ALGEBRA

II

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

ALGEBRA II

Wednesday, June 22, 2022 — 9:15 a.m. to 12:15 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 For all positive values of x, which expression is equivalent to $x^{\frac{3}{4}}$?

(1) $\sqrt[4]{x^3}$ (3) $(x^3)^4$

(2) $\sqrt[3]{x^4}$ (4) $3(x^4)$

2 Mrs. Favata's statistics class wants to conduct a survey to see how students feel about changing the school mascot's name. Which plan is the best process for gathering an appropriate sample?

(1) Survey students in a random sample of senior homerooms.

(2) Survey every tenth student entering art classes in the school.

(3) Survey every fourth student entering the cafeteria during each lunch period.

(4) Survey all members of the school's varsity sports teams.

3 Given $x \neq -3$, the expression $\dfrac{2x^3 + 7x^2 - 3x - 25}{x + 3}$ is equivalent to

(1) $2x^2 + x - 6 - \dfrac{7}{x+3}$ (3) $2x^2 + x - 13$

(2) $2x^2 + 13x - 36 + \dfrac{83}{x+3}$ (4) $x^2 + 4x - 15 + \dfrac{20}{x+3}$

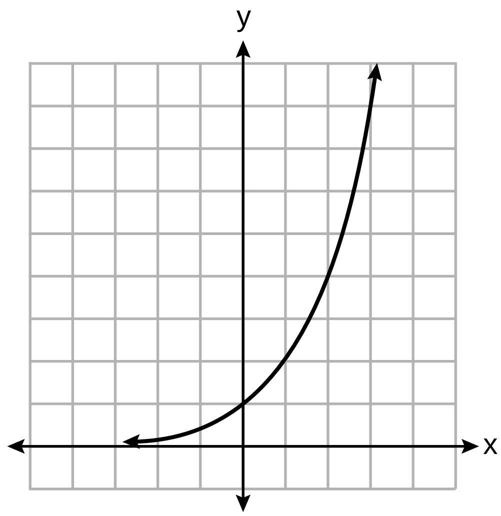
Use this space for computations.

4 In a group of 40 people, 20 have brown hair, 22 have blue eyes, and 15 have both brown hair and blue eyes. How many people have neither brown hair nor blue eyes?

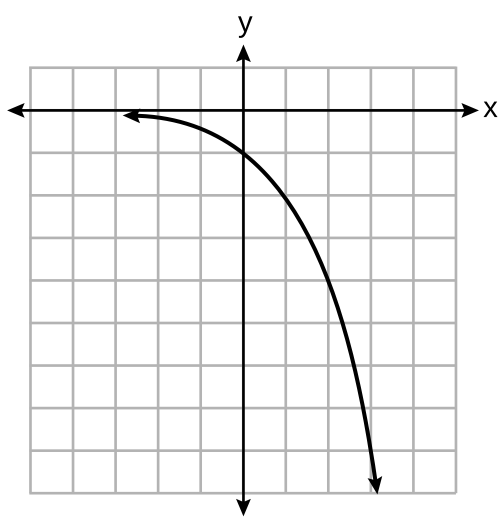
(1) 0 (3) 27

(2) 13 (4) 32

5 Consider the function $y = h(x)$, defined by the graph below.



Which equation could be used to represent the graph shown below?



(1) $y = h(x) - 2$ (3) $y = -h(x)$

(2) $y = h(x - 2)$ (4) $y = h(-x)$

Use this space for computations.

6 For the polynomial $p(x)$, if $p(3) = 0$, it can be concluded that

(1) $x + 3$ is a factor of $p(x)$

(2) $x - 3$ is a factor of $p(x)$

(3) when $p(x)$ is divided by 3, the remainder is zero

(4) when $p(x)$ is divided by -3, the remainder is zero

7 The solution to the equation $5e^{x+2} = 7$ is

(1) $-2 + ln\left(\frac{7}{5}\right)$

(2) $\left(\frac{ln\ 7}{ln\ 5}\right) - 2$

(3) $\frac{-3}{5}$

(4) $-2 + ln(2)$

8 Consider the system of equations below.

$$\begin{aligned} x + 2y - z &= 1 \\ -x - 3y + 2z &= 0 \\ 2x - 4y + z &= 10 \end{aligned}$$

What is the solution to the given system of equations?

(1) (1,1,2)

(2) (3,−1,0)

(3) (5,−1,2)

(4) (3,5,8)

Use this space for computations.

9 Monthly mortgage payments can be found using the formula below, where M is the monthly payment, P is the amount borrowed, r is the annual interest rate, and n is the total number of monthly payments.

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

If Adam takes out a 15-year mortgage, borrowing \$240,000 at an annual interest rate of 4.5%, his monthly payment will be

(1) \$1379.09 (3) \$1835.98

(2) \$1604.80 (4) \$9011.94

10 For all real values of x, if $f(x) = (x - 3)^2$ and $g(x) = (x + 3)^2$, what is $f(x) - g(x)$?

(1) -18 (3) $-12x$

(2) 0 (4) $2x^2 - 12x - 18$

11 If $f(t) = 50(.5)^{\frac{t}{5715}}$ represents a mass, in grams, of carbon-14 remaining after t years, which statement(s) must be true?

I. The mass of the carbon-14 is decreasing by half each year.

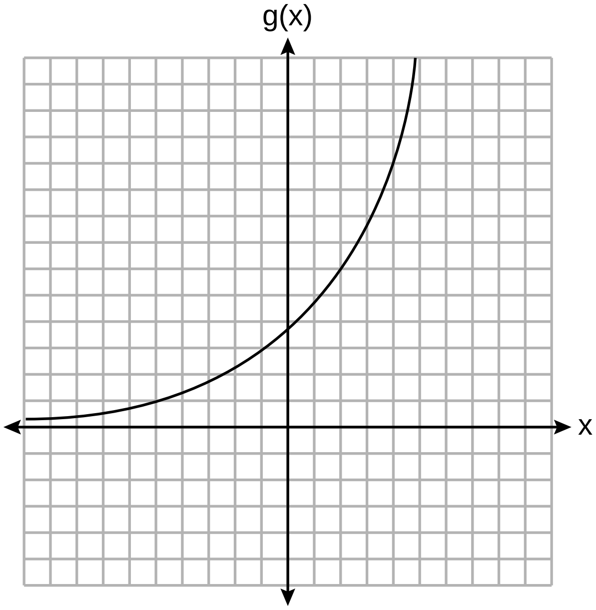
II. The mass of the original sample is 50 g.

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

(2) II, only (4) neither I nor II

Use this space for computations.

12 Consider the graph of g and the table representing t below.



x	t(x)
–1	3
0	5
1	2
2	–5
3	–1
4	3

Over the interval [2, 4], which statement regarding the average rate of change for g and t is true?

(1) g has a greater average rate of change.

(2) The average rates of change are equal.

(3) The average rate of change for g is twice the average rate of change for t.

(4) The average rate of change for g is half the average rate of change for t.

13 A parabola has a directrix of $y = 3$ and a vertex at (2,1). Which ordered pair is the focus of the parabola?

(1) $(2,-1)$

(2) (2,0)

(3) (2,2)

(4) (2,5)

Use this space for computations.

14 The heights of the 3300 students at Oceanview High School are approximately normally distributed with a mean of 65.5 inches and a standard deviation of 2.9 inches. The number of students at Oceanview who are between 64 and 68 inches tall is closest to

(1) 1660
(2) 1070
(3) 2244
(4) 1640

15 Which statement below about the graph of $f(x) = -\log(x + 4) + 2$ is true?

(1) $f(x)$ has a y-intercept at (0,2).
(2) $-f(x)$ has a y-intercept at (0,2).
(3) As $x \to \infty, f(x) \to \infty$.
(4) As $x \to -4, f(x) \to \infty$.

16 A researcher wants to determine if room-darkening shades cause people to sleep longer. Which method of data collection is most appropriate?

(1) census
(2) survey
(3) observation study
(4) controlled experiment

17 The inverse of $f(x) = -6x + \frac{1}{2}$ is

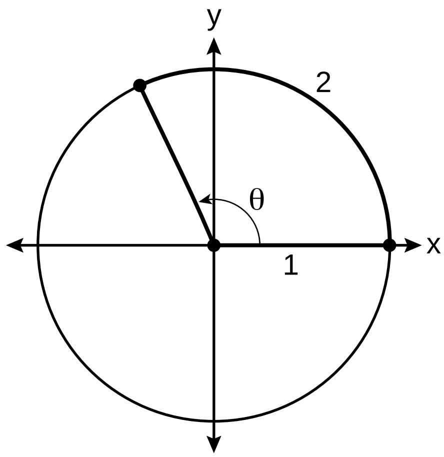
(1) $f^{-1}(x) = 6x - \frac{1}{2}$
(2) $f^{-1}(x) = \dfrac{1}{-6x + \frac{1}{2}}$
(3) $f^{-1}(x) = -\frac{1}{6}x + \frac{1}{12}$
(4) $f^{-1}(x) = -\frac{1}{6}x + 2$

18 The expression $\dfrac{x^2 + 12}{x^2 + 3}$ can be rewritten as

(1) $\dfrac{10}{x^2 + 3}$
(2) $1 + \dfrac{9}{x^2 + 3}$
(3) $x + 9$
(4) 4

Use this space for computations.

19 An angle, θ, is rotated counterclockwise on the unit circle, with its terminal side in the second quadrant, as shown in the diagram below.



Which value represents the radian measure of angle θ?

(1) 1 (3) 65.4

(2) 2 (4) 114.6

20 The depth of the water, $d(t)$, in feet, on a given day at Thunder Bay, t hours after midnight is modeled by $d(t) = 5\sin\left(\frac{\pi}{6}(t - 5)\right) + 7$.

Which statement about the Thunder Bay tide is *false*?

(1) A low tide occurred at 2 a.m.

(2) The maximum depth of the water was 12 feet.

(3) The water depth at 9 a.m. was approximately 11 feet.

(4) The difference in water depth between high tide and low tide is 14 feet.

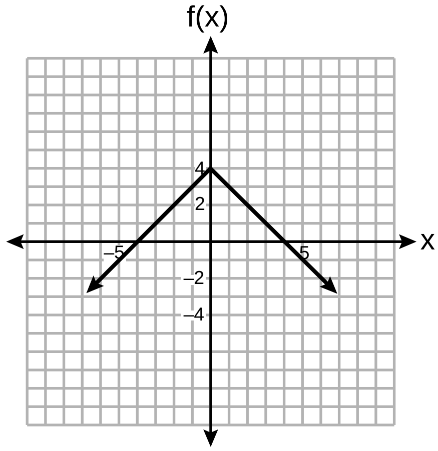
21 A function is defined as $a_n = a_{n-1} + \log_{n+1}(n - 1)$, where $a_1 = 8$. What is the value of a_3?

(1) 8 (3) 9.2

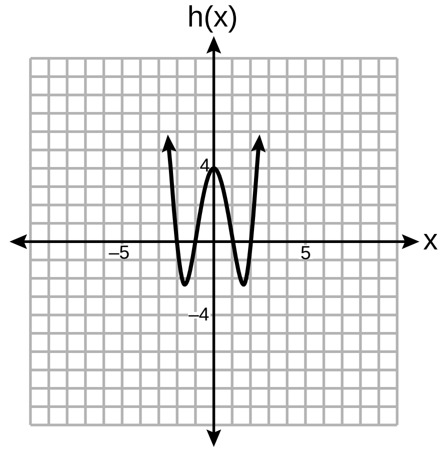
(2) 8.5 (4) 10

Use this space for computations.

22 Which function has a maximum y-value of 4 and a midline of $y = 1$?



(1)



(3)

$g(x) = -3\cos(x) + 1$

(2)

$j(x) = 4\sin(x) + 1$

(4)

23 Which expression is equivalent to $(x + yi)(x^2 - xyi - y^2)$, where i is the imaginary unit?

(1) $x^3 + y^3i$

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

(3) $x^3 - 2xy^2 - y^3i$

(4) $x^3 - y^3i$

24 The growth of a \$500 investment can be modeled by the function $P(t) = 500(1.03)^{t}$, where t represents time in years. In terms of the monthly rate of growth, the value of the investment can be best approximated by

(1) $P(t) = 500(1.00247)^{12t}$

(2) $P(t) = 500(1.00247)^{t}$

(3) $P(t) = 500(1.03)^{12t}$

(4) $P(t) = 500(1.03)^{\frac{t}{12}}$

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 Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.

26 The initial push of a child on a swing causes the swing to travel a total of 6 feet. Each successive swing travels 80% of the distance of the previous swing. Determine the total distance, to the *nearest hundredth of a foot*, a child travels in the first five swings.

