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.

1. The Hot and Tasty Coffee chain conducts a survey of its customers at its location at the Staten Island ferry terminal. After the survey is completed, the statistical consultant states that 70% of customers who took the survey said the most important factor in choosing where to get their coffee is how fast they are served. Based on this result, Hot and Tasty Coffee can infer that
   (1) most of its customers in New York State care most about being served quickly
   (2) coffee drinkers care less about taste and more about being served quickly
   (3) most of its customers at the Staten Island ferry terminal care most about being served quickly
   (4) most of its customers at transportation terminals and stations care most about being served quickly

2. Given that $i$ is the imaginary unit, the expression $(x - 2i)^2$ is equivalent to
   (1) $x^2 + 4$
   (2) $x^2 - 4$
   (3) $x^2 - 2xi - 4$
   (4) $x^2 - 4xi - 4$

3. The equation below can be used to model the height of a tide in feet, $H(t)$, on a beach at $t$ hours.

\[ H(t) = 4.8\sin\left(\frac{\pi}{6}(t + 3)\right) + 5.1 \]

Using this function, the amplitude of the tide is
   (1) $\frac{\pi}{6}$
   (2) 4.8
   (3) 3
   (4) 5.1
4 In watching auditions for lead singer in a band, Liem became curious as to whether there is an association between how animated the lead singer is and the amount of applause from the audience. He decided to watch each singer and rate the singer on a scale of 1 to 5, where 1 is the least animated and 5 is the most animated. He did this for all 5 nights of auditions and found that the more animated singers did receive louder applause.

The study Liem conducted would be best described as

(1) experimental  (3) a sample survey
(2) observational  (4) a random assignment

5 In the diagram of a unit circle below, point $A, \left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$, represents the point where the terminal side of $\theta$ intersects the unit circle.

What is $m\angle \theta$?

(1) $30^\circ$  (3) $135^\circ$
(2) $120^\circ$  (4) $150^\circ$

6 Consider the function $f(x) = 2x^3 + x^2 - 18x - 9$. Which statement is true?

(1) $2x - 1$ is a factor of $f(x)$.
(2) $x - 3$ is a factor of $f(x)$.
(3) $f(3) \neq f\left(-\frac{1}{2}\right)$
(4) $f\left(\frac{1}{2}\right) = 0$
7 Which sketch could represent the function \( m(x) = -\log_{10}(x - 2) \)?

(1) (3)

(2) (4)

8 Which equation has roots of \( 3 + i \) and \( 3 - i \)?

(1) \( x^2 - 6x + 10 = 0 \)  
(2) \( x^2 + 6x - 10 = 0 \)
(3) \( x^2 - 10x + 6 = 0 \)  
(4) \( x^2 + 10x - 6 = 0 \)

9 A local university has a current enrollment of 12,000 students. The enrollment is increasing continuously at a rate of 2.5% each year. Which logarithm is equal to the number of years it will take for the population to increase to 15,000 students?

(1) \( \frac{\ln 1.25}{0.25} \)  
(2) \( \frac{\ln 3000}{0.025} \)
(3) \( \frac{\ln 1.25}{2.5} \)  
(4) \( \frac{\ln 1.25}{0.025} \)

Use this space for computations.
10 What is the total number of points of intersection of the graphs of the equations $y = e^x$ and $xy = 20$?

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

11 The amount of a substance, $A(t)$, in grams, remaining after $t$ days is modeled by $A(t) = 50(0.5)^{\frac{t}{3}}$. Which statement is false?

(1) In 20 days, there is no substance remaining.
(2) After two half-lives, there is 25% of the substance remaining.
(3) The amount of the substance remaining can also be modeled by $A(t) = 50(2)^{-\frac{t}{3}}$.
(4) After one week, there is less than 10g of the substance remaining.

12 A parabola that has a vertex at $(2,1)$ and a focus of $(2,-3)$ has an equation of

(1) $y = \frac{1}{16} (x - 2)^2 + 1$  
(2) $y = -\frac{1}{16} (x + 2)^2 - 1$  
(3) $y = -\frac{1}{16} (x - 2)^2 + 1$  
(4) $y = -\frac{1}{16} (x - 2)^2 - 3$
13 The expression \( \left( a \sqrt[3]{2b^2} \right) \left( \sqrt[4]{a^2b} \right) \) is equivalent to

(1) \( 2ab \sqrt[3]{a^2} \)  
(2) \( 2ab \)  
(3) \( 2ab \sqrt[3]{2a^2} \)  
(4) \( 2a^2b \sqrt[3]{2b} \)

14 Given \( f(x) = 3^{x-1} + 2 \), as \( x \to -\infty \)

(1) \( f(x) \to -1 \)  
(2) \( f(x) \to 0 \)  
(3) \( f(x) \to 2 \)  
(4) \( f(x) \to -\infty \)

15 For all values of \( x \) for which the expression is defined, \( \frac{x^2 + 3x}{x^2 + 5x + 6} \) is equivalent to

(1) \( 1 - \frac{x}{x + 2} \)  
(2) \( \frac{x}{x + 2} \)  
(3) \( \frac{3x}{5x + 6} \)  
(4) \( 1 + \frac{1}{2x + 6} \)

16 A recursive formula for the sequence 64, 48, 36, … is

(1) \( a_n = 64(0.75)^{n-1} \)  
(2) \( a_1 = 64 \)  
(3) \( a_n = 64 + (n - 1)(-16) \)  
(4) \( a_1 = 64 \)  
\( a_n = a_{n-1} - 16 \)  
(4) \( a_1 = 64 \)  
\( a_n = 0.75 a_{n-1} \)
17 Which expression is equivalent to \( \frac{x^3 - 2}{x - 2} \)?

(1) \( x^2 \)  
(2) \( x^2 + 2x + 4 + \frac{6}{x - 2} \)  
(3) \( x^2 - 2 \)  
(4) \( x^2 - 2x + 4 - \frac{10}{x - 2} \)

18 What is the solution set of the equation \( \frac{4}{k^2 - 8k + 12} = \frac{k}{k - 2} + \frac{1}{k - 6} \)?

(1) \( \{-1, 6\} \)  
(2) \( \{1, -6\} \)  
(3) \( \{-1\} \)  
(4) \( \{1\} \)

19 Given the polynomial identity \( x^6 + y^6 = (x^2 + y^2)(x^4 - x^2y^2 + y^4) \), which equation must also be true for all values of \( x \) and \( y \)?

(1) \( x^6 + y^6 = x^2(x^4 - x^2y^2 + y^4) + y^2(x^4 - x^2y^2 + y^4) \)  
(2) \( x^6 + y^6 = (x^2 + y^2)(x^2 - y^2)(x^2 - y^2) \)  
(3) \( (x^3 + y^3)^2 = (x^2 + y^2)(x^4 - x^2y^2 + y^4) \)  
(4) \( (x^6 + y^6) - (x^2 + y^2) = x^4 - x^2y^2 + y^4 \)

20 Given \( p(\theta) = 3\sin\left(\frac{1}{2}\theta\right) \) on the interval \(-\pi < \theta < \pi\), the function \( p \)

(1) decreases, then increases  
(2) increases, then decreases  
(3) decreases throughout the interval  
(4) increases throughout the interval
21 A company fired several employees in order to save money. The amount of money the company saved per year over five years following the loss of employees is shown in the table below.

