ALGEBRA

II

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

ALGEBRA II

Thursday, June 14, 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 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 graphs of the equations $y = x^2 + 4x - 1$ and $y + 3 = x$ are drawn on the same set of axes. One solution of this system is

(1) $(-5,-2)$

(2) $(-1,-4)$

(3) $(1,4)$

(4) $(-2,-1)$

2 Which statement is true about the graph of $f(x) = \left(\frac{1}{8}\right)^x$?

(1) The graph is always increasing.

(2) The graph is always decreasing.

(3) The graph passes through (1,0).

(4) The graph has an asymptote, $x = 0$.

3 For all values of x for which the expression is defined, $\frac{x^3 + 2x^2 - 9x - 18}{x^3 - x^2 - 6x}$, in simplest form, is equivalent to

(1) 3

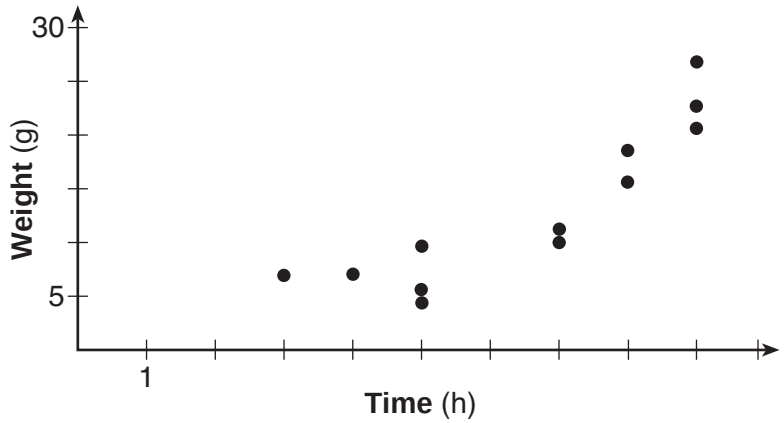
(2) $-\frac{17}{2}$

(3) $\frac{x+3}{x}$

(4) $\frac{x^2 - 9}{x(x-3)}$

Use this space for computations.

4 A scatterplot showing the weight, w, in grams, of each crystal after growing t hours is shown below.



The relationship between weight, w, and time, t, is best modeled by

(1) $w = 4^t + 5$

(2) $w = (1.4)^t + 2$

(3) $w = 5(2.1)^t$

(4) $w = 8(.75)^t$

5 Where i is the imaginary unit, the expression $(x + 3i)^2 - (2x - 3i)^2$ is equivalent to

(1) $-3x^2$

(2) $-3x^2 - 18$

(3) $-3x^2 + 18xi$

(4) $-3x^2 - 6xi - 18$

6 Which function is even?

(1) $f(x) = \sin x$

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

(3) $f(x) = |x - 2| + 5$

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

Use this space for computations.

7 The function $N(t) = 100e^{-0.023t}$ models the number of grams in a sample of cesium-137 that remain after t years. On which interval is the sample's average rate of decay the fastest?

(1) [1,10]

(2) [10,20]

(3) [15,25]

(4) [1,30]

8 Which expression can be rewritten as $(x + 7)(x - 1)$?

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

(2) $(x + 3)^2 - 10(x + 3) - 2(x + 3) + 20$

(3) $\frac{(x-1)\left(x^2-6x-7\right)}{(x+1)}$

(4) $\frac{(x+7)\left(x^2+4x+3\right)}{(x+3)}$

9 What is the solution set of the equation $\frac{2}{x} - \frac{3x}{x+3} = \frac{x}{x+3}$?

(1) $\{3\}$

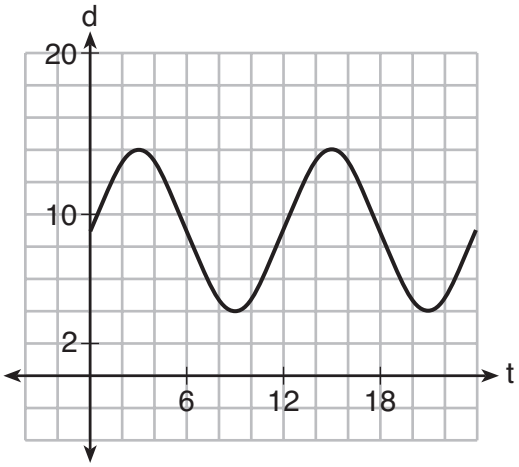
(2) $\left\{\frac{3}{2}\right\}$

(3) $\{-2,3\}$

(4) $\left\{-1,\frac{3}{2}\right\}$

Use this space for computations.

10 The depth of the water at a marker 20 feet from the shore in a bay is depicted in the graph below.



If the depth, d, is measured in feet and time, t, is measured in hours since midnight, what is an equation for the depth of the water at the marker?

(1) $d = 5\cos\left(\frac{\pi}{6}t\right) + 9$

(2) $d = 9\cos\left(\frac{\pi}{6}t\right) + 5$

(3) $d = 9\sin\left(\frac{\pi}{6}t\right) + 5$

(4) $d = 5\sin\left(\frac{\pi}{6}t\right) + 9$

11 On a given school day, the probability that Nick oversleeps is 48% and the probability he has a pop quiz is 25%. Assuming these two events are independent, what is the probability that Nick oversleeps and has a pop quiz on the same day?

(1) 73%

(2) 36%

(3) 23%

(4) 12%

12 If $x - 1$ is a factor of $x^3 - kx^2 + 2x$, what is the value of k?

(1) 0

(2) 2

(3) 3

(4) -3

Use this space for computations.

13 The profit function, $p(x)$, for a company is the cost function, $c(x)$, subtracted from the revenue function, $r(x)$. The profit function for the Acme Corporation is $p(x) = -0.5x^2 + 250x - 300$ and the revenue function is $r(x) = -0.3x^2 + 150x$. The cost function for the Acme Corporation is

(1) $c(x) = 0.2x^2 - 100x + 300$

(2) $c(x) = 0.2x^2 + 100x + 300$

(3) $c(x) = -0.2x^2 + 100x - 300$

(4) $c(x) = -0.8x^2 + 400x - 300$

14 The populations of two small towns at the beginning of 2018 and their annual population growth rate are shown in the table below.

Town	Population	Annual Population Growth Rate
Jonesville	1240	6% increase
Williamstown	890	11% increase

Assuming the trend continues, approximately how many years after the beginning of 2018 will it take for the populations to be equal?

(1) 7

(2) 20

(3) 68

(4) 125

15 What is the inverse of $f(x) = x^3 - 2$?

(1) $f^{-1}(x) = \sqrt[3]{x} + 2$

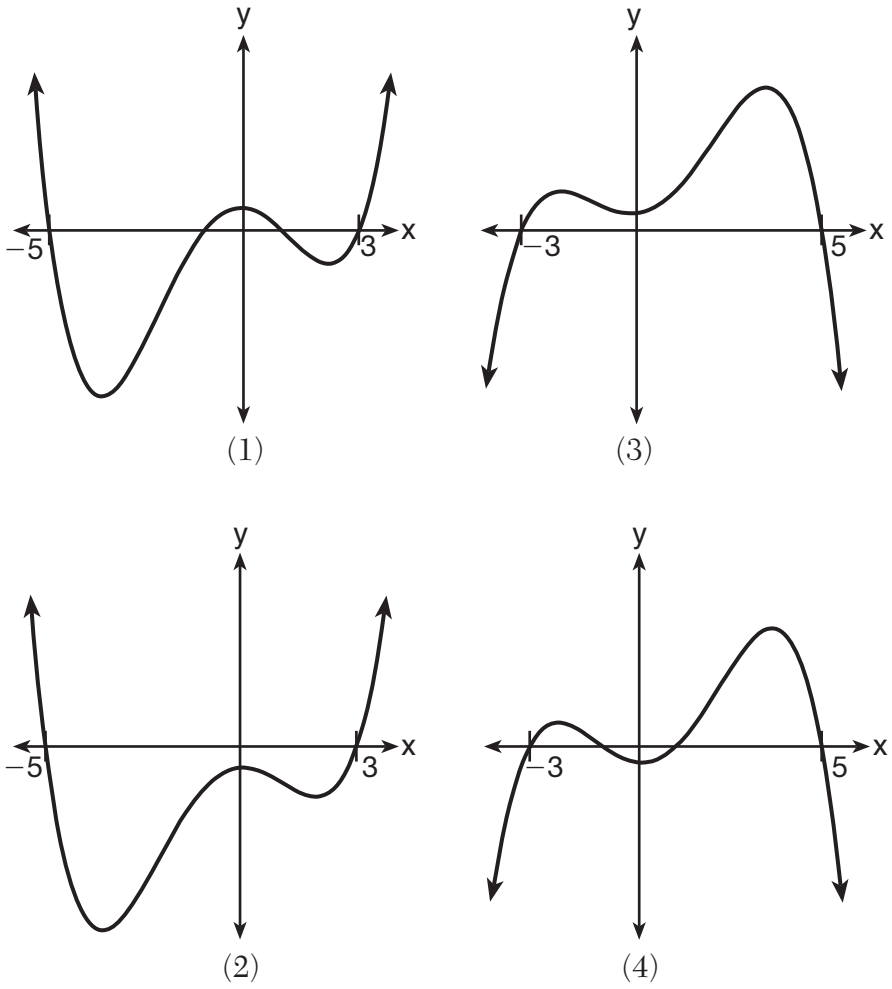
(2) $f^{-1}(x) = \pm\sqrt[3]{x} + 2$

(3) $f^{-1}(x) = \sqrt[3]{x + 2}$

(4) $f^{-1}(x) = \pm\sqrt[3]{x + 2}$

Use this space for computations.

16 A 4th degree polynomial has zeros -5, 3, i, and $-i$. Which graph could represent the function defined by this polynomial?



17 The weights of bags of Graseck's Chocolate Candies are normally distributed with a mean of 4.3 ounces and a standard deviation of 0.05 ounces. What is the probability that a bag of these chocolate candies weighs less than 4.27 ounces?

(1) 0.2257
(2) 0.2743
(3) 0.7257
(4) 0.7757

Use this space for computations.

18 The half-life of iodine-131 is 8 days. The percent of the isotope left in the body d days after being introduced is $I = 100\left(\frac{1}{2}\right)^{\frac{d}{8}}$. When this equation is written in terms of the number e, the base of the natural logarithm, it is equivalent to $I = 100e^{kd}$. What is the approximate value of the constant, k?

(1) -0.087
(2) 0.087
(3) -11.542
(4) 11.542

19 The graph of $y = \log_2 x$ is translated to the right 1 unit and down 1 unit. The coordinates of the x-intercept of the translated graph are

(1) (0,0)
(2) (1,0)
(3) (2,0)
(4) (3,0)

20 For positive values of x, which expression is equivalent to $\sqrt{16x^2} \cdot x^{\frac{2}{3}} + \sqrt[3]{8x^5}$?

(1) $6\sqrt[5]{x^3}$
(2) $6\sqrt[3]{x^5}$
(3) $4\sqrt[3]{x^2} + 2\sqrt[3]{x^5}$
(4) $4\sqrt{x^3} + 2\sqrt[5]{x^3}$

Use this space for computations.

21 Which equation represents a parabola with a focus of $(-2,5)$ and a directrix of $y = 9$?

(1) $(y - 7)^2 = 8(x + 2)$

(2) $(y - 7)^2 = -8(x + 2)$

(3) $(x + 2)^2 = 8(y - 7)$

(4) $(x + 2)^2 = -8(y - 7)$

22 Given the following polynomials

$$x = (a + b + c)^2$$
$$y = a^2 + b^2 + c^2$$
$$z = ab + bc + ac$$

Which identity is true?

(1) $x = y - z$

(2) $x = y + z$

(3) $x = y - 2z$

(4) $x = y + 2z$

Use this space for computations.

23 On average, college seniors graduating in 2012 could compute their growing student loan debt using the function $D(t) = 29{,}400(1.068)^t$, where t is time in years. Which expression is equivalent to $29{,}400(1.068)^t$ and could be used by students to identify an approximate daily interest rate on their loans?

(1) $29{,}400\left(1.068^{\frac{1}{365}}\right)^t$

(2) $29{,}400\left(\frac{1.068}{365}\right)^{365t}$

(3) $29{,}400\left(1 + \frac{0.068}{365}\right)^t$

(4) $29{,}400\left(1.068^{\frac{1}{365}}\right)^{365t}$

24 A manufacturing plant produces two different-sized containers of peanuts. One container weighs x ounces and the other weighs y pounds. If a gift set can hold one of each size container, which expression represents the number of gift sets needed to hold 124 ounces?

(1) $\frac{124}{16x + y}$

(2) $\frac{x + 16y}{124}$

(3) $\frac{124}{x + 16y}$

(4) $\frac{16x + y}{124}$

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]

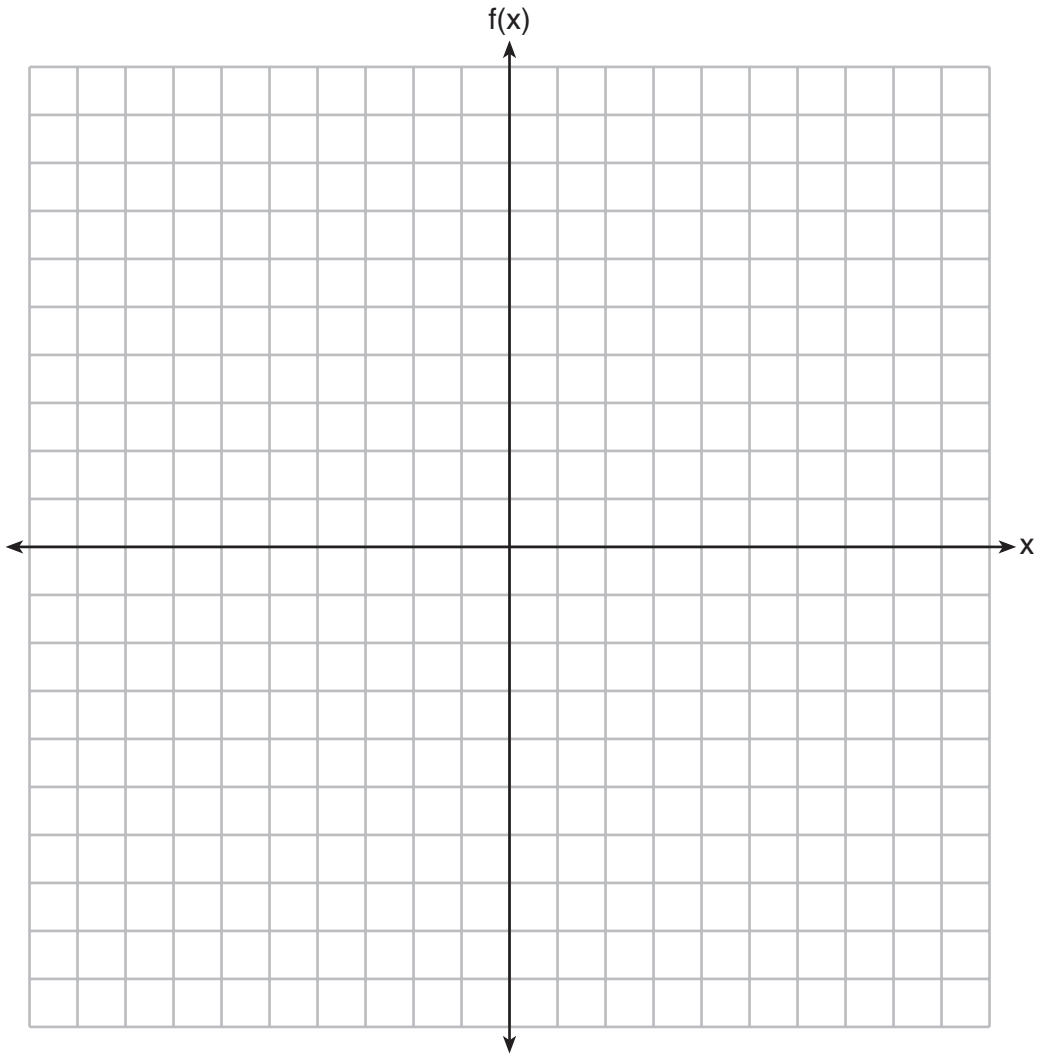
25 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

Favorite Type of Program

	Sports	Reality Show	Comedy Series
Senior	83	110	67
Freshman	119	103	54

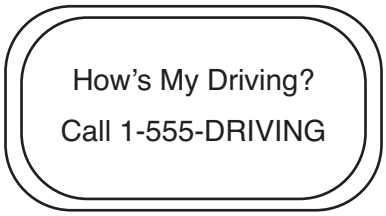
A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.

26 On the grid below, graph the function $f(x) = x^3 - 6x^2 + 9x + 6$ on the domain $-1 \leq x \leq 4$.



27 Solve the equation $2x^2 + 5x + 8 = 0$. Express the answer in $a + bi$ form.

28 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.



The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

29 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.

30 The recursive formula to describe a sequence is shown below.

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

State the first four terms of this sequence.

Can this sequence be represented using an explicit geometric formula? Justify your answer.

31 The Wells family is looking to purchase a home in a suburb of Rochester with a 30-year mortgage that has an annual interest rate of 3.6%. The house the family wants to purchase is \$152,500 and they will make a \$15,250 down payment and borrow the remainder. Use the formula below to determine their monthly payment, to the *nearest dollar*.

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

M = monthly payment
P = amount borrowed
r = annual interest rate
n = total number of monthly payments

32 An angle, θ, is in standard position and its terminal side passes through the point $(2,-1)$. Find the *exact* value of $\sin\theta$.