27 Solve algebraically for n: $\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$.

28 Factor completely over the set of integers:

$$-2x^4 + x^3 + 18x^2 - 9x$$

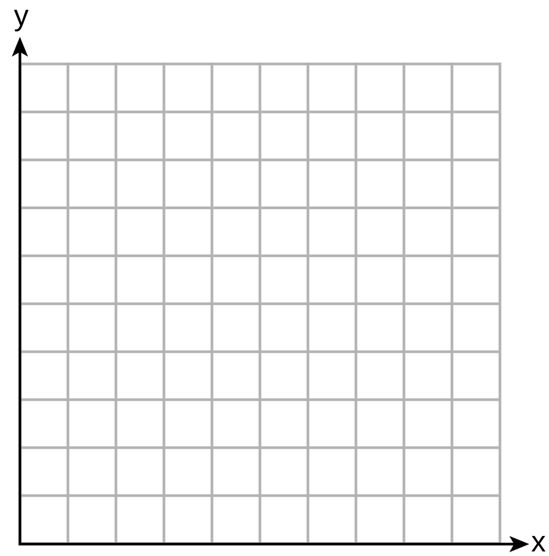
29 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

	Wear Glasses	**Don't Wear Glasses**
Blue Eyes	0.14	0.26
Brown Eyes	0.11	0.24
Green Eyes	0.10	0.15

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

30 For $x \neq 0$ and $y \neq 0$, $\sqrt[3]{81x^{15}y^{9}} = 3^{a}x^{5}y^{3}$. Determine the value of a.

31 Graph $y = 2\cos\left(\frac{1}{2}x\right) + 5$ on the interval $[0,2\pi]$, using the axes below.



32 A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

t	0	5	10	15	20	25
F(t)	180	144	120	104	93.3	86.2

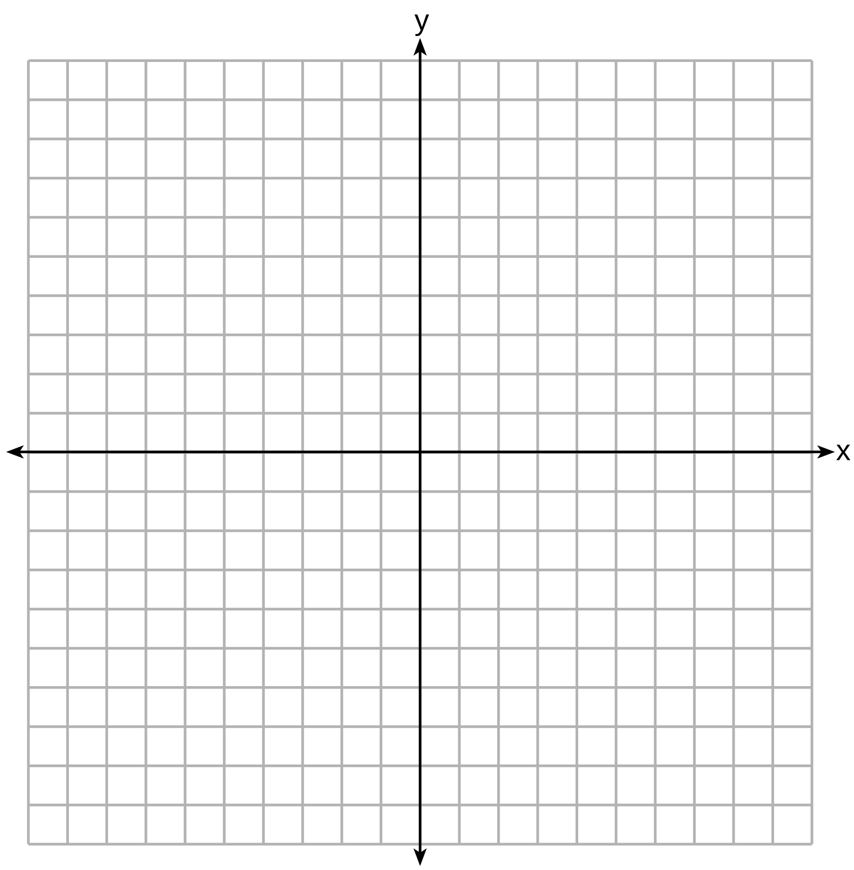
Based on these data, write an exponential regression equation, $F(t)$, to model the temperature of the coffee. Round all values to the *nearest thousandth*.

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 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



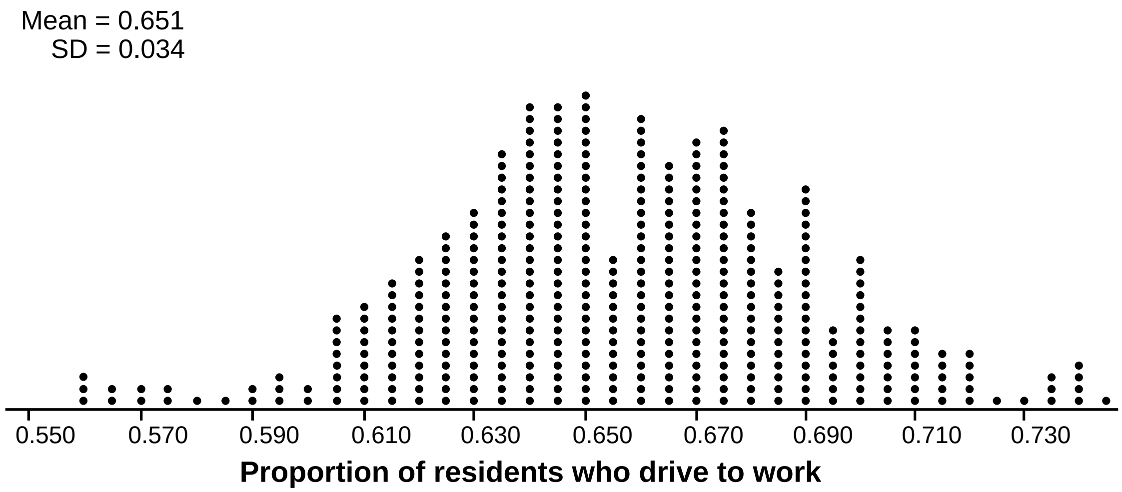
State the number of solutions to the equation $f(x) = g(x)$.

34 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2.

The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing.

Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*.

One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

36 Solve the system of equations algebraically:

$$x^2 + y^2 = 25$$
$$y + 5 = 2x$$

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 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

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

ALGEBRA II

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ALGEBRA II

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

Regents Examination in Algebra II – June 2022

Scoring Key: Part I (Multiple-Choice Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Algebra II	June '22	**1**	1	MC	2	1
Algebra II	June '22	**2**	3	MC	2	1
Algebra II	June '22	**3**	1	MC	2	1
Algebra II	June '22	**4**	2	MC	2	1
Algebra II	June '22	**5**	3	MC	2	1
Algebra II	June '22	**6**	2	MC	2	1
Algebra II	June '22	**7**	1	MC	2	1
Algebra II	June '22	**8**	2	MC	2	1
Algebra II	June '22	**9**	3	MC	2	1
Algebra II	June '22	**10**	3	MC	2	1
Algebra II	June '22	**11**	2	MC	2	1
Algebra II	June '22	**12**	4	MC	2	1
Algebra II	June '22	**13**	1	MC	2	1
Algebra II	June '22	**14**	1	MC	2	1
Algebra II	June '22	**15**	4	MC	2	1
Algebra II	June '22	**16**	4	MC	2	1
Algebra II	June '22	**17**	3	MC	2	1
Algebra II	June '22	**18**	2	MC	2	1
Algebra II	June '22	**19**	2	MC	2	1
Algebra II	June '22	**20**	4	MC	2	1
Algebra II	June '22	**21**	2	MC	2	1
Algebra II	June '22	**22**	2	MC	2	1
Algebra II	June '22	**23**	4	MC	2	1
Algebra II	June '22	**24**	1	MC	2	1

Regents Examination in Algebra II – June 2022

Scoring Key: Parts II, III, and IV (Constructed-Response Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Algebra II	June '22	**25**	-	CR	2	1
Algebra II	June '22	**26**	-	CR	2	1
Algebra II	June '22	**27**	-	CR	2	1
Algebra II	June '22	**28**	-	CR	2	1
Algebra II	June '22	**29**	-	CR	2	1
Algebra II	June '22	**30**	-	CR	2	1
Algebra II	June '22	**31**	-	CR	2	1
Algebra II	June '22	**32**	-	CR	2	1
Algebra II	June '22	**33**	-	CR	4	1
Algebra II	June '22	**34**	-	CR	4	1
Algebra II	June '22	**35**	-	CR	4	1
Algebra II	June '22	**36**	-	CR	4	1
Algebra II	June '22	**37**	-	CR	6	1

Key
MC = Multiple-choice question
CR = Constructed-response question

The chart for determining students' final examination scores for the **June 2022 Regents Examination in Algebra II** will be posted on the Department's web site at: https://www.nysedregents.org/algebratwo/ on the day of the examination. Conversion charts provided for the previous administrations of the Regents Examination in Algebra II must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

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

ALGEBRA II

Wednesday, June 22, 2022 — 9:15 a.m. to 12:15 p.m., only

RATING GUIDE

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.nysed.gov/state-assessment/high-school-regents-examinations 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 intended 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 https://www.nysedregents.org/algebratwo/.

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 constructed-response 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.nysed.gov/state-assessment/high-school-regents-examinations by Wednesday, June 22, 2022. 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.

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]** A positive response is indicated and a correct justification is given.

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

or

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

or

[1] Appropriate work is shown, but yes is not indicated.

or

[1] Yes, but an incomplete justification is given.

[0] Yes, but no justification is given.

or

[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]** 20.17, 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] 20.17, but no work is shown.

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

(27) **[2]** $\frac{2}{3}$, and correct algebraic work is shown.

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

or

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

or

[1] $\frac{2}{3}$, but a method other than algebraic is used.

or

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

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

(28) **[2]** $x(-2x + 1)(x + 3)(x - 3)$ or equivalent and correct work is shown.

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

or

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

or

[1] $x(-2x + 1)(x + 3)(x - 3)$, but no work is shown.

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

(29) **[2]** A positive response is indicated, 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] Yes, but an incomplete justification is given.

[0] Yes, but the justification is incorrect or missing.

or

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

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

(31) **[2]** A correct cosine graph is drawn over the interval $[0,2\pi]$.

[1] Appropriate work is shown, but one graphing or labeling 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.

(32) **[2]** $F(t) = 169.136(0.971)^t$ or equivalent.

[1] One computational, rounding, or notation 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.

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]** Correct graphs are drawn, and 3.

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

or

[3] $y = f(x)$ and $y = g(x)$ are graphed correctly, but no further correct work is shown.

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

or

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

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

or

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

or

[1] 3, 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.

(34) **[4]** 16.4 and 22.9, and correct work is shown.

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

or

[3] Appropriate work is shown to find 22.9, but no further correct work is shown.

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

or

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

or

[2] 16.4 and 22.9, but no work is shown.

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

or

[1] 16.4, 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.

(35) **[4]** A correct interval, such as (0.58,0.72), and correct work is shown, a negative response is indicated, and a correct statistical explanation is provided.

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

[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 (0.58,0.72), but no further correct work is shown.

or

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

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

or

[1] (0.58,0.72), but no work is shown.

[0] No, but no statistical 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.

(36) **[4]** $(0,-5)$ and $(4,3)$ or equivalent solutions, and correct algebraic work is shown.

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

or

[3] Appropriate work is shown to find one solution, or to find either both x-values or both y-values, but no further correct work is shown.

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

or

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

or

[2] A quadratic equation in standard form is written, but no further correct work is shown.

or

[2] Appropriate work is shown to find (0, –5) and (4, 3), but a method other than algebraic is used.

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

or

[1] A correct quadratic equation in one variable is written, but no further correct work is shown.

or

[1] $(0,-5)$ and $(4,3)$, but no work is shown.

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

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]** 1.5, a correct function is written, such as $P(t) = 92.2(1.015)^t$ or $P(t) = 92.2e^{0.015t}$, 79 and correct algebraic work shown.

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

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

or

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

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

or

[3] Appropriate work is shown to find 79, but no further correct work is shown.

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

or

[2] $P(t) = 92.2(1.015)^t$, is written, but no further correct work is shown.

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

or

[1] 1.5 or 79 is stated, 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 2022

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

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

Regents Examination in Algebra II

June 2022

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

The *Chart for Determining the Final Examination Score for the June 2022 Regents Examination in Algebra II* will be posted on the Department's web site at: http://www.nysed.gov/state-assessment/high-school-regents-examinations by Wednesday, June 22, 2022. 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 https://www.surveymonkey.com/r/8LNLLDW.

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

Wednesday, June 22, 2022 — 9:15 a.m. to 12:15 p.m., only

MODEL RESPONSE SET

Table of Contents

Question 25

25 Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.