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount Saved (in dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>59,000</td>
</tr>
<tr>
<td>2</td>
<td>64,900</td>
</tr>
<tr>
<td>3</td>
<td>71,390</td>
</tr>
<tr>
<td>4</td>
<td>78,529</td>
</tr>
<tr>
<td>5</td>
<td>86,381.9</td>
</tr>
</tbody>
</table>

Which expression determines the total amount of money saved by the company over 5 years?

(1) \(\frac{59,000 - 59,000(1.1)^5}{1 - 1.1}\)  
(2) \(\frac{59,000 - 59,000(0.1)^5}{1 - 0.1}\)  
(3) \(\sum_{n=1}^{5} 59,000(1.1)^n\)  
(4) \(\sum_{n=1}^{5} 59,000(0.1)^n - 1\)

22 A rush-hour commuter train has arrived on time 64 of its first 80 days. As arrivals continue, which equation can be used to find \(x\), the number of consecutive days that the train must arrive on schedule to raise its on-time performance rate to 90%?

(1) \(\frac{64 + x}{80 + x} = \frac{90}{100}\)  
(2) \(\frac{64 + x}{80 + x} = \frac{90}{100}\)  
(3) \(\frac{64 + x}{80} = \frac{90}{100}\)  
(4) \(\frac{x}{80 + x} = \frac{90}{100}\)
23 Given \( f(x) = -\frac{2}{5}x + 4 \), which statement is true of the inverse function \( f^{-1}(x) \)?

(1) \( f^{-1}(x) \) is a line with slope \( \frac{5}{2} \).

(2) \( f^{-1}(x) \) is a line with slope \( \frac{2}{5} \).

(3) \( f^{-1}(x) \) passes through the point \((6, -5)\).

(4) \( f^{-1}(x) \) has a \( y \)-intercept at \((0, -4)\).

24 The amount of a substance, \( A(t) \), that remains after \( t \) days can be given by the equation \( A(t) = A_0 \sqrt[0.0803]{0.5^t} \), where \( A_0 \) represents the initial amount of the substance. An equivalent form of this equation is

(1) \( A(t) = A_0 (0.000178)^t \)

(2) \( A(t) = A_0 (0.945861)^t \)

(3) \( A(t) = A_0 (0.04015)^t \)

(4) \( A(t) = A_0 (1.08361)^t \)
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 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.
26 Factor the expression \( x^3 - 2x^2 - 9x + 18 \) completely.
27 Solve algebraically for all values of $x$:

$$\sqrt{4x + 1} = 11 - x$$
28 Given that \( \left( \frac{15}{y^3} \right)^{-4} = y^n \), where \( y > 0 \), determine the value of \( n \).
29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.
According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the nearest integer, approximately how many babies weighed more than 4 kg.
31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

<table>
<thead>
<tr>
<th></th>
<th>Rap</th>
<th>Techno</th>
<th>Classic Rock</th>
<th>Classical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>39</td>
<td>17</td>
<td>42</td>
<td>12</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>37</td>
<td>36</td>
<td>15</td>
</tr>
</tbody>
</table>
Algebraically determine the solution set for the system of equations below.

\[ y = 2x^2 - 7x + 4 \]
\[ y = 11 - 2x \]
33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, \( p(t) \), that can be used to model the population of bacteria, \( p \), on a smartphone screen, where \( t \) represents the time in minutes after it is first observed under a microscope.

b) Using \( p(t) \) from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.
The function \( v(x) = x(3 - x)(x + 4) \) models the volume, in cubic inches, of a rectangular solid for \( 0 \leq x \leq 3 \).

Graph \( y = v(x) \) over the domain \( 0 \leq x \leq 3 \).

To the nearest tenth of a cubic inch, what is the maximum volume of the rectangular solid?
Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \), in the form \( q(x) + \frac{r(x)}{g(x)} \).

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.
State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

![Graph showing 200 simulated surveys with mean = 0.819 and SD = 0.053]

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.
Part IV

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

37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where $x$ is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.

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

To the nearest integer, solve the equation $A(x) = B(x)$.

Determine, to the nearest minute, $B(100) - A(100)$. Explain what this value represents in the given context.
Scrap Graph Paper — this sheet will *not* be scored.
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 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

<table>
<thead>
<tr>
<th>Shape</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangle</td>
<td>$A = \frac{1}{2}bh$</td>
</tr>
<tr>
<td>Parallelogram</td>
<td>$A = bh$</td>
</tr>
<tr>
<td>Circle</td>
<td>$A = \pi r^2$</td>
</tr>
<tr>
<td>Circle</td>
<td>$C = \pi d$ or $C = 2\pi r$</td>
</tr>
<tr>
<td>General Prisms</td>
<td>$V = Bh$</td>
</tr>
<tr>
<td>Cylinder</td>
<td>$V = \pi r^2h$</td>
</tr>
<tr>
<td>Sphere</td>
<td>$V = \frac{4}{3}\pi r^3$</td>
</tr>
<tr>
<td>Cone</td>
<td>$V = \frac{1}{3}\pi r^2h$</td>
</tr>
<tr>
<td>Pyramid</td>
<td>$V = \frac{1}{3}Bh$</td>
</tr>
</tbody>
</table>

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

Algebra II – Aug. ’22
The chart for determining students' final examination scores for the **August 2022 Regents Examination in Algebra II** will be posted on the Department's web site at: [https://www.nysedregents.org/algebratwo/](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

Tuesday, August 16, 2022 — 12:30 to 3:30 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/ by Tuesday, August 16, 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] 20, 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] 20, 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.

(26) [2] \((x - 2)(x + 3)(x - 3)\), 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] Appropriate work is shown to find \((x - 2)(x^2 - 9)\), but no further correct work is shown.

or

[1] \((x - 2)(x + 3)(x - 3)\), 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.
(27) [2] 6 and correct algebraic work is shown.

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

or

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

or

[1] Appropriate work is shown, but 20 is not rejected.

or

[1] 6, but a method other than algebraic is used.

or

[1] 6, 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] $-\frac{7}{2}$ or equivalent, 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] $-\frac{7}{2}$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
(29)  [2]  \(-\frac{1}{\sqrt{10}}\) or equivalent, and correct work is shown.

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

\textit{or}

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

\textit{or}

[1] Appropriate work is shown, but the answer is stated as a decimal.

\textit{or}

[1] \(-\frac{1}{\sqrt{10}}\), but no work is shown.

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

(30)  [2] 1237, and correct work is shown.

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

\textit{or}

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

\textit{or}

[1] 1237, 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 negative response is indicated and a correct justification is given.

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

\textit{or}

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

\textit{or}

[1] No, but an incomplete justification is given.

[0] No, but no justification is given.

\textit{or}

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
(32) \[2\] (3.5,4), (−1,13), and correct algebraic work is shown.

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

\[\text{or}\]

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

\[\text{or}\]

[1] Appropriate work is shown to find \(x = 3.5\) and \(x = −1\), but no further correct work is shown.

\[\text{or}\]

[1] (3.5,4), (−1,13), but a method other than algebraic is used.

\[\text{or}\]

[1] (3.5,4), (−1,13), but no work is shown.