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 Solve algebraically for all values of x:

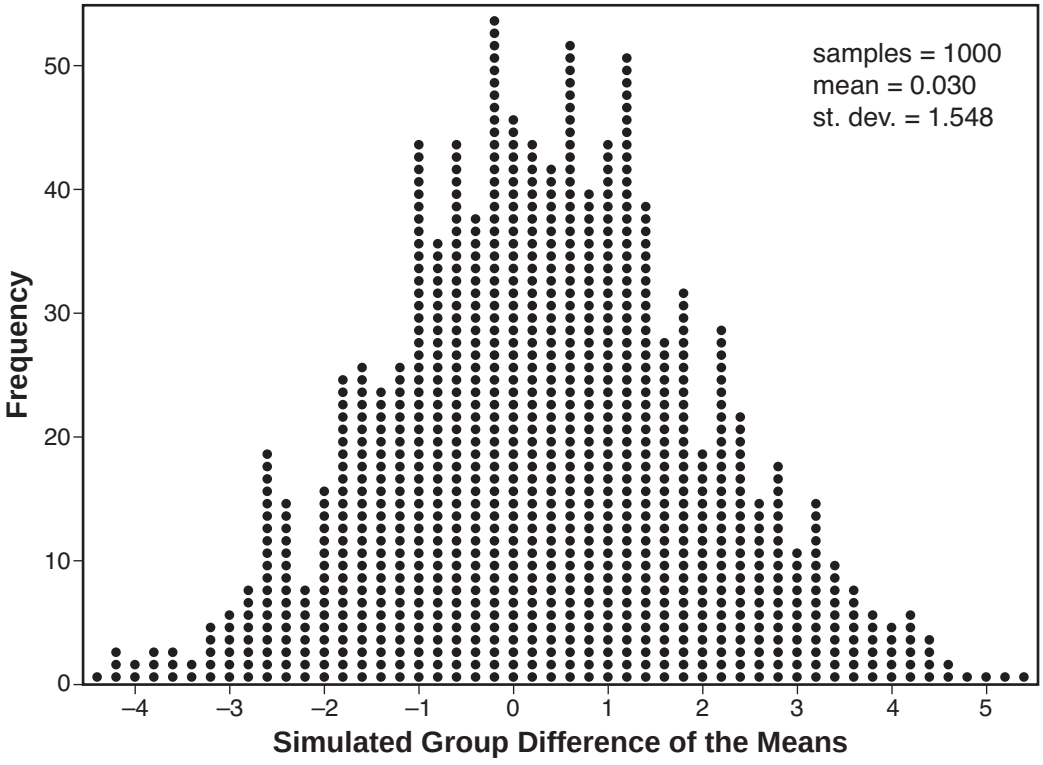
$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented – unscented).

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



Question 34 is continued on the next page.

Question 34 continued

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.

Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.

At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

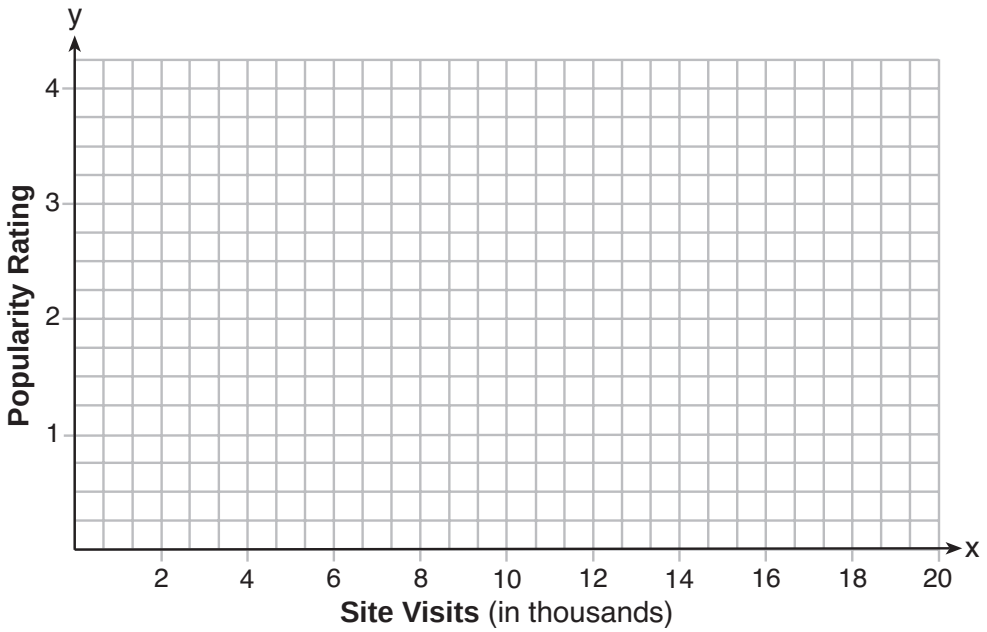
Part IV

Answer the question in this part. A correct answer will receive 6 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. Utilize the information provided to determine your answer. Note that diagrams are not necessarily drawn to scale. A correct numerical answer with no work shown will receive only 1 credit. All answers should be written in pen, except for graphs and drawings, which should be done in pencil. [6]

37 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating.

According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

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Scrap Graph Paper — This sheet will *not* be scored.

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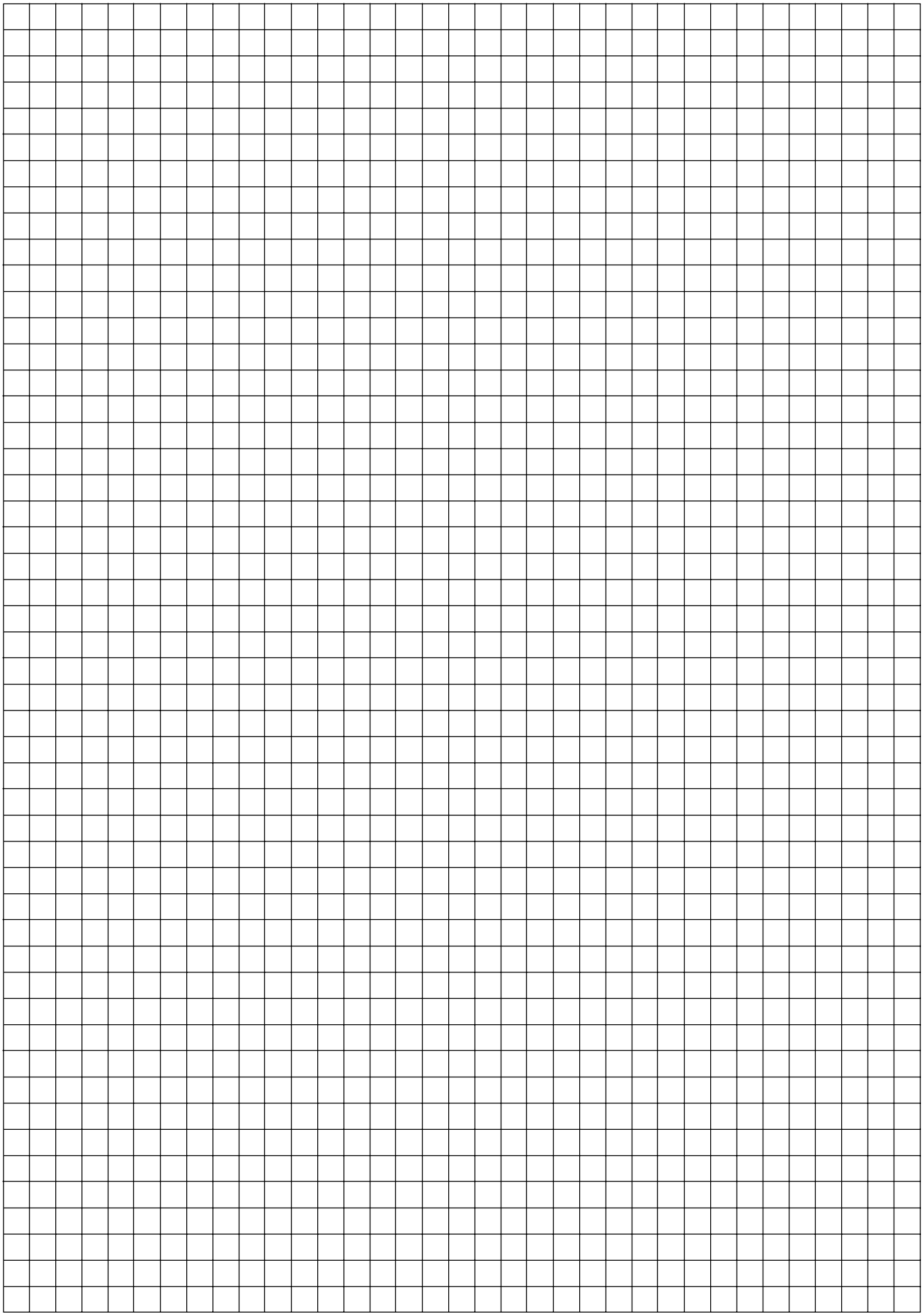

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High School Math Reference Sheet

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 5280 feet
1 mile = 1760 yards
1 mile = 1.609 kilometers

1 kilometer = 0.62 mile
1 pound = 16 ounces
1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds
1 ton = 2000 pounds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
1 gallon = 3.785 liters
1 liter = 0.264 gallon
1 liter = 1000 cubic centimeters

Triangle	$A = \frac{1}{2}bh$
Parallelogram	$A = bh$
Circle	$A = \pi r^2$
Circle	$C = \pi d$ or $C = 2\pi r$
General Prisms	$V = Bh$
Cylinder	$V = \pi r^2 h$
Sphere	$V = \frac{4}{3}\pi r^3$
Cone	$V = \frac{1}{3}\pi r^2 h$
Pyramid	$V = \frac{1}{3}Bh$

Pythagorean Theorem	$a^2 + b^2 = c^2$
Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Arithmetic Sequence	$a_n = a_1 + (n - 1)d$
Geometric Sequence	$a_n = a_1 r^{n-1}$
Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Radians	1 radian $= \frac{180}{\pi}$ degrees
Degrees	1 degree $= \frac{\pi}{180}$ radians
Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$

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ALGEBRA II

FOR TEACHERS ONLY

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

ALGEBRA II

Thursday, June 14, 2018 — 1:15 to 4:15 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, June 14, 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). 2	(9). 4	(17). . . . . 2 . . . . .
(2). 2	(10). 4	(18). . . . . 1 . . . . .
(3). 3	(11). 4	(19). . . . . 4 . . . . .
(4). 2	(12). 3	(20). . . . . 2 . . . . .
(5). 3	(13). 1	(21). . . . . 4 . . . . .
(6). 2	(14). 1	(22). . . . . 4 . . . . .
(7). 1	(15). 3	(23). . . . . 4 . . . . .
(8). 1	(16). 2	(24). . . . . 3 . . . . .

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: http://www.p12.nysed.gov/assessment/ and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

The Department is providing supplemental scoring guidance, the "Model Response Set," for the Regents Examination in Algebra II. This guidance is recommended to be part of the scorer training. Schools are encouraged to incorporate the Model Response Sets into the scorer training or to use them as additional information during scoring. While not reflective of all scenarios, the model responses selected for the Model Response Set illustrate how less common student responses to constructed-response questions may be scored. The Model Response Set will be available on the Department's web site at http://www.nysedregents.org/algebratwo/.

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]** $\frac{103}{213}$

[1] One computational 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]** A correct graph is drawn.

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

or

[1] Appropriate work is shown, but 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.

(27) **[2]** $-\frac{5}{4} \pm \frac{\sqrt{39}}{4}i$ or equivalent $a + bi$ form, 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 to find $x = \frac{-5 \pm i\sqrt{39}}{4}$, but no further correct work is shown.

or

[1] $-\frac{5}{4} \pm \frac{\sqrt{39}}{4}i$, 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]** A correct statistical bias is explained.

[1] An incomplete statistical explanation is written.

[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]** $2a^2 + 5a + 2 - \frac{5}{3a - 2}$ or an equivalent answer, and correct algebraic 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] $2a^2 + 5a + 2 - \frac{5}{3a - 2}$, 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]** 3, 7, 15, 31, No, and a correct justification is given.

[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] 3, 7, 15, 31, but no further correct work is shown.

[0] No, 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.

(31) **[2]** \$624, 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] Appropriate work is shown to substitute correct values in for P, r, and n, but no further correct work is shown.

or

[1] \$624, 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]** $\frac{-1}{\sqrt{5}}$, or an equivalent answer and correct 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] Appropriate work is shown, but the answer is written as a decimal.

or

[1] $\frac{-1}{\sqrt{5}}$, 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.

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]** -15, and correct algebraic work is shown.

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

or

[3] Appropriate work is shown but -29 is not rejected.

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

or

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

or

[2] Appropriate work is shown and $x^2 + 44x + 435 = 0$ is written, but no further correct work is shown.

or

[2] -15, but a method other than algebraic is used.

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

or

[1] -15, 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]** 5, a correct interval is stated such as (−3.07, 3.13), and correct work is shown, yes and a correct explanation is written.

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

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

or

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

or

[2] Appropriate work is shown to find (−3.07,3.13), but no further correct work is shown.

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

or

[1] 5, but no further correct work is shown.

or

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

[0] Yes, but no explanation is written.

or

[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]** $C(t) = 63{,}000\left(1 + \frac{0.0255}{12}\right)^{12t}$ or equivalent, 18.14 and correct algebraic work is shown.

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

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

or

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

or

[2] $C(t) = 63{,}000\left(1 + \frac{0.0255}{12}\right)^{12t}$ and 18.14, but a method other than algebraic is used.

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

or

[1] $C(t) = 63{,}000\left(1 + \frac{0.0255}{12}\right)^{12t}$, but no further correct work is shown.

or

[1] 18.14, but no work is shown.

[0] The expression $63{,}000\left(1 + \frac{0.0255}{12}\right)^{12t}$ is written, but no further correct 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.

---

(36) **[4]** −12 and correct work is shown, 2.2, 3.8, and a correct justification is given.

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

or

[3] Appropriate work is shown to find −12, 2.2 or 3.8 and a correct justification is given.

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

or

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

or

[2] Appropriate work is shown to find −12, but no further correct work is shown.

or

[2] 2.2, 3.8, and a correct justification is given, 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] −12, but no work is shown.

or

[1] 2.2 and 3.8, but no justification is given.

[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]** 1.1, correct graphs, 14,000 visits, and correct work is shown.

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

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

or

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

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

or

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

or

[3] 1.1 and 14,000, but no work is shown.

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

or

[2] 1.1, but no further correct work is shown.

or

[2] $P(x)$ is graphed correctly, but no further correct work is shown.

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

or

[1] $R(x)$ is graphed correctly, but no further correct work is shown.

or

[1] 14,000, but no further correct 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
June 2018

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

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

Regents Examination in Algebra II

June 2018

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the June 2018 Regents Examination in Algebra II* will be posted on the Department's web site at: http://www.p12.nysed.gov/assessment/ by Thursday, June 14, 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, June 14, 2018 — 1:15 to 4:15 p.m., only

MODEL RESPONSE SET

Table of Contents

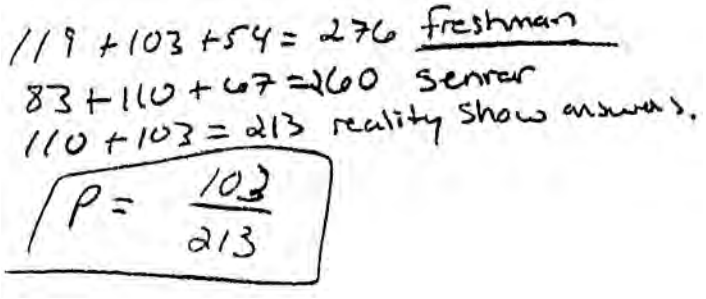
Question 25

25 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

Favorite Type of Program

	Sports	Reality Show	Comedy Series
Senior	83	110	67
Freshman	119	103	54

A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.



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

Question 25

25 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

Favorite Type of Program

	Sports	Reality Show	Comedy Series
Senior	83	110	67
Freshman	119	103	54

A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.

$\frac{103}{213}$

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

Question 25

25 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

Favorite Type of Program

	Sports	Reality Show	Comedy Series
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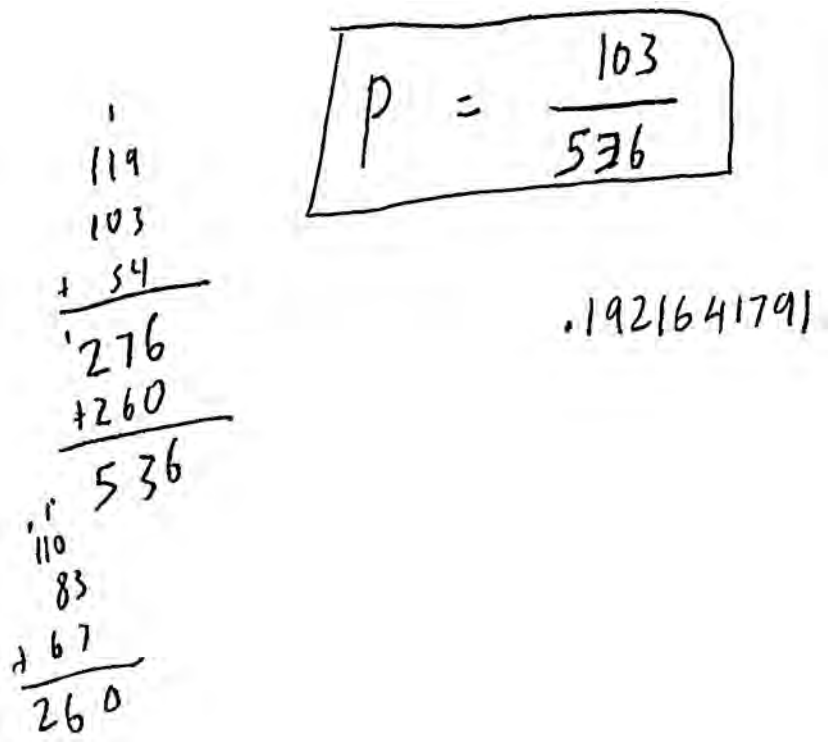


Score 1: The student used the total number of students instead of the number of students who prefer to watch reality shows.

Question 25

25 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

Favorite Type of Program

	Sports	Reality Show	Comedy Series
Senior	83	110	67
Freshman	119	103	54

A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.

110
+103
213

$\frac{103}{213} \times 100 \approx$ 48%

Score 1: The student gave a non-exact probability.

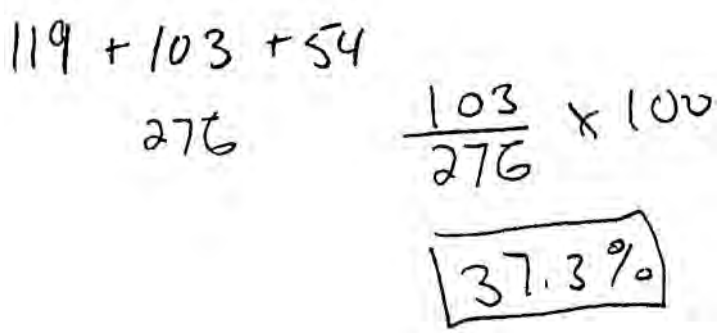
Question 25

25 A survey about television-viewing preferences was given to randomly selected freshmen and seniors at Fairport High School. The results are shown in the table below.