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

$$x = \frac{(-4) \pm \sqrt{(-4)^2 - 4(1)(13)}}{2(1)}$$

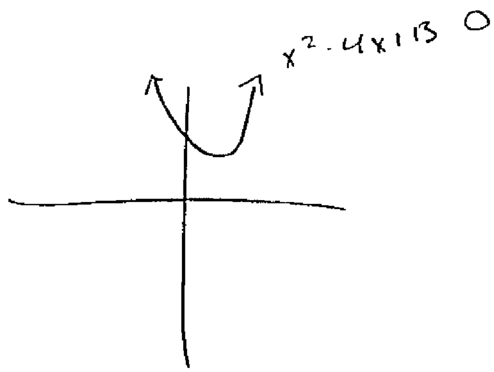
$$x = \frac{4 \pm \sqrt{-36}}{2}$$

Yes the equation has imaginary solution because there is a negitive number under the radical.

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

Question 25

25 Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.



Yes the equation does have imaginary solutions because when you graph it, it doesn't pass through the x axis. Meaning it has no real roots or solutions

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

Question 25

25 Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.

$$\sqrt{b^2+4ac}$$

$$(-4)^2+4(1)(13)$$

$$\sqrt{68}$$

no, the # under the $\sqrt{\ }$ is positive, which means it is not imaginary.

Score 1: The student used the wrong formula for the discriminant.

Question 25

25 Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.

$$x^2 - 4x + 13 = 0$$

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

$$\frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(13)}}{2(1)}$$

$$\frac{4 \pm \sqrt{16 - 4(13)}}{2}$$

$$\frac{4 \pm \sqrt{-36}}{2} \qquad \frac{\overset{2}{4} \pm \overset{2}{6i}}{\underset{2}{2}}$$

$$\frac{2 \pm 3i}{2}$$

Yes, it does have imaginary solutions.

Score 1: The student simplified incorrectly.

Question 25

25 Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.

$x^2 - 4x + 13 = 0$

$-13 = -13$

$x - 4x = -13 + 4$

$x - 4x + 2x$

$x - 4x + 2x = \sqrt{9}$

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

No, the equation $x^2 - 4x + 13 = 0$ doesn't have imaginary solution, it has only one solution which is 3.

Score 0: The student gave a completely incorrect response.

Question 25

25 Does the equation $x^2 - 4x + 13 = 0$ have imaginary solutions? Justify your answer.

$$x^2 \cdot 4x + 13 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4(A)(C)}}{2(A)}$$

$$x = \frac{-(-4) \pm \sqrt{4^2 - 4(1)(13)}}{2(1)}$$

$$x = \frac{4 \pm \sqrt{-36}}{2}$$

$$x = 2 \pm \sqrt{-36}$$

Score 0: The student made a simplification error and did not indicate the solutions are imaginary.

Question 26

26 The initial push of a child on a swing causes the swing to travel a total of 6 feet. Each successive swing travels 80% of the distance of the previous swing. Determine the total distance, to the *nearest hundredth of a foot*, a child travels in the first five swings.

$a_1 = 6$
$r = 0.80$

$$S_5 = \frac{6 - 6(0.80)^5}{1 - 0.80}$$

$$S_5 = 20.17$$

A child travels 20.17 feet in total in the first five swings

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

Question 26

26 The initial push of a child on a swing causes the swing to travel a total of 6 feet. Each successive swing travels 80% of the distance of the previous swing. Determine the total distance, to the *nearest hundredth of a foot*, a child travels in the first five swings.

1 swing = 6 feet

2nd swing = 4.8 feet

3rd swing = 3.84 feet

4th swing = 3.072 ft

5th swing + = 2.4576 ft

20.1696 ft

Total distance: 20.17 feet

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

Question 26

26 The initial push of a child on a swing causes the swing to travel a total of 6 feet. Each successive swing travels 80% of the distance of the previous swing. Determine the total distance, to the *nearest hundredth of a foot*, a child travels in the first five swings.

$A = A_{n-1}(.80)$

$= 6(.80) = 4.8$ 1)

$4.8(.80) = 3.84$ 2)

3.072 3)

2.4576 4)

1.96608 5)

$= 16.13568$

$\downarrow$

16.14 feet

Score 1: The student calculated the sum of swings 2 through 6.

Question 26

26 The initial push of a child on a swing causes the swing to travel a total of 6 feet. Each successive swing travels 80% of the distance of the previous swing. Determine the total distance, to the *nearest hundredth of a foot*, a child travels in the first five swings.

Swing 1: 6 ft

$6 \cdot 0.8 = 4.8$

Swing 2: 4.8 ft

$4.8 \cdot .8 = 3.84$

Swing 3: 3.84 ft

$3.84 \cdot 0.8 = 3.072$

Swing 4: 3.072 ft

$3.072 \cdot 0.8 = 2.4576$

Swing 5: 2.4576

$6 + 4.8 + 3.84 + 3.072 + 2.4576 =$

20.7 ft

Score 1: The student wrote 20.7 instead of 20.17.

Question 26

26 The initial push of a child on a swing causes the swing to travel a total of 6 feet. Each successive swing travels 80% of the distance of the previous swing. Determine the total distance, to the *nearest hundredth of a foot*, a child travels in the first five swings.

6feet

80% of 6 = 4.8

80% of 48 = 38.4

80% of 38.4 = 30.72

80% of 30.72 = 24.58

80% of 24.58 = 19.6608

161.36 ft

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

Question 27

27 Solve algebraically for n: $\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$.

$$\frac{n}{n}$$

$$\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$$

$$\frac{2}{n^2} + \frac{3n}{n^2} = \frac{4}{n^2}$$

$$2 + 3n = 4$$

$$-2 \quad -2$$

$$3n = 2$$

$$\frac{3n}{3} = \frac{2}{3}$$

$$\boxed{n = \frac{2}{3}}$$

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

Question 27

27 Solve algebraically for n: $\frac{2}{\cancel{n^2}} + \frac{3}{\cancel{n}} = \frac{4}{\cancel{n^2}}$.

$$2 + 3n = 4$$

$$3n = 2$$

$$\boxed{n = \frac{2}{3}}$$

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

Question 27

27 Solve algebraically for n: $\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$.

$$n^3 \cdot \frac{2}{\cancel{n^2}} + \frac{3 \; n^{\cancel{3}2}}{\cancel{n}} = \frac{4 \; n^{\cancel{3}}}{\cancel{n^2}}$$

$$2n + 3n^2 = 4n$$

$$-4n \qquad\qquad -4n$$

$$-2n + 3n^2 = 0$$

$$n(-2 + 3n) = 0$$

$$\boxed{n = 0} \qquad -2 + 3n = 0$$

$$+2 \qquad\qquad +2$$

$$\frac{3n}{3} = \frac{2}{3}$$

$$\boxed{n = \frac{2}{3}}$$

Score 1: The student did not reject the extraneous solution.

27 Solve algebraically for n: $\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$.

$$2n^{-2} + 3n^{-1} = 4n^{-2}$$

$$\frac{3n^{-1}}{n^{-1}} = \frac{2n^{-2}}{n^{-1}}$$

$$3 = \frac{2n^{-2}}{n^{-1}}$$

$$\frac{3}{2} = \frac{2n}{2}$$

$$\boxed{n = \frac{3}{2}}$$

Score 1: The student incorrectly simplified the right side of the equation.

Question 27

27 Solve algebraically for n: $\frac{2}{n^2} + \frac{3}{n} = \frac{4}{n^2}$.

$$\frac{2+3n}{\cancel{n^2}} \quad \frac{-4}{\cancel{n^2}}$$

$$2+3n = -4$$
$$-2 \qquad -2$$
$$3n = -6$$
$$\frac{3n}{3} = \frac{-6}{3}$$
$$n = 2$$

Score 0: The student made multiple errors.

Question 28

28 Factor completely over the set of integers:

$$-2x^4 + x^3 + 18x^2 - 9x$$

$-2x^4 + x^3 + 18x^2 - 9x$

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

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

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

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

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

Question 28

28 Factor completely over the set of integers:

$$(-2x^4 + x^3)(+ 18x^2 - 9x)$$

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

$$(-x^2+9)\ (2x^2-x)$$

$$-1(x^2-9)$$

$$\boxed{-1(x-3)(x+3)\ x(2x-1)}$$

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

Question 28

28 Factor completely over the set of integers:

$$\underbrace{-2x^4 + x^3} + \underbrace{18x^2 - 9x}$$

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

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

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

Score 1: The student did not factor completely.

Question 28

28 Factor completely over the set of integers:

$$\underbrace{-2x^4 + x^3} + \underbrace{18x^2 - 9x}$$

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

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

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

Score 1: The student made one factoring error.

Question 28

28 Factor completely over the set of integers:

$$-2x^4 + x^3 + 18x^2 - 9x$$

$x(-2x^3+x^2+18x-9)$

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

Question 29

29 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

	S Wear Glasses	N Don't Wear Glasses
L Blue Eyes	0.14	0.26
B Brown Eyes	0.11	0.24
G Green Eyes	0.10	0.15

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

$P(L|S) = \frac{.14}{.35} = .4$ $\quad P(L|S) \stackrel{?}{=} P(L)$

$P(L) = .4$

$.4 = .4$

They are independent because $P(L|S) = P(L)$

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

Question 29

29 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

	Wear Glasses	Don't Wear Glasses
Blue Eyes	0.14	0.26
Brown Eyes	0.11	0.24
Green Eyes	0.10	0.15

.4

.35

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

$(.4)(.35) = .14$

$.14 = .14$ ✓

Yes, they are independent because the values are equal.

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

Question 29

29 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

	Wear Glasses	Don't Wear Glasses	
Blue Eyes	0.14	0.26	= .4
Brown Eyes	0.11	0.24	
Green Eyes	0.10	0.15	

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

$P(A) = P(A/B)$

$.4 = \frac{.4}{.35}$

$.4 \neq 1.1428...$

No, They are not equal making them not independent from each other

Score 1: The student made one error in determining $P(A|B)$.

Question 29

29 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

	Wear Glasses	Don't Wear Glasses	
Blue Eyes	0.14	0.26	.4
Brown Eyes	0.11	0.24	
Green Eyes	0.10	0.15	
	.35		1

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

$P(A) = \frac{.4}{1} = .4$

$P(B) = \frac{.35}{1} = .35$

$P(A \text{ and } B) = P(A)P(B)$

$.14 = .14$

not independent b/c prob =

Score 1: The student made an incorrect conclusion based on appropriate work.

Question 29

29 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

	Wear Glasses	Don't Wear Glasses
Blue Eyes	0.14	0.26
Brown Eyes	0.11	0.24
Green Eyes	0.10	0.15

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

No, bc $P(A \cap B) = P(B)$

$A = \text{Blue}$

$B = \text{Glasses}$

$P(.14) = .35$

Since they do not equal having blue eyes and wearing glasses is not independent its dependent

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

Question 29

29 The relative frequency table shows the proportion of a population who have a given eye color and the proportion of the same population who wear glasses.

	Wear Glasses	Don't Wear Glasses	
Blue Eyes	0.14	0.26	$\boxed{0.30}$
Brown Eyes	0.11	0.24	
Green Eyes	0.10	0.15	
	$\boxed{0.35}$		

Given the data, are the events of having blue eyes and wearing glasses independent? Justify your answer.

$$\frac{0.14}{0.30} = 0.466\cdots = 47\%$$

$$\frac{0.14}{0.35} = 0.4 = 40\%$$

$$40\% \neq 47\%$$

$\therefore$ is dependent

Score 0: The student made a calculation error and did not complete a test for independence.

Question 30

30 For $x \neq 0$ and $y \neq 0$, $\sqrt[3]{81x^{15}y^9} = 3^a x^5 y^3$. Determine the value of a.

$$\left(\sqrt[3]{81x^{15}y^9}\right)^3 = \left(3^a x^5 y^3\right)^3$$

$$81 \cancel{x^{15}} \cancel{y^9} = 3^{3a} \cancel{x^{15}} \cancel{y^9}$$

$$81 = 3^{3a}$$

$$3^4 = 3^{3a}$$

$$\frac{4}{3} = \frac{3a}{3}$$

$$a = \frac{4}{3}$$

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

Question 30

30 For $x \neq 0$ and $y \neq 0$, $\sqrt[3]{81x^{15}y^{9}} = 3^{a}x^{5}y^{3}$. Determine the value of a.

$$\left(\sqrt[3]{81x^{15}y^{9}}\right)^{3} = \left(3^{a}x^{5}y^{3}\right)^{3}$$

$$\frac{81x^{15}y^{9}}{x^{15}y^{9}} = \frac{3^{3a}x^{15}y^{9}}{x^{15}y^{9}}$$

$$\log(81) = \log(3^{3a})$$

$$\frac{\log(81)}{\log(3)} = \frac{3a\log(3)}{\log(3)}$$

$$\frac{4}{3} = \frac{3a}{3}$$

$$a = \boxed{\frac{4}{3}}$$

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

Question 30

30 For $x \neq 0$ and $y \neq 0$, $\sqrt[3]{81x^{15}y^9} = 3^a x^5 y^3$. Determine the value of a.

$$\sqrt[3]{81}\ \sqrt[3]{x^{15}}\ \sqrt[3]{y^9} = 3^a x^5 y^3$$

$$\sqrt[3]{27}\ \sqrt[3]{3}\quad x^5 \quad y^3$$

$$3^1 \cdot \sqrt[3]{3}\quad x^5 \quad y^3$$

$$3^1 \cdot 3^{\frac{1}{3}} \cdot x^5 y^3 = 3^a x^5 y^3$$

$$3^{\frac{1}{3}} x^5 y^3 = 3^a x^5 y^3$$

$$3^{\frac{1}{3}} = 3^a$$

$$a = \frac{1}{3}$$

Score 1: The student multiplies exponents instead of adding.

