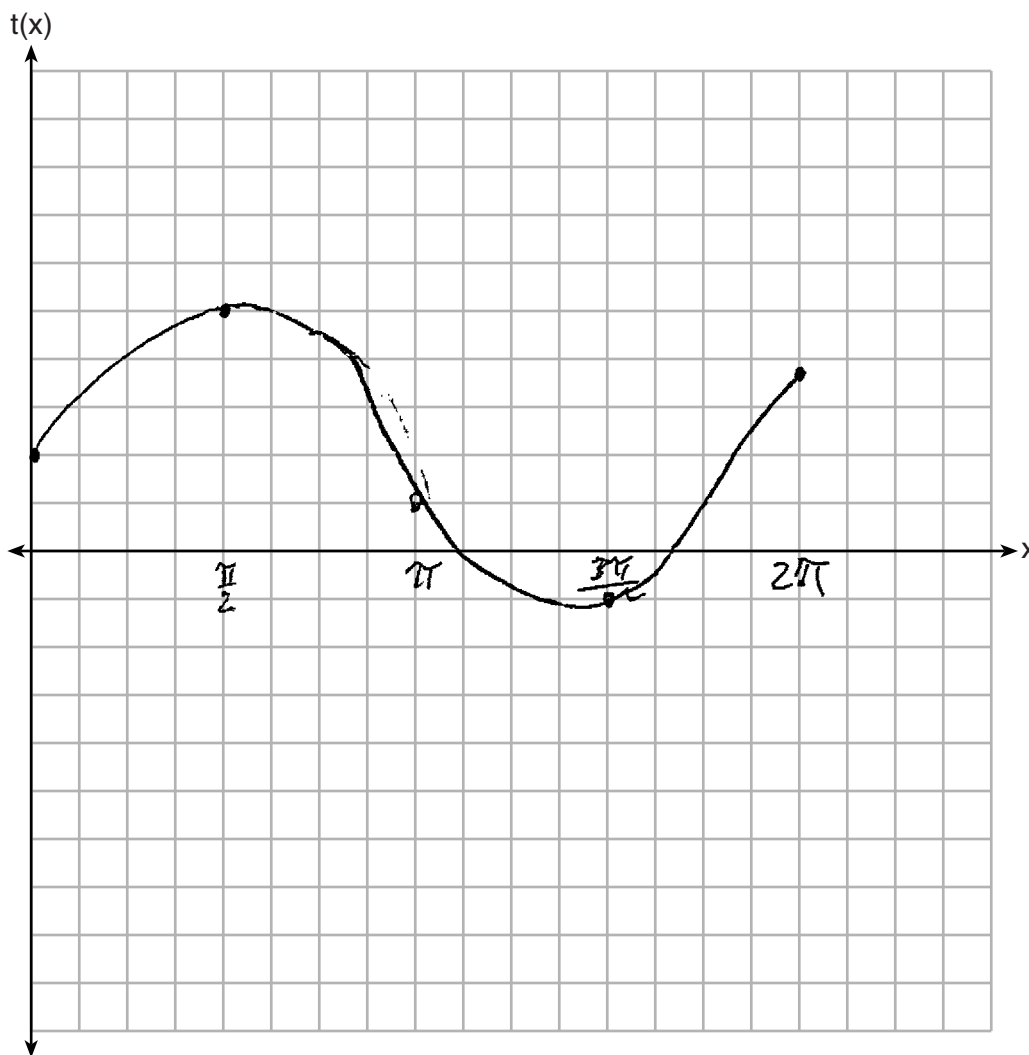
Score 0: The student made multiple graphing errors.

31 Solve the following system of equations algebraically.

$$x^2 + y^2 = 400$$

$$y = x - 28$$

$$x^2 + (x-28)^2 = 400$$
$$x^2 + x^2 - 56x + 784 = 400$$
$$ -400 \quad -400$$
$$\overline{2x^2 - 56x + 384 = 0}$$
$$2(x^2 - 28x + 192) = 0$$
$$x^2 - 28x + 192 = 0$$
$$(x-16)(x-12) = 0$$
$$x - 16 = 0 \quad | \quad x - 12 = 0$$
$$x = 16 \quad | \quad x = 12$$

$$y = 16 - 28 \qquad y = 12 - 28$$
$$y = -12 \qquad \quad y = -16$$

$$\boxed{\begin{array}{l} x = 16, \, y = -12 \\ x = 12, \, y = -16 \end{array}}$$

Score 2:   The student gave a complete and correct response.

31 Solve the following system of equations algebraically.

$$x^2 + y^2 = 400$$

$$y = x - 28$$

$$x^2 + (x-28)^2 = 400$$

$$x^2 + -x(x-28) - 28(x-28) = 400$$

$$x^2 + x^2 - 28x - 28x + 784 = 400$$

$$2x^2 - 56x + 784 = 400$$

$$ -400 \quad -400$$

$$2x^2 - 56x + 384 = 0$$

$$2(x^2 - 28x + 192) = 0$$

$$2(x^2 - 12x - 16x + 192) = 0$$

$$2(x(x-12) - 16(x-12)) = 0$$

$$2(x-16)(x-12) = 0$$

$$\overset{\frown}{x = 16}$$

$$\underline{x = 12}$$

$$(16, -12)$$

$$(12, -16)$$

$$y = 16 - 28$$

$$\boxed{y = -12}$$

$$y = 12 - 28$$

$$\boxed{y = -16}$$

$$\frac{192}{}$$

$$1 \times 192$$

$$2 \times 96$$

$$3 \times 64$$

$$4 \times 48$$

$$6 \times 32$$

$$8 \times 24$$

$$12 \times 16$$

Score 2: The student gave a complete and correct response.

31 Solve the following system of equations algebraically.

$$x^2 + y^2 = 400$$
$$y = x - 28$$

$$\begin{array}{c|c|c}
 & X & -28 \\
\hline
X & X^2 & -28x \\
\hline
-28 & -28x & 784
\end{array}$$

$$X^2 + X^2 - 56X + 784 = 400$$
$$ -400 \quad -400$$

$$2X^2 - 56X + 384$$

$$A = 2$$
$$B = -56$$
$$C = 384$$

$$X = \frac{56 \pm \sqrt{3136 - 4(2)(384)}}{4}$$

$$X = \frac{56 \pm \sqrt{64}}{4}$$

$$X = \frac{56 \pm 8}{4}$$

$$\boxed{\begin{array}{l} X = 16 \\ X = 12 \end{array}}$$

Score 1: The student failed to find the corresponding y-values.

31 Solve the following system of equations algebraically.

$$x^2 + y^2 = 400$$
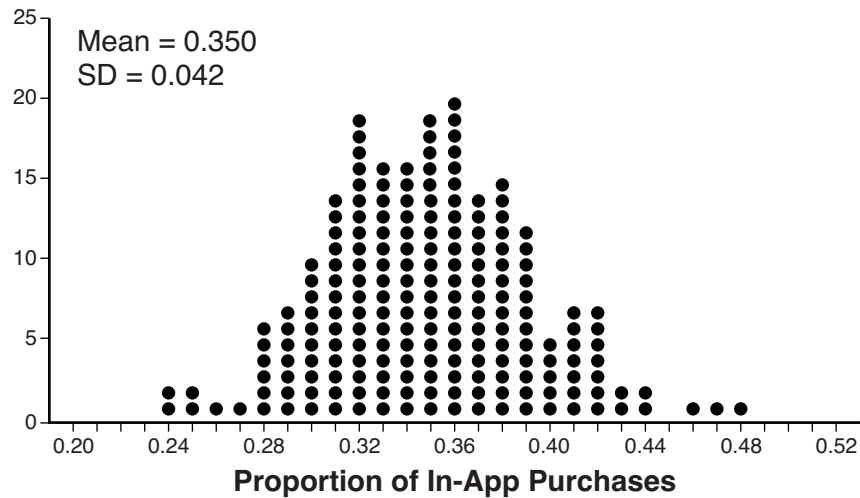
$$y = x - 28$$

$$x^2 + (x-28)^2 = 400$$

$$x^2 + (x-28)(x-28) = 400$$

$$x^2 + x^2 - 28x - 28x + 784 = 400$$

$$2x^2 - 56x + 784 = 400$$

$$ -400 \quad -400$$

$$2x^2 - 56x + 384 = 0$$

$$x = \frac{56 \pm \sqrt{(-56)^2 - 4(2)(384)}}{2(2)}$$

$$x = \frac{56 \pm \sqrt{6208}}{4}$$

$$x = \frac{56 + 78}{4}$$

$$x = \frac{134}{4}$$

$$x = 34$$

$$y = 34 - 28$$

$$y = 6$$

$$x = 34$$
$$y = 6$$

Score 1: The student correctly determined $2x^2 - 56x + 384 = 0$.

31 Solve the following system of equations algebraically.

$$x^2 + y^2 = 400$$

$$y = x - 28$$

$$x^2 + (x - 28)^2 = 400$$

$$x + x - 28 = 20$$

$$x + x = \frac{+28}{48}$$
$$ \frac{48}{2}$$

$$x = 24$$

Score 0: The student made a conceptual error and only found a value for x.

32 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.