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

\[
(33) \quad [4] \quad p(t) = 11,000(2)^{t/20} \text{ or an equivalent function is written, 130.13, and correct algebraic work is shown.}
\]

\[
[3] \quad \text{Appropriate work is shown, but one computational, notation, or rounding error is made.}
\]

\[
[2] \quad \text{Appropriate work is shown, but two or more computational, notation, or rounding errors are made.}
\]

\[
\text{or}
\]

\[
[2] \quad \text{Appropriate work is shown, but one conceptual error is made.}
\]

\[
\text{or}
\]

\[
[2] \quad \text{ } p(t) = 11,000(2)^{t/20}, \text{ but no further correct work is shown.}
\]

\[
\text{or}
\]

\[
[2] \quad \text{Appropriate work is shown to find 130.13, but no further correct work is shown.}
\]

\[
[1] \quad \text{Appropriate work is shown, but one conceptual and one computational, notation, or rounding error are made.}
\]

\[
\text{or}
\]

\[
[1] \quad 130.13, \text{ but a method other than algebraic is used.}
\]

\[
\text{or}
\]

\[
[1] \quad 130.13, \text{ but no work is shown.}
\]

\[
[0] \quad \text{A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.}
\]
(34) [4] A correct graph is drawn and 12.6 is stated.

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

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

or

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

or

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

or

[2] 12.6, but no further correct work is shown.

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

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
(35) \[ 3x^2 + 8x + 34 + \frac{135}{x - 4} \] and correct work is shown, a negative response is indicated, and a correct explanation is written.

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

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

or

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

or

[2] Appropriate work is shown to find \( 3x^2 + 8x + 34 + \frac{135}{x - 4} \), but no further correct work is shown.

or

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

[1] \( 3x^2 + 8x + 34 + \frac{135}{x - 4} \) but no work is shown.

or

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

or

[1] No, but an incomplete explanation is written.

[0] No, but the explanation 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.
A correct interval is determined, such as (0.713, 0.925), and a correct explanation is written.

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

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

or

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

or

[2] Appropriate work is shown to determine (0.713, 0.925), but no further correct work is shown.

or

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

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

or

[1] (0.713, 0.925), 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] Correct graphs are drawn with a least one labeled, 35, 2, and a correct explanation is written.

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

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

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

or

[2] Correct graphs for \( A(x) \) and \( B(x) \) are drawn and at least one is labeled correctly, but no further correct work is shown.

or

[2] 35, but no further correct work is shown.

or

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

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

or

[1] 2, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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The Chart for Determining the Final Examination Score for the August 2022 Regents Examination in Algebra II will be posted on the Department’s web site at: http://www.nysed.gov/state-assessment/ by Tuesday, August 16, 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/8LNLLDLW.

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

Tuesday, August 16, 2022 — 12:30 to 3:30 p.m., only

MODEL RESPONSE SET

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25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

Distance
Time

\[ \frac{\Delta y}{\Delta x} = \frac{60 - 20}{4 - 2} = \frac{40}{2} = 20 \]

20 mph = average rate of change

Score 2: The student gave a complete and correct response.
Question 25

Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

\[
\frac{40 \text{ miles}}{2 \text{ hours}} = 20 \text{ mph}
\]

Score 2: The student gave a complete and correct response.
Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

\[ \text{Average rate of change} = 20 \text{ mph} \]

Score 1: The student did not show any work.
Question 25

25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

\[
\frac{20}{2} = 10 \text{ mph} \quad \text{10 + 8.8 + 15 = } \frac{33.8}{3} \\
\frac{25}{3} = 8.8 \text{ mph} \quad \boxed{= 11.1 \text{ mph}}
\]

\[
\frac{60}{4} = 15 \text{ mph}
\]

Score 0: The student did not show enough correct work to receive any credit.
25 Determine the average rate of change, in mph, from 2 to 4 hours on the graph shown below.

Score 0: The student did not show enough correct work to receive any credit.
26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

\[
\begin{align*}
  x^2(x-2) & \quad -9(x-2) \\
  & \quad \downarrow \quad \downarrow \\
  & \quad (x^2 - 9)(x-2) \\
  & \quad \downarrow \\
  & \quad (x+3)(x-3)(x-2)
\end{align*}
\]

**Score 2:** The student gave a complete and correct response.
26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

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

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

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

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

$x - 3 = 0 \quad x + 3 = 0 \quad x - 2 = 0$

$x = 3 \quad x = -3 \quad x = 2$

$$
X = \frac{-3}{2}, 2, 3 \exists
$$

Score 1: The student found the roots after factoring completely.
26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

\[
x^3 - 2x^2 + qx + 18
\]

\[
x(x - 2) - q(x - 2)
\]

\[
(x-q)(x-2)
\]

**Score 1:** The student made a factoring error.
26 Factor the expression $x^3 - 2x^2 - 9x + 18$ completely.

\[ x^3 - 2x^2 - 9x + 18 = (x^2 - 2x - 9 + 18) \times (x - 3) \times (x + 3) \]

**Score 0:** The student made multiple factoring errors.
26 Factor the expression \((x^3 - 2x^2)(9x + 18)\) completely.

\[
\begin{align*}
x^2(x - 2) + 9(x - 2) \\
(x^2 + 9)(x - 2) = 0 \\
\end{align*}
\]

\[
\begin{align*}
x^2 + 9 &= 0 \\
\pm \sqrt{-9} &= x \\
\pm 3i &= x
\end{align*}
\]

\[
\begin{align*}
x &= 2
\end{align*}
\]

Score 0: The student made a factoring error and found the roots.
27 Solve algebraically for all values of $x$:

\[
\sqrt{4x + 1} = 11 - x
\]

\[
\frac{(\sqrt{4x + 1})^2}{(11 - x)^2} = \frac{(11-x)(11-x)}{121-x^2 - 11x + x^2}
\]

\[
4x + 1 = x^2 - 22x + 121
\]

\[
0 = x^2 - 26x + 120
\]

\[
(x - 20)(x - 6)
\]

\[
x = 20, 6
\]

\[
\sqrt{4(20) + 1} = 11 - 20
\]

\[
\sqrt{81} = -9
\]

\[
x = 20, 6
\]

\[
\sqrt{4(6) + 1} = 11 - 6
\]

\[
\sqrt{25} = 5
\]

\[
x = 6
\]

Score 2: The student gave a complete and correct response.
27 Solve algebraically for all values of $x$:

\[
\sqrt{\frac{4x + 1}{x - 1}} = \frac{1}{x - 1}
\]

\[
4x + 1 = (11 - x)(11 - x)
\]

\[
4x + 1 = 121 - 11x - 11x + x^2
\]

\[
4x + 1 = x^2 - 22x + 121
\]

\[
x^2 - 26x + 120 = 0
\]

\[
(x^2 - 26x + 120) = 0
\]

\[
x(x - 26) + 20(x - 26) = 0
\]

\[
(x - 20)(x - 26) = 0
\]

\[
x = 26, x = 20
\]

Score 2: The student gave a complete and correct response.
27 Solve algebraically for all values of $x$:

\[
\sqrt{\frac{2}{4x + 1}} - (1 - x)^2
\]

\[
(1-x)(1-x)
\]

\[
(21-11x-1(1x+x^2)
\]

\[
4x + 1 = 20 + 2x + x^2
\]

\[
-4x = 1 - 4x = 1
\]

\[
0 = x^2 - 2(6x + 20)
\]

\[
0 = (x - 20)(x - 6)
\]

\[
x - 20 = 0 \quad x - 6 = 0
\]

\[
+20 +26 + 6 + 6
\]

\[
x = 20 \quad x = 6
\]