Question 30

30 For $x \neq 0$ and $y \neq 0$, $\sqrt[3]{81x^{15}y^9} = 3^a x^5 y^3$. Determine the value of a.

$$\sqrt[3]{81x^{15}y^9} = 3^a = x^5y^3$$

$$81^{1/3}\ x^{15/3}\ y^{9/3} = 3^a\ x^5y^3$$

$$\frac{27x^5y^3}{3a} = \frac{\cancel{3a}x^5y^3}{\cancel{3a}}$$

$$9ax^5y^3 = x^5y^3$$

$$\boxed{a = 3}$$

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

Question 30

30 For $x \neq 0$ and $y \neq 0$, $\sqrt[3]{81x^{15}y^{9}} = 3^{a}x^{5}y^{3}$. Determine the value of a.

$$\sqrt[3]{81x^{15}y^{9}}^{2} = (3^{a}x^{5}y^{3})^{2}$$

$$81x^{15}y^{9} = 3^{2a}x^{10}y^{6}$$

$$-y^{6} \qquad -y^{6}$$

$$81x^{15}y^{3} = 3^{2a}x^{10}$$

$$-x^{10} \qquad -x^{10}$$

$$\frac{81x^{5}y^{3}}{3} = \frac{3^{2a}}{3}$$

$$\frac{81x^{5}y^{3}}{3} = 2a$$

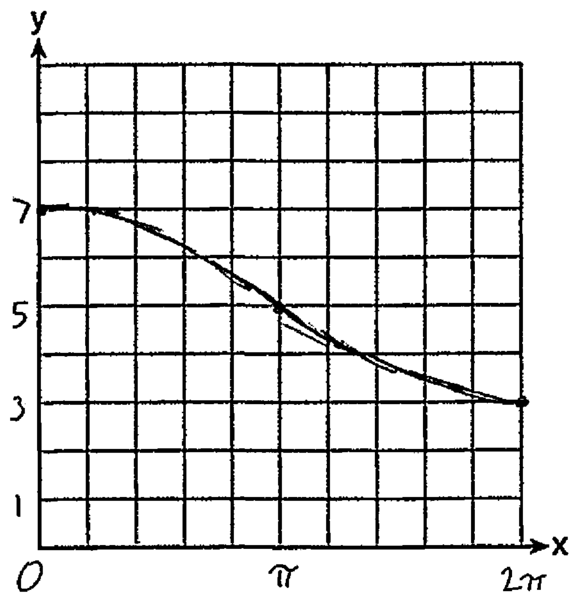
$$\frac{27x^{5}y^{3}}{2} = \frac{2a}{2}$$

$$13.5x^{5}y^{3} = a$$

Score 0: The student gave a completely incorrect response.

Question 31

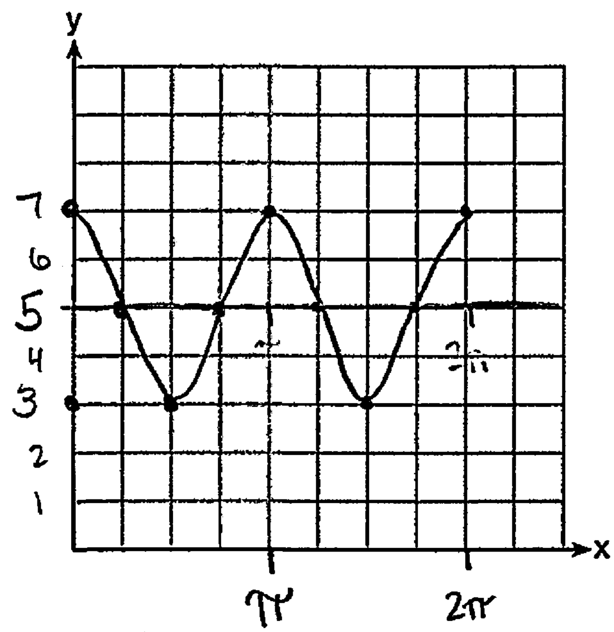
31 Graph $y = 2\cos\left(\frac{1}{2}x\right) + 5$ on the interval $[0,2\pi]$, using the axes below.



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

Question 31

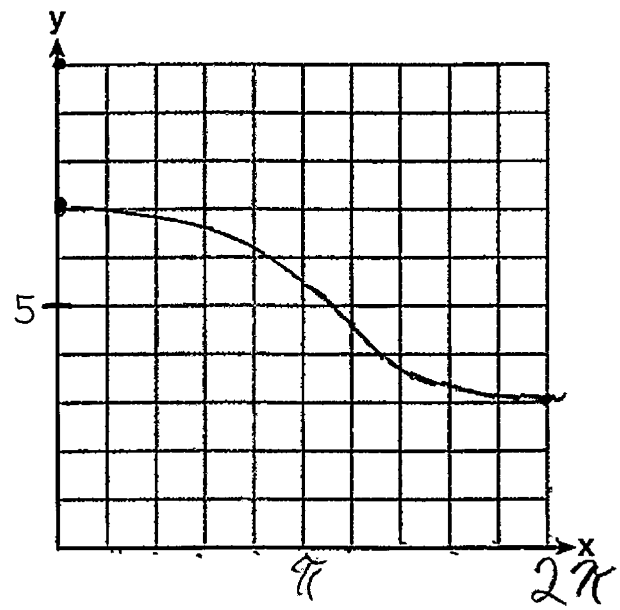
31 Graph $y = 2\cos\left(\frac{1}{2}x\right) + 5$ on the interval $[0,2\pi]$, using the axes below.



Score 1: The student used an incorrect period.

Question 31

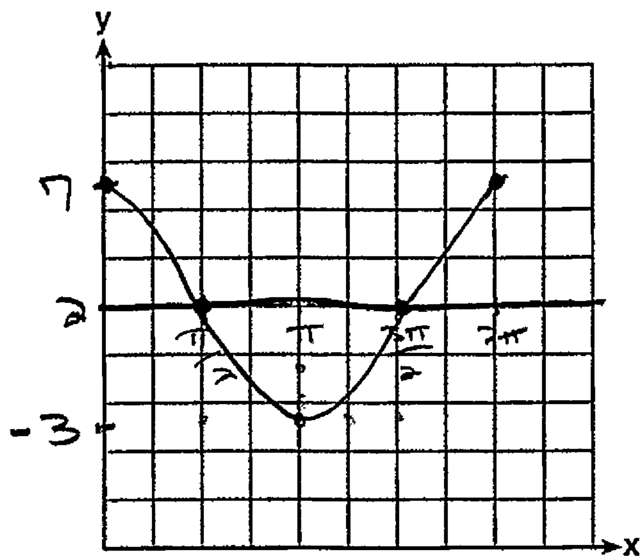
31 Graph $y = 2\cos\left(\frac{1}{2}x\right) + 5$ on the interval $[0,2\pi]$, using the axes below.



Score 1: The student made one graphing error at $x = \pi$.

Question 31

31 Graph $y = 2\cos\left(\frac{1}{2}x\right) + 5$ on the interval $[0,2\pi]$, using the axes below.



$y = 2\cos\frac{1}{2}x + 5$

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

Question 32

32 A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

t	0	5	10	15	20	25
F(t)	180	144	120	104	93.3	86.2

Based on these data, write an exponential regression equation, $F(t)$, to model the temperature of the coffee. Round all values to the *nearest thousandth*.

$$\boxed{F(t) = 169.136(0.971)^t}$$

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

Question 32

32 A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

t	0	5	10	15	20	25
F(t)	180	144	120	104	93.3	86.2

Based on these data, write an exponential regression equation, $F(t)$, to model the temperature of the coffee. Round all values to the *nearest thousandth*.

y = axb^x

a = 169.136

b = 0.971

Score 1: The student made a notation error by not using $F(t)$ and t.

Question 32

32 A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

t	0	5	10	15	20	25
F(t)	180	144	120	104	93.3	86.2

Based on these data, write an exponential regression equation, $F(t)$, to model the temperature of the coffee. Round all values to the *nearest thousandth*.

$F(t) = 171.426(.970)^x$

Score 0: The student made a notation error and wrote an exponential function with incorrect values.

Question 32

32 A cup of coffee is left out on a countertop to cool. The table below represents the temperature, $F(t)$, in degrees Fahrenheit, of the coffee after it is left out for t minutes.

t	0	5	10	15	20	25
F(t)	180	144	120	104	93.3	86.2

Based on these data, write an exponential regression equation, $F(t)$, to model the temperature of the coffee. Round all values to the *nearest thousandth*.

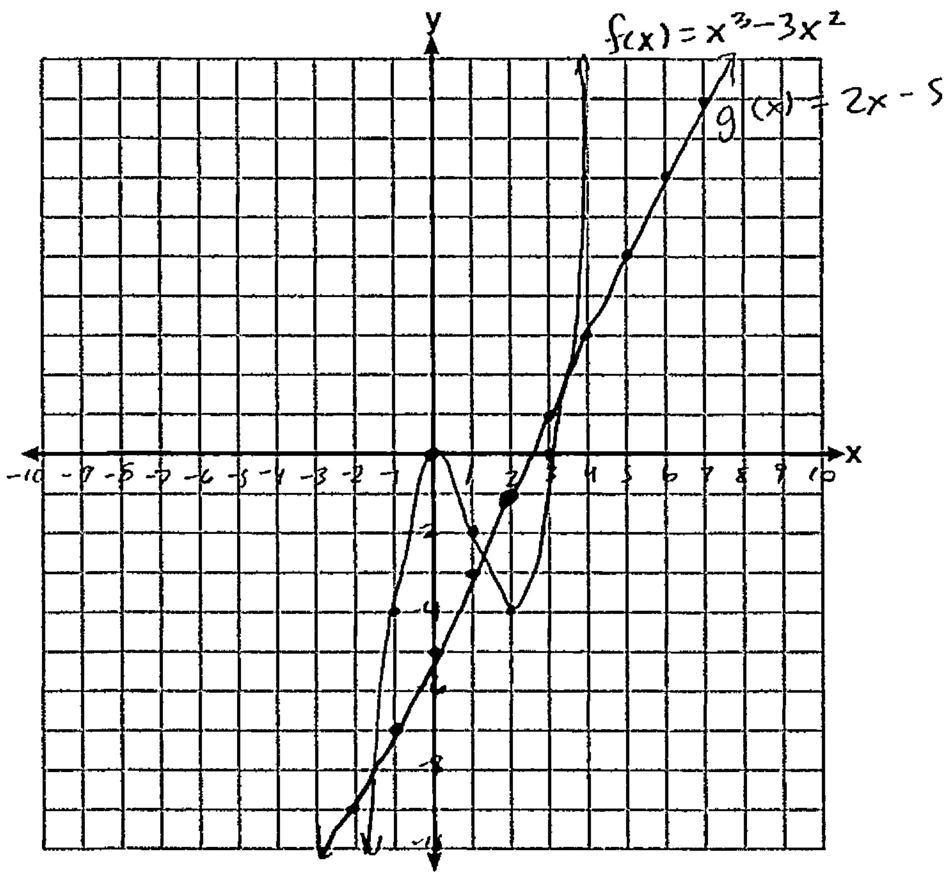
$F(t) = .141x^2 - 7.171x + 178.525$

Score 0: The student made a notation error and used a quadratic regression.

Question 33

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



State the number of solutions to the equation $f(x) = g(x)$.