Mean = 0.350
SD = 0.042

Proportion of In-App Purchases

Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.
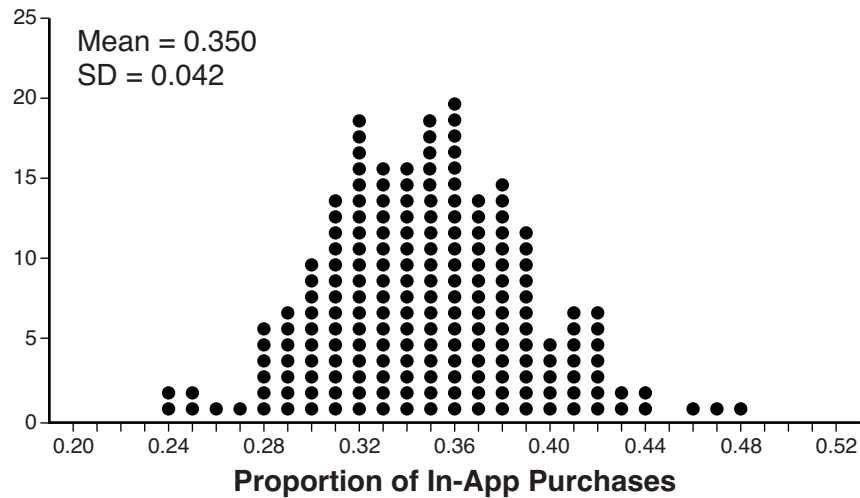
$$ME = 2SD = 2(.042) = .084 = .08$$

A ME of .08 means that 27 – 43% of users ~~will make~~ are expected to make in-app purchases.

$$\begin{array}{r} .35 \\ +\ .08 \\ \hline .43 \end{array} \qquad \begin{array}{r} .35 \\ -\ .08 \\ \hline .27 \end{array}$$

Score 2: The student gave a complete and correct response.

32 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.

Mean = 0.350
SD = 0.042

Proportion of In-App Purchases

Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.

2 SD =   .08

This means that 95% falls between

.35 ± .08.

Score 1:   The student did not refer to the given context.

32 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.

Mean = 0.350
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Proportion of In-App Purchases

Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.
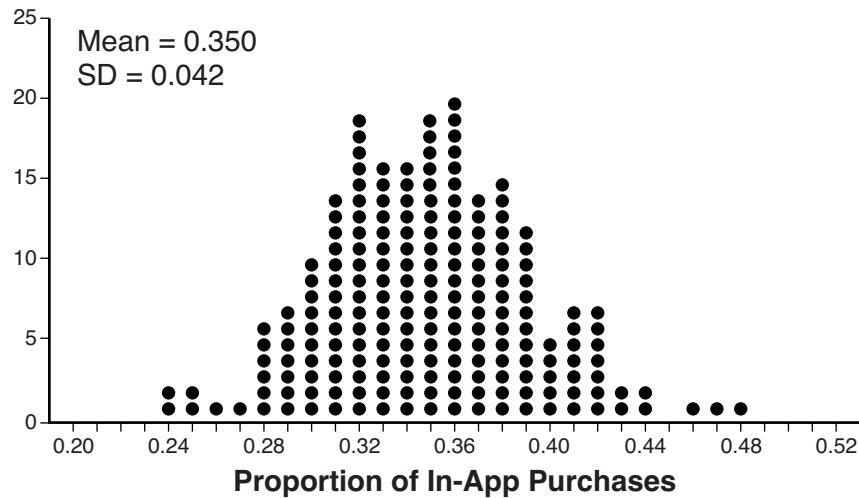
Margin of Error = 2(S.D.)

MoE = 2(0.042)

MoE = .08

Score 1: The student did not provide an explanation.

32 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.

Mean = 0.350
SD = 0.042

Proportion of In-App Purchases

Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.
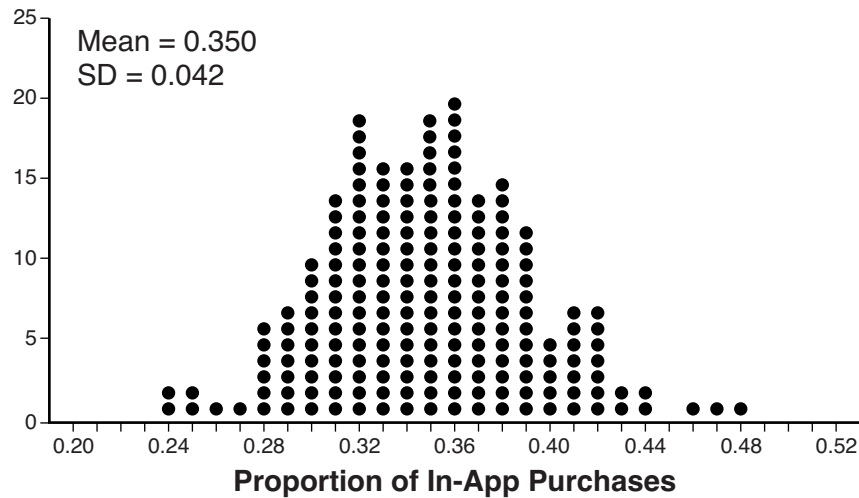
$ME = .04$

You can expect the percent of people making in-app purchases to be within 4% of 35%.

Score 1: The student stated an incorrect margin of error, but provided an appropriate explanation.

32 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.

Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.

$$2(.042) = \boxed{.084}$$

This represents the max and the min values of where the data falls and how many make in-app purchases

Score 0: The student made a rounding error stating the margin of error and gave an incorrect explanation.

32 Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below.

Proportion of In-App Purchases

Considering the middle 95% of the data, determine the margin of error, to the *nearest hundredth*, for the simulated results. In the given context, explain what this value represents.

$.35 \pm 2(.042)$

$.266 - .434$

$\boxed{.168}$

this means 95% of the data falls within this range.

Score 0: The student did not show enough correct work to get any credit.

33 Solve the following system of equations algebraically for all values of x, y, and z.

$$2x + 3y - 4z = -1$$
$$x - 2y + 5z = 3$$
$$-4x + y + z = 16$$

1) $-2(x - 2y + 5z = 3)$
   $2x + 3y - 4z = -1$
   $-2x + 4y - 10z = -6$

   $7y - 14z = -7$

2) $-4x + y + z = 16$
   $4(x - 2y + 5z = 3)$
   $-4x + y + z = 16$
   $4x - 8y + 20z = 12$

   $-7y + 21z = 28$

3) $7y - 14z = -7$
   $-7y + 21z = 28$

   $\dfrac{7z}{7} = \dfrac{21}{7}$

   $\boxed{z = 3}$

4) $-7y + 21(3) = 28$
   $-7y + 63 = 28$
   $\quad\; - 63 \; - 63$

   $\dfrac{-7y}{-7} = \dfrac{-35}{7}$

   $\boxed{y = 5}$

5) $2(x) + 3(5) - 4(3) = -1$
   $2(x) + 15 - 12 = -1$
   $2(x) + 3 = -1$
   $\quad\; -3 \quad -3$

   $\dfrac{2(x)}{2} = \dfrac{-4}{2}$

   $\boxed{x = -2}$

Score 4:   The student gave a complete and correct response.

33 Solve the following system of equations algebraically for all values of x, y, and z.

$$2x + 3y - 4z = -1$$
$$x - 2y + 5z = 3$$
$$-4x + y + z = 16$$

$2\ (2x+3y-4z=-1\ )$

$4x+6y-8z=-2$

$-4x+y+z=16$

$7y-7z=14$

$y=2+z$

$\boxed{y=2+3=5}$

$4(x-2y+5z=3)$

$4x-8y+20z=12$

$-4x+y+z=16$

$-7y+21z=28$

$X-2(5)+5(3)=3$

$X-10+15=3$

$X+5=3$

$X=2$

$-7(2+z)+21z=28$

$-14-7z+21z=28$

$-14+14z=28$

$14z=42$

$\boxed{z=3}$

Score 3: The student made one computational error solving for x.

33 Solve the following system of equations algebraically for all values of x, y, and z.

$$3(2x + 3y - 4z = -1)$$
$$-2(x - 2y + 5z = 3)$$
$$-4x + y + z = 16$$

$$2x + 3y - 4z = -1$$
$$-2x + 4y - 10z = -3$$

$$7y - 14z = -4$$
$$-7y + 7z = -4$$

$$\frac{-7z}{-7} = \frac{-8}{-7}$$

$$z = \frac{8}{7}$$

$$x - 2\left(\frac{-4}{7}\right) + 5\left(\frac{8}{7}\right) = 3$$

$$x = \frac{-27}{7}$$

$$-4x + y + z = 6$$
$$4x + 6y - 8z = -2$$

$$7y - 7z = 4$$

$$7y - 7\left(\frac{8}{7}\right) = 4$$

$$\frac{7y}{7} = \frac{-4}{7}$$

$$y = \frac{-4}{7}$$

Score 2: The student made two or more computational errors.

33 Solve the following system of equations algebraically for all values of x, y, and z.

$$2x + 3y - 4z = -1$$
$$x - 2y + 5z = 3$$
$$-4x + y + z = 16$$

$$2x + 3y - 4z = -1 \cdot$$
$$+(-2x + 4y - 10z) = -6$$
$$\overline{\qquad\qquad\qquad}$$
$$7y - 14z = -7$$

$$4x + 6y - 8z = -2$$
$$-4x + y + z = 16$$
$$\overline{\qquad\qquad\qquad}$$
$$7y - 7z = 14$$

Score 1: The student only made two equations eliminating the same variable.

33 Solve the following system of equations algebraically for all values of x, y, and z.

$$2x + 3y - 4z = -1$$
$$x - 2y + 5z = 3$$
$$-4x + y + z = 16$$

$$1(2x + 3y - 4z = -1)$$
$$2(x - 2y + 5z = 3)$$

$$2x + 3y - 4z = -1$$
$$-(2x - 4y + 10z = 6)$$
$$\overline{7y - 14z = -7}$$

Score 0: The student did not do enough correct work to receive a credit.