Checks:

\[
\sqrt{4x + 1} = 1 - x
\]

\[
\sqrt{4(20 + 1)} = 11 - 0.0
\]

\[
\sqrt{80 + 1}
\]

\[
\sqrt{81} = 11 - 20
\]

\[
\pm q = 11 - 20
\]

\[
-9 \neq -9
\]

\[
\sqrt{4x + 1} = 11 - x
\]

\[
\sqrt{4(6) + 1} = 11 - 6
\]

\[
\sqrt{25} = 11 - 6
\]

\[
5 \neq 5
\]

Score 1: The student made a computational error in the check for extraneous roots.
27 Solve algebraically for all values of $x$:

\[ \sqrt{4x + 1} = 11 - x \]

\[ x = 6 \]

Score 1: The student received credit for stating 6.
Solve algebraically for all values of $x$:

$$\sqrt{4x + 1} = 11 - x$$

\[
\begin{align*}
\left(\sqrt{4x + 1}\right)^2 &= (11 - x)^2 (11 - x) \\
4x + 1 &= -x^2 - 11x - 11x + 121 \\
4x + 1 &= -x^2 - 22x + 121 \\
&\quad\quad + x^2 + 22x - 121
\end{align*}
\]

$$x^2 + 26x - 120 = 0$$

$$\left(x + 30\right)\left(x - 4\right) = 0$$

$x = -30, 4$

No Solutions

Check:

\[
\begin{align*}
\sqrt{4(-30) + 1} &= 11 - (-30) \\
\sqrt{-119} &\approx -11 \\
\sqrt{41(4) + 1} &= 11 - 4 \\
\sqrt{171} &\approx 7
\end{align*}
\]

Score 1: The student made one computational error.
27 Solve algebraically for all values of $x$:

$$\sqrt{4x + 1} = 11 - x$$

\[4x + 1 = -x^2 + 121\]
\[+x^2 + x^2\]

\[x^2 + 4x + 1 = 121\]
\[-121 - 121\]

\[A \quad B \quad C\]
\[x^2 + 4x - 120 = 0\]

\[x = -b \pm \sqrt{b^2 - 4ac}\]
\[\frac{2a}{2a}\]
\[= -A \pm \sqrt{16 - 4(1)(126)}\]
\[x = -2 \pm \sqrt{496}\]
\[x = -2 \pm 2\sqrt{3}\]

Score 0: The student made multiple errors.
Question 27

Solve algebraically for all values of $x$:

$$\sqrt{4x + 1} = 11 - x$$

\[
\begin{align*}
4x + 1 &= (11-x)^2 \\
4x + 1 &= 121 - 22x - x^2 \\
26x &= 120 - x^2 \\
0 &= -x^2 - 26x + 120 \\
x^2 + 26x - 120 &= 0 \\
(x-4)(x+30) &= 0 \\
x &= 4 \quad x = -30
\end{align*}
\]

Score 0: The student made a computational error and did not check for extraneous roots.
28 Given that \( \left( \frac{y^{17/8}}{y^{-1/8}} \right)^4 = y^n \), where \( y > 0 \), determine the value of \( n \).

\[
\left( \frac{y^{17/8}}{y^{-1/8}} \right)^4 = y^n
\]

\[
\left( y^{17/8} \cdot y^{1/8} \right)^4 = y^n
\]

\[
\left( y^{9/4} \right)^4 = y^n
\]

\[
y^{36} = y^n
\]

\[
n = -\frac{7}{2}
\]

Score 2: The student gave a complete and correct response.
28 Given that \( \left( \frac{y^{17}}{y^8} \right)^4 = y^n \), where \( y > 0 \), determine the value of \( n \).

Score 2: The student gave a complete and correct response.
28 Given that \( \left( \frac{17}{y^{\frac{5}{4}}} \right)^{-4} = y^n \), where \( y > 0 \), determine the value of \( n \).

\[
y^{\frac{12}{4}} = y^{-12}
\]

\[
y^{\frac{12}{4}} = y^{-12}
\]

\[
(y^{\frac{3}{4}})^{-4} = y^{-12}
\]

\[
(y^{\frac{3}{4}})^{-4} = y^{-12}
\]

\[
\frac{12}{4} = -12
\]

\[
\frac{12}{4} = -12
\]

\[
h = -12
\]

\[
h = -12
\]

Score 1: The student made a computational error.
28 Given that \( \left( \frac{\frac{17}{y^4}}{y^8} \right)^{-4} = y^n \), where \( y > 0 \), determine the value of \( n \).

Score 0: The student did not show enough correct work to receive any credit.
29 Given $\cos A = \frac{3}{\sqrt{10}}$ and $\cot A = -3$, determine the value of $\sin A$ in radical form.

\[ \sin C = \frac{\text{opp}}{\text{hyp}} \]
\[ \cot C = \frac{\text{adj}}{\text{opp}} \]
\[ \cos C = \frac{\text{adj}}{\text{hyp}} \]

$\cos A = \frac{3 \text{ adj.}}{\sqrt{10} \text{ hyp.}}$
$\cot A = \frac{3 \text{ adj.}}{-1 \text{ opp.}}$

$\sin A = -\frac{1}{\sqrt{10}}$

Score 2: The student gave a complete and correct response.
29 Given \( \cos A = \frac{3}{\sqrt{10}} \) and \( \cot A = -3 \), determine the value of \( \sin A \) in radical form.

Score 2: The student gave a complete and correct response.
29 Given \( \cos A = \frac{3}{\sqrt{10}} \) and \( \cot A = -3 \), determine the value of \( \sin A \) in radical form.

\[
\sin A = \frac{1}{\sqrt{10} \cdot \sqrt{10}} = \frac{\sqrt{10}}{10}
\]

Score 1: The student ignored the sign of the function in Quadrant IV.
29 Given \( \cos A = \frac{3}{\sqrt{10}} \) and \( \cot A = -3 \), determine the value of \( \sin A \) in radical form.

\[
\cos A = \frac{3}{\sqrt{10}}
\]

\[
\left( \cos(A) \right)^2 + \left( \sin(A) \right)^2 = 1
\]

\[
0.9 + \left( \sin(A) \right)^2 = 1
\]

\[
\sqrt{\left( \sin(A) \right)^2} = \sqrt{0.1}
\]

\[
\sin A = \sqrt{0.1}
\]

**Score 1:** The student ignored the sign of the function in Quadrant IV.
29 Given \( \cos A = \frac{3}{\sqrt{10}} \) and \( \cot A = -3 \), determine the value of \( \sin A \) in radical form.

\[
\frac{\cos}{\sin} = \frac{3}{\sqrt{10}}
\]

\[-3 \times \frac{3}{\sqrt{10}} = \sin A \]

\[-3 \times \frac{3}{\sqrt{10}} = -\frac{9}{\sqrt{10}}
\]

Score 1: The student did not give the value in radical form.
Question 29

29 Given \( \cos A = \frac{3}{\sqrt{10}} \) and \( \cot A = -3 \), determine the value of \( \sin A \) in radical form.

\[
\sin A = \frac{\sqrt{10}}{10}
\]

\[
\sin A = \frac{1}{10}
\]

Score 0: The student made multiple errors.
According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the nearest integer, approximately how many babies weighed more than 4 kg.

\[
\text{normalcdf}(4, 100000, 3.39, 0.55) = 0.1336... \\
0.1336... \times 9256 = 1237\ \text{babies born last year weighed more than 4 kg.}
\]

Score 2: The student gave a complete and correct response.
According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the nearest integer, approximately how many babies weighed more than 4 kg.