$x^3 - 3x^2 = 2x - 5$
$+5 \quad -2x + 5$

$x^3 - 3x^2 - 2x + 5 = 0$

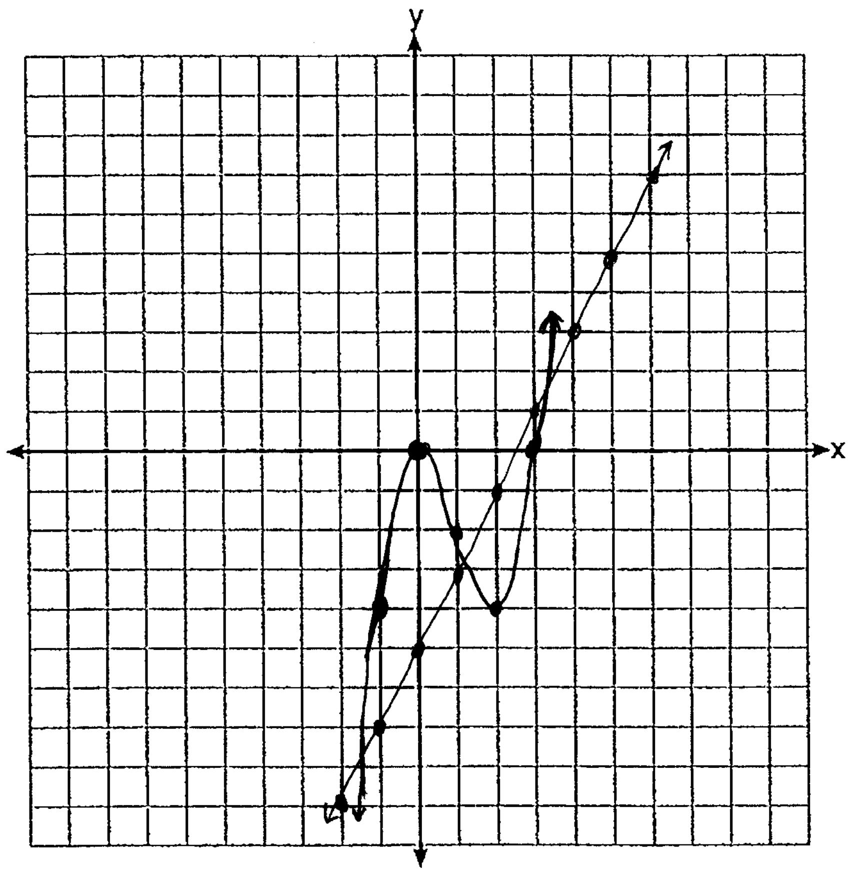
$\boxed{3 \text{ solutions}}$

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

Question 33

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



State the number of solutions to the equation $f(x) = g(x)$.

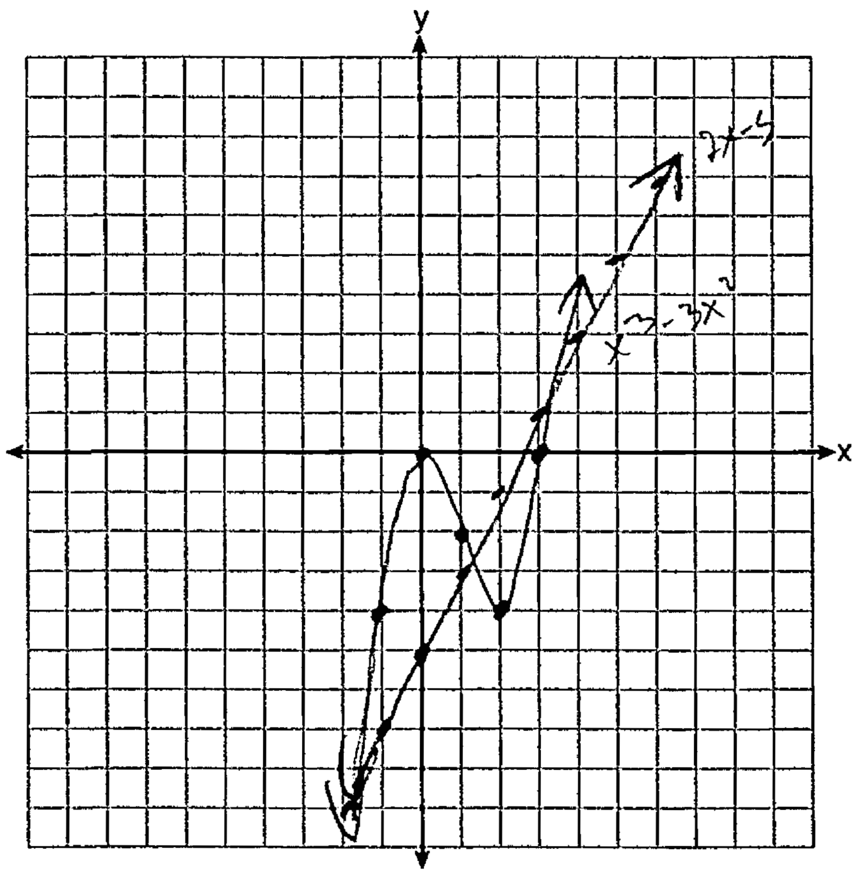
3

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

Question 33

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



State the number of solutions to the equation $f(x) = g(x)$.

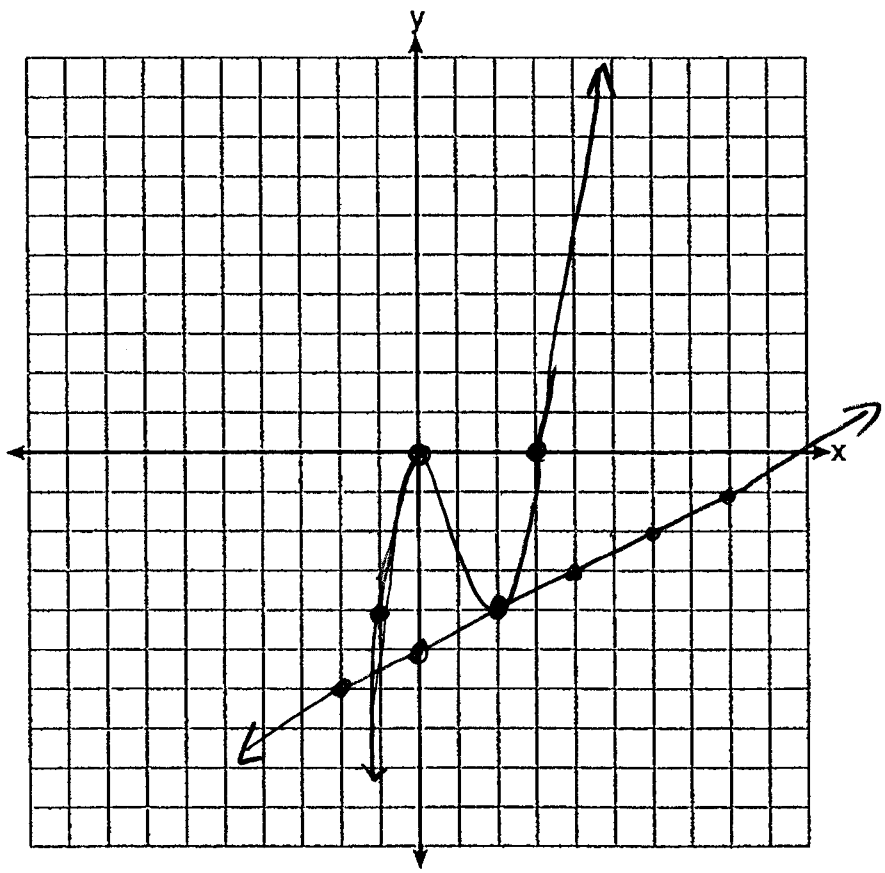
there are no solutions.

Score 3: The student incorrectly stated the number of solutions.

Question 33

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



State the number of solutions to the equation $f(x) = g(x)$.

2

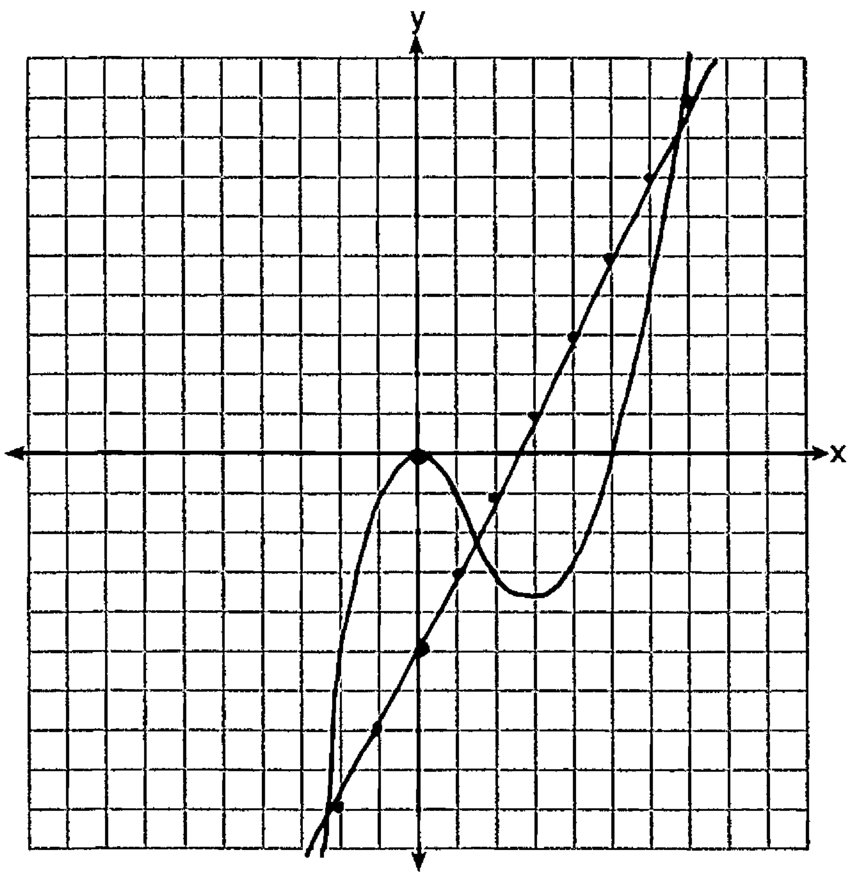
Score 3: The student graphed $y = g(x)$ incorrectly.

Question 33

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$

$x^3 - 3x^2 = 2x - 5$



State the number of solutions to the equation $f(x) = g(x)$.

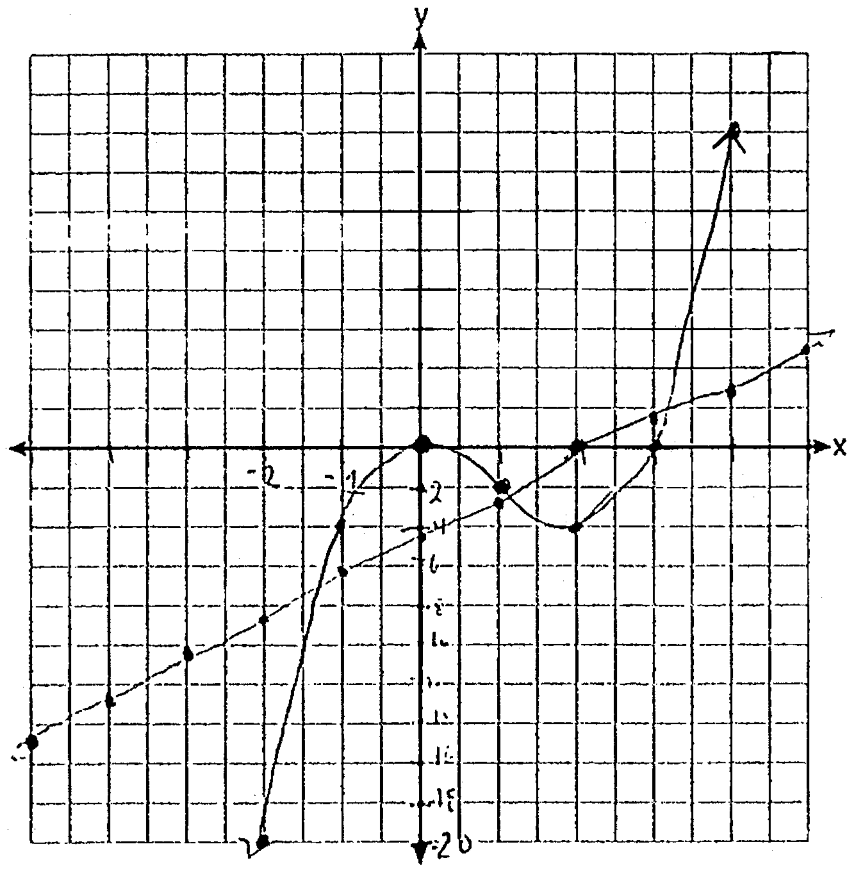
3 ~~zero~~ solutions

Score 2: The student graphed $y = f(x)$ incorrectly.

Question 33

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



State the number of solutions to the equation $f(x) = g(x)$.