Favorite Type of Program

	Sports	Reality Show	Comedy Series
Senior	83	110	67
Freshman	119	103	54

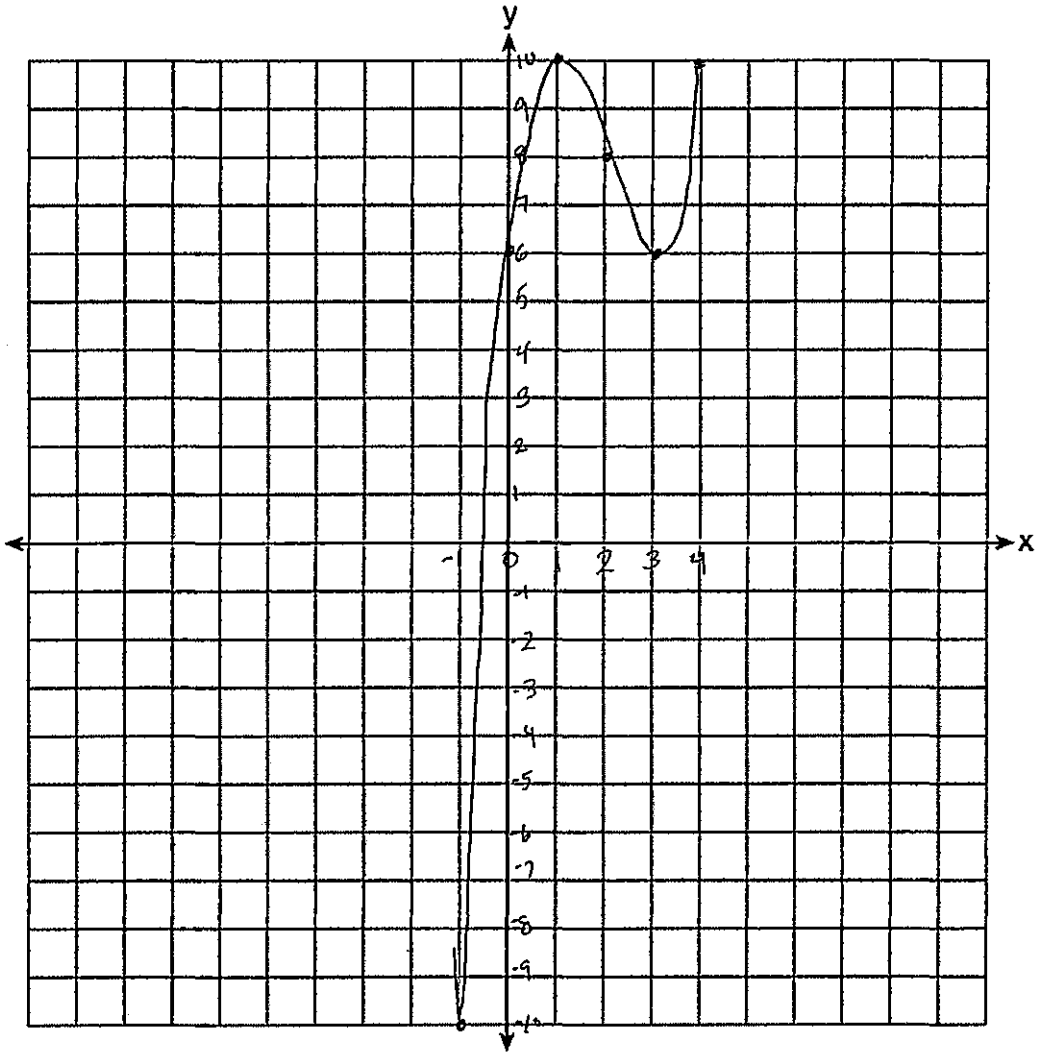
A student response is selected at random from the results. State the *exact* probability the student response is from a freshman, given the student prefers to watch reality shows on television.



Score 0: The student calculated the incorrect conditional probability and stated a non-exact probability.

Question 26

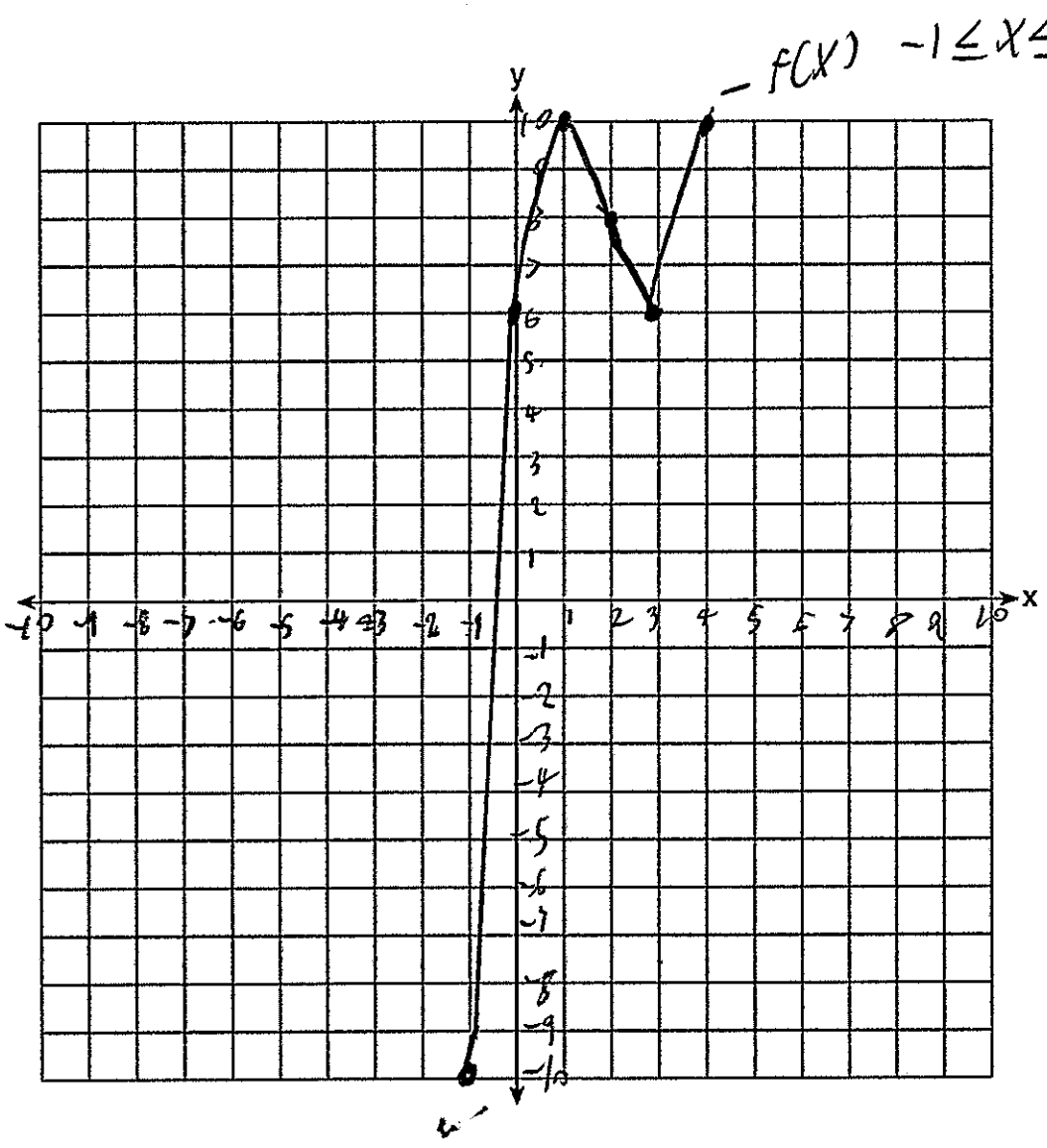
26 On the grid below, graph the function $f(x) = x^3 - 6x^2 + 9x + 6$ on the domain $-1 \leq x \leq 4$.



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

Question 26

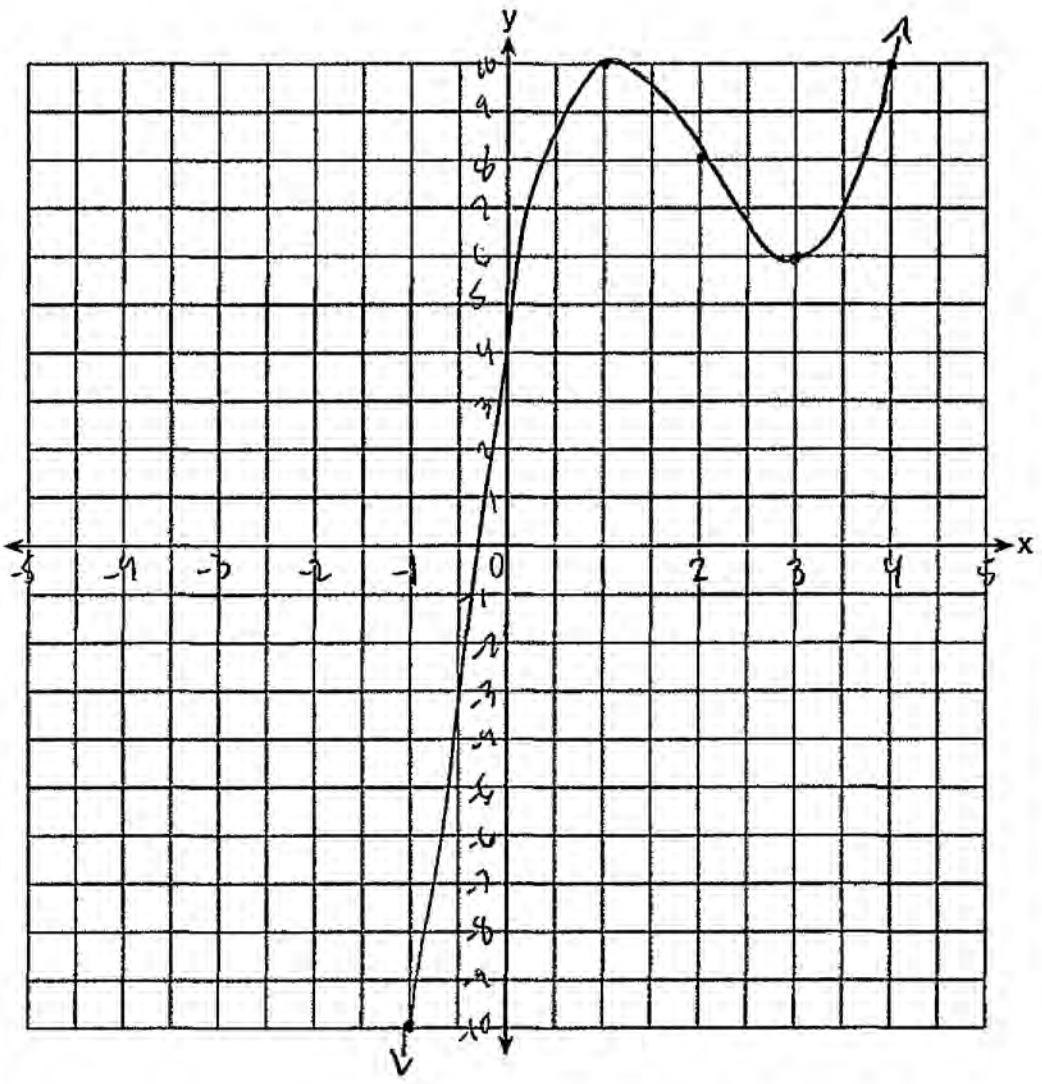
26 On the grid below, graph the function $f(x) = x^3 - 6x^2 + 9x + 6$ on the domain $-1 \leq x \leq 4$.



Score 1: The student did not draw a smooth curve on the interval $1 \leq x \leq 4$.

Question 26

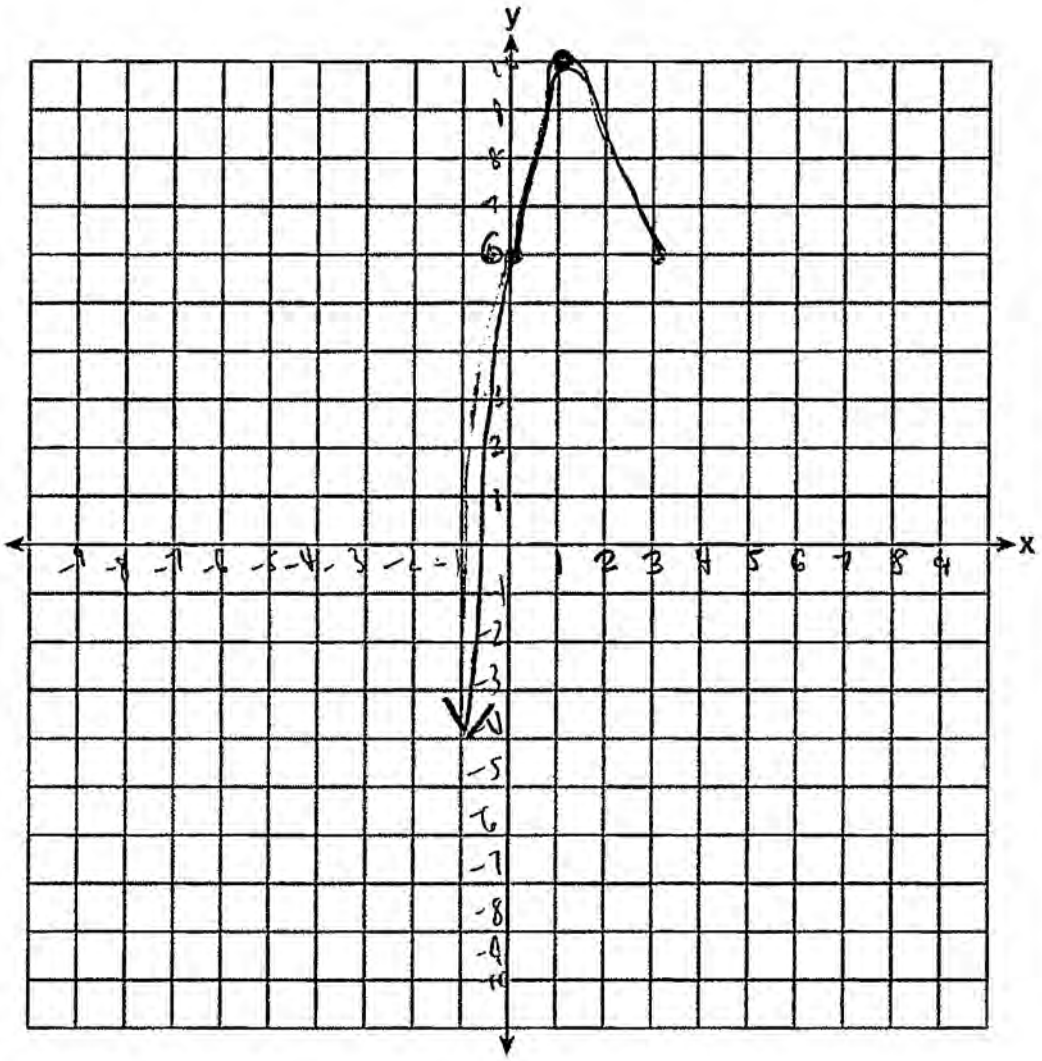
26 On the grid below, graph the function $f(x) = x^3 - 6x^2 + 9x + 6$ on the domain $-1 \leq x \leq 4$.



Score 0: The student plotted the y-intercept incorrectly and made a domain error, as indicated by the arrows.

Question 26

26 On the grid below, graph the function $f(x) = x^3 - 6x^2 + 9x + 6$ on the domain $-1 \leq x \leq 4$.



Score 0: The student made multiple errors.

Question 27

27 Solve the equation $2x^2 + 5x + 8 = 0$. Express the answer in $a + bi$ form.

$2x^2+5x+8=0$

$a=2$
$b=5$
$c=8$

$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$\frac{-5 \pm \sqrt{25-4(2)(8)}}{4}$

$\frac{-5 \pm \sqrt{-39}}{4}$

$\frac{-5 \pm i\sqrt{39}}{4}$

$\frac{-5}{4} \pm \frac{i\sqrt{39}}{4}$

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

Question 27

27 Solve the equation $2x^2 + 5x + 8 = 0$. Express the answer in $a + bi$ form.

$\frac{2x^2}{2} + \frac{5x}{2} + \frac{8}{2} = 0$

$x^2 + \frac{5}{2}x + 4 = 0$

$-4 \quad -4$

$x^2 + \frac{5}{2}x = -4$

$\left(\frac{5}{2}\right)\left(\frac{1}{2}\right) \frac{5}{4}$

$\left(\frac{5}{4}\right)^2 = \frac{25}{16}$

$x^2 + \frac{5}{2}x + \frac{25}{16} = -4 + \frac{25}{16}$

$\frac{16}{16}\left(\frac{-4}{1}\right) + \frac{25}{16}$

$\frac{-64 + 25}{16}$

$\sqrt{\left(x + \frac{5}{4}\right)^2} = \sqrt{\frac{-39}{16}}$

$x + \frac{5}{4} = \pm \frac{\sqrt{-39}}{\sqrt{16}}$

$x + \frac{5}{4} = \pm \frac{i\sqrt{39}}{4}$

$x = -\frac{5}{4} \pm \frac{i\sqrt{39}}{4}$

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

Question 27

27 Solve the equation $2x^2 + 5x + 8 = 0$. Express the answer in $a + bi$ form.

$2x^2+5x+8=0$

$a=2$
$b=5$
$C=8$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x=\frac{-5\pm\sqrt{25-4(2)(8)}}{2(2)}$

$x=\frac{-5\pm\sqrt{-39}}{4}$

$x=\boxed{\frac{-5\pm i\sqrt{39}}{4}}$

Score 1: The student did not express the answer in $a + bi$ form.