Score 2: The student gave a complete and correct response.
According to a study done at a hospital, the average weight of a newborn baby is $3.39$ kg, with a standard deviation of $0.55$ kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the nearest integer, approximately how many babies weighed more than 4 kg.

\[
\text{normal cdf}(4, 1000, 3.39, 0.55) = 0.1336955 \approx 0.13 \times 9256 = 1238 \text{ babies}
\]

**Score 1:** The student rounded incorrectly.
30 According to a study done at a hospital, the average weight of a newborn baby is 3.39 kg, with a standard deviation of 0.55 kg. The weights of all the newborns in this hospital closely follow a normal distribution. Last year, 9256 babies were born at this hospital. Determine, to the nearest integer, approximately how many babies weighed more than 4 kg.

\[ \text{normal cdf}(4, \infty, 0.55, 3.39) \]

1388 babies

**Score 0:** The student did not show enough correct work to receive any credit.
31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

<table>
<thead>
<tr>
<th></th>
<th>Rap</th>
<th>Techno</th>
<th>Classic Rock</th>
<th>Classical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>39</td>
<td>17</td>
<td>42</td>
<td>12</td>
</tr>
<tr>
<td>Female</td>
<td>17</td>
<td>37</td>
<td>36</td>
<td>15</td>
</tr>
</tbody>
</table>

\[
P(F \text{ and } CR) = P(F) \cdot P(CR) \\
\frac{36}{215} = \frac{105}{215} \cdot \frac{78}{215}
\]

0.167418605 ≠ 0.1771768524

\[
P(F|CR) = P(F) \\
\frac{36}{78} = \frac{105}{215}
\]

0.4615384615 ≠ 0.48372093

No, the events are not independent of each other because the probabilities are different.

Score 2: The student gave a complete and correct response.
31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

<table>
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<td>36</td>
<td>15</td>
</tr>
</tbody>
</table>

\[
A \mid B = \frac{36}{78} = 0.4615384615 \\
\frac{105}{215} = 0.4892048615
\]

no, not independent

Score 2: The student gave a complete and correct response.
31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

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<td>37</td>
<td>36</td>
<td>15</td>
</tr>
</tbody>
</table>

\[
P(A) = P(B|A) \quad \text{and} \quad P(B) = P(A|B)\]

\[
\frac{105}{215} = \frac{36}{105} \quad \text{and} \quad \frac{78}{215} = \frac{36}{78}
\]

\[0.488 \neq 0.34285\]

\[0.36279 \neq 0.46\]

The events “the person is female” and “the person prefers classic rock” are not independent of each other because using the equation \(P(A) \neq P(B|A)\), the probability are not equal.

Score 1: The student stated a correct conclusion based on an incorrect test for independence.
31 The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

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<td>37</td>
<td>36</td>
<td>15</td>
</tr>
</tbody>
</table>

\[
M = \frac{42}{140} \times 100 = 30\%
\]

\[
F = \frac{36}{105} \times 100 = 34.28\%
\]

Females are not more likely to like classic rock so the events are independent.
The table below shows the results of gender and music preference. Based on these data, determine if the events “the person is female” and “the person prefers classic rock” are independent of each other. Justify your answer.

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<td>17</td>
<td>37</td>
<td>36</td>
<td>15</td>
</tr>
</tbody>
</table>

\[ P(A) + P(B) = P(A \cap B) \]

\[
\frac{105}{215} + \frac{78}{215} = \frac{15}{27} \\
0.488 + 0.3627 = 0.8511
\]

\[ \checkmark \]

**Score 0:** The student made multiple errors.
32 Algebraically determine the solution set for the system of equations below.

\[
\begin{align*}
y &= 2x^2 - 7x + 4 \\
y &= 11 - 2x
\end{align*}
\]

\[
2x^2 - 7x + 4 = 11 - 2x + 2x - 11 - 11 + 2x
\]

\[
2x^2 - 5x - 7 = 0
\]

\[
(2x - 7)(x + 1) = 0
\]

\[
2x - 7 = 0 \quad x + 1 = 0
\]

\[
x = \frac{7}{2}
\]

\[
y = 11 - 2(-1) = 11 - 2\left(\frac{7}{2}\right)
\]

\[
y = 11 + 2
\]

\[
y = 13
\]

\[
\text{Solution}
\]

\[
x, y \left(-1, 13\right)
\]

\[
x, y \left(\frac{7}{2}, 4\right)
\]

**Score 2:** The student gave a complete and correct response.
32 Algebraically determine the solution set for the system of equations below.

\[ y = 2x^2 - 7x + 4 \]
\[ y = 11 - 2x \]
\[ \sqrt{y} = 11 - 2x \]
\[ y = 11 - 2(\frac{3}{2}) \quad \text{or} \quad y = 11 - 2(-1) \]
\[ y = 4 \quad \text{or} \quad y = 13 \]
\[ 11 - 2x = 2x^2 - 7x + 6 \]
\[ -11 + 2x = 2x - 11 \]
\[ 0 = 2x^2 - 5x - 7 \]
\[ 2x^2 + 2x - 7x - 7 \]
\[ 2x(x + 1) - 7(x + 1) \]
\[ (2x - 7)(x + 1) \]
\[ 2x - 7 = 0 \quad \text{or} \quad x + 1 = 0 \]
\[ x = \frac{7}{2} \quad \text{or} \quad x = -1 \]
\[ x = 3.5 \]

Score 2: The student gave a complete and correct response.
32 Algebraically determine the solution set for the system of equations below.

\[
\begin{align*}
y &= 2x^2 - 7x + 4 \\
y &= 11 - 2x
\end{align*}
\]

\[
\begin{align*}
11 - 2x &= 2x^2 - 7x + 4 \\
-11 + 2x &= -11 + 2x
\end{align*}
\]

\[
0 = 2x^2 - 5x - 7
\]

\[
\begin{array}{c|c|c}
 & (2x - 7) & (x + 1) \\
2x &= 7 & x = -1 \\
x &= \frac{7}{2} & \boxed{x = -1}
\end{array}
\]

\[
x = -1, \ \frac{7}{2}
\]

\[
y = 4, \ 13
\]

**Score 1:** The student did not clearly indicate the solution set.
32 Algebraically determine the solution set for the system of equations below.

\[
\begin{align*}
y &= 2x^2 - 7x + 4 \\
y &= 11 - 2x
\end{align*}
\]

\[
\begin{align*}
0 &= 2x^2 - 7x + 4 - (11 - 2x) \\
0 &= 2x^2 - 5x - 7 \\
(2x-7)(x+1) &= 0
\end{align*}
\]

\[
\begin{align*}
x+1 &= 0 \\
x &= -1
\end{align*}
\]

\[
\begin{align*}
2x-7 &= 0 \\
x &= \frac{7}{2}
\end{align*}
\]

\[
\begin{align*}
x &= -1 \\
x &= \frac{7}{2}
\end{align*}
\]

\[
\begin{align*}
\left(\frac{3}{5}, 4\right)
\end{align*}
\]