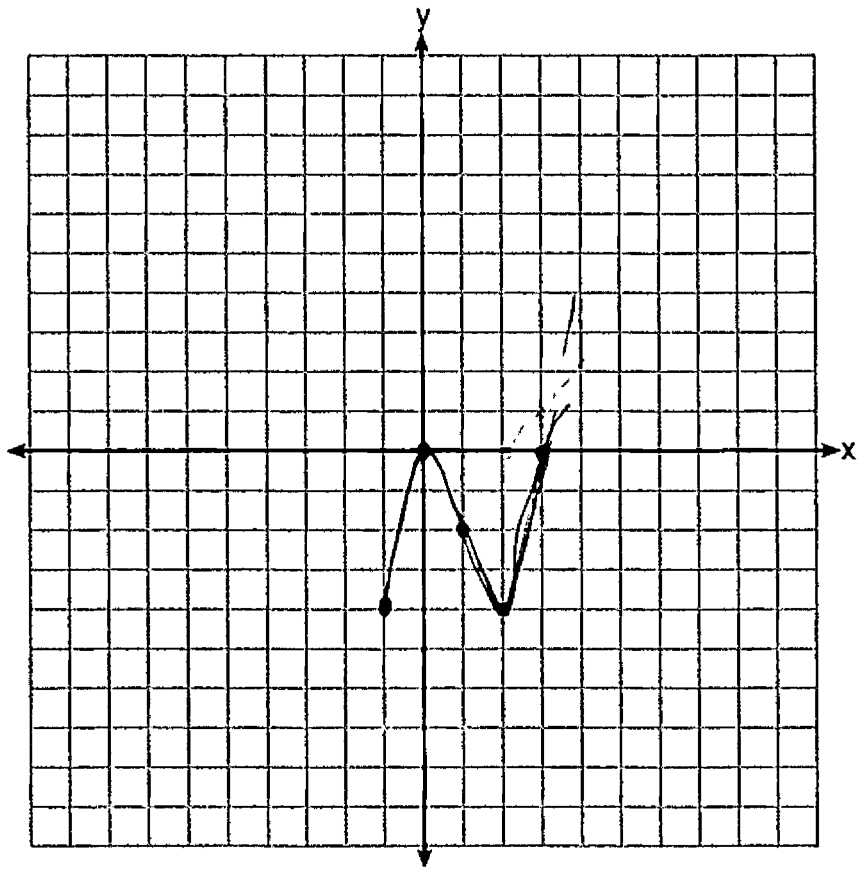
There are no solutions to the equations f(x)=g(x)

Score 2: The student only correctly graphed $y = f(x)$.

Question 33

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



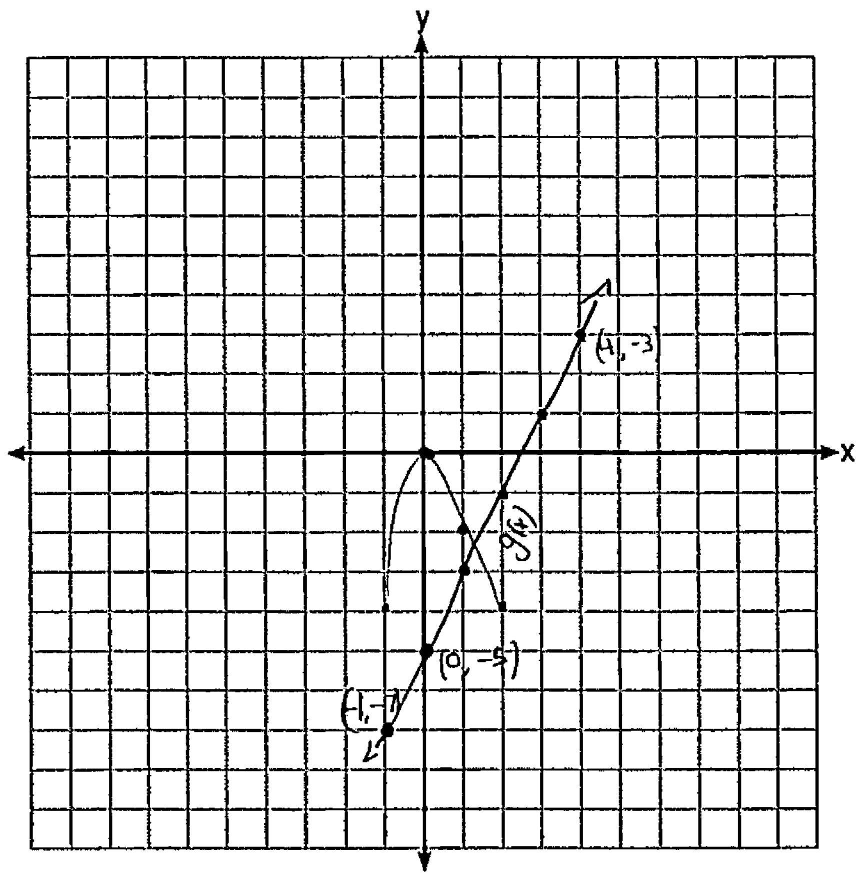
State the number of solutions to the equation $f(x) = g(x)$.

There are zero solutions.

Score 1: The student made a domain error graphing $y = f(x)$ and showed no further correct work.

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



State the number of solutions to the equation $f(x) = g(x)$.

$$x^3 - 3x^2 - 2x + 5 = 0$$

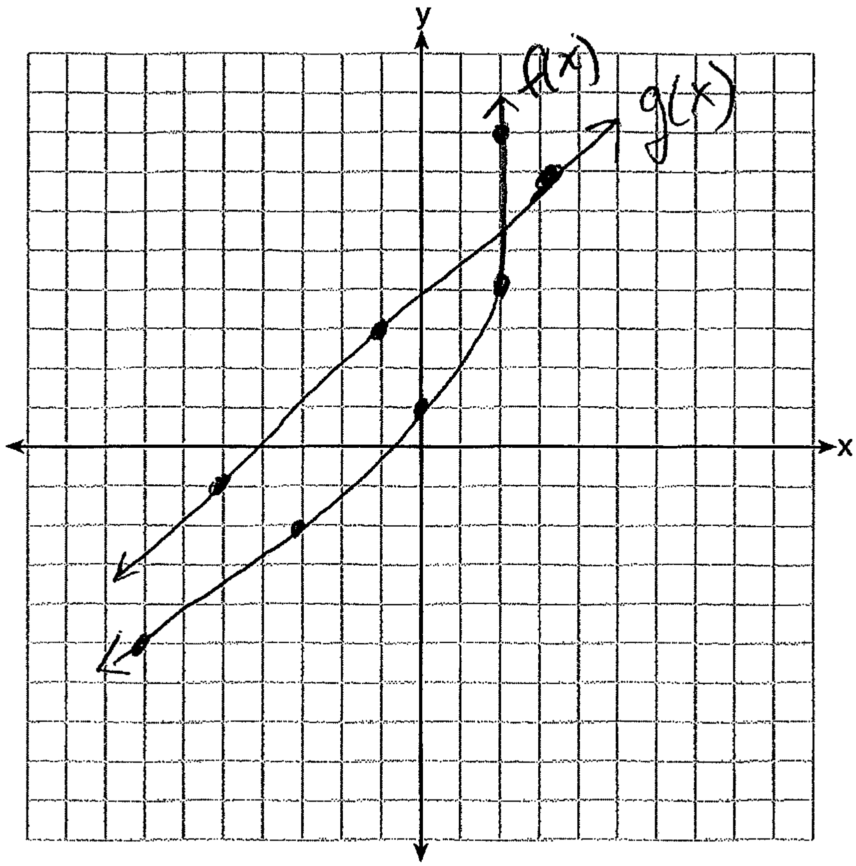
$$(x-3)\left(x^2 - 2 - \frac{1}{x-3}\right.$$

Score 1: The student only correctly graphed $y = g(x)$.

Question 33

33 On the set of axes below, graph $y = f(x)$ and $y = g(x)$ for the given functions.

$$f(x) = x^3 - 3x^2$$
$$g(x) = 2x - 5$$



State the number of solutions to the equation $f(x) = g(x)$.

0 solutions

Score 0: The student gave a completely incorrect response.

Question 34

34 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2.

The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing.

$$t = 2\pi\sqrt{\frac{67}{9.81}}$$

$$t = 2\pi\sqrt{6.829765545}$$

$$t = 2\pi(2.613382013)$$

$$t = 16.4$$

Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

$$\frac{9.6}{2\pi} = \frac{\cancel{2\pi}\sqrt{\frac{L}{9.81}}}{\cancel{2\pi}}$$

$$\left(\frac{9.6}{2\pi}\right)^2 = \cancel{\sqrt{\frac{L}{9.81}}}^{\,2}$$

$$9.81 \cdot \left(\frac{9.6}{2\pi}\right)^2 = \frac{L}{\cancel{9.81}} \cdot \cancel{9.81}$$

$$\left(\frac{9.6}{2\pi}\right)^2 \cdot 9.81 = L$$

$$22.9 = L$$

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

Question 34

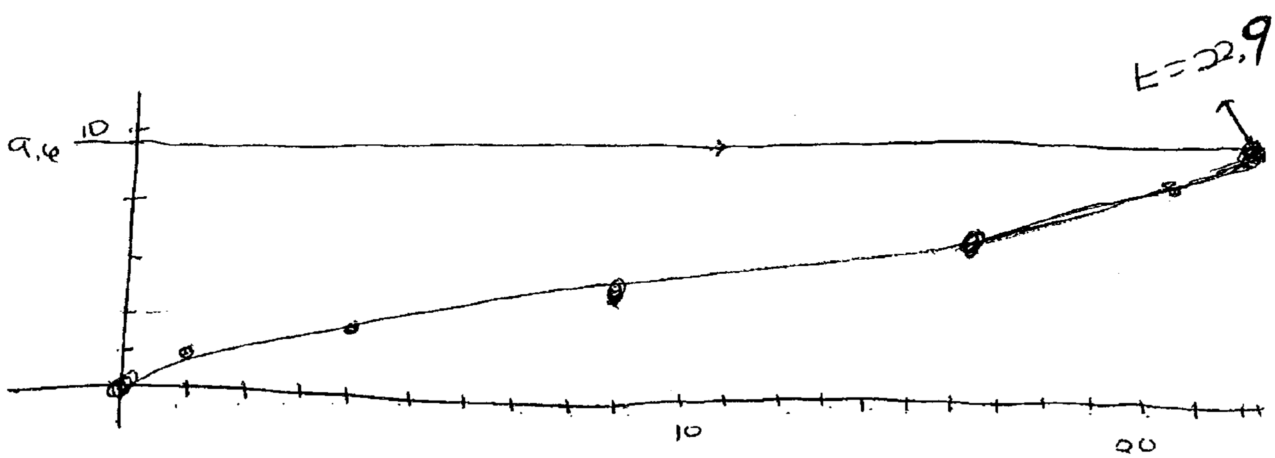
34 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2.

The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing.

(67, 16.42)

16.42

Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.



Score 3: The student rounded incorrectly.

Question 34

34 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2.

The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing.

Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

$$\frac{9.6}{2\pi} = \frac{2\pi\sqrt{\frac{L}{9.81\,m/s^2}}}{2\pi}$$

$$\left(\frac{9.6}{2\pi}\right)^2 = \left(\sqrt{\frac{L}{9.81\,m/s^2}}\right)^2$$

$$\left(\frac{9.6}{2\pi}\right)^2 = \frac{L}{9.8\,m/s^2}$$

$$\boxed{L = 22.9}$$

Score 3: The student did not find the period.

Question 34

34 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2.

The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing.

$2\pi \rightarrow 6.3$

Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

L=length

$\frac{9.6}{2\pi} = \frac{\cancel{2\pi}}{\cancel{2\pi}}\sqrt{\frac{L}{9.81}}$

$(1.5079644737)^2 = \left(\sqrt{\frac{L}{9.81}}\right)^2$

$(9.81)\,2.27395684 = \frac{L}{\cancel{9.81}}(\cancel{9.81})$

$L = 22.30.8$

Score 2: The student incorrectly calculated the period and made a computational error.

34 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2.

The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing.

Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

$$9.6 = 2\pi\sqrt{\frac{L}{9.81}}$$

$$15.07964474 = \sqrt{\frac{L}{9.81}}$$

$$227.3956854 = \frac{L}{9.81}$$

$$23.179988 = L$$

$$23.2$$

Score 1: The student did not find the period and made two errors when determining the length of the pendulum.

Question 34

34 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2.

The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing.

$\boxed{\text{16.4 Seconds}}$

(67, 16.42) if graph it.

Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

$\boxed{\text{23m}}$

Score 1: The student only determined the period correctly.

Question 34

34 A Foucault pendulum can be used to demonstrate that the Earth rotates. The time, t, in seconds, that it takes for one swing or period of the pendulum can be modeled by the equation $t = 2\pi\sqrt{\frac{L}{g}}$ where L is the length of the pendulum in meters and g is a constant of 9.81 m/s^2.