Question 27

27 Solve the equation $2x^2 + 5x + 8 = 0$. Express the answer in $a + bi$ form.

$$\frac{-5 \pm \sqrt{5^2 - 4(2)(8)}}{2}$$

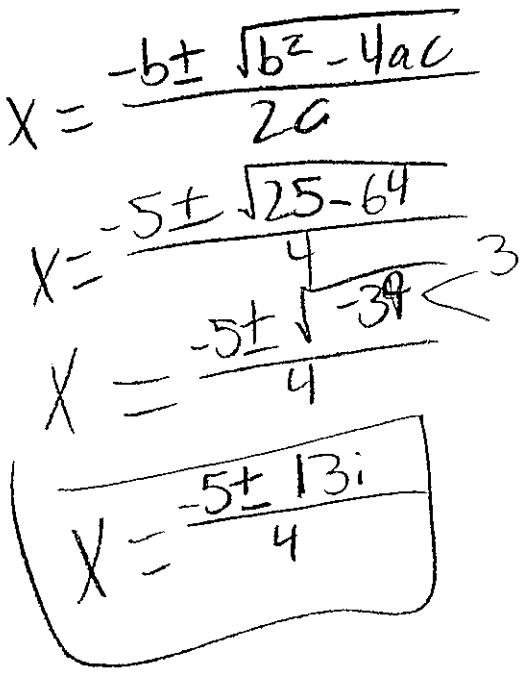
$$\frac{-5 \pm \sqrt{-39}}{2}$$

$$-\frac{5}{2} \pm i\frac{\sqrt{39}}{2}$$

Score 1: The student used an incorrect denominator.

Question 27

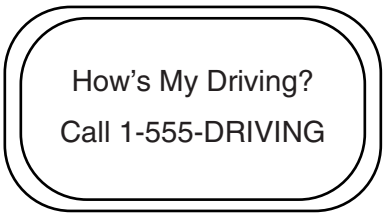
27 Solve the equation $2x^2 + 5x + 8 = 0$. Express the answer in $a + bi$ form.



Score 0: The student incorrectly simplified the radical and did not express the answer in $a + bi$ form.

Question 28

28 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.



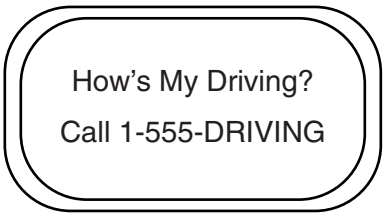
The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

They are performing a survey, and a possible bias is that only those with time to call will call, thus making the employee of the month the one who drives by the most people with a lot of free time.

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

Question 28

28 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.



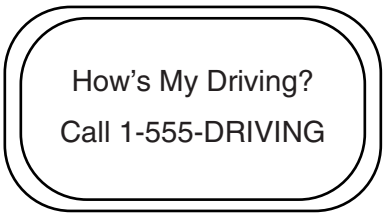
The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

A possible bias could occur because there may be one car driving behind this truck for a long time, so they may not get as many calls as another truck.

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

Question 28

28 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.



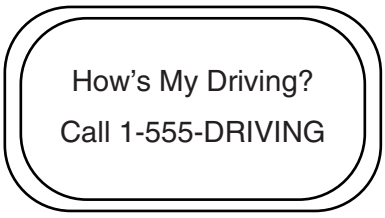
The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

One possible bias is that drivers can persuade people to call.

Score 1: The student gave an incomplete explanation.

Question 28

28 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.



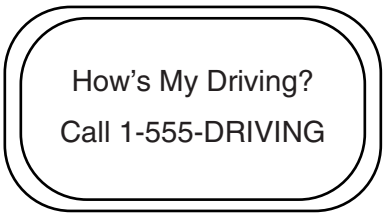
The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

Depending on the age of the driver their driving abilities may be inpaired. The Biased is that it is unfair calling about someone driving if their age is a large factor.

Score 0: The student's response is irrelevant.

Question 28

28 Chuck's Trucking Company has decided to initiate an Employee of the Month program. To determine the recipient, they put the following sign on the back of each truck.



The driver who receives the highest number of positive comments will win the recognition. Explain *one* statistical bias in this data collection method.

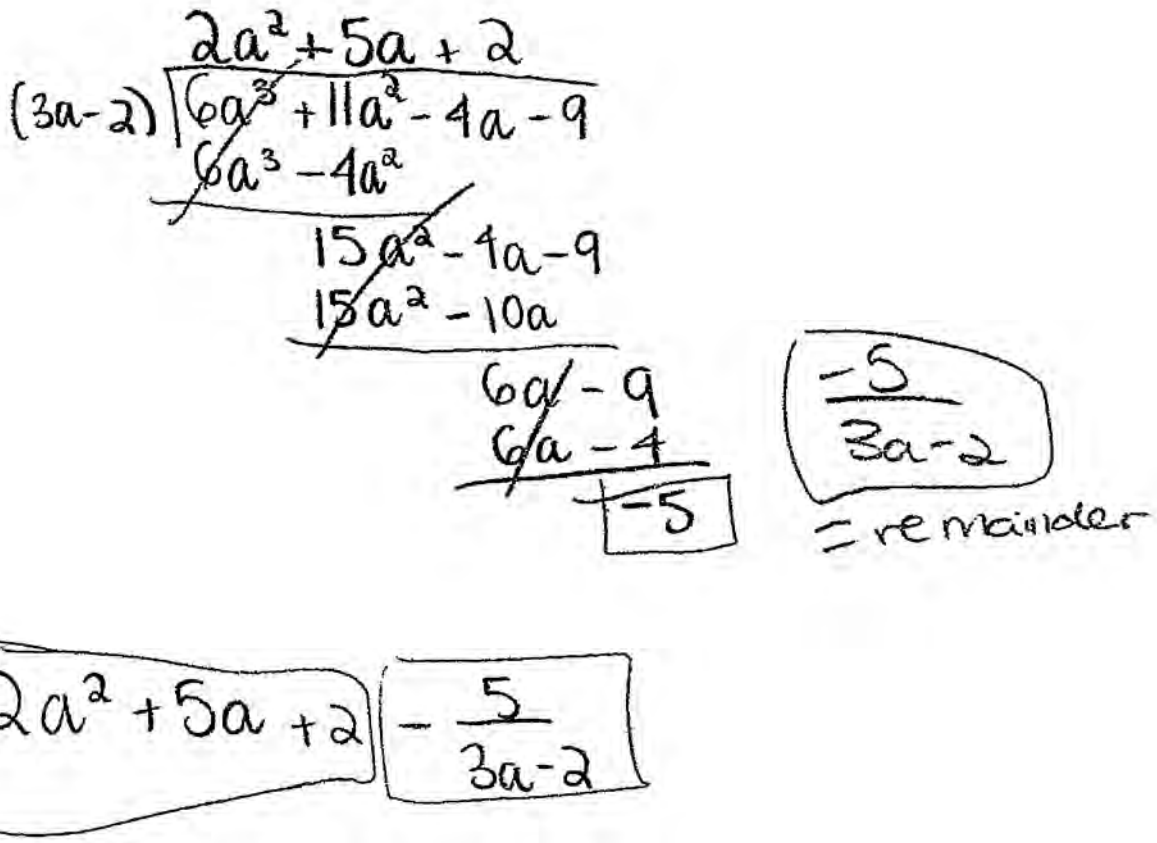
Randomly choose 5 from each 10 comments.

Score 0: The student gave a completely incorrect response.

Question 29

29 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.

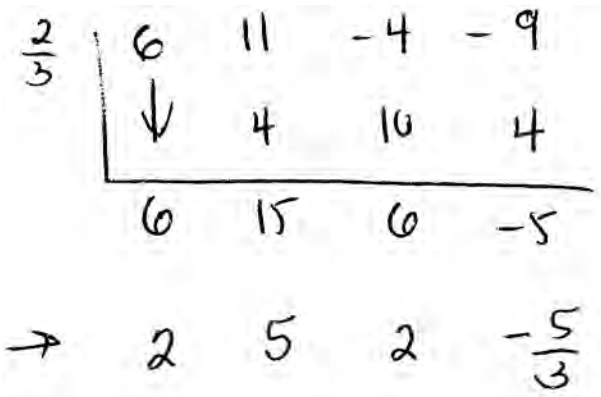


Score 2: The student gave a complete and correct response.

Question 29

29 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.



$$2a^2 + 5a + 2 - \frac{5}{3(a-\frac{2}{3})}$$

$$2a^2 + 5a + 2 - \frac{5}{3a-2}$$

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

Question 29

29 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.

$$
\begin{array}{r|l}
3a-2 & 2a^2+5a+2 \\
\hline
 & 6a^3+11a^2-4a-9 \\
 & \underline{6a^3-4a^2} \\
 & \quad 15a^2-4a \\
 & \quad \underline{15a^2+10a} \\
 & \qquad -6a-9 \\
 & \qquad \underline{-6a-4} \\
 & \qquad\quad -13
\end{array}
$$

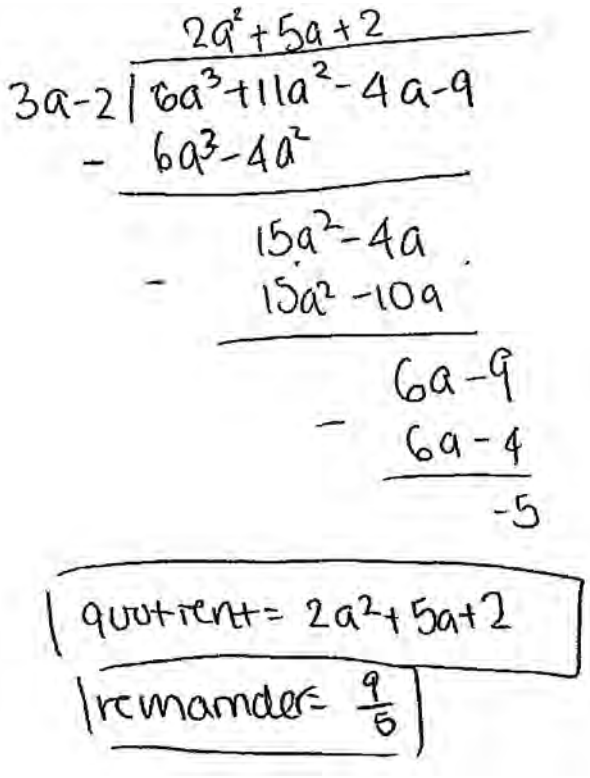
$$2a^2+5a+2 - \frac{13}{3a-2}$$

Score 1: The student made one computational error.

Question 29

29 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.

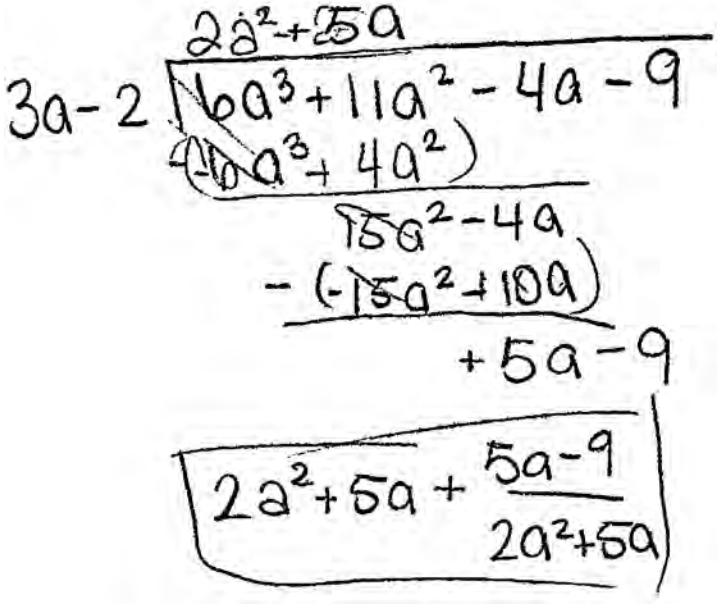


Score 0: The student made an error expressing the remainder and did not express the answer in the required form.

Question 29

29 Determine the quotient and remainder when $(6a^3 + 11a^2 - 4a - 9)$ is divided by $(3a - 2)$.

Express your answer in the form $q(a) + \frac{r(a)}{d(a)}$.



Score 0: The student made multiple errors.

Question 30

30 The recursive formula to describe a sequence is shown below.

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

State the first four terms of this sequence.

$a_2 = 1 + 2(3)$
$a_2 = 1 + 6 \rightarrow 7$
$a_3 = 1 + 2(7)$
$a_3 = 15$
$a_4 = 1 + 2(15) \rightarrow a_4 = 31$

Answer: 3, 7, 15, 31

Can this sequence be represented using an explicit geometric formula? Justify your answer.

$\frac{7}{3}$ $\frac{15}{7}$

No an explicit geometric formula cannot be used as there is no common ratio between the numbers.

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

Question 30

30 The recursive formula to describe a sequence is shown below.

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

State the first four terms of this sequence.

$a_1 = 3$
$a_2 = 7$
$a_3 = 15$
$a_4 = 31$

Can this sequence be represented using an explicit geometric formula? Justify your answer.

Score 1: The student correctly determined the first four terms only.

Question 30

30 The recursive formula to describe a sequence is shown below.

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

State the first four terms of this sequence.

$a_2 = 1 + 6$ $a_2 = 7$

$a_3 = 1 + 14$ $a_3 = 15$

$a_4 = 1 + 28$ $a_4 = 29$

Can this sequence be represented using an explicit geometric formula? Justify your answer.

No since there is no common ratio that would give us these terms exactly.

Score 1: The student incorrectly stated the first four terms, but gave a correct justification based on those terms.

Question 30

30 The recursive formula to describe a sequence is shown below.

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

State the first four terms of this sequence.

$a_2 = 1 + 2a_{2-1}$ $a_2 = 7$

$a_2^3 = 1 + 2a_1$

$a_2 = 1 + 2(3)$

$a_2 = 1 + 6$

$a_3 = 1 + 2a_{3-1}$

$a_3 = 1 + 2(7)$

$1 + 14 = 15$

$a_4 = 1 + 2a_{4-1}$

$a_4 = 1 + 2a_3$

$a_4 = 1 + 2(15)$

a_4 $1 + 30$

3, 7, 15, 30

Can this sequence be represented using an explicit geometric formula? Justify your answer.

No because this is an arithmetic sequence. You have to multiply to get the next term. In a geometric sequence you add.

Score 0: The student made a computational error and gave an incorrect justification.

Question 30

30 The recursive formula to describe a sequence is shown below.

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

State the first four terms of this sequence.

$a_2 = 1 + 2a_1 = 1 + 2(3) = 7$
$a_3 = 1 + 2a_2 = 1 + 2(7) = 15$
$a_4 = 1 + 2a_3 = 1 + 2(15) = 31$
$a_5 = 1 + 2a_4 = 1 + 2(31) = 63$

Can this sequence be represented using an explicit geometric formula? Justify your answer.

Yes, because if you find the difference once you can then multiply those differences and get 2.

7 >+8 >·2
15 >+16 >·2
31 >+32
63

Score 0: The student did not state the first term and gave an incorrect justification.

Question 31

31 The Wells family is looking to purchase a home in a suburb of Rochester with a 30-year mortgage that has an annual interest rate of 3.6%. The house the family wants to purchase is $152,500 and they will make a $15,250 down payment and borrow the remainder. Use the formula below to determine their monthly payment, to the *nearest dollar*.

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

M = monthly payment
P = amount borrowed
r = annual interest rate
n = total number of monthly payments

30 yr. mortgage

3.6% annual

152,500 - 15,250

137,250

$$M = \frac{137{,}250\left(\frac{.036}{12}\right)\left(1+\frac{.036}{12}\right)^{360}}{\left(1+\frac{.036}{12}\right)^{360}-1}$$

624 dollars

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

Question 31

31 The Wells family is looking to purchase a home in a suburb of Rochester with a 30-year mortgage that has an annual interest rate of 3.6%. The house the family wants to purchase is \$152,500 and they will make a \$15,250 down payment and borrow the remainder. Use the formula below to determine their monthly payment, to the *nearest dollar*.

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

M = monthly payment
P = amount borrowed
r = annual interest rate
n = total number of monthly payments

$M = \frac{137250\left(\frac{.036}{12}\right)\left(1+\frac{.036}{12}\right)^{30}}{\left(1+\frac{.036}{12}\right)^{30}-1}$ 152,500 - 15250 = 137250

$M = \frac{137250(.003)(1.003)^{30}}{(1.003)^{30}-1}$

$M = \frac{137250(.003)(1.094027)}{(1.094027)-1}$

$M = \frac{450.46560173}{.094027}$ M = \$4791

M = 4790.811 333

Score 1: The student used 30 instead of 360.

Question 31

31 The Wells family is looking to purchase a home in a suburb of Rochester with a 30-year mortgage that has an annual interest rate of 3.6%. The house the family wants to purchase is \$152,500 and they will make a \$15,250 down payment and borrow the remainder. Use the formula below to determine their monthly payment, to the *nearest dollar*.

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

3.6

M = monthly payment
P = amount borrowed
r = annual interest rate
n = total number of monthly payments

152500
− 15250
137250

$$M = \frac{137250\left(\frac{.036}{12}\right)\left(1+\frac{.036}{12}\right)^{360}}{\left(1+\frac{.036}{12}\right)^{360}-1}$$

The monthly payment would be about \$40.

Score 1: The student substituted correct values into the formula, but showed no further correct work.

Question 31

31 The Wells family is looking to purchase a home in a suburb of Rochester with a 30-year mortgage that has an annual interest rate of 3.6%. The house the family wants to purchase is $152,500 and they will make a $15,250 down payment and borrow the remainder. Use the formula below to determine their monthly payment, to the *nearest dollar*.

r < 1

0.0036

$$M = \frac{P\left(\frac{r}{12}\right)\left(1+\frac{r}{12}\right)^{n}}{\left(1+\frac{r}{12}\right)^{n}-1}$$

M = monthly payment
P = amount borrowed
r = annual interest rate
n = total number of monthly payments

30 · 12 = 360 months

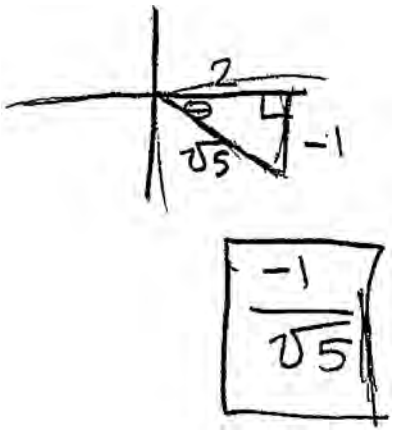
$$M = \frac{15{,}250\left(\frac{0.0036}{12}\right)\left(1+\frac{0.0036}{12}\right)^{360}}{\left(1+\frac{0.0036}{12}\right)^{360}-1}$$

M = 44.696 ≈ M = $45

Score 0: The student made multiple errors.