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

$$2(-1)^4 - (-1)^3 - 35(-1)^2 + 16(-1) + 48 =$$
$$2(1) - (-1) - 35(1) + 16(-1) + 48$$
$$2 + 1 - 35 - 16 + 48 = 0$$

That $x+1$ is a factor of $2x^4 - x^3 - 35x^2 + 16x + 48$

Algebraically find the remaining zeros of $j(x)$.

$$2x^4 - x^3 - 35x^2 + 16x + 48$$

$$
\begin{array}{r|rrrrr}
-1 & 2 & -1 & -35 & 16 & 48 \\
   & \downarrow & -2 & 3 & 32 & -48 \\
\hline
   & 2 & -3 & -32 & 48 & \,|\, 0 \\
\end{array}
$$

$$2x^3 - 3x^2 - 32x + 48 = 0$$

$$x^2(2x - 3) - 16(2x - 3) = 0$$

$$(x^2 - 16)(2x - 3) = 0$$

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

$$\boxed{x = +4, -4, +\tfrac{3}{2}}$$

Score 4: The student gave a complete and correct response.

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

$$2(-1)^4 - (-1)^3 - 35(-1)^2 + 16(-1) + 48 = 0$$

It shows us that $x+1$

a factor of $j(x)$

Algebraically find the remaining zeros of $j(x)$.

$$2x^4 - x^3 - 35x^2 + 16x + 48 = 0$$

$$2(-4)^4 - (-4)^3 - 35(-4)^2 + 16(-4) + 48 = 0$$

$$2(4)^4 - (4)^3 - 35(4)^2 + 16(4) + 48 = 0$$

$$2(1.5)^2 - 4(1.5)^3 - 35(1.5)^2 + 16(1.5) + 48 = 0$$

$$x = 1.5, \quad x = -1, \quad x = -4, \quad x = 4$$

Score 3:   The student did not find the remaining zeros algebraically.

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

x+1 is a divisible factor of j(x), because there would not be a remainder since j(-1)=0. because it intercepts the x-axis; it acts as a root/or a zero.

$j(-1) = 2(-1)^4 - (-1)^3 - 35(-1)^2 + 16(-1) + 48$

$j(-1) = 2 + 1 - 35 + -16 + 48$

$j(-1) = 0$

```
-1 | 2   -1   -35   16   48
   |     -2    3    32  -48
     2   -3   -32   48  (0)
```

Algebraically find the remaining zeros of $j(x)$.

$(2x^3 - 3x^2 - 32x + 48)(x+1)$

$2x^3 - 3x^2 = 32x + 48$

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

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

$x = 4$
$x = \dfrac{3}{2}$
$x = -1$

Score 3:   The student omitted one of the zeros.

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

$$\begin{array}{r} 2x^3 - 3x^2 - 32x + 48 \\ x+1 \overline{)\, 2x^4 - x^3 - 35x^2 + 16x + 48} \\ \underline{2x^4 + 2x^3} \\ -3x^3 - 35x^2 \\ \underline{-3x^3 - 3x^2} \\ -32x^2 + 16x \end{array}$$

$48x + 48$

x+1 is a factor because when you divide it into
$j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$
the remainder is zero.

Algebraically find the remaining zeros of $j(x)$.

$$2x^3 - 3x^2 - 32x + 48$$

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

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

$$\begin{array}{ll} x^2 - 16 = 0 & 2x - 3 = 0 \\ x^2 = 16 & 2x = 3 \\ x = 4 & x = \frac{3}{2} \\ x = -4 & \end{array}$$

$$X = \left\{ -4, \frac{3}{2}, -4 \right\}$$

Score 2: The student did not evaluate $j(-1)$ and made a transcription error writing the answers.

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

$$j(-1) = 0$$
$$x+1 \text{ is a factor of } j(x)$$

Algebraically find the remaining zeros of $j(x)$.

Score 2: The student did not find the remaining zeros.

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

$$2(-1)^4 - (-1)^3 - 35(-1)^2 + 16(-1) + 48$$

$$-2 + 1 - 35 - 16 + 48$$

$$-4 \qquad \therefore x+1 \text{ is not a factor of } j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$$
$$\text{because there is a remainder.}$$

Algebraically find the remaining zeros of $j(x)$.

Score 1: The student received one credit for an explanation based on a calculation error.

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

$$J(-1) = 2(-1)^4 (-1)^3 - 35(-1)^2 + 16(-1) + 48$$

$$J(-1) = 0$$
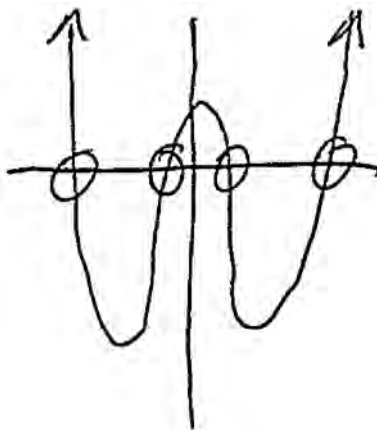
This tells me that $(x+1)$ is a Zero of function $J(x)$.

Algebraically find the remaining zeros of $j(x)$.

Remaining zeros: $(-4), (4), (1)$

Score 1: The student only received credit for evaluating $j(-1)$ correctly.

34 Evaluate $j(-1)$ given $j(x) = 2x^4 - x^3 - 35x^2 + 16x + 48$. Explain what your answer tells you about $x + 1$ as a factor.

Algebraically find the remaining zeros of $j(x)$.

$(4,0)(-4,0)$
$(1,0)(-1,0)$

Score 0: The student used a graphical method and did not find the correct zeros.

35 Determine, to the *nearest tenth of a year*, how long it would take an investment to double at a $3\frac{3}{4}$% interest rate, compounded continuously.

$A = Pe^{rt}$ Solve for t

let $P = \$500$

let $A = (500)(2)$

$r = 3\frac{3}{4}\% \approx 3.75\% = .0375$

It would take aproximately 18.5 years for the investement to double.

$(500)(2) = 500 e^{.0375t}$

$\dfrac{1,000}{500} = \dfrac{500 e^{.0375t}}{500}$

$2 = e^{.0375t}$ apply ln to get rid of e. apply on both sides

$\ln 2 = \ln e^{.0375t}$

$\ln 2 = .0375t \ln e$

$\ln 2 = .0375t (1)$ $\ln e = 1$

$\dfrac{\ln 2}{.0375} = \dfrac{.0375t}{.0375}$

$t \approx 18.5$

Score 4:   The student gave a complete and correct response.

35 Determine, to the *nearest tenth of a year*, how long it would take an investment to double at a $3\frac{3}{4}$% interest rate, compounded continuously.

3.75% c

$$A = Pe^{rt}$$

$$1000 = 500e^{.0375t}$$

$$2 = e^{.0375t}$$

$$\log 2 = \log e^{.0375t}$$

$$\frac{\log 2}{\log e} = \frac{.0375t \, \log e}{\log e}$$

$$\frac{.693147180 6}{.0375} = \frac{.0375t}{.0375}$$

$$\boxed{t \approx 18.5 \text{ years}}$$

Score 4: The student gave a complete and correct response.

35 Determine, to the *nearest tenth of a year,* how long it would take an investment to double at a $3\frac{3}{4}\%$ interest rate, compounded continuously.

$$\frac{2000}{1000} = \frac{1000e^{.0375t}}{1000}$$

$$2 = e^{.0375t}$$

$$\log 2 = \log e^{.0375t}$$

$$\frac{\log 2}{\log 1.0382\,1997} = \frac{\log (1.0382\,1997)t}{\log 1.0382\,1997}$$

$$t = 18.48392485$$

$$t = 18 \text{ years}$$

Score 3: The student made one rounding error.

35 Determine, to the *nearest tenth of a year,* how long it would take an investment to double at a $3\frac{3}{4}\%$ interest rate, compounded continuously.

$$\frac{500}{500}\left(1+.0375\right)^{x} = \frac{1000}{500}$$

$$\log\left(1.0375\right)^{x} = \log 2$$

$$\frac{x\log 1.0375}{\log 1.0375} = \frac{\log 2}{\log 1.0375}$$

$$x = \boxed{18.8 \text{ years}}$$

Score 2: The student wrote an incorrect equation, but showed appropriate work.

35 Determine, to the *nearest tenth of a year*, how long it would take an investment to double at a $3\frac{3}{4}\%$ interest rate, compounded continuously.

Let's use $100

$$200 = 100 \cdot (1 + 0.0375)^x$$

0.0375

.9625

3.75%

18.8

Score 1: The student wrote an incorrect equation and provided insufficient work to determine 18.8.

35 Determine, to the *nearest tenth of a year*, how long it would take an investment to double at a $3\frac{3}{4}\%$ interest rate, compounded continuously.

$$100 \cdot 1.0375$$

$$\frac{6.007}{7.375} = \frac{X}{100}$$

18.8 years

Score 0: The student did not do enough correct work to receive any credit.

36 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90, 89

Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer.

John obtained this value by calculating the mean score for each group and then subtracting one from the other.
This value represents that the classical group's mean score was 7; higher than that of the rap group.

To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.