**Score 1:** The student did not find both solutions.
32 Algebraically determine the solution set for the system of equations below.

\[ \begin{align*}
    & y = 2x^2 - 7x + 4 \\
    & y = 11 - 2x \\
\end{align*} \]

\[
    \begin{align*}
    11 - 2x &= 2x^2 - 7x + 4 \\
    2x^2 + 5x - 7 &= 0 \\
    2x^2 + 7x + 3x - 7 &= 0 \\
    2x(x-1) + 7(x-1) &= 0 \\
    (2x+7)(x-1) &= 0 \\
    \frac{7}{2} &\text{ or } -1 \\
\end{align*} \]

\[
    \begin{align*}
    x &= \frac{7}{2} \quad \text{or} \quad x = -1 \\
    y &= 11 - 2(\frac{7}{2}) \rightarrow 4 \\
    y &= 11 - 2(1) \rightarrow 9 \\
\end{align*} \]

\[
    \left( \frac{7}{2}, 4 \right) \\
    \left( 1, 9 \right) \\
\]

Score 0: The student made multiple computational errors.
When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, \( p(t) \), that can be used to model the population of bacteria, \( p \), on a smartphone screen, where \( t \) represents the time in minutes after it is first observed under a microscope.

\[
p(t) = 11,000 \left(2^{\frac{t}{20}}\right)
\]

b) Using \( p(t) \) from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

\[
1,000,000 = 11,000 \left(2^{\frac{t}{20}}\right)
\]

\[
90.90909 = 2^{\frac{t}{20}}
\]

\[
\log 90.90909 = \log 2^{\frac{t}{20}}
\]

\[
= \frac{t}{20} \log 2
\]

\[
t = 20 \frac{\log 90.90909}{\log 2} \approx 130.13
\]

Score 4: The student gave a complete and correct response.
33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, \( p(t) \), that can be used to model the population of bacteria, \( p \), on a smartphone screen, where \( t \) represents the time in minutes after it is first observed under a microscope.

\[
p(t) = 11,000 e^{\left(\frac{\ln 2}{20}\right)t}
\]

b) Using \( p(t) \) from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

\[
1,000,000 = 11,000 e^{\left(\frac{\ln 2}{20}\right)t}
\]

\[
\frac{1}{20} \ln 0.91 = \frac{\ln 2}{20} t
\]

\[
\frac{\ln 0.91}{\ln 2} = \frac{t}{20}
\]

\[
t = 130.13 \text{ minutes}
\]

Score 4: The student gave a complete and correct response.
33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, \( p(t) \), that can be used to model the population of bacteria, \( p \), on a smartphone screen, where \( t \) represents the time in minutes after it is first observed under a microscope.

\[
p(t) = 11000 \times 2^t
\]

b) Using \( p(t) \) from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

\[
11000 \times 2^t = 1000000
\]

\[
\log 2^t = \frac{\log 1000000}{\log 11000}
\]

\[
t = \frac{\log 1000000}{\log 11000}
\]

\[
t = 6.51
\]

Score 3: The student made an error in the exponent in part a.
33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, $p(t)$, that can be used to model the population of bacteria, $p$, on a smartphone screen, where $t$ represents the time in minutes after it is first observed under a microscope.

$$p(t) = 11,000(2)^{\frac{t}{20}}$$

b) Using $p(t)$ from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

$$1,000,000 = 11,000(2)^{\frac{t}{20}}$$

$$\log(1,000,000) = \frac{t}{20} \log(22,000)$$

$$\frac{\log(1,000,000)}{\log(22,000)} = \frac{t}{20}$$

$$1.381717175 = \frac{t}{20}$$

$$t = 27.6343435$$

$$t = 27.6$$ minutes

Score 2: The student multiplied 11,000 by 2 and made a rounding error.
When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, \( p(t) \), that can be used to model the population of bacteria, \( p \), on a smartphone screen, where \( t \) represents the time in minutes after it is first observed under a microscope.

\[
p(t) = 11,000 \cdot 2^{\frac{t}{20}}
\]

b) Using \( p(t) \) from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

\[
\frac{1,000,000}{11,000} = \frac{11,000 \cdot 2^{\frac{t}{20}}}{11,000}
\]

\[
100 \cdot 2^{\frac{t}{20}} = 100
\]

\[
2^{\frac{t}{20}} = 1
\]

\[
\frac{t}{20} = \log_2 1
\]

\[
t = 0
\]

\[
+ \approx 130.67
\]

Score 2: The student only received credit for part a.
When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, \( p(t) \), that can be used to model the population of bacteria, \( p \), on a smartphone screen, where \( t \) represents the time in minutes after it is first observed under a microscope.

\[
 p(t) = 11,000 \left( 1 + 2 \right)^{\frac{t}{20}}
\]

b) Using \( p(t) \) from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

\[
1,000,000 = 11,000 \left( 1 + 2 \right)^{\frac{t}{20}}
\]

\[
0.909 = \left( 1 + 2 \right)^{\frac{t}{20}}
\]

\[
0.909 = 3^{\frac{t}{20}}
\]

Score 1: The student had an incorrect base in part a and did not show enough further correct work.
33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, \( p(t) \), that can be used to model the population of bacteria, \( p \), on a smartphone screen, where \( t \) represents the time in minutes after it is first observed under a microscope.

\[
p(t) = 11000(2)^{t/20}
\]

b) Using \( p(t) \) from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

\[
6.5 \times 20 = 130.0 \text{ minutes}
\]

Score 1: The student received 1 credit for the equation in part a.
33 When observed by researchers under a microscope, a smartphone screen contained approximately 11,000 bacteria per square inch. Bacteria, under normal conditions, double in population every 20 minutes.

a) Assuming an initial value of 11,000 bacteria, write a function, \( p(t) \), that can be used to model the population of bacteria, \( p \), on a smartphone screen, where \( t \) represents the time in minutes after it is first observed under a microscope.

\[
p = 11,000 \cdot \left( \frac{1}{2} \right)^t
\]

b) Using \( p(t) \) from part a, determine algebraically, to the nearest hundredth of a minute, the amount of time it would take for a smartphone screen that was not touched or cleaned to have a population of 1,000,000 bacteria per square inch.

\[
1,000,000 = 11,000 \cdot \left( \frac{1}{2} \right)^t
\]

\[
1,000,000 = 2 \cdot 10^3 \\
1,000,000 = 2 \cdot 10^3 \\
\log_{2 \cdot 10^3}(1,000,000) = t
\]

\[
t = 138.17 \text{ minutes}
\]

Score 0: The student made multiple errors in the equation and solution.
34 The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$. 

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$. 

To the nearest tenth of a cubic inch, what is the maximum volume of the rectangular solid?

12.6

Score 4: The student gave a complete and correct response.
34 The function \( v(x) = x(3 - x)(x + 4) \) models the volume, in cubic inches, of a rectangular solid for \( 0 \leq x \leq 3 \).

Graph \( y = v(x) \) over the domain \( 0 \leq x \leq 3 \).