Question 32

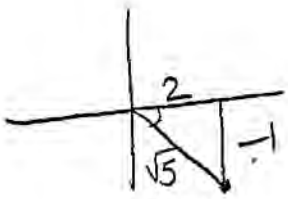
32 An angle, θ, is in standard position and its terminal side passes through the point (2,−1). Find the *exact* value of sin θ.



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

Question 32

32 An angle, θ, is in standard position and its terminal side passes through the point (2,−1). Find the *exact* value of sin θ.



$c^2 = a^2 + b^2$

$c^2 = (2)^2 + (-1)^2$

$c^2 = 5$

$\sqrt{5} = c$

SOHCAHTOA

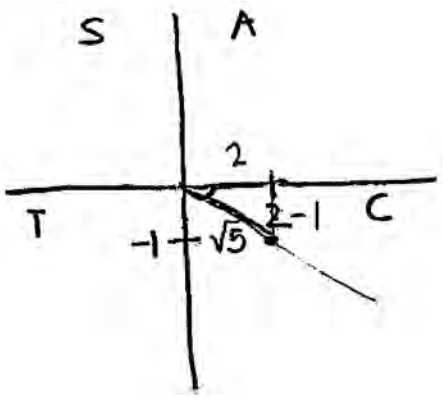
↓

$\frac{-1}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \boxed{\frac{-\sqrt{5}}{5}}$

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

Question 32

32 An angle, θ, is in standard position and its terminal side passes through the point (2,−1). Find the *exact* value of sin θ.



$\sin\left(\frac{-1}{\sqrt{5}}\right)$

$\sin\left(\frac{-\sqrt{5}}{5}\right)$

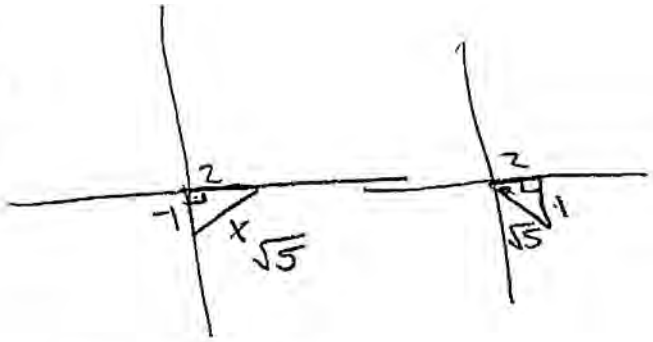
Score 1: The student incorrectly represented the answer.

Question 32

32 An angle, θ, is in standard position and its terminal side passes through the point (2,−1). Find the *exact* value of sin θ.

SOH CAH TOA

$\frac{1}{\sqrt{5}}$



$a^2 + b^2 = c^2$

$(-1)^2 + 2^2 = c^2$

$1 + 4 = c^2$

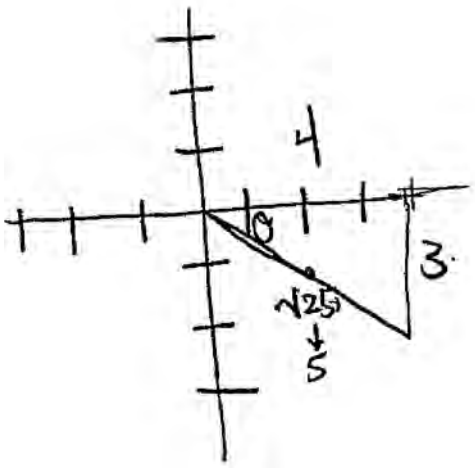
$\sqrt{5} = \sqrt{c^2}$

$\sqrt{5} = c$

Score 1: The student omitted a negative sign.

Question 32

32 An angle, θ, is in standard position and its terminal side passes through the point (2,−1). Find the *exact* value of sin θ.



$\frac{o}{h}$

$\frac{a}{h}$

$\frac{o}{a}$

$\sin\theta = \frac{3}{5}$

Score 0: The student gave a completely incorrect response.

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

$-x \qquad -x$

$\sqrt{6-2x} = 2x + 30 - 9 - x$

$6 - 2x = (x + 21)^2$

FOIL $(x+21)(x+21)$

$6 - 2x = x^2 + 21x + 21x + 441$

$6 - 2x = x^2 + 42x + 441$

$-6 \quad +2x \qquad +2x \quad -6$

$0 = x^2 + 44x + 435$

$0 = (x + 29)(x + 15)$

$x + 29 = 0 \qquad x + 15 = 0$

$x = -29 \qquad x = -15$

Check

$\sqrt{6 - 2(-29)} + (-29) = 2((-29) + 15) - 9$

$8 + -29 = -28 - 9$ ✗

$-21 \neq -37$

$\sqrt{+6 - 2(-15)} + (-15) = 2((-15) + 15) - 9$

$6 + -15 = 0 - 9$

$-9 = -9$ ✓

$\{-15\}$

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

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

$2x - 9 = 21$

$\sqrt{6-2x} + x = 2x + 21$

$-x \quad -x$

$(\sqrt{6-2x})^2 = (x+21)^2$

$(x+21)(x+21)$

$x^2 + 42x + 441$

$6 - 2x = x^2 + 42x + 441$

$-6 \quad +2x \qquad +2x \qquad -6$

$x^2 + 44x + 435 = 0$

$(x+29)(x+15)$

~~$x = -29$~~ $\qquad x = -15$

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

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

$-x \quad -x$

$\sqrt{6-2x} = 2x + 30 - 9$

$-x$

$(\sqrt{6-2x})^2 = (x+21)^2$

$6 - 2x = (x+21)(x+21)$

$6 - 2x = x^2 + 42x + 441$

$-6 \quad +2x \qquad +2x \quad -6$

$0 = x^2 + 44x + 435$

$0 = (x+15)(x+29)$

$x+15=0 \quad | \quad x+29=0$

$-15 \quad -15 \quad | \quad -29 \quad -29$

$x = -15 \quad | \quad x = -29$

435

1 435

3 145

5 87

15 29

$\{-29, -15\}$

Score 3: The student failed to reject −29.

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

$\sqrt{6-2x+x} = 2x+30-9$

$-x \quad -x$

$\sqrt{6-2x} = x+30-9$

$(\sqrt{6-2x})^2 = (x+21)^2$

$6-2x = x^2+42x+441$

$-6 \quad +2x \qquad +2x-6$

$0 = x^2+44x+435$

$0 = (x+15)(x+29)$

$x \neq -15 \qquad x = -29$

Rejected

Score 3: The student found the correct values, but then made a rejection error.

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

$\sqrt{6-2x}+x=2(x+15)-9$

$\sqrt{6-2x}+x=2x+30-9$

$\sqrt{6-2x}+x=2x+21$

$-x \quad -x$

$\sqrt{6-2x}^{(2)} = x+21^{(2)}$

$6-2x=(x+21)(x+21)$

$6-2x=x^2+42x+441$

$+6+2x \quad 2x \quad -6$

$0=x^2+44x+435$

$\frac{-b\pm\sqrt{(b)^2-4ac}}{2a} \quad \frac{-44\pm\sqrt{(44)^2-4(1)(435)}}{2(1)}$

$\frac{-44\pm\sqrt{1936-1740}}{2}$

$\frac{-44\pm\sqrt{196}}{2}$

$x \quad \frac{-44\pm14}{2}$

X3

$x=\frac{-44+14}{2} \quad x=\frac{-44-14}{2}$

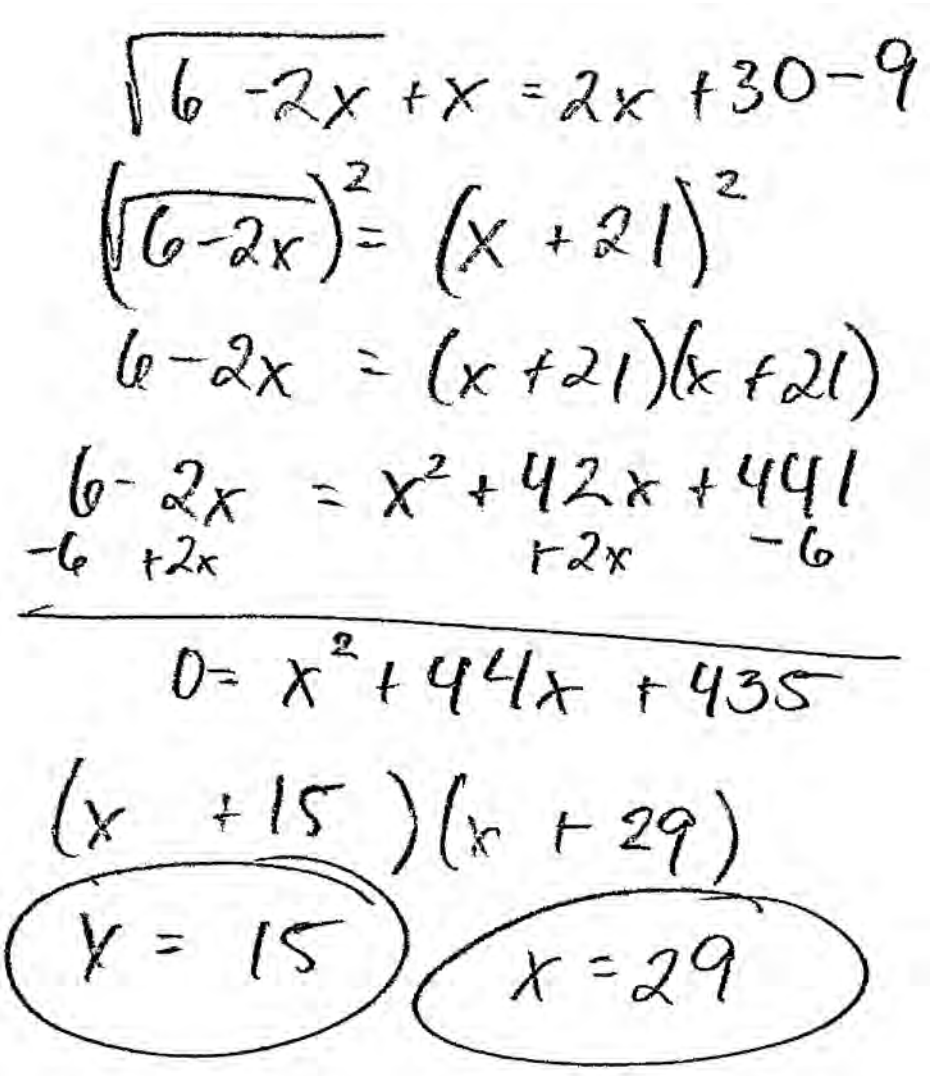
$x=-37 \quad x=-29$

Score 2: The student made a computational error and failed to reject.

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$



Score 2: The student wrote a correct quadratic equation set equal to zero.

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$

$\sqrt{6-2x} + x = 2(x+15) - 9$

$\sqrt{6-2x} + x = 2x + 30 - 9$

$-x \quad -x$

$\sqrt{6-2x} = x + 30 - 9$

$(\sqrt{6-2x})^2 = (x+21)^2$

$6 - 2x = (x+21)(x+21)$

$6 - 2x = x^2 + 21x + 21x + 441$

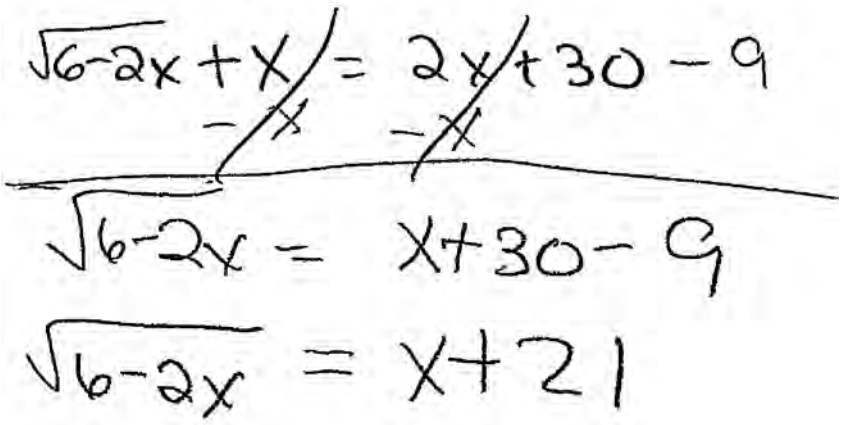
$6 - 2x = x^2 + 42x + 441$

Score 1: The student did not do enough work to receive a second point.

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6 - 2x} + x = 2(x + 15) - 9$$



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

Question 33

33 Solve algebraically for all values of x:

$$\sqrt{6-2x}+x=2(x+15)-9$$

$\sqrt{6-2x}+x=2x+30-9$

$\sqrt{6-2x}+x=2x-21$

$-x \quad -x$

$(\sqrt{6-2x})^2=(x-21)^2$

$6-2x=x^2-21$

$-6+2x \quad -6+2x$

$0=x^2+2x-27$

$0=x^2+9x+3x-27$

$0=x(x+9)+3(x-9)$

$0=(x+3)(x+9)$

$0=x+3 \quad 0=x+9$

$-3 \quad -3 \quad -9 \quad -9$

$x=-3 \quad x=-9$

Score 0: The student made multiple conceptual and computational errors, and failed to reject.

Question 34

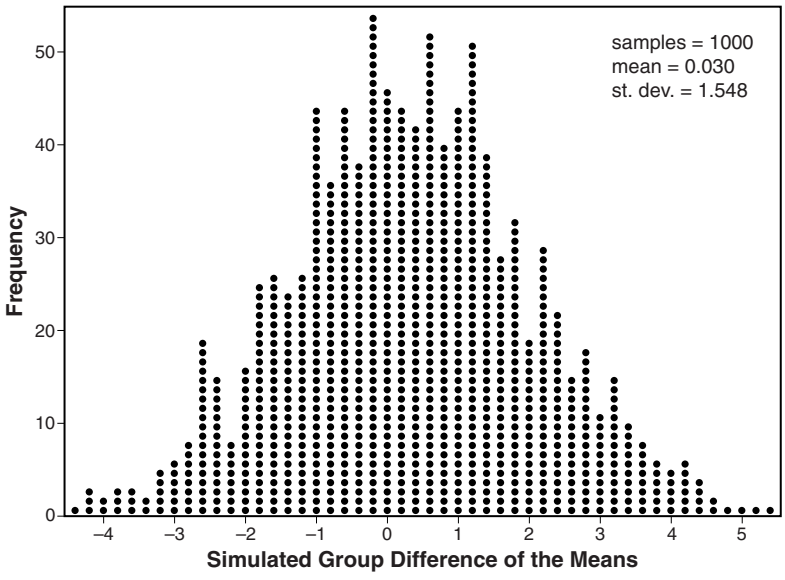
34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented – unscented).

23 - 18 = 5

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



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

Question 34 continued.

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.

$\bar{x} \pm 2\sigma \quad 0.03 \pm 2(1.548) < \begin{matrix} -3.066 \\ 3.126 \end{matrix}$ **-3.07 -3.13**

Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

yes - 5 is greater than 3.13, so it doesn't fall in the 95%, meaning it is statistically significant

Question 34

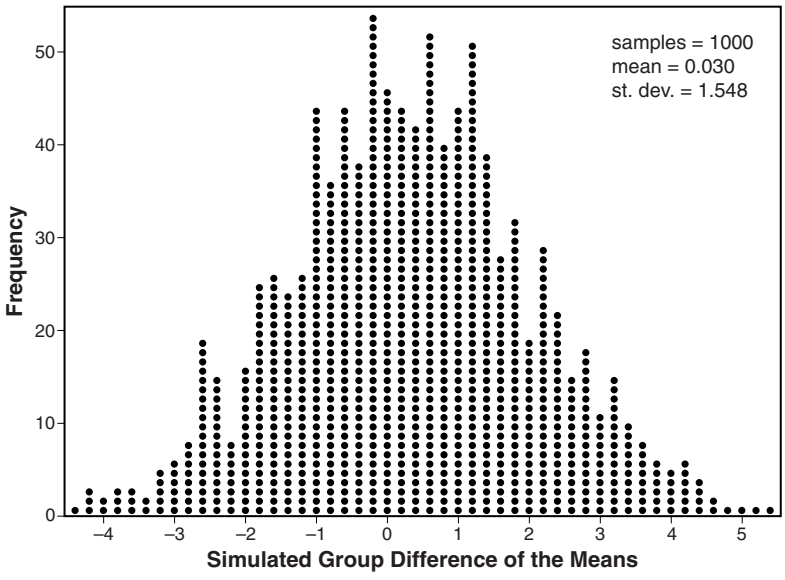
34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented – unscented).

23-18 = 5

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



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

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.

.030 + 2(1.548) = 3126

.030 − 2(1.549) = − 3.07

~~3.07 to 3~~

~~x6~~ −3.07 to 3.13

Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

Yes. A difference of 5 or greater occurred only 3 ~~less than~~ times out of 1000 which is statistically significant.

Question 34

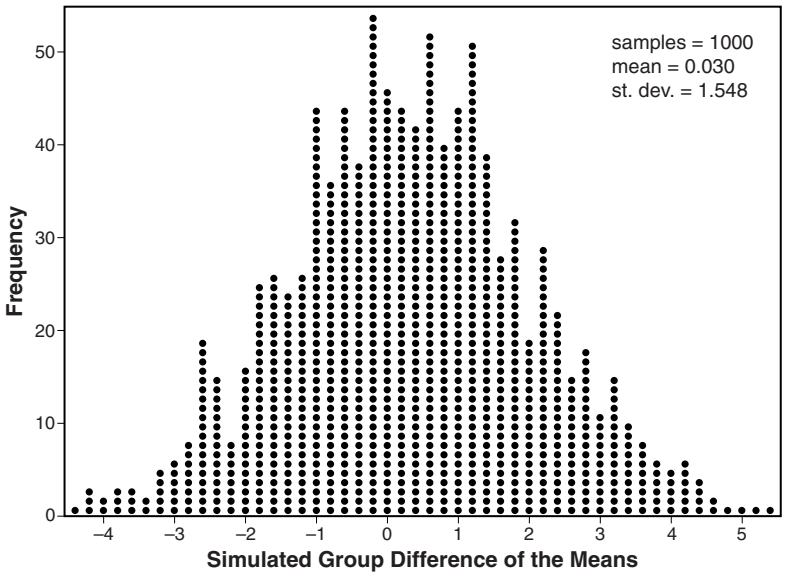
34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented – unscented).