The first Foucault pendulum was constructed in 1851 and has a pendulum length of 67 m. Determine, to the *nearest tenth of a second*, the time it takes this pendulum to complete one swing.

$$t = 2\pi\sqrt{\frac{L}{g}}$$

$$t = 2\pi\sqrt{\frac{67m}{9.81m/s^2}}$$

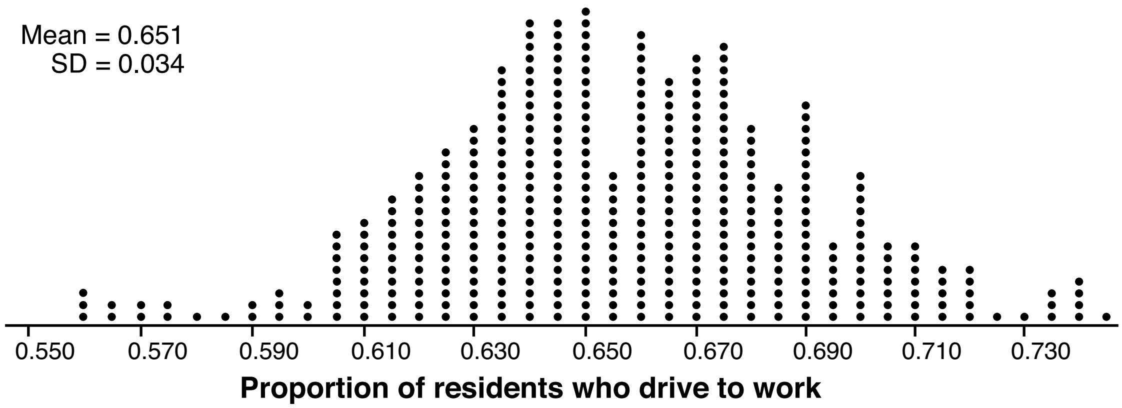
$$t = 2\pi(2.613382013)$$

Another Foucault pendulum at the United Nations building takes 9.6 seconds to complete one swing. Determine, to the *nearest tenth of a meter*, the length of this pendulum.

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

Question 35

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*.

$0.034(2) = 0.068$

$.58$ to $.72$

$0.651 + .068 = .719 \to .72$

$0.651 - .068 = .583 \to .58$

One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

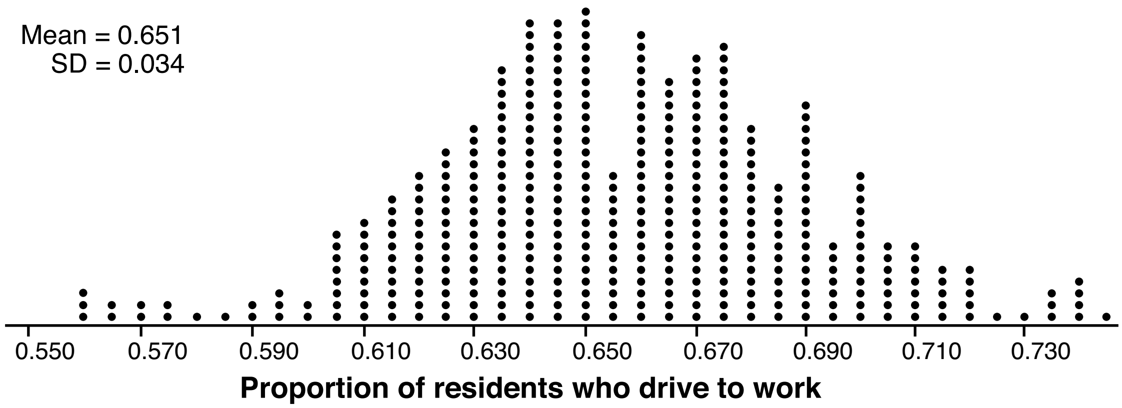
$\frac{122}{200} = 0.61$

No, the campaign wasn't effective because the proportion of people who drive to work is within the 95% interval. Yes, there was a decrease, but it wasn't statistically significant.

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

Question 35

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*.

$\bar{x} - 2\sigma = .58$

$\bar{x} + 2\sigma = .72$

$\boxed{[.58, .72]}$

One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

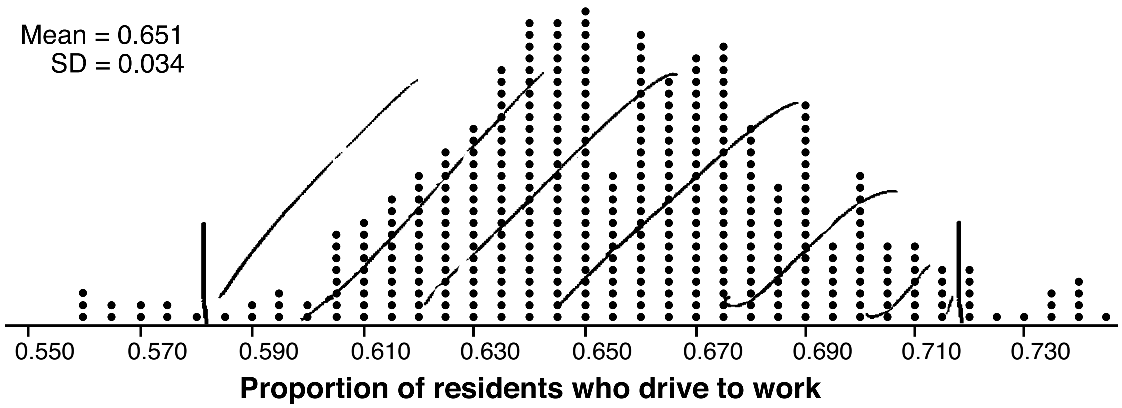
$\frac{122}{200} = .61$

No, because $\frac{122}{200}$ is included in the interval [.58, .72].

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

Question 35

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*.

$.651 - (2).034$

$.651 + (2).034$

$.583 - .719$

One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

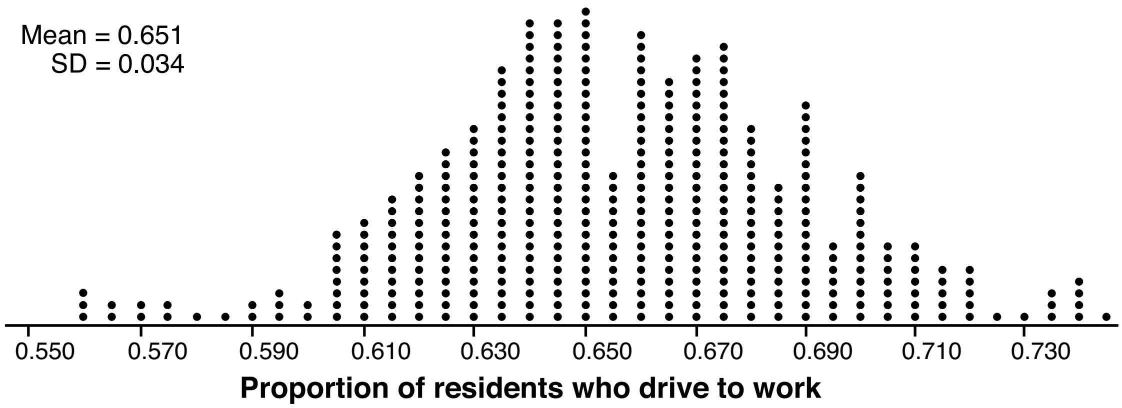
$\frac{122}{200} = .61$

No because the proportion of people still driving to work is within the previous 95% confidence interval.

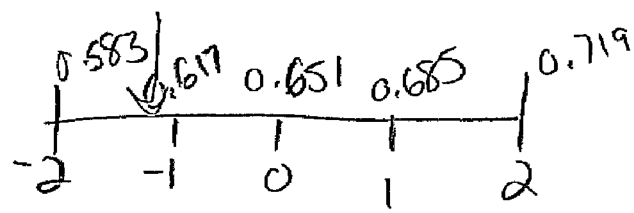
Score 3: The student made a rounding error.

Question 35

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*.



$\boxed{0.58 - 0.72}$

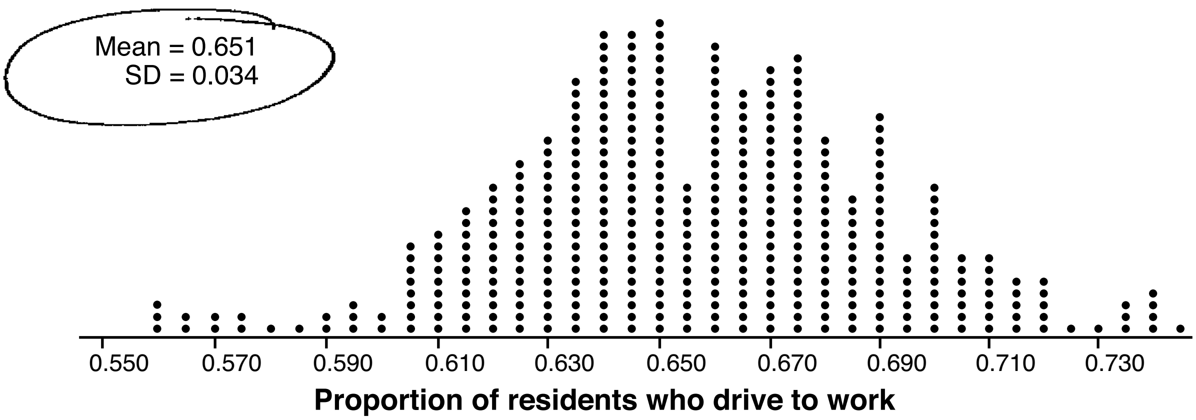
One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

It was effective b/c $\frac{122}{200} = 0.61$
the survey's results
lies between the 95% interval

Score 3: The student did not state a correct conclusion.

Question 35

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, ~~run 400 times~~ based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*.

[.58 , .72]

$0.651 - 2(0.034)$
$0.651 + 2(0.034)$

One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

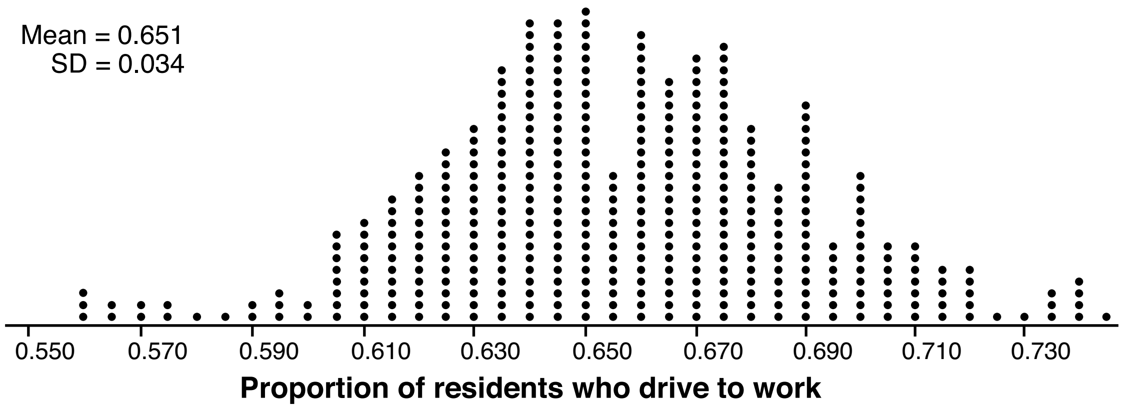
$\frac{112}{200} = 0.56$

No, it was not effective.
The amount who drive was not within the confidence interval.

Score 2: The student only received credit for the interval.

Question 35

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth.*

.58 – .72

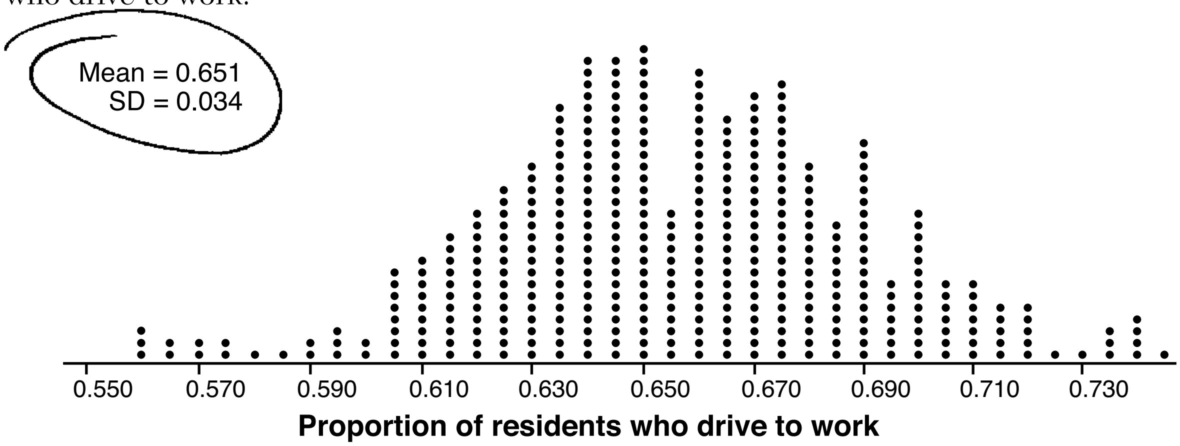
One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

$\frac{122}{200} \approx .61$ yes it is in the 95% range and close to the mean

Score 2: The student did not show work for the interval and stated an incorrect conclusion.