Classical vs. Rap
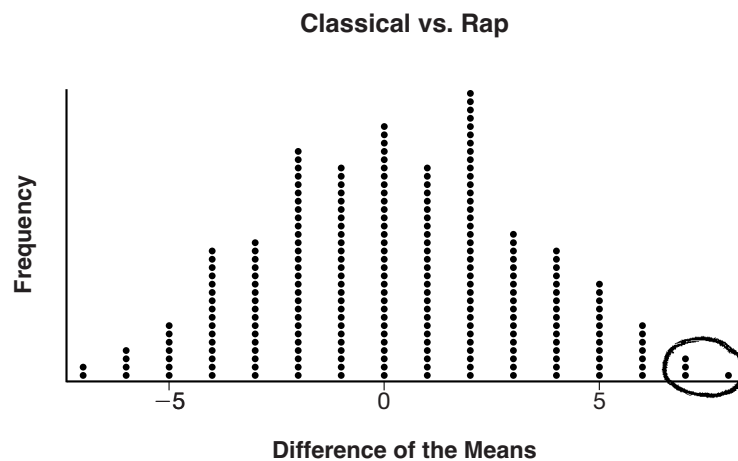
Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

Yes, because there is less than 5% chance of this difference occurring due to random chance, so it is likely that the difference was due to the different types of music and was therefore significant.

Score 4: The student gave a complete and correct response.

36 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90, 89

Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer.

John added up all the test scores for rap and averaged them, averaged all the test scores for classical and averaged them, and then subtracted one from the other to get the mean difference. In this context, this value represents that on average, someone listening to classical music during the test scored 7 points higher than those listening to rap.

To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.

Classical vs. Rap

Difference of the Means
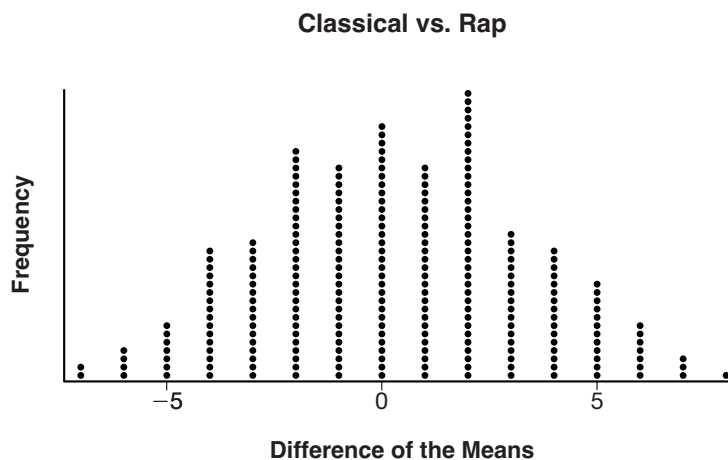
Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

Yes, because if it were closer to the mean difference of zero, we wouldn't think anything of it because it's so common, but since it was so rare it shows that there may be a significant difference in quiz scores.

Score 3:   The student provided insufficient evidence for a significant difference.

36 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90, 89 *82.5*

Rap: 77, 80, 78, 74, 69, 72, 78, 69 *74 ish*

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer.

John added the values of each group together and divided each by 8. Then he subtracted the two values. This shows that, on average, classical gives scores 7 higher than rap.

To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.

Classical vs. Rap

Difference of the Means
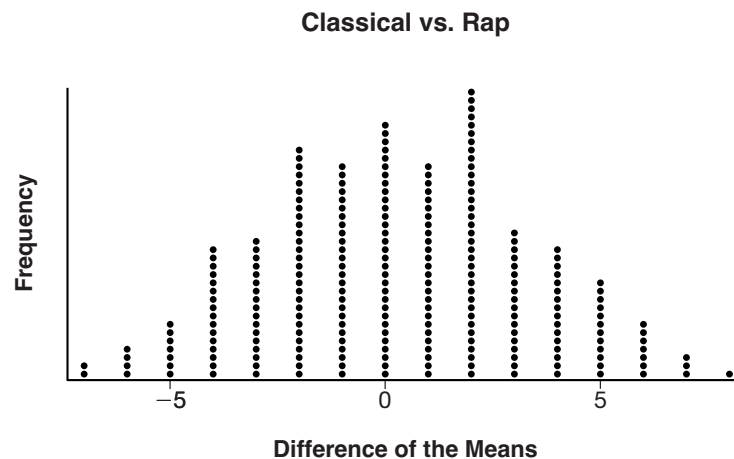
Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

No. The simulation shows that the original was an outlier, and the experiment is a standard distributed graph centered around 0.

Score 2: The student only received credit for the first part.

36 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:
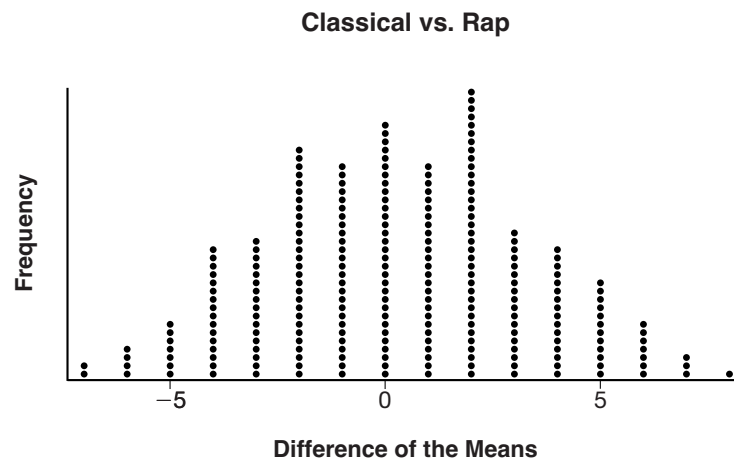
Classical: 74, 83, 77, 77, 84, 82, 90, 89

Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer.

It means that the mean grades of the classical music group are approximatly 7 points higher than the mean grade of the rap music group.

To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.

Classical vs. Rap

Frequency

−5   0   5

Difference of the Means

Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

yes there may be a signeficant difference b/c 7 does not fall in the center of distribution.

Score 2:   The student received partial credit for each part.

36 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:
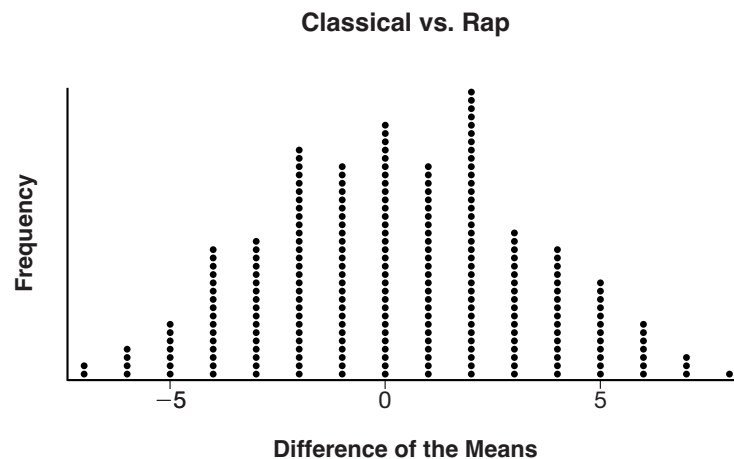
Classical: 74, 83, 77, 77, 84, 82, 90, 89

Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer.

He found the mean of each by adding them together and dividing by 8, and then subtracted the means of each.

To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.

Classical vs. Rap

Difference of the Means

Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

yes, because there is a large variation in the chart.

Score 1:   The student received partial credit for the first part.

36 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90, 89

Rap: 77, 80, 78, 74, 69, 72, 78, 69

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer.

John obtained the value by finding the means of both groups then subtracted them to get the difference.

To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.

Classical vs. Rap

Difference of the Means
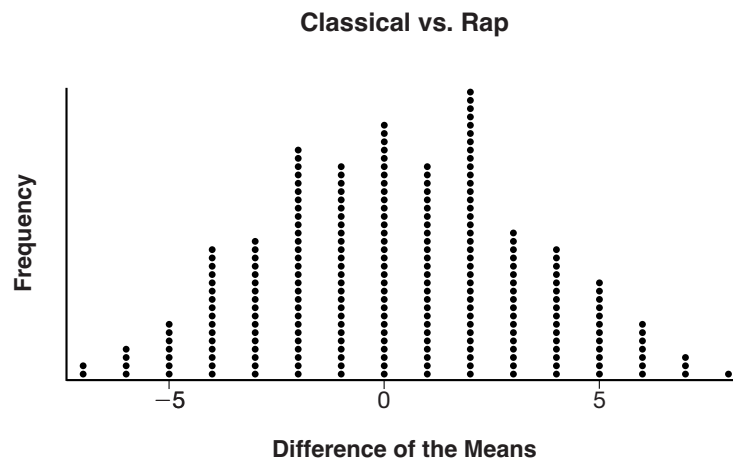
Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

yes, the theory that there may be a significant difference in quiz scores is proven through the stimulation.

Score 1:   The student received partial credit for the first part.

36 To determine if the type of music played while taking a quiz has a relationship to results, 16 students were randomly assigned to either a room softly playing classical music or a room softly playing rap music. The results on the quiz were as follows:

Classical: 74, 83, 77, 77, 84, 82, 90. 89 82

Rap: 77, 80, 78, 74, 69, 72, 78, 69 84

John correctly rounded the difference of the means of his experimental groups as 7. How did John obtain this value and what does it represent in the given context? Justify your answer.

John obtained his values by subtracting $Q_1 = 77$ from $Q_3 = 84$. This value represents the mean difference of the two experimental groups.

To determine if there is any significance in this value, John rerandomized the 16 scores into two groups of 8, calculated the difference of the means, and simulated this process 250 times as shown below.