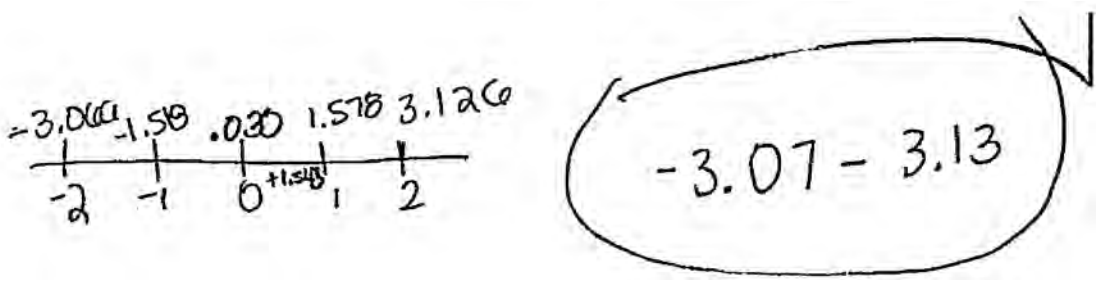
23 − 18 = (5)

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



Score 3: The student gave an incomplete response regarding the statistical significance of the results.

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.



Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

NO it is not because 5 doesn't fall within 2 standard deviations.

Question 34

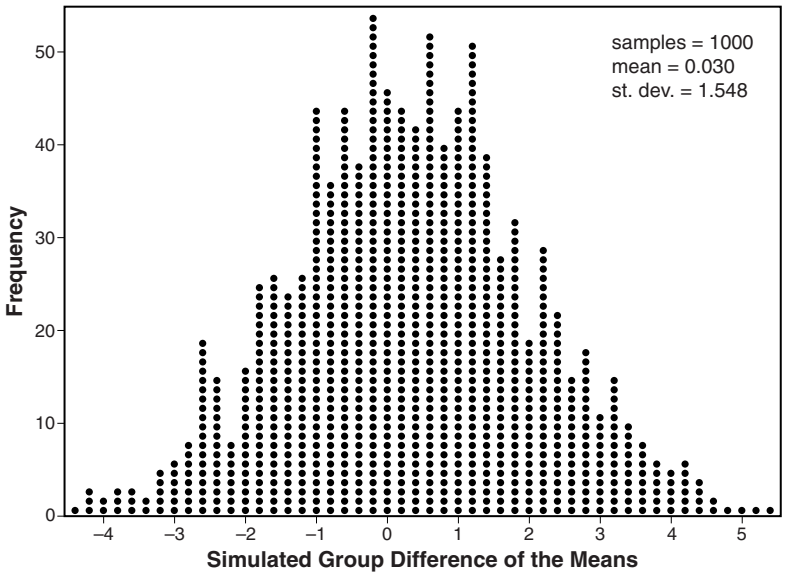
34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented – unscented).

23 - 18 = 5

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



Score 3: The student made a rounding error.

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.

$.030 \pm 2(1.548)$

$-3.066 - 3.126$

Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

The difference of the means is statistically significant as the value lies well outside the interval

Question 34

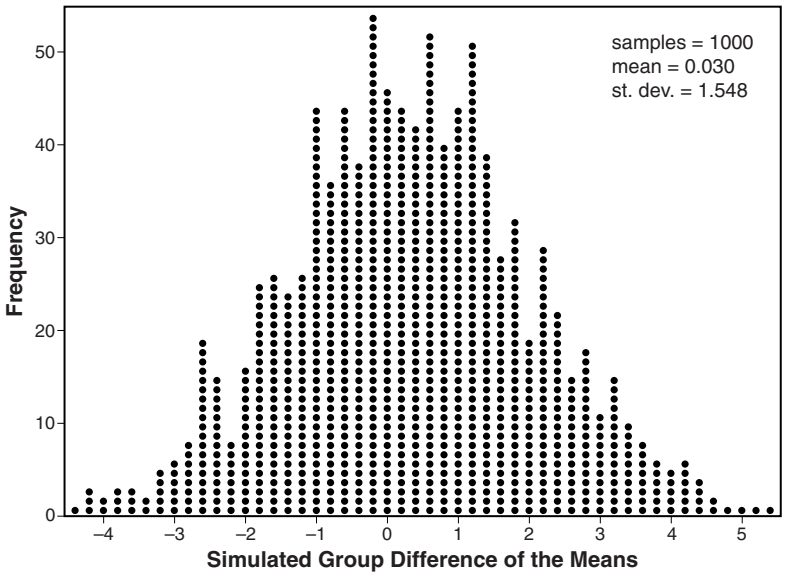
34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented – unscented).

5

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



Score 2: The student received one point for each of the first two parts.

Question 34 continued.

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.

-3.07 to 3.13

Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

yes since the difference between Joseph's mean was 5 while the simulation was 6-2.

Question 34

34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

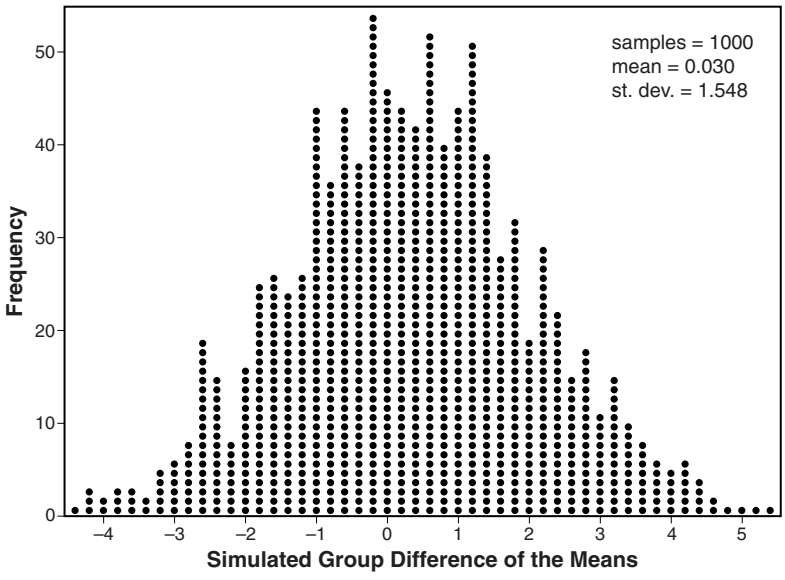
mean

SD

Calculate the difference in means in the experimental test grades (scented – unscented).

23-18=5 5

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



Score 2: The student made a rounding error and gave an incorrect explanation.

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.

0.030 ± 3.096

(−3.066, 3.126)

ME = SD(2)

1.548 • 2 = 3.098

Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

Yes since there is a clear difference that students given scented paper did better than with unscented

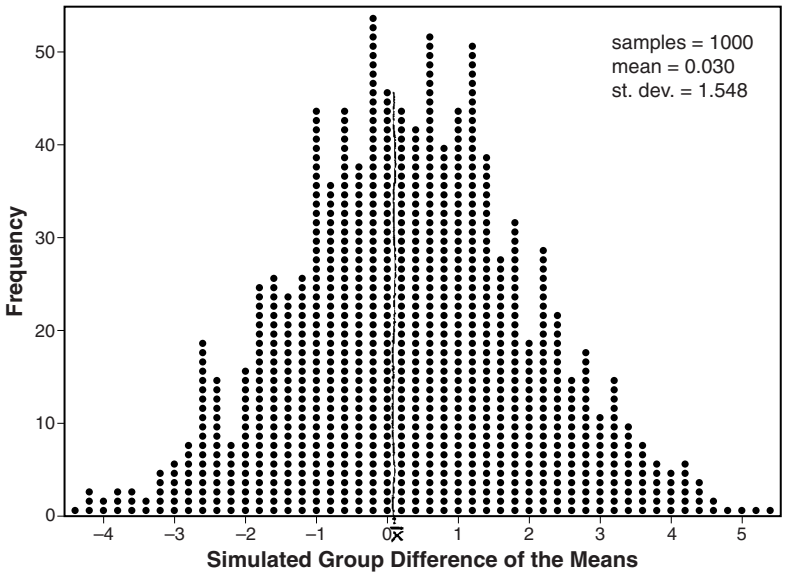
Question 34

34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

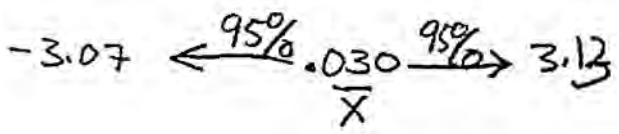
Calculate the difference in means in the experimental test grades (scented – unscented).

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



Score 1: The student received only one credit for the interval.

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.



Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

No.

Question 34

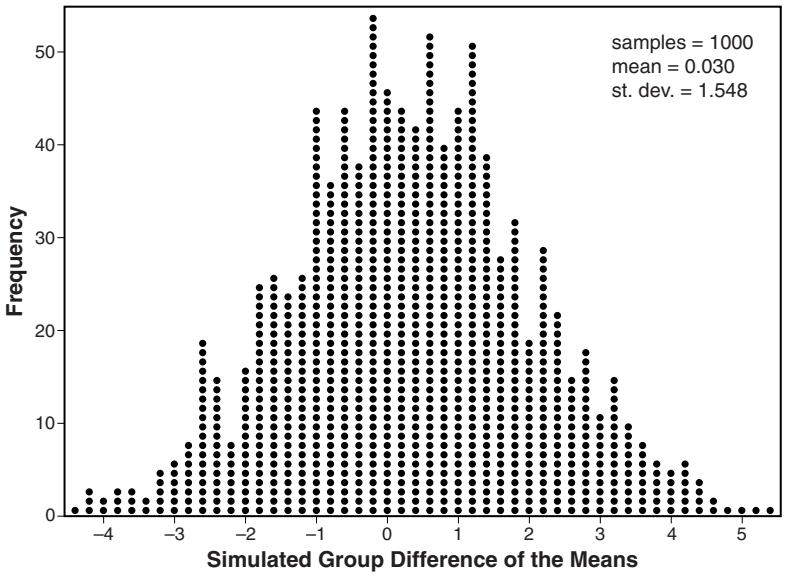
34 Joseph was curious to determine if scent improves memory. A test was created where better memory is indicated by higher test scores. A controlled experiment was performed where one group was given the test on scented paper and the other group was given the test on unscented paper. The summary statistics from the experiment are given below.

	Scented Paper	Unscented Paper
$\bar{x}$	23	18
s_x	2.898	2.408

Calculate the difference in means in the experimental test grades (scented – unscented).

-5

A simulation was conducted in which the subjects' scores were rerandomized into two groups 1000 times. The differences of the group means were calculated each time. The results are shown below.



Score 0: The student gave a completely incorrect response.

Question 34 continued.

Use the simulation results to determine the interval representing the middle 95% of the difference in means, to the *nearest hundredth*.

$-3.07 \text{ — } 3.126$

Is the difference in means in Joseph's experiment statistically significant based on the simulation? Explain.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

$$C(t) = 63{,}000\left(1 + \frac{.0255}{12}\right)^{12(t)}$$

Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

$$100000 = 63000\left(1 + \frac{.0255}{12}\right)^{12(t)}$$

$$\frac{100000}{63000} = \frac{63000(1.002125)^{12(t)}}{63000}$$

$$1.5873 = (1.002125)^{12(t)}$$

$$\log 1.5873 = \log(1.002125)^{12(t)}$$

$$\frac{\log 1.5873}{\log(1.002125)} = \frac{12(t)\log(1.002125)}{\log(1.002125)}$$

$$\frac{217.6559}{12} = \frac{12t}{12}$$

$t = 18.14$ years

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

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts $63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

$C(t) = 63000(1.002125)^{12t}$

Calculate algebraically the number of years it will take for the account to reach $100,000, to the *nearest hundredth of a year*.

$100{,}000 = 63000(1.002125)^{12t}$

$1.587301587 = (1.002125)^{12t}$

$\log_{1.002125}(1.587301587) = 12t$

$217.6543875 = 12t$

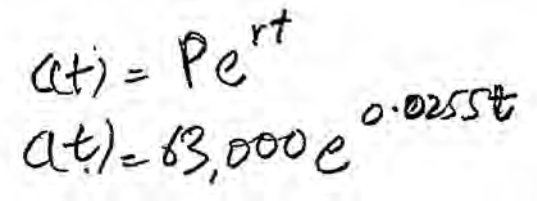
$18.13828229 = t$

18.14 years

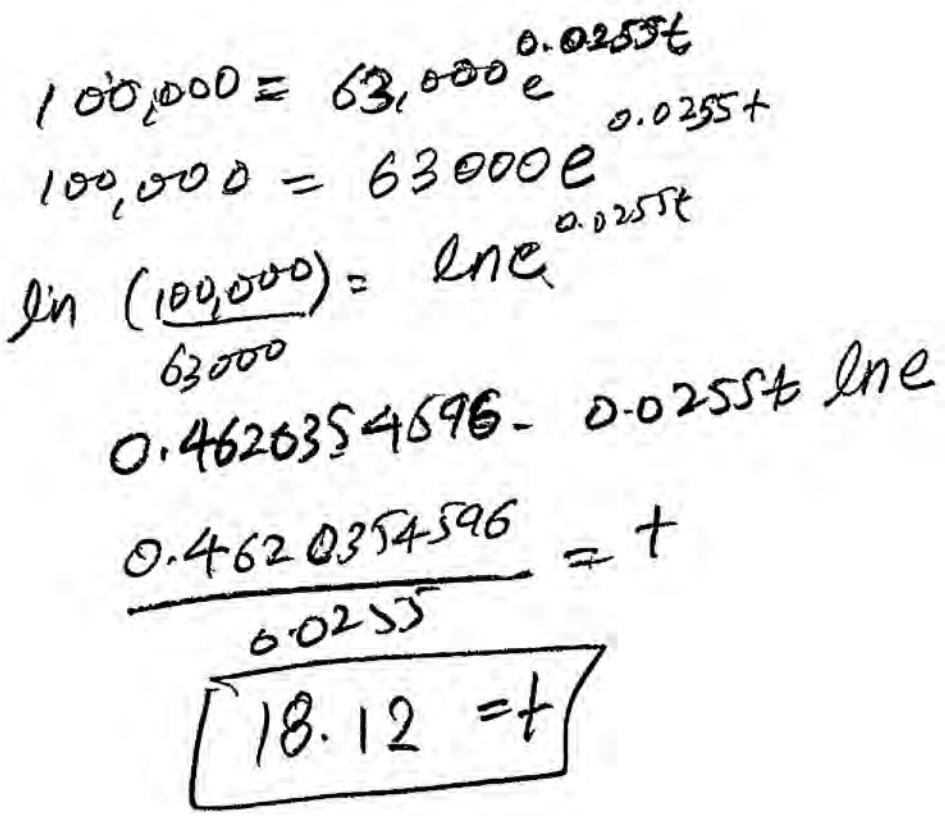
Score 4: The student gave a complete and correct response.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts $63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.



Calculate algebraically the number of years it will take for the account to reach $100,000, to the *nearest hundredth of a year*.



Score 3: The student used the wrong formula, but evaluated it correctly.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

$C(t) = 63000\left(1 + \frac{.0255}{12}\right)^{12t}$

Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

$\frac{100{,}000}{63000} = \frac{63000\left(1 + \frac{.0255}{12}\right)^{12t}}{63000}$

$1.587 = \left(1 + \frac{.0255}{12}\right)^{12t}$

$1.587 = (1.002125)^{12t}$

$\frac{\log_{1.002125}(1.587)}{12} = \frac{12t}{12}$

18.13 years

Score 3: The student made an error by rounding too early.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

$$C(t) = 63{,}000\left(1 + \frac{.0255}{12}\right)^{12t}$$

Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

$$\frac{100{,}000}{63{,}000} = \frac{63{,}000(1.002125)^{12t}}{63{,}000}$$

$$\frac{\ln\frac{100}{63}}{\ln(1.002125)} = \frac{12t\ln(1.002125)}{\ln(1.002125)}$$

$$\frac{100}{63} = (1.002125)^{12t}$$

$$\ln\frac{100}{63} = \ln(1.002125)^{12t}$$

Score 2: The student failed to solve the equation for t.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

$C(t) = 63000\ e^{0.0255t}$

Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

$100000 = 63000\ e^{0.0255t}$

$\ln\left(\frac{100000}{63000}\right) = \ln\left(e^{0.0255t}\right)$

$0.415515444 = 0.0255t$

$16.29477239 = t$

16.29

~~16.3~~ $= t$

Score 2: The student used the wrong formula then made a computational error.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

2.55
0.0255

$C(t) = \$63,000\left(1+\frac{0.0255}{12}\right)^{(t)(12)}$

Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

$C(t) = 63,000\left(1+\frac{0.0255}{12}\right)^{(1)(12)}$

$C(t) = 63,000\left(1+\frac{0.255}{12}\right)^{(20)(12)}$

20 years

Score 1: The student wrote the correct function, but did no further correct work.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

$C(t) = 63{,}000\left(\frac{0.0255}{12}\right)^{12t}$

Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

$\frac{100{,}000}{63{,}000} = \frac{63{,}000}{63{,}000}\left(\frac{.0255}{12}\right)^{12t}$

$\log 1.5873015873 = \log\left(\frac{.0255}{12}\right)^{12t}$

$\log 1.5873015873 = \log(.002125)^{12t}$

$12 \div \frac{\log 1.587\ldots}{\log(.002125)} = 12t \div 12$ $\quad \frac{\log(.002125)^{12t}}{\log(.002125)}$

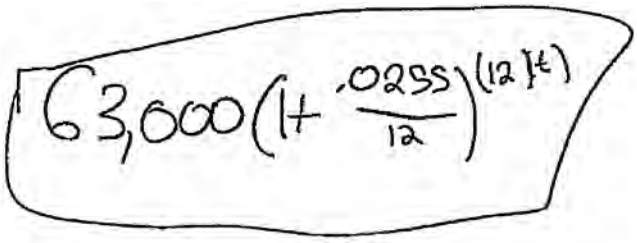
$.0062565906 = t$

$t = .006$ years

Score 1: The student gave the wrong equation and made a transcription error and a rounding error.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts \$63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.