To the nearest tenth of a cubic inch, what is the maximum volume of the rectangular solid?

\[ \text{Max} = 12.6 \]

**Score 3:** The student made a graphing error at the maximum.
The function \( v(x) = x(3 - x)(x + 4) \) models the volume, in cubic inches, of a rectangular solid for \( 0 \leq x \leq 3 \).

Graph \( y = v(x) \) over the domain \( 0 \leq x \leq 3 \).

To the nearest tenth of a cubic inch, what is the maximum volume of the rectangular solid?

To the nearest tenth of a cubic inch, what is the maximum volume of the rectangular solid?

\( 14.5 \) is 12.6.

**Score 2:** The student only received credit for stating the maximum.
The function \( v(x) = x(3 - x)(x + 4) \) models the volume, in cubic inches, of a rectangular solid for \( 0 \leq x \leq 3 \).

Graph \( y = v(x) \) over the domain \( 0 \leq x \leq 3 \).

To the nearest tenth of a cubic inch, what is the maximum volume of the rectangular solid?

\[ (1.7, 12.6) \]

**Score 1:** The student stated the coordinates of the maximum.
34 The function \( v(x) = x(3 - x)(x + 4) \) models the volume, in cubic inches, of a rectangular solid for \( 0 \leq x \leq 3 \).

Graph \( y = v(x) \) over the domain \( 0 \leq x \leq 3 \).

To the nearest tenth of a cubic inch, what is the maximum volume of the rectangular solid?

Score 1: The student did not graph the correct maximum and showed no further correct work.
The function $v(x) = x(3 - x)(x + 4)$ models the volume, in cubic inches, of a rectangular solid for $0 \leq x \leq 3$.

Graph $y = v(x)$ over the domain $0 \leq x \leq 3$.

To the nearest tenth of a cubic inch, what is the maximum volume of the rectangular solid?

The maximum volume was 12.0.
Question 35

Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \), in the form \( q(x) + \frac{r(x)}{g(x)} \).

\[
\begin{array}{c|cccc}
\phantom{1} & 3x^2 & +8x & +34 \\
\hline
3x^3 & -4x^2 & +2x & -1 \\
\hline
& 3x^3 & -12x^2 \\
& \hline
& 8x^2 & +2x \\
& - (8x^2 & -32x) \\
& \hline
& 34x & -1 \\
& - (34x & -136) \\
& \hline
& 135 \\
\end{array}
\]

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.

\[ \text{no, because when you divide you get a remainder of 135 and not a remainder of 0.} \]

Score 4: The student gave a complete and correct response.
35 Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \), in the form \( q(x) + \frac{r(x)}{g(x)} \).

\[
\begin{array}{c|cccc}
3 & 3 & -4 & 2 & -1 \\
\hline
 & 12 & 32 & 36 \\
\end{array}
\]

\[
3x^2 + 8x + 34 \equiv \frac{135}{x-4}
\]

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.

No because when \( f(x) \) was divided by \( x-4 \) there was a remainder.
35 Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \), in the form \( q(x) + \frac{r(x)}{g(x)} \).

\[
\begin{array}{c|ccc}
 x-4 & 3x^3 & -4x^2 & +2x-1 \\
 \hline
 & 3x^2 & -12x & \\
\hline
 & 8x & +2x-1 \\
 & -8x & -32x & \\
\hline
 & 34x & -1 & \\
 & -34x & -136 & \\
\hline
 & 135 \\
\end{array}
\]

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.

No. When 4 is substituted for \( x \), it does not equal to zero meaning it is not a root.

**Score 3:** The student did not write the quotient and remainder in the correct form.
Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \), in the form \( q(x) + \frac{r(x)}{g(x)} \).

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.

No, \( x = 4 \) is not a root of \( f(x) \) because there is a remainder.

Score 3: The student made a computational error in the long division.
35 Given $f(x) = 3x^3 - 4x^2 + 2x - 1$ and $g(x) = x - 4$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

\[ \begin{array}{c|ccccc}
 x-4 & 3x^3 & -4x^2 & +2x & -1 \\
 \hline
 & & & & & \\
 \end{array} \]

Is $x = 4$ a root of $f(x)$? Explain your answer.

No it is not.
Because $f(4)$ does not equal zero.

Score 2: The student wrote a correct explanation but showed no further correct work.
35 Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \) in the form \( q(x) + \frac{r(x)}{g(x)} \).

\[
\begin{array}{c}
3x^3 - 4x^2 + 2x - 1 \\
\underline{x - 4} \\
-3x^2 - 18x + 63 \\
-3x^2 + 12x - 36 \\
\hline
15x + 12 \\
15x - 60 \\
\hline
72
\end{array}
\]

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.

\[ f(4) = 3(4)^3 - 4(4)^2 + 2(4) - 1 = 162 \]

No, \( x = 4 \) is not a root of \( f(x) \).

Score 1: The student received one credit for the explanation.
35 Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \), in the form \( q(x) + \frac{r(x)}{g(x)} \).

\[
\begin{array}{c|cccc}
 & 4 & 2 & -1 \\
\hline
4 & 16 & 40 & 199 \\
\hline
 & 4 & 12 & 50 & 199 \\
\end{array}
\]

\[4x^2 + 12x + 50 + \frac{199}{x-4}\]

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.

**Score 1:** The student has one computational error in the synthetic division and showed no further correct work.
Question 35

Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \), in the form \( q(x) + \frac{r(x)}{g(x)} \).

\[
q(x) = x - 4
\]
\[
f(x) = 3x^3 - 4x^2 + 2x - 1
\]
\[
f(x) = 3x^3 - 4x^2 + 2(-4) - 1
\]
\[
f(x) = 3x^3 - 4x^2 - 8 - 1
\]
\[
f(x) = 3x^3 - 4x^2 - 9
\]

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.

**NO because it can’t go to 0.**

**Score 0:** The student did not show enough correct work to receive any credit.
Question 35

35 Given \( f(x) = 3x^3 - 4x^2 + 2x - 1 \) and \( g(x) = x - 4 \), state the quotient and remainder of \( \frac{f(x)}{g(x)} \), in the form \( q(x) + \frac{r(x)}{g(x)} \).

\[
\begin{array}{c}
3x^2 - 4x + 2 \\
\hline
x + 4 \left[ 3x^3 - 4x^2 + 2x - 1 \right] \\
3x^3 - 4x^2 \\
\hline
-4x^2 \\
-4x^2 \\
\hline
0 - 1 \\
-1
\end{array}
\]

Is \( x = 4 \) a root of \( f(x) \)? Explain your answer.

**Score 0:** The student did not show enough correct work to receive any credit.
State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

\[ 0.819 \pm 2 \times 0.053 \]
\[ 0.713 \text{ to } 0.925 \]

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

71.3% to 92.5%. The organization should question the State officials' claim because 70% is outside of the 95% interval.

Score 4: The student gave a complete and correct response.
State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

\[
95\% \pm 2 \times \frac{0.053}{\sqrt{60}} = 0.819 \pm 0.106
\]

\[
0.713 \text{ to } 0.925
\]

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials’ claim.

They should question the claim because their survey results are outside the range of plausible proportions.

Score 4: The student gave a complete and correct response.
State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

\[
0.819 \pm 2(0.053) < \frac{0.819 + 2(0.053)}{0.819 - 2(0.053)} = 0.925
\]

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials’ claim.