$\bar{X} = 81.91457286$

$\Sigma x = 48903$

$\Sigma x^2 = 4023321$

$Sx = 5.411373062$

$\sigma x = 5.406839024$

$\downarrow n = 597$

$minx = 74$

$Q_1 = 77$

$Med = 82$

$Q_3 = 84$
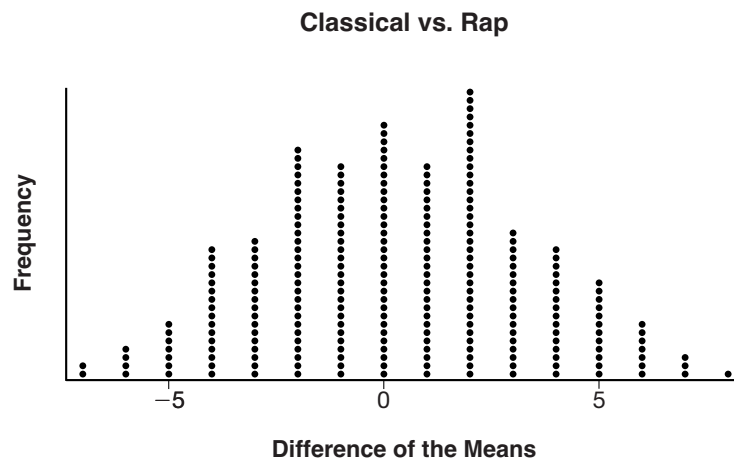
$maxX = 90$

Classical vs. Rap

Frequency

Difference of the Means

Does the simulation support the theory that there may be a significant difference in quiz scores? Explain.

This simulation does support the theory that there may be a significant difference in the quiz scores because the values range from a low frequency to a very high frequency as depicted in the simulation

Score 0: The student did not show enough correct work to receive any credit.

37 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12,000x^2 + 83,000x + 7000$$
$$C(x) = 880x^3 - 21,000x^2 + 150,000x - 160,000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.
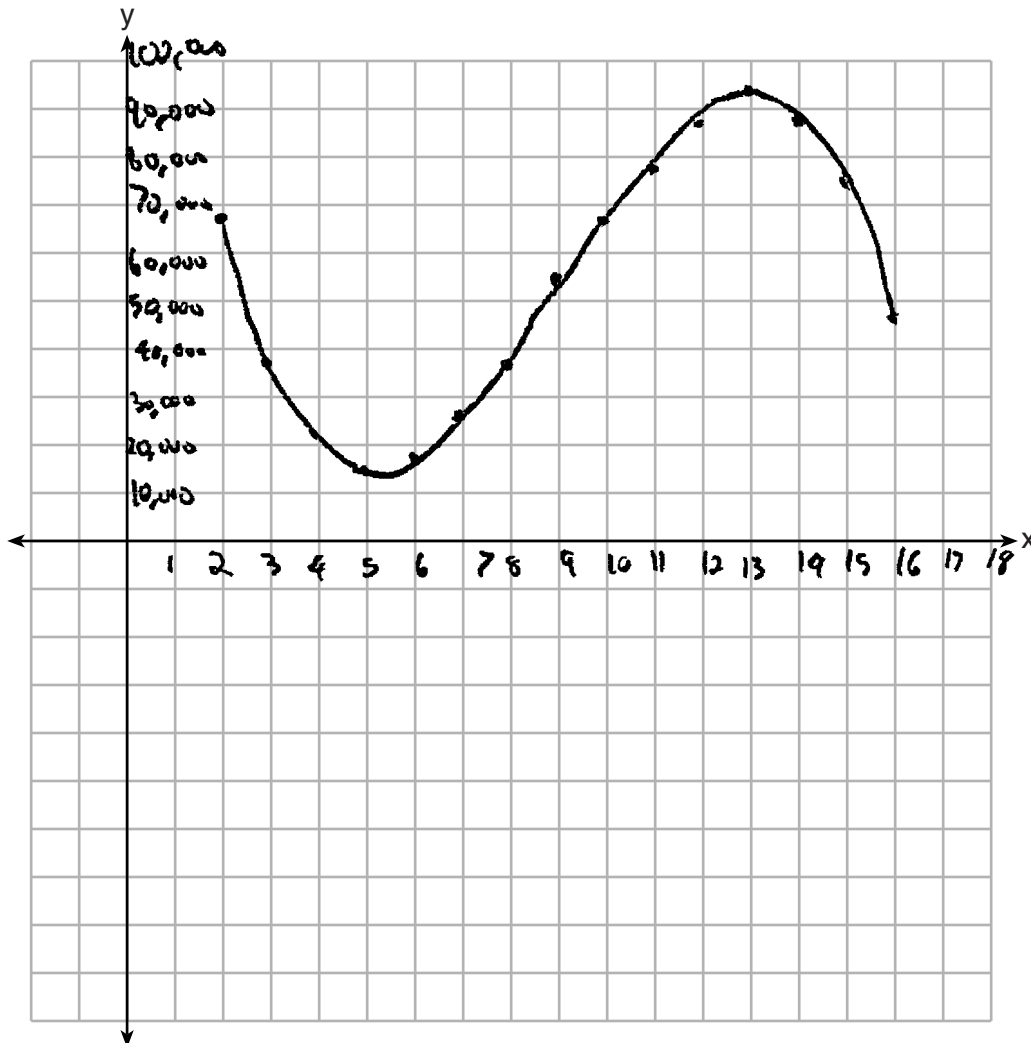
$P(x) = R(x) - C(x)$

$550x^3 - 12000x^2 + 83000x + 7000 - (880x^3 - 21000x^2 + 150000x - 160000)$

$P(x) = -330x^3 + 9000x^2 - 67000x + 167000$

Score 6: The student gave a complete and correct response.

Graph $y = P(x)$ on the set of axes below over the domain $2 \leq x \leq 16$.

Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

The company was least profitable in the fifth year and most profitable in the 13th year because it made $15250 in year 5 which was the lowest on the interval and $91990 in year 13 which was the highest in the interval.

37 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12{,}000x^2 + 83{,}000x + 7000$$
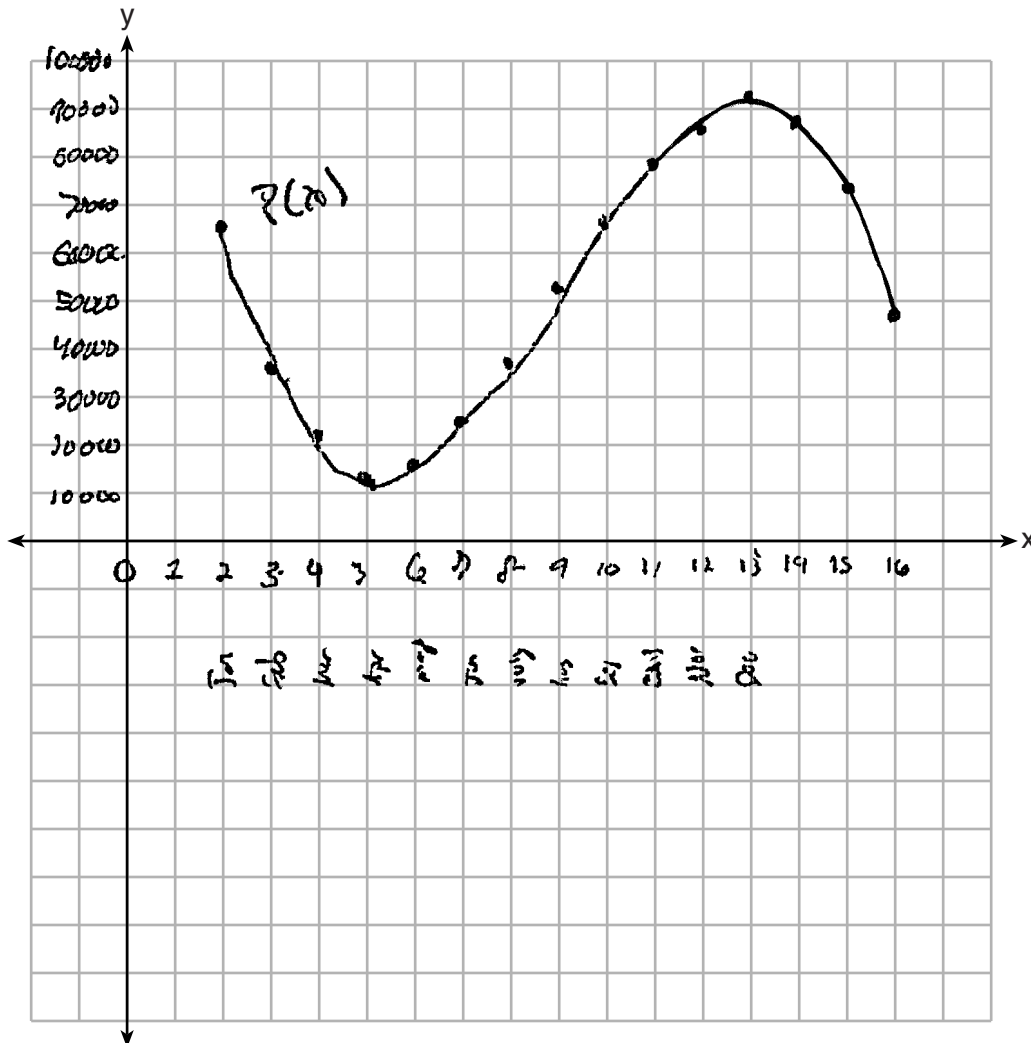$$C(x) = 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.

$$550x^3 - 12000x^2 + 83{,}000x + 7000$$
$$- 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000)$$
$$\overline{P(x) = -330x^3 + 9000x^2 - 67000x + 167000}$$

Score 5:   The student misunderstood the meaning of the independent variable.