Question 35

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth.*

$M \pm 2\sigma$

$.651 \pm 2(.034)$

$.583$ to $.719$

One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

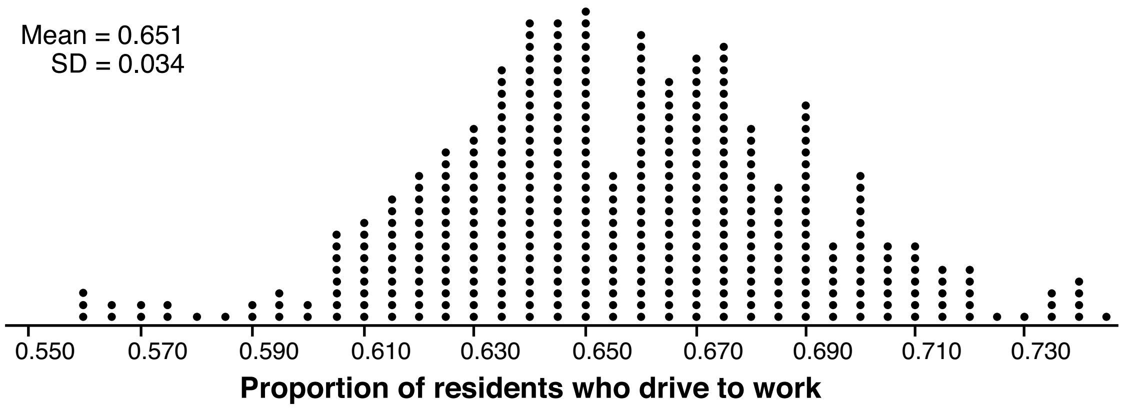
$\boxed{.988}$

It was 99%
effective

Score 1: The student made a rounding error and showed no further correct work.

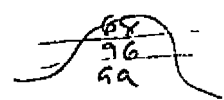
Question 35

35 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.



Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*.

.63 . - .69



One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

$\frac{122}{200} = 61\%$

Yes b/c the percentage of people who drove to work in the sample population decreased.

Score 0: The student wrote an incorrect interval and received no credit for the explanation.

Question 36

36 Solve the system of equations algebraically:

$$x^2 + y^2 = 25$$
$$y + 5 = 2x$$

	$2x$	-5
$2x$	$4x^2$	$-10x$
-5	$-10x$	25

$y + \cancel{5} = 2x$
$\quad -\cancel{5}$

$y = 2x - 5$

$x^2 + (2x-5)^2 = 25$

$x^2 + 4x^2 - 20x + \cancel{25} = \cancel{25}$
$\quad -25 \quad -25$

$5x^2 - 20x = 0$

$x(5x - 20) = 0$

$\boxed{x = 0}$ | $\frac{5x}{5} = \frac{20}{5}$

$\boxed{x = 4}$

solutions
$(0, -5)$
$(4, 3)$

$y + 5 = 2x$
$y + 5 = 2(0)$
$y + \cancel{5} = 0$
$\quad -\cancel{5} -5$
$\boxed{y = -5}$

$y + 5 = 2(4)$
$y + \cancel{5} = 8$
$\quad -\cancel{5} -5$
$\boxed{y = 3}$

Check
$(4)^2 + (3)^2 = 25$
$16 + 9 = 25$
$25 = 25$ ✓

$(0)^2 + (-5)^2 = 25$
$0 + 25 = 25$
$25 = 25$ ✓

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

Question 36

36 Solve the system of equations algebraically:

$$x^2 + y^2 = 25$$
$$y + 5 = 2x$$

$y = 2x - 5$

$x^2 + (2x-5)^2 = 25$

$x^2 + (2x-5)(2x-5) = 25$

$x^2 + 4x^2 - 20x + \cancel{25} = \cancel{25}$

$5x^2 - 20x = 0$

$5x(x-4) = 0$

$x = 0 \quad x = 4$

$y + 5 = 2(0) \quad y + 5 = 2(4)$

$y = -5 \quad y = 3$

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

Question 36

36 Solve the system of equations algebraically:

$$x^2 + y^2 = 25$$
$$y + 5 = 2x$$

$y = 2x - 5$

$x^2 + (2x-5)^2 = 25$

$(2x-5)(2x-5)$
$4x^2 - 10x - 10x + 25$
$4x^2 - 20x + 25$

$x^2 + 4x^2 - 20x + 25 = 25$
$5x^2 - 20x + 25 = 25$
$5x^2 - 20x = 0$
$5x(x-4) = 0$
$5x = 0$ $\boxed{x = 4}$
$x = 0$ reject

$y + 5 = 2x$
$y + 5 = 2(4)$
$y + 5 = 8$
$\boxed{y = 3}$

Score 3: The student stated only one solution.

Question 36

36 Solve the system of equations algebraically:

$$x^2 + y^2 = 25$$
$$y + 5 = 2x$$

-5

$y = 2x - 5$

$x^2 + (2x-5)^2 = 25$

$x^2 + (2x-5)(2x-5) = 25$

$x^2 + 4x^2 - 10x - 10x + 25 = 25$

$-25 \quad -25$

$(5x^2 - 20x) = 0$

$x(5x - 20) = 0$

$5x = 20$

$\boxed{x = 4}$

$y + 5 = 2(8)$

$y + 5 = 16$

$-5 \quad -5$

$\boxed{y = 11}$

Score 2: The student received credit for writing a quadratic equation in standard form.

Question 36

36 Solve the system of equations algebraically:

$$x^2 + y^2 = 25$$
$$y + 5 = 2x$$

$-5 \quad -5$

$y = 2x - 5$

$\sqrt{x^2 + (2x-5)^2} = \sqrt{25}$

$3x + 5 = 5$
$-5 \quad -5$

$\frac{3x}{3} = \frac{0}{3}$

$\boxed{x = 0 \quad y = -5}$

Score 1: The student found a correct quadratic equation in one variable, but showed no further correct work.

Question 36

36 Solve the system of equations algebraically:

$$x^2 + \cancel{y^2} = 25$$

$$\cancel{y} + 5 = 2x$$

x=4
y=3

$-5y=-2x+y$

y=2x-5

$y^2=25-x^2$

$x^2=25$

$\sqrt{x^2}+\sqrt{y^2}=25$

$x+y=25-x$

$x^2+(2x-5)^2=25$

$(2x-5)(2x-5)$

$4x^2-10x-10x+25$

y=2x-5

$5x^2-20x+25=25$

y=25-x

y=2x-5

25-x=2x-5

25=3x-5

30=3x

x=10

y+5=2·10

y+5=20

y=15

Score 1: The student found a correct quadratic equation in one variable but earned no credit for $x = 4$ and $y = 3$ because no work was shown to solve the quadratic equation.

Question 36

36 Solve the system of equations algebraically:

$$x^2 + y^2 = 25$$
$$y + 5 = 2x$$

$y = 2x - 5$

$y^2 = -x^2 + 25$

$y = \sqrt{-x^2} + 25$

$\sqrt{-x^2} + 25 = 2x - 5$

$\sqrt{-x^2} + 30 = 2x$

$x + 30 = 2x$

$x = 30$

$y + 5 = 2x$

$y + 5 = 2(30)$

$y + 5 = 60$

$-5 \quad -5$

$y = 55$

$y = 55$

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

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

$1.015 - 1 = 0.015 \times 100 = 1.5$

$\boxed{1.5\%}$

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$P(t) = 92.2(1.015)^t$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

$300 = 92.2(1.015)^t$

$\frac{300}{92.2} = (1.015)^t$

$\frac{\log\left(\frac{300}{92.2}\right)}{\log(1.015)} = \frac{t\log(1.015)}{\log(1.015)}$

$79.24 = t$

$t \approx 79$

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

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

1.5%

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$$P(t) = 92.2e^{.015t}$$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

$$\frac{300}{92.2} = \frac{\cancel{92.2}e^{.015t}}{\cancel{92.2}}$$

$$\frac{\ln\left(\frac{300}{92.2}\right)}{.015} = \frac{\cancel{.015}t}{\cancel{.015}} \underbrace{\ln e}_{1}$$

$$t = 78.65$$

$$t = 79$$

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

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

$.015$

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$$P(t) = 92.2(1.015)^t$$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

$$300 = 92.2(1.015)^t$$
$$\overline{92.2} \qquad \overline{92.2}$$
$$3.253796095 = (1.015)^t$$
$$\frac{t\log 1.015}{\log 1.015} = \frac{\log 3.253796095}{\log 1.015}$$
$$t = 79$$

Score 5: The student wrote the percent incorrectly.

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

it will grow 1.5 percent
Per year

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$P(t) = 92.2(1.015)^t$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

$\frac{300{,}000{,}000}{92.2} = \frac{92.2(1.015)^t}{92.2}$

$\frac{\log 3253796.095}{\log 1.015} = \frac{t \log 1.015}{\log 1.015}$

oops

$1007.16 = t$

$\boxed{t = 1007}$

Score 5: The student made an incorrect substitution for the population.

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

$1.015(92.5) = 93.8875$

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$y = 92.2(1.015)^x$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

$\frac{300}{92.2} = \frac{92.2(1.015)^x}{92.2}$

$\frac{300}{92.2} = 1.015^x$

$\frac{\log\left(\frac{300}{92.2}\right)}{\log(1.015)} = \frac{x\log(1.015)}{\log(1.015)}$

$x = 79$

Score 4: The student did not identify the annual growth rate and made a notation error in writing the exponental function.

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

$1.015 - 1 = .015 \times 100 = 1.5\%$

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$P(t) = 92.2^{1.5t}$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

$P(t) = 92.2^{1.5t}$

$\log(300 = 92.2^{1.5t})$

$\log 300 = 1.5t \log 92.2$

$\frac{\log 300}{\log 92.2} = 1.5t$

$\frac{\frac{\log 300}{\log 92.2}}{1.5} = t \qquad .84 = t$

Score 3: The student wrote an incorrect exponential function, then made a rounding error.

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

$a_1 = 1.015(92.2) = 93.6$

94%

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$y = 92.2(1.015)^x$

93.6 = 1
95.0 = 2
96.4 = 3
97.8 = 4
99.3 = 5

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

$300 = 92.2(1.015)^x$

$x = 79$

Score 2: The student did not find the correct percentage, made a notation error, and showed no work for $x = 79$.

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$92.2(1+.015)^t$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

Score 1: The student wrote a correct expression.

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

1.5%

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$(1.015)^t$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

~~$a_1 = a_3$~~
~~$a_2 =$~~
~~$a_3 =$~~
~~$a_4 =$~~

$(1.015)^{300} = 87.06$

$\boxed{87 \text{ years}}$

Score 1: The student correctly found the percent of annual growth, but showed no further correct work.

Question 37

37 The population, in millions of people, of the United States can be represented by the recursive formula below, where a_0 represents the population in 1910 and n represents the number of years since 1910.

$$a_0 = 92.2$$
$$a_n = 1.015a_{n-1}$$

Identify the percentage of the annual rate of growth from the equation $a_n = 1.015a_{n-1}$.

93.583 $\sqrt{A=A_0 r}$ $(1.015)(92.2)$

10% growth

Write an exponential function, P, where $P(t)$ represents the United States population in millions of people, and t is the number of years since 1910.

$P(t) = A_0 (n-1)^t$

$P(t) = A_0 \; (n-1)^{t}$

According to this model, determine algebraically the number of years it takes for the population of the United States to be approximately 300 million people. Round your answer to the *nearest year*.

$P(t) = 3.00 \times 10^8 \; (n-1)^t$

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

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

Regents Examination in Algebra II – June 2022

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

(Use for the June 2022 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	**94**	5
79	**93**	5
78	**92**	5
77	**92**	5
76	**91**	5
75	**90**	5
74	**89**	5
73	**89**	5
72	**88**	5
71	**88**	5
70	**87**	5
69	**86**	5
68	**86**	5
67	**86**	5
66	**85**	5
65	**84**	4
64	**84**	4
63	**83**	4
62	**83**	4
61	**83**	4
60	**82**	4
59	**82**	4
58	**81**	4
57	**81**	4
56	**81**	4
55	**80**	4
54	**80**	4
53	**80**	4
52	**79**	4
51	**79**	4
50	**79**	4
49	**78**	4
48	**78**	4
47	**77**	3
46	**77**	3
45	**77**	3
44	**76**	3
43	**76**	3
42	**75**	3
41	**75**	3
40	**74**	3
39	**74**	3
38	**73**	3
37	**72**	3
36	**72**	3
35	**71**	3
34	**70**	3
33	**70**	3
32	**69**	3
31	**68**	3
30	**67**	3
29	**66**	3
28	**65**	3
27	**64**	2
26	**63**	2
25	**61**	2
24	**60**	2
23	**58**	2
22	**56**	2
21	**55**	2
20	**53**	1
19	**52**	1
18	**50**	1
17	**48**	1
16	**46**	1
15	**44**	1
14	**42**	1
13	**39**	1
12	**37**	1
11	**34**	1
10	**32**	1
9	**29**	1
8	**26**	1
7	**23**	1
6	**20**	1
5	**17**	1
4	**14**	1
3	**10**	1
2	**7**	1
1	**3**	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.