Calculate algebraically the number of years it will take for the account to reach \$100,000, to the *nearest hundredth of a year*.

14 years

Score 0: The student wrote an expression, but showed no further correct work.

Question 35

35 Carla wants to start a college fund for her daughter Lila. She puts $63,000 into an account that grows at a rate of 2.55% per year, compounded monthly. Write a function, $C(t)$, that represents the amount of money in the account t years after the account is opened, given that no more money is deposited into or withdrawn from the account.

$C(t) = 63{,}000 e^{.0255(t)}$

.6375 - 25 .51 - 20 .4335 - 17 .459 - 18

Calculate algebraically the number of years it will take for the account to reach $100,000, to the *nearest hundredth of a year*.

$C(t) = 63{,}000 e^{.0255(25)}$

$C(t) = 119{,}179.9777$

$C(t) = 63{,}000 e^{.0255(20}$

$= 104913.3453$

18.10 to 18.20 years

$C(t) = 63{,}000 e^{.0255(18)}$

$= 103351.3891$

.4347775
.44625

$C(t) = 63{,}000 e^{.0255(17)}$

$= 97186.78315$

$C(t) = 63{,}000 e^{.0255(17.8)}$

$= 99,189$

17.95

17.98 - 99646

18.01 - 99671

18.05 - 99824

18.08 - 99900

18.09 - 99925

18.2 - 100100

$C(t) = 63000 e^{.0255(17.9)}$

$= 99,443.01101$

Score 0: The student gave the wrong equation and was unsuccessful using trial-and-error.

Question 36

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.

$\frac{14-2}{1-2} = \frac{12}{-1} = -12$

At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

$\frac{\pi}{3} = 60°$

$x = 2.2$

$x = 3.8$

Plug into calculator and go to graph then click 2nd trace and choose 0 and find value,

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

Question 36

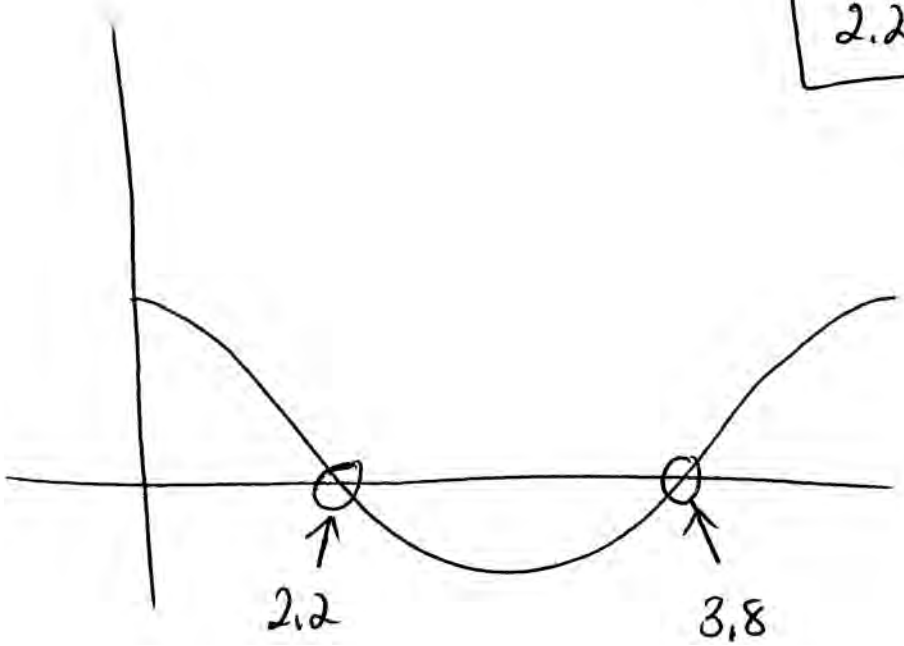
36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.

$\frac{2-14}{2-1} = \frac{-12}{1} = -12$

At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

2.2 and 3.8



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

Question 36

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.

t	$h(t)$
1	14
2	2

Avg. Rate of Change

$\frac{14-2}{1-2} = \frac{12}{-1} = \boxed{-12}$

At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

$0 = 12\cos\left(\frac{\pi}{3}t\right) + 8$

$\frac{-8}{12} = \frac{12\cos\left(\frac{\pi}{3}t\right)}{12}$

$-\frac{2}{3} = \cos\left(\frac{\pi}{3}t\right)$

$\cos^{-1}\left(-\frac{2}{3}\right) = \frac{\pi}{3}t$

Ref $\measuredangle$ = .841069

S | A II: 2.301

T | C III: 3.983

$\frac{2.301}{\pi/3} = \frac{\frac{\pi}{3}t}{\pi/3}$ and $\frac{3.983}{\frac{\pi}{3}} = \frac{\frac{\pi}{3}t}{\frac{\pi}{3}}$

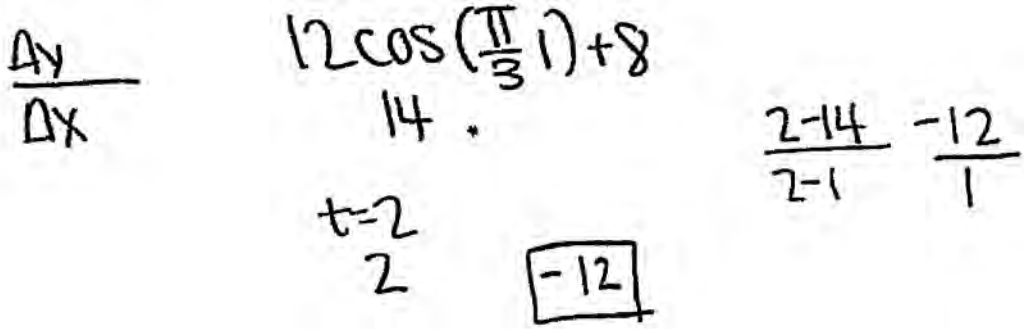
$\boxed{2.2 = t}$ and $\boxed{3.8 = t}$

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

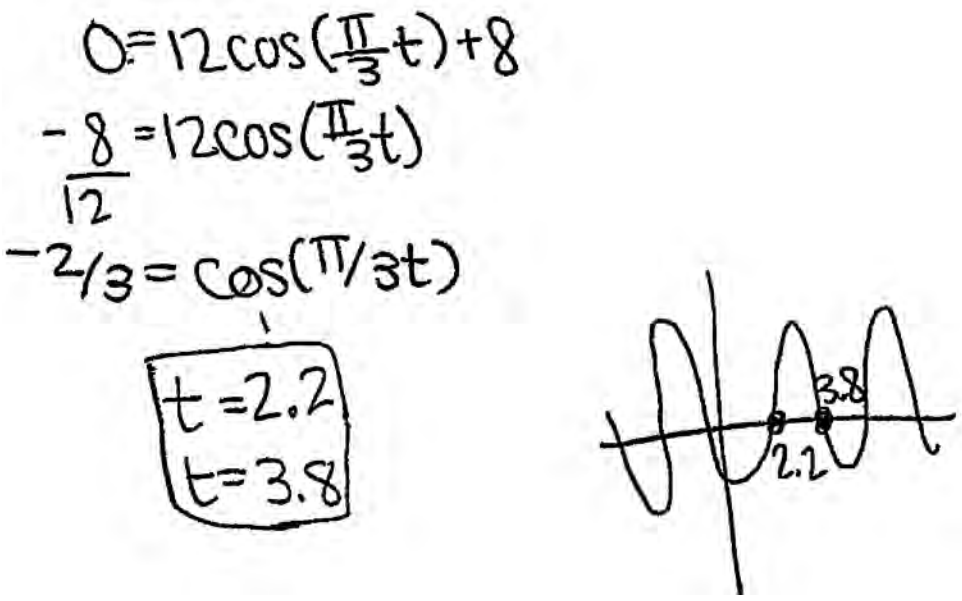
Question 36

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.



At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.



Score 3: The student made a graphing error in the justification.

Question 36

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.

$\frac{\Delta y}{\Delta x} = \frac{2-14}{2-1} = \frac{-12}{1} = \boxed{-12}$

At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

$\boxed{\begin{array}{l} x = 2.2 \\ x = 3.8 \end{array}}$

$0 = 12\cos\left(\frac{\pi}{3}t\right) + 8$

Score 3: The student did not provide a justification.

Question 36

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.

$y = 12\cos\left(\frac{\pi}{3} \cdot 1\right) + 8$

$y = 12\cos\frac{\pi}{3} + 8$

$y = \left(12 \cdot \frac{1}{2}\right) + 8$

$y = 14$

$y = 12\cos\left(\frac{\pi}{3} \cdot 2\right) + 8$

$y = 12\cos\frac{2\pi}{3} + 8$

$y = 12\left(-\frac{1}{2}\right) + 8$

$y = -6 + 8$

$y = 2$

1, 14

2, 2

$\frac{14-2}{1-2} = \frac{12}{-1} = -12$

Answer: Average rate of change is -12

At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

$0 = 12\cos\frac{\pi}{3}t + 8$

$-8 = 12\cos\frac{\pi}{3}t$

$-\frac{2}{3} = \cos\left(\frac{\pi}{3}t\right)$

Answ: 2.2

Score 2: The student correctly computed the average rate of change.

Question 36

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.

the average rate of change is 8

$t_1 = 14$
$t_2 = 2$
$\frac{14+2}{2} = 8$

At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

2.2 and 3.8

Score 1: The student incorrectly computed the average rate of change and did not provide a justification.

Question 36

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.

AROC: -12

At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

$0 = 12\cos\left(\frac{\pi}{3}t\right) + 8$

$-8 \qquad -8$

$-8 = 12\cos\left(\frac{\pi}{3}t\right)$

$\frac{-8}{12} = \frac{12\cos\left(\frac{\pi}{3}t\right)}{12}$

$-\frac{8}{12} = \cos\left(\frac{\pi}{3}t\right)$

used calculator

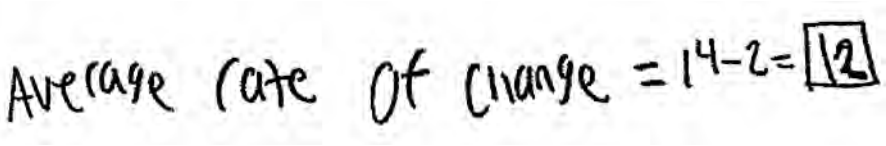
2.3 seconds

Score 1: The student provided the correct average rate of change, but showed no work.

Question 36

36 The height, $h(t)$ in cm, of a piston, is given by the equation $h(t) = 12\cos\left(\frac{\pi}{3}t\right) + 8$, where t represents the number of seconds since the measurements began.

Determine the average rate of change, in cm/sec, of the piston's height on the interval $1 \leq t \leq 2$.



At what value(s) of t, to the *nearest tenth of a second*, does $h(t) = 0$ in the interval $1 \leq t \leq 5$? Justify your answer.

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

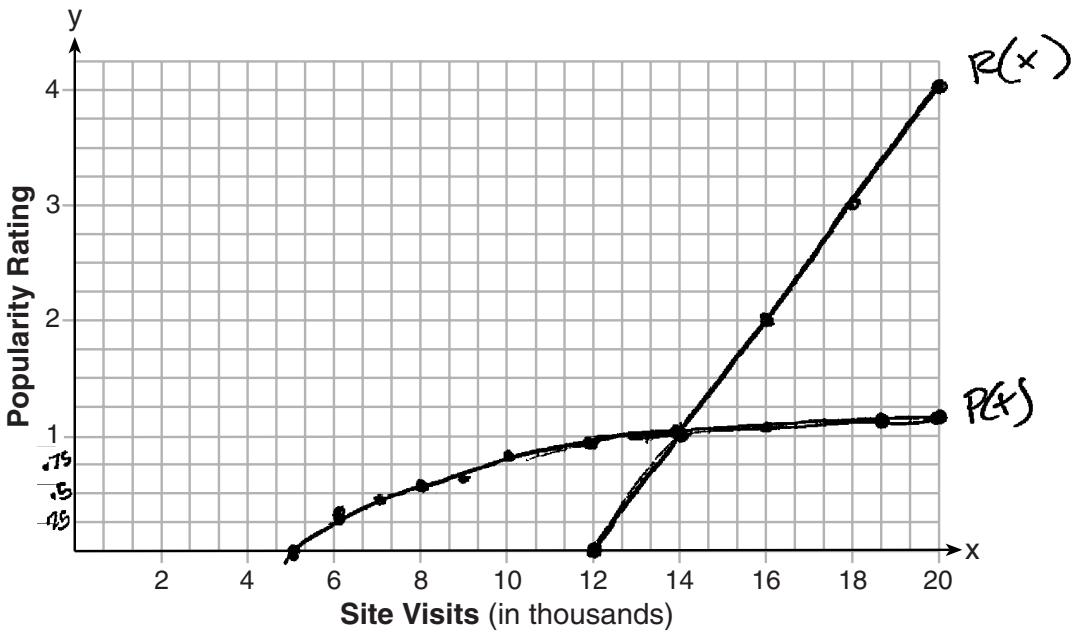
Question 37

37 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating.

According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

$P(16) = \log(16 - 4) \approx 1.1$ popularity rating

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

14,000 site visits

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

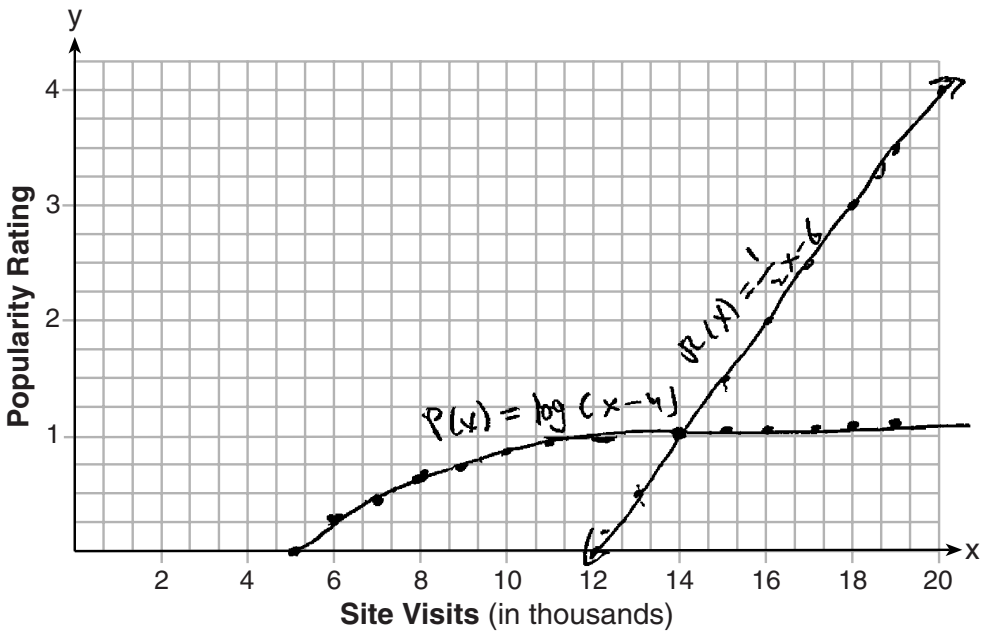
Question 37

37 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating.

According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

1.0792 = → 1.1

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

14,000 weekly visits

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

Question 37

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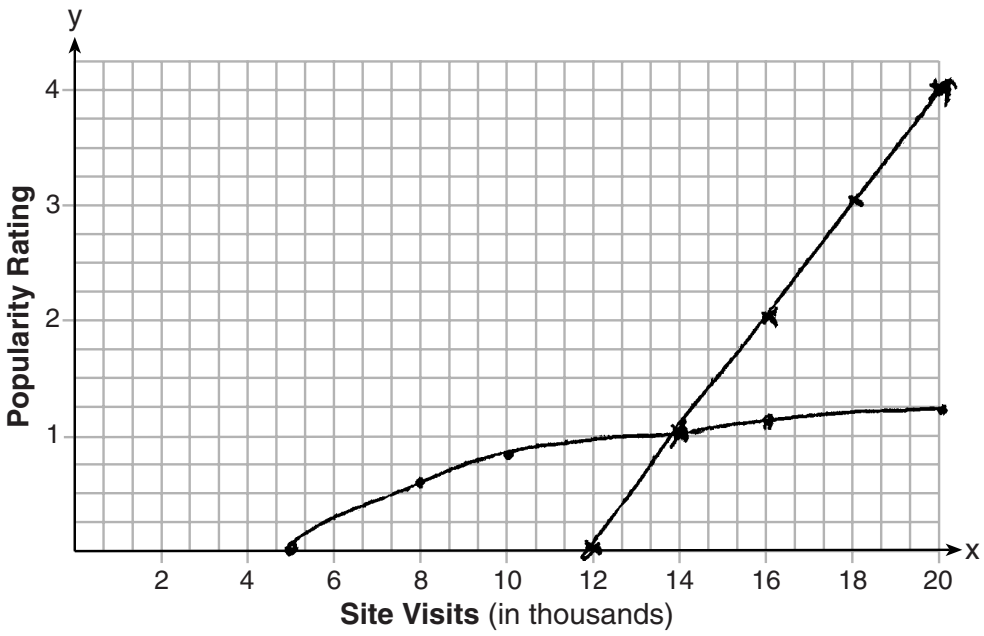
According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

1.1

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

14

Score 5: The student gave 14 instead of 14,000.