Graph $y = P(x)$ on the set of axes below over the domain $2 \le x \le 16$.

Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

least in april b/c thats when the graph is the lowest and December b/c thats when its the highest

37 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12,000x^2 + 83,000x + 7000$$
$$C(x) = 880x^3 - 21,000x^2 + 150,000x - 160,000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.

$$C(x) - R(x) = P(x)$$
$$880x^3 - 21,000x^2 + 150,000x - 160,000 - (550x^3 - 12,000x^2 + 83,000x + 7000)$$

$$\boxed{330x^3 - 9000x^2 + 67,000x - 167,000}$$

Score 5: The student made an error finding $P(x)$.

Graph $y = P(x)$ on the set of axes below over the domain $2 \leq x \leq 16$.

$P(x) = 330x^3 - 9000x^2 + 67{,}000x - 167{,}000$
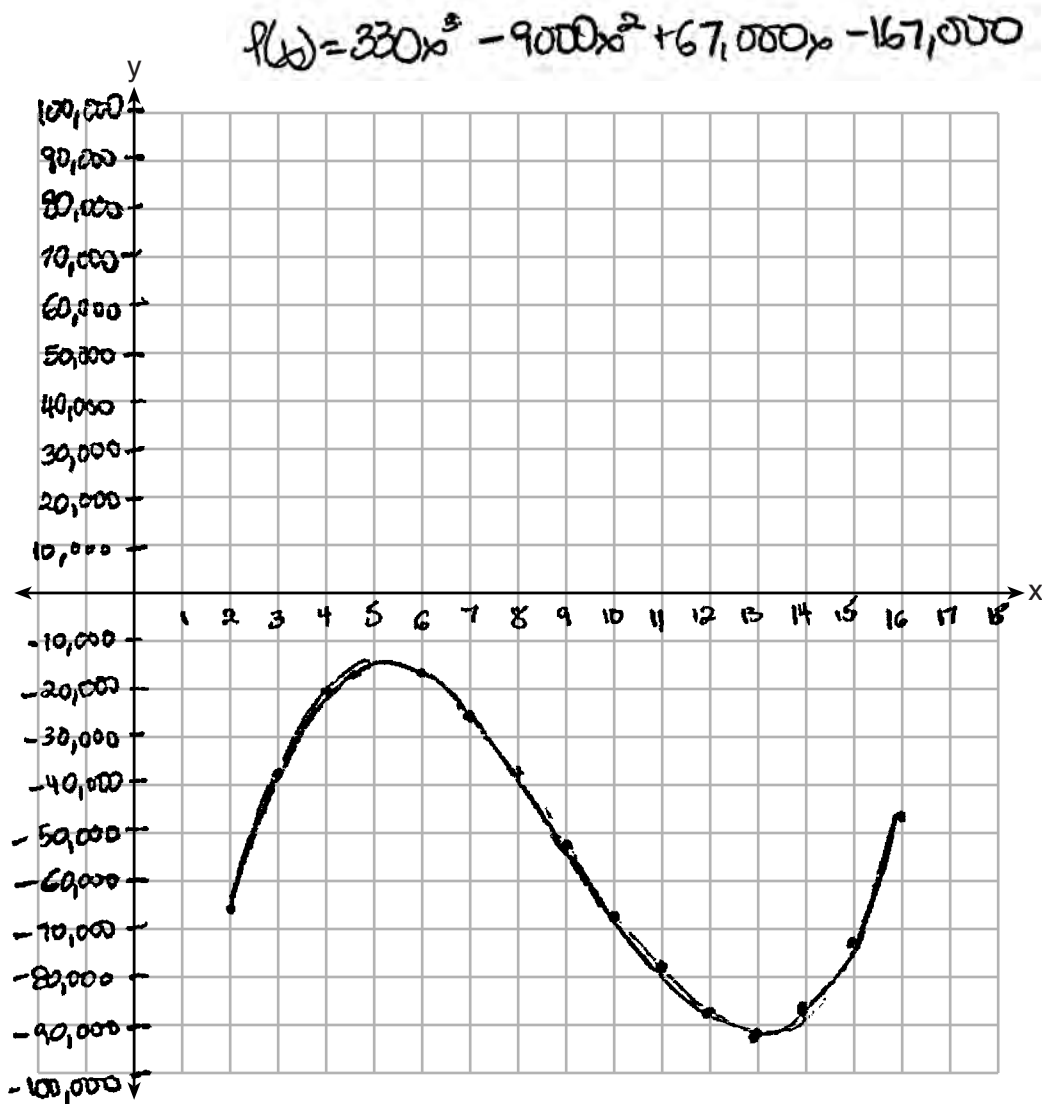
Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

The company is least profitable at 13 years, and most profitable at 5 years. I determined my answer by observing the minimum and maximum values of the range.

37 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12{,}000x^2 + 83{,}000x + 7000$$
$$C(x) = 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.
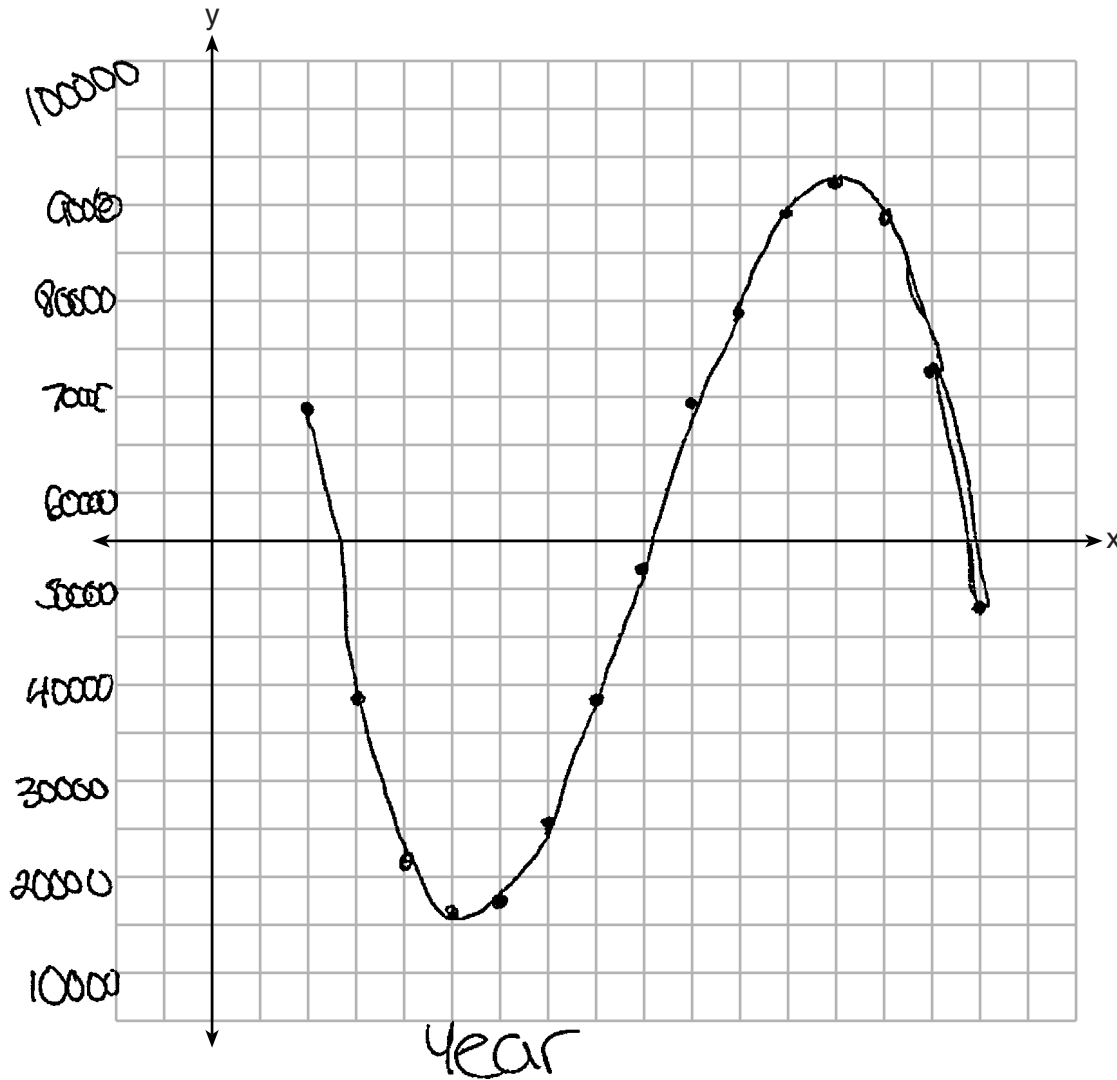
$$550x^3 - 12000x^2 + 83000x + 7000$$
$$880x^3 - 21000x^2 + 150000x - 160000$$

$$P(x) = -330x^3 + 9000x^2 - 67000x + 167000$$

Score 4:   The student received one credit each for $P(x)$, the graph, 5, and 13.

Graph $y = P(x)$ on the set of axes below over the domain $2 \leq x \leq 16$.

y

100000

90000

80000

70000

60000

50000

40000

30000

20000

10000

x

year

Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

13

The company was the least profitable during years 5 and the most profitable during year 13.

37 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12{,}000x^2 + 83{,}000x + 7000$$
$$C(x) = 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.
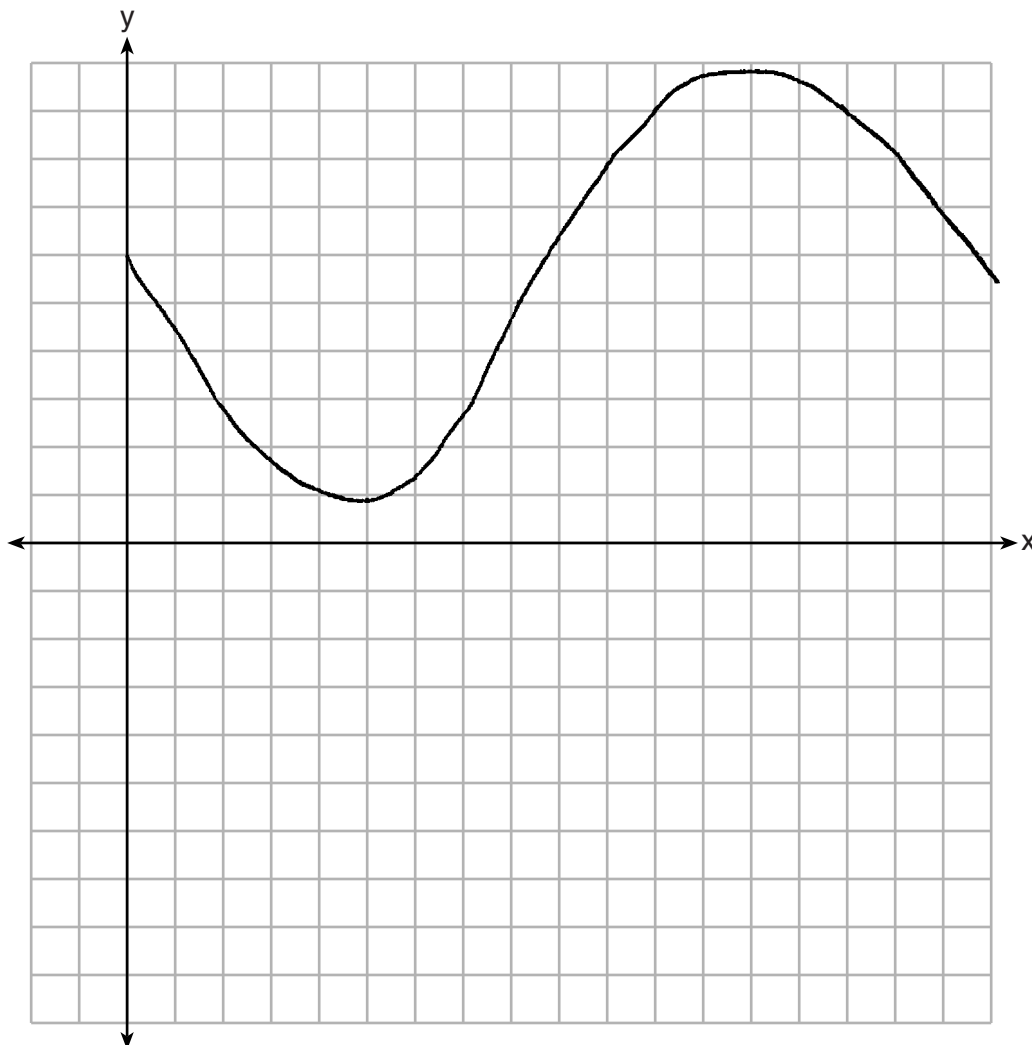
$$P(x) = C(x) - R(x)$$

$$P(x) = (550x^3 - 12000x^2 + 83000x + 7000) - (880x^3 - 21000x^2 + 150000x - 160000)$$

$$\boxed{P(x) = -330x^3 + 9000x^2 - 67000x + 167000}$$

Score 3: The student received credit for finding $P(x)$, 5, and 13.

Graph $y = P(x)$ on the set of axes below over the domain $2 \le x \le 16$.

Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

The Company was the least profitable at around the 5th year. It was the most profitable ~~is~~ during about the 13th year.

37 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

revenue $R(x) = 550x^3 - 12{,}000x^2 + 83{,}000x + 7000$
*costs* $C(x) = 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.

$$P(x) = -330x^3 + 9000x^2 - 67{,}000x + 167{,}000$$

Score 2: The student received one credit for $P(x)$ and only one credit for graphing $P(x)$ outside the domain.

Graph $y = P(x)$ on the set of axes below over the domain $2 \leq x \leq 16$.

2 is less than X   X is less than/equal to 16
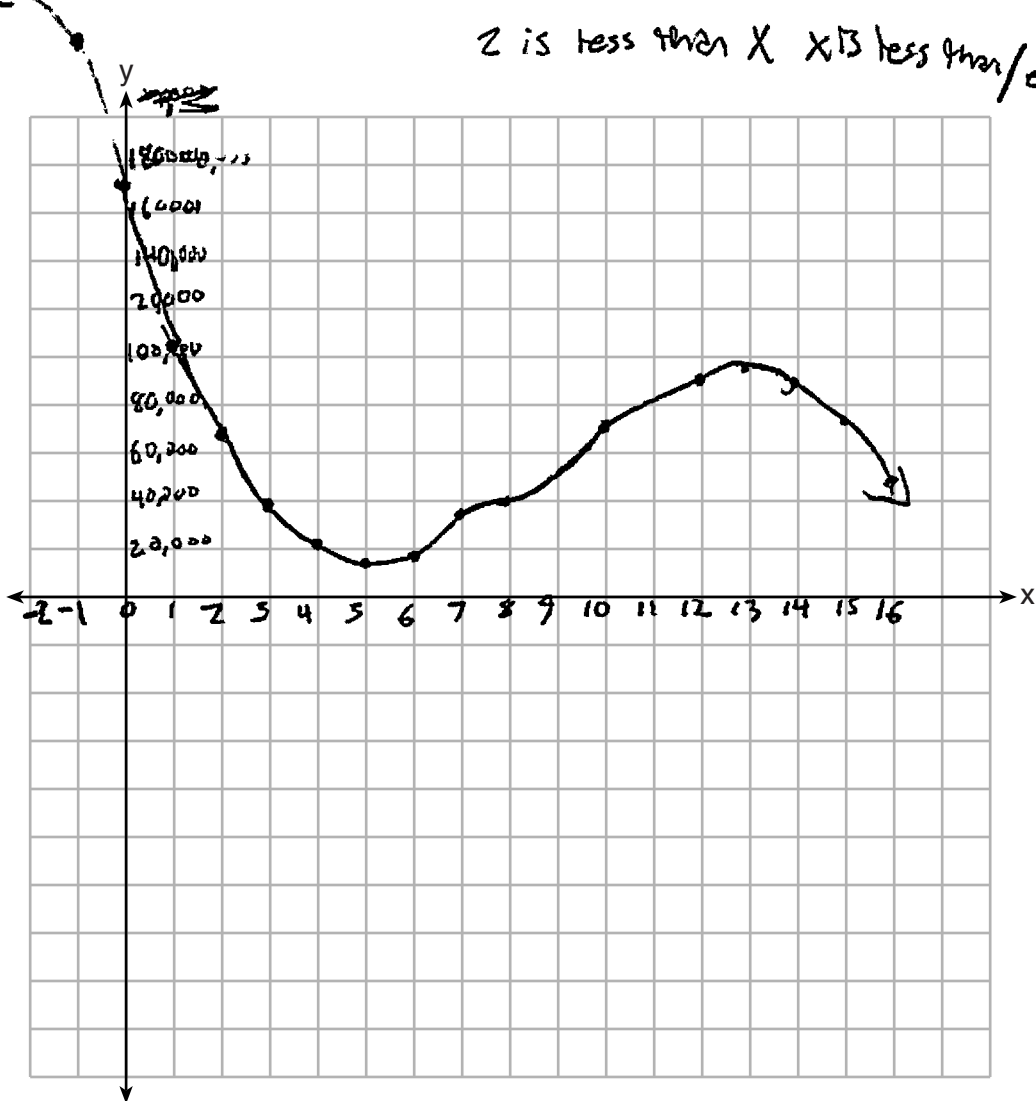
Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

Least profitable was in 75 years (5·15)

Most profitable was in 15 years (1·15)

-2-0 don't count for you can't make money with no cars. So you find highest and lowest points, and you multiply the X value by 15 for It says R(x)/C(x) is in fifteen years.

37 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12{,}000x^2 + 83{,}000x + 7000$$
$$C(x) = 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.

$$R(x) = 550x^3 - 12000x^2 + 83{,}000x + 7000$$

$$C(x) = 880x^3 - 21000x^2 + 150{,}000x - 160{,}000$$

$$R(x) - C(x) = P(x) \qquad \overline{-330x^3 + 9000x^2 - 67000x + 167{,}000}$$

$$P(x) = -330x^3 + 9000x^2 - 67000x + 167000$$

Score 1:   The student only found $P(x)$ correctly.