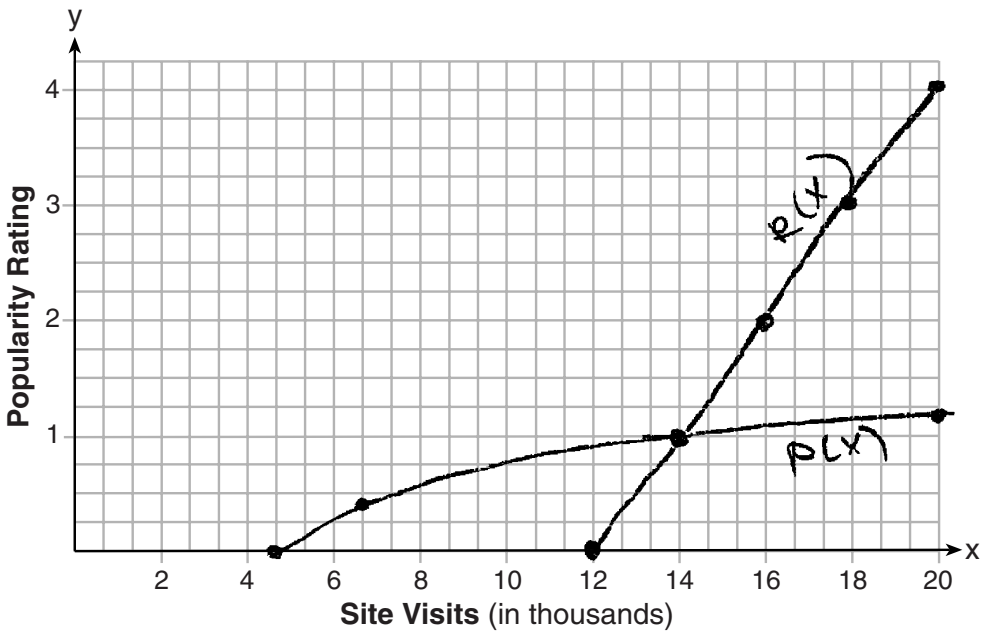
Question 37

37 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating.

According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

1.1

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

14000

Score 5: The student made an error graphing the x-intercept of $y = P(x)$.

Question 37

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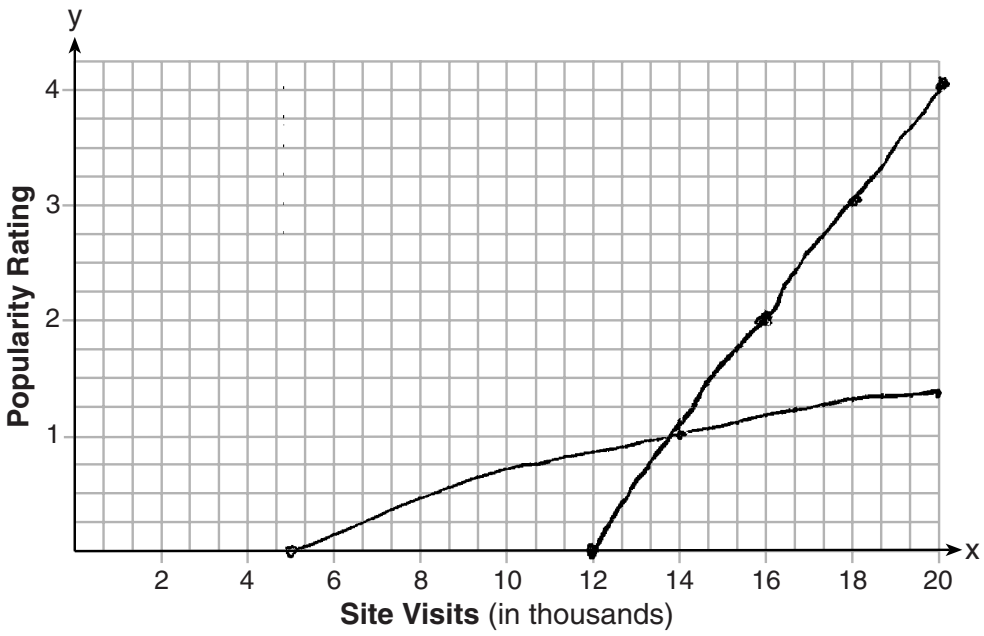
According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

1.1

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

14 weeks

Score 4: The student made a graphing error and stated 14 instead of 14,000.

Question 37

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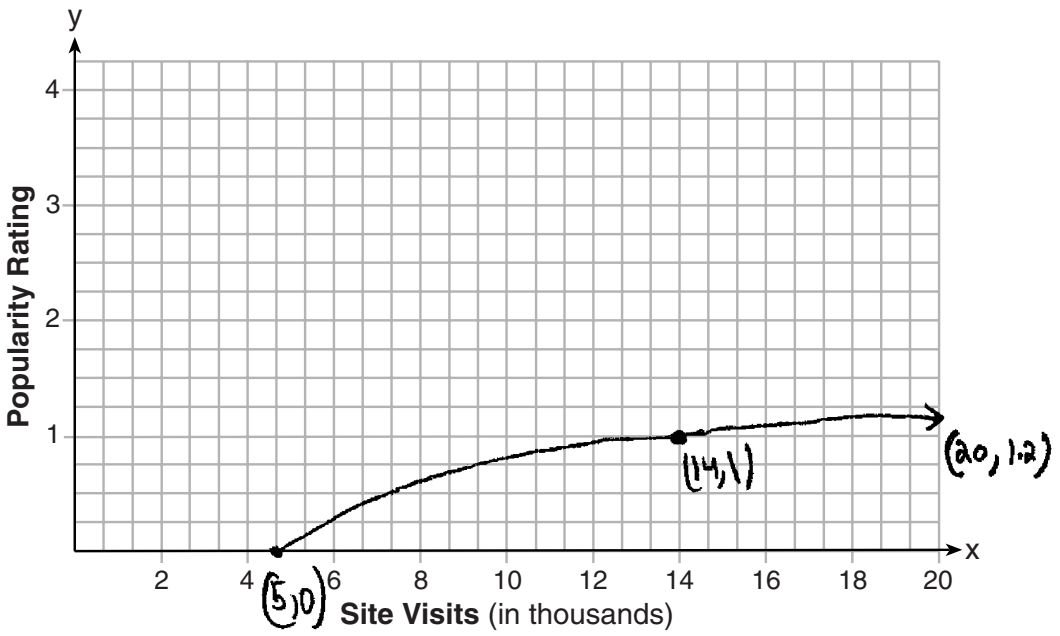
According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

1.1

1.1 $P(x) = \log(16-4)$

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

Score 3: The student made a graphing error and did not attempt the third part.

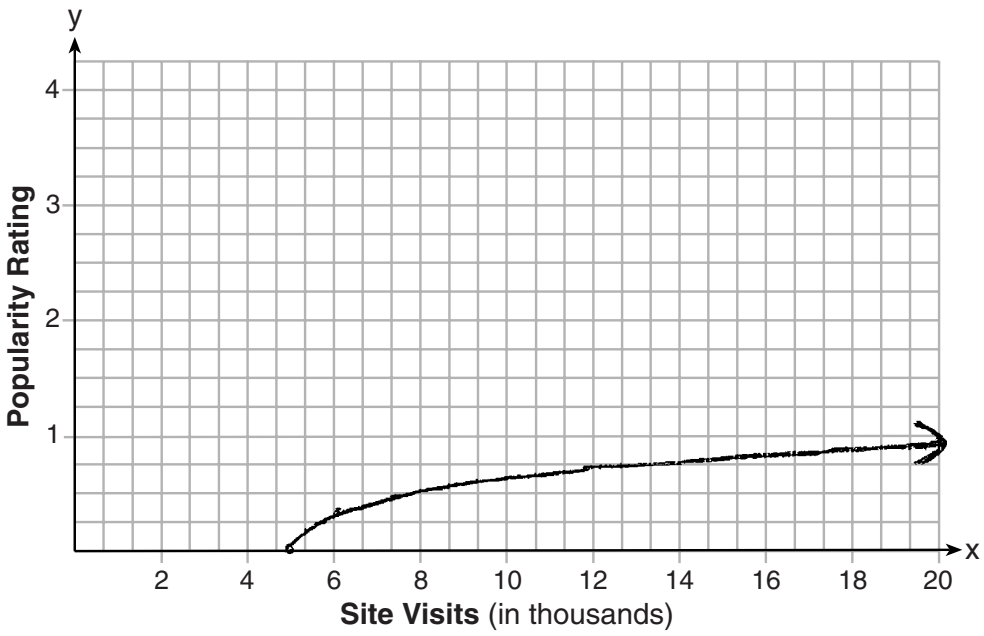
Question 37

37 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating.

According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

log(16000 - 4) = 4.2

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

Intersection: (14, 1)

Graphed both equations, calc, intersect

Score 2: The student incorrectly substituted into $P(x)$, but evaluated it correctly. The student only received one credit for graphing $y = P(x)$ due to a lack of precision.

Question 37

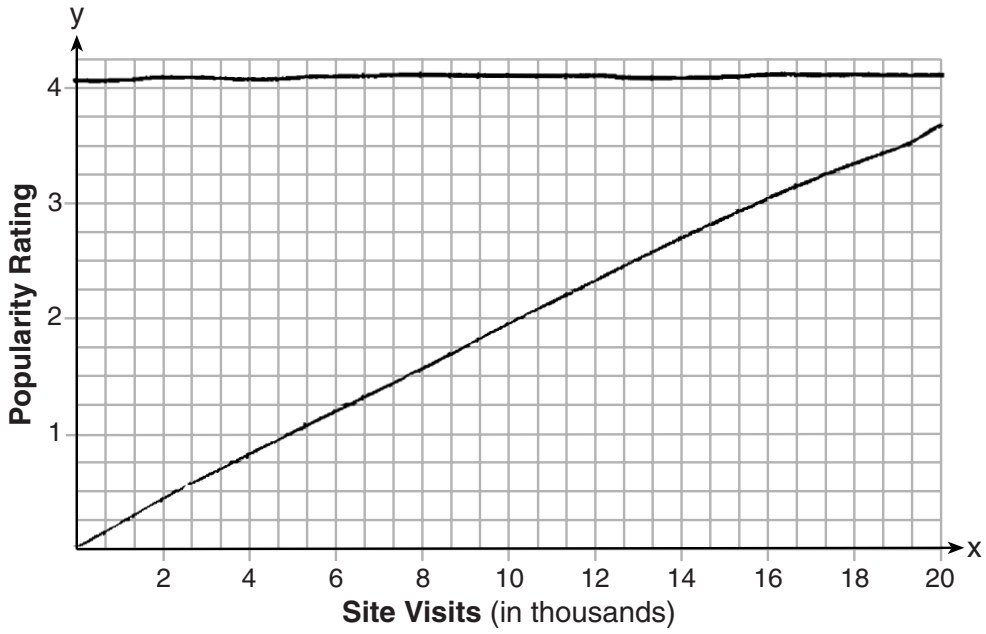
37 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating.

According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

4.2

$P(x) = \log(16000 - 4)$

Graph $y = P(x)$ on the axes below.



11

An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

$\frac{1}{2}x - 6 = 4.2$

$+6 \quad +6$

$\frac{1}{2}x = 10.2$

$x = 20.4$

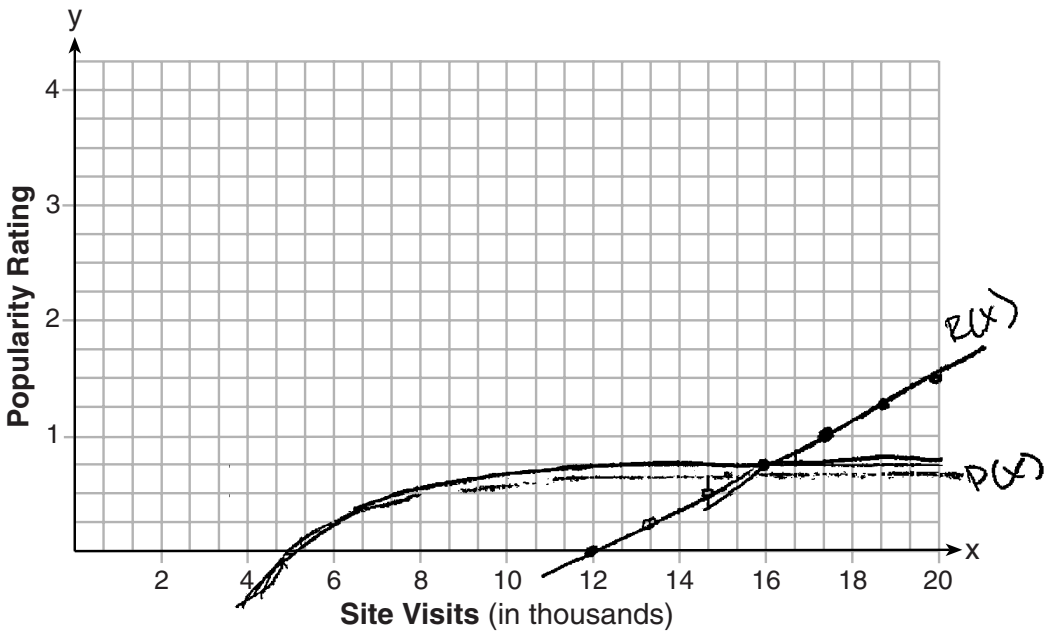
Score 1: The student incorrectly substituted into $P(x)$, but evaluated it correctly, and showed no further correct work.

Question 37

37 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating.

According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

16,000 visitors

Score 1: The student made a rounding error and multiple graphing errors, but received credit for reading the graph correctly in the third part.

Question 37

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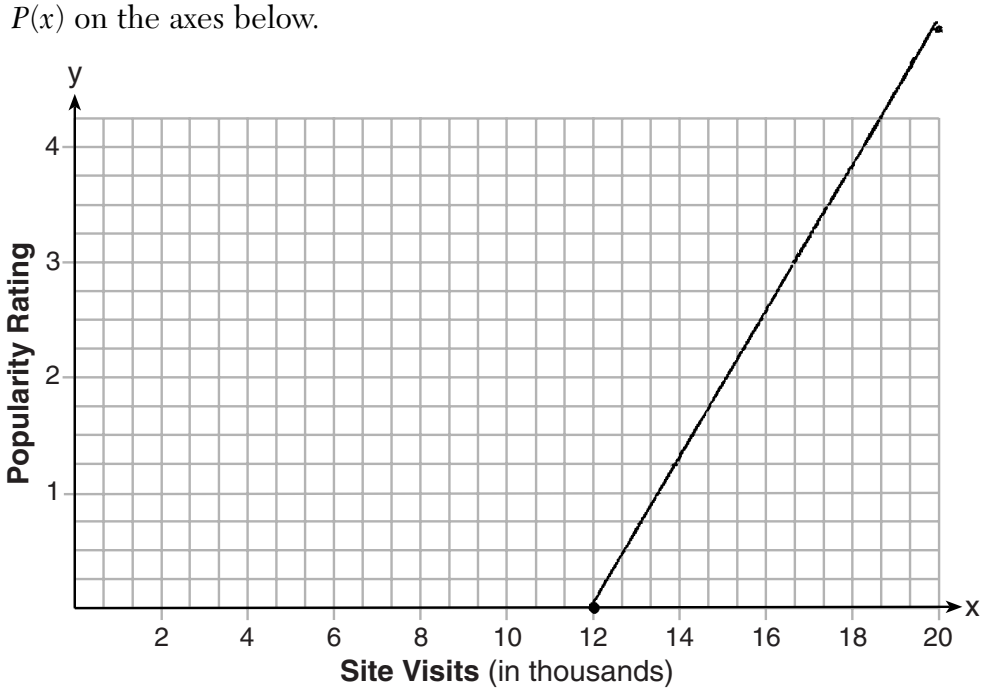
According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

Score 0: The student incorrectly graphed the linear function and did nothing else.

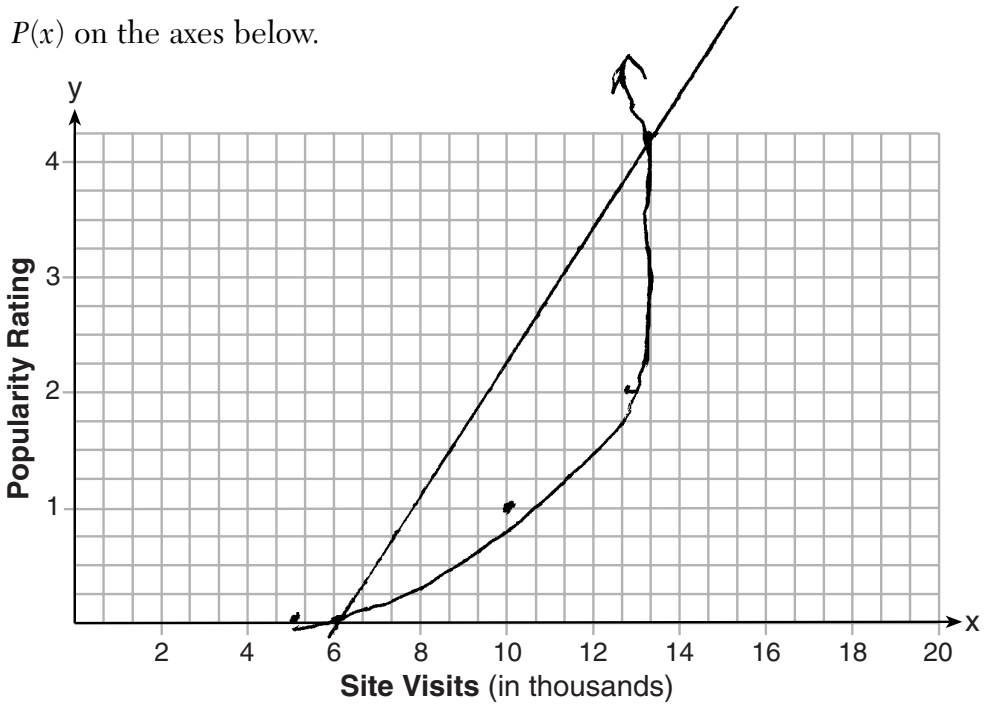
Question 37

37 Website popularity ratings are often determined using models that incorporate the number of visits per week a website receives. One model for ranking websites is $P(x) = \log(x - 4)$, where x is the number of visits per week in thousands and $P(x)$ is the website's popularity rating.

According to this model, if a website is visited 16,000 times in one week, what is its popularity rating, rounded to the *nearest tenth*?

1.2

Graph $y = P(x)$ on the axes below.



An alternative rating model is represented by $R(x) = \frac{1}{2}x - 6$, where x is the number of visits per week in thousands. Graph $R(x)$ on the same set of axes. For what number of weekly visits will the two models provide the same rating?

14

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

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

Regents Examination in Algebra II – June 2018

Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)

(Use for the June 2018 exam only.)

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