Graph $y = P(x)$ on the set of axes below over the domain $2 \leq x \leq 16$.
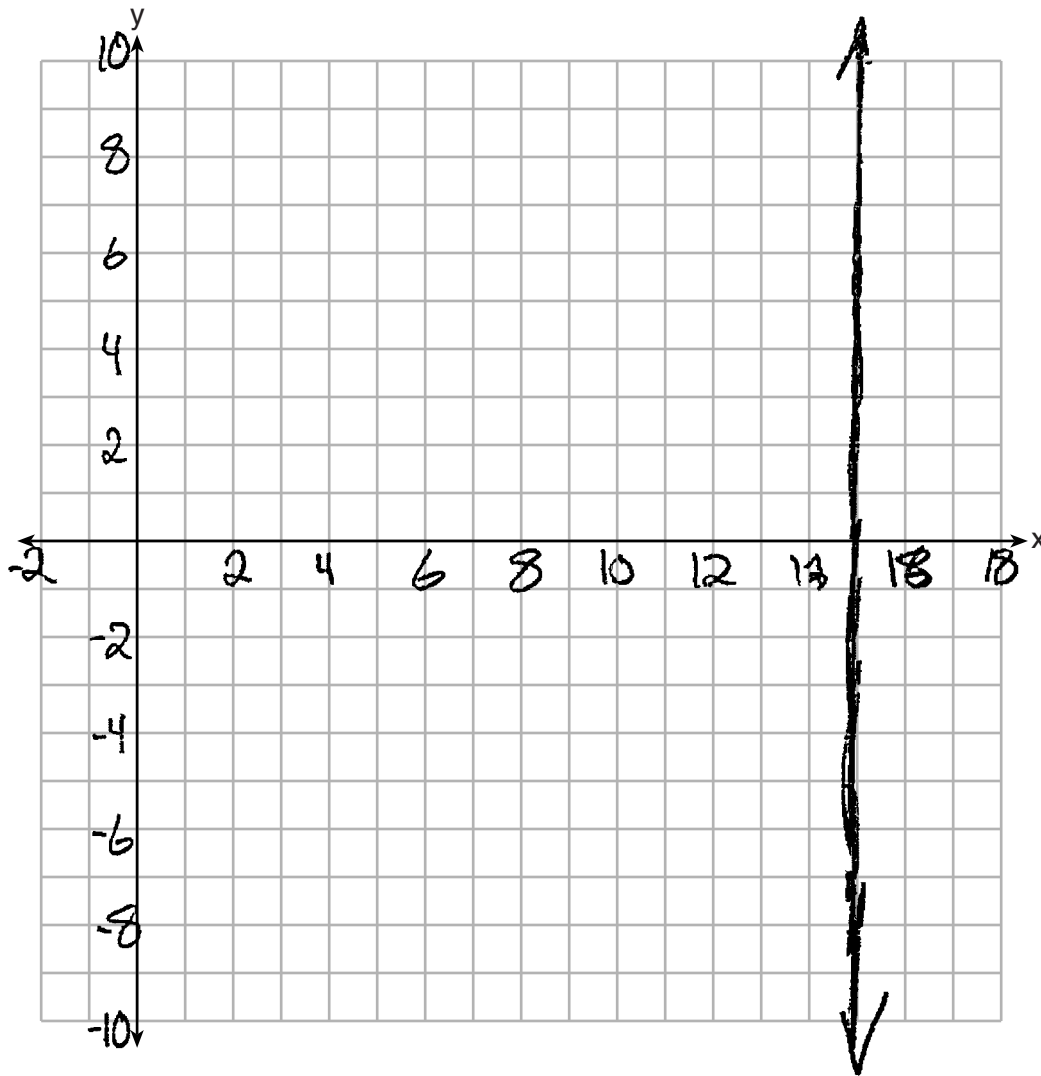
Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

Most profitable in 2017

least profitable in 1972

37 A major car company analyzes its revenue, $R(x)$, and costs $C(x)$, in millions of dollars over a fifteen-year period. The company represents its revenue and costs as a function of time, in years, x, using the given functions.

$$R(x) = 550x^3 - 12{,}000x^2 + 83{,}000x + 7000$$
$$C(x) = 880x^3 - 21{,}000x^2 + 150{,}000x - 160{,}000$$

The company's profits can be represented as the difference between its revenue and costs. Write the profit function, $P(x)$, as a polynomial in standard form.

$P(x) \quad (R(x)) - (C(x))$

$P(x) = 550x^3 - 12000x^2 + 83000x + 7000 - (880x^3 - 21000x^2 + 150000x - 160000)$

$550x^3 - 12000x^2 + 83000x + 7000 - 880x^3 + 21000x^2 - 15000x + 160000$

$-330x^3 + 9000x^2 + 68000x + 167000$

$$P(x) = -330x^3 + 9000x^2 + 68000x + 167000$$

Score 0: The student made a computational error finding $P(x)$ and showed no further correct work.

Graph $y = P(x)$ on the set of axes below over the domain $2 \le x \le 16$.
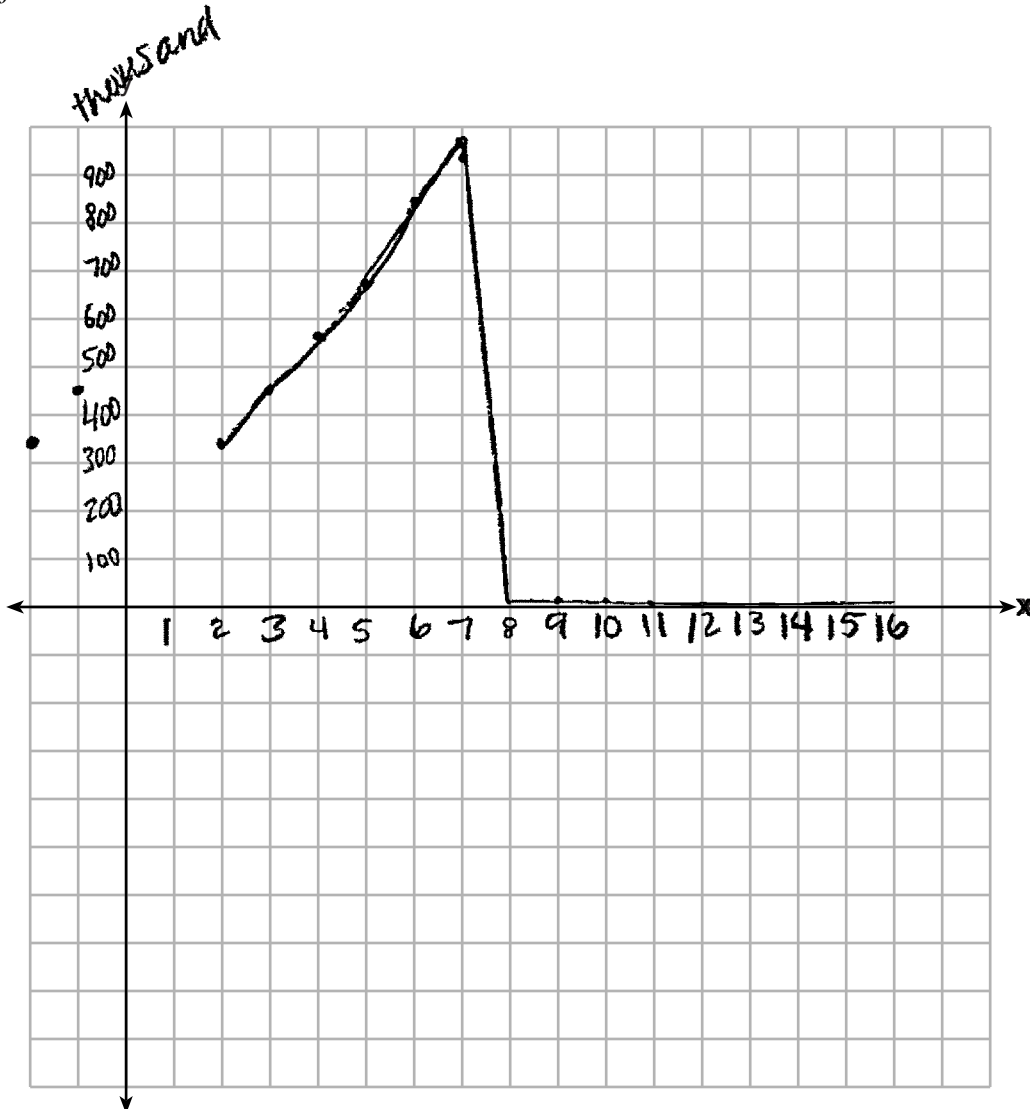
Over the given domain, state when the company was the least profitable and the most profitable, to the *nearest year*. Explain how you determined your answer.

The company was least profitable between years 8 to 16 because that's after there was a drop in profit. The company was most profitable between years 2 to 7, where their profit kept increasing.

The State Education Department / The University of the State of New York

Regents Examination in Algebra II – August 2018
Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)
(Use for the August 2018 exam only.)

Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level	Raw Score	Scale Score	Performance Level
86	100	5	57	81	4	28	67	3
85	99	5	56	81	4	27	66	3
84	98	5	55	81	4	26	65	3
83	97	5	54	80	4	25	63	2
82	96	5	53	80	4	24	62	2
81	95	5	52	80	4	23	61	2
80	94	5	51	79	4	22	59	2
79	93	5	50	79	4	21	57	2
78	93	5	49	79	4	20	55	2
77	92	5	48	78	4	19	54	1
76	91	5	47	78	4	18	52	1
75	91	5	46	78	4	17	50	1
74	90	5	45	77	3	16	48	1
73	89	5	44	77	3	15	46	1
72	89	5	43	77	3	14	44	1
71	88	5	42	76	3	13	42	1
70	87	5	41	76	3	12	39	1
69	87	5	40	75	3	11	36	1
68	86	5	39	75	3	10	34	1
67	86	5	38	74	3	9	31	1
66	86	5	37	74	3	8	28	1
65	85	5	36	73	3	7	25	1
64	84	4	35	72	3	6	22	1
63	84	4	34	72	3	5	18	1
62	83	4	33	71	3	4	15	1
61	83	4	32	70	3	3	11	1
60	83	4	31	70	3	2	8	1
59	82	4	30	69	3	1	4	1
58	82	4	29	68	3	0	0	1

To determine the student's final examination score (scale score), find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Algebra II.