Score 3: The student did not state a correct interval.
State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

\[ 0.72 - 0.92 \]

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials’ claim.

The organization should question the official’s claim because 0.70 is outside the interval 0.72 - 0.92.

**Score 3:** The student did not round the interval to the nearest thousandth.
State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

\[
\begin{align*}
(0.819) + 2(0.053) &= 0.925 \\
(0.819) - 2(0.053) &= 0.713 \\
0.713 &\leq p \leq 0.925
\end{align*}
\]

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials’ claim.

70% is lower than the mean of 81.9%.

Score 2: The student stated a correct interval but showed no further correct work.
36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials’ claim.

Because the dot graph does not show that 70% supported the repeal.

Score 1: The student wrote the interval incorrectly.
36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

\[
\frac{310}{950} = \frac{31}{9.095} = 32.6
\]

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials’ claim.

They should question the state officials claim because it is wrong and it states that 70% of the community supported the repeal.

Score 0: The student did not show enough correct work to receive any credit.
36 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.

Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the nearest thousandth.

\[ 0.72 \leq \hat{p} \leq 0.90 \]

The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials’ claim.

Score 0: The student did not give a correct interval and wrote an incorrect explanation.
A technology company is comparing two plans for speeding up its technical support time. Plan \( A \) can be modeled by the function
\[
A(x) = 15.7(0.98)^x
\]
and plan \( B \) can be modeled by the function
\[
B(x) = 11(0.99)^x
\]
where \( x \) is the number of customer service representatives employed by the company and \( A(x) \) and \( B(x) \) represent the average wait time, in minutes, of each customer.

Graph \( A(x) \) and \( B(x) \) in the interval \( 0 \leq x \leq 100 \) on the set of axes below.

Score 6: The student gave a complete and correct response.
Question 37 continued

To the nearest integer, solve the equation $A(x) = B(x)$.

$$x = 35$$

Determine, to the nearest minute, $B(100) - A(100)$. Explain what this value represents in the given context.

$B(100) = 4.0264$

$A(100) = \frac{-2.0812}{1.9} \approx 2\text{ min}$

For 100 customer Service Representatives. The difference in average wait time is 2 minutes.
A technology company is comparing two plans for speeding up its technical support time. Plan $A$ can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan $B$ can be modeled by the function $B(x) = 11(0.99)^x$ where $x$ is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.

Score 5: The student made a domain error in the graph.
Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

\[
15.7 \cdot (1.98)^x = 11(99)^x
\]

\[x \approx 3.5\text{ customer service reps}\]

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

\[B(100) = 4.0264, \quad A(100) = 2.0821\]

This value represents that with 100 customer service representatives, Plan B is 2 minutes slower than Plan A. So, in 100 customer service representatives, Plan B is 2 minutes than Plan A.

\[4.0264 - 2.0821 = 1.9443 \times 2\text{ min}\]
A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where $x$ is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.
Question 37 continued

To the nearest integer, solve the equation $A(x) = B(x)$.

\[ 35 \]

Determine, to the nearest minute, $B(100) - A(100)$. Explain what this value represents in the given context.

\[ 4.0264 - 2.0812 = 1.9 \quad \text{2 min is the difference in wait time.} \]
A technology company is comparing two plans for speeding up its technical support time. Plan \( A \) can be modeled by the function \( A(x) = 15.7(0.98)^x \) and plan \( B \) can be modeled by the function \( B(x) = 11(0.99)^x \) where \( x \) is the number of customer service representatives employed by the company and \( A(x) \) and \( B(x) \) represent the average wait time, in minutes, of each customer.

Graph \( A(x) \) and \( B(x) \) in the interval \( 0 \leq x \leq 100 \) on the set of axes below.

Score 4: The student made a domain error and wrote an incomplete explanation.
Question 37 continued

To the *nearest integer*, solve the equation $A(x) = B(x)$.

$$x = 35$$

Determine, to the *nearest minute*, $B(100) - A(100)$. Explain what this value represents in the given context.

$$4 - 2 = 2$$

2 minutes of faster support line
A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function \( A(x) = 15.7(0.98)^x \) and plan B can be modeled by the function \( B(x) = 11(0.99)^x \) where \( x \) is the number of customer service representatives employed by the company and \( A(x) \) and \( B(x) \) represent the average wait time, in minutes, of each customer.

Graph \( A(x) \) and \( B(x) \) in the interval \( 0 \leq x \leq 100 \) on the set of axes below.

Score 3: The student made a domain error, wrote no labels and an incomplete explanation.
Question 37 continued

To the nearest integer, solve the equation $A(x) = B(x)$.

Determine, to the nearest minute, $B(100) - A(100)$. Explain what this value represents in the given context.

The difference in line between the line $y = d$ (dotted line).
37 A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function \( A(x) = 15.7(0.98)^x \) and plan B can be modeled by the function \( B(x) = 11(0.99)^x \) where \( x \) is the number of customer service representatives employed by the company and \( A(x) \) and \( B(x) \) represent the average wait time, in minutes, of each customer.

Graph \( A(x) \) and \( B(x) \) in the interval \( 0 \leq x \leq 100 \) on the set of axes below.

Score 2: The student only received credit for the second part.
Question 37 continued

To the nearest integer, solve the equation $A(x) = B(x)$.

$$15.7(0.99)^x = 11(0.99)^x$$

$x = 35$

Determine, to the nearest minute, $B(100) - A(100)$. Explain what this value represents in the given context.

$$41.0264 - 2.0821 = 1.9443$$

This represents the difference
A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function \( A(x) = 15.7(0.98)^x \) and plan B can be modeled by the function \( B(x) = 11(0.99)^x \) where \( x \) is the number of customer service representatives employed by the company and \( A(x) \) and \( B(x) \) represent the average wait time, in minutes, of each customer.

Graph \( A(x) \) and \( B(x) \) in the interval \( 0 \leq x \leq 100 \) on the set of axes below.
To the nearest integer, solve the equation \( A(x) = B(x) \). 

\[
\begin{align*}
15.7(0.98) &= 36.0412545 \\ 15.7(1.95) &= 35.6412545 \\
\Rightarrow x &= 35.0412545
\end{align*}
\]

Determine, to the nearest minute, \( B(100) - A(100) \). Explain what this value represents in the given context.

\[
4.0264 - 2.0821 =
\]
A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function $A(x) = 15.7(0.98)^x$ and plan B can be modeled by the function $B(x) = 11(0.99)^x$ where $x$ is the number of customer service representatives employed by the company and $A(x)$ and $B(x)$ represent the average wait time, in minutes, of each customer.

Graph $A(x)$ and $B(x)$ in the interval $0 \leq x \leq 100$ on the set of axes below.

**Score 1:** The student calculated $B(100) - A(100)$, but showed no further correct work.
Question 37 continued

To the nearest integer, solve the equation $A(x) = B(x)$.

$$15.7(0.98)^x = 11(0.99)^y$$

Determine, to the nearest minute, $B(100) - A(100)$. Explain what this value represents in the given context.

$$B = 11(0.99)^{100}$$

$B$ is $4.026355754$

$$A = 15.7(0.98)^{100}$$

$A$ is $2.082127028$

$B(100) - A(100) = 1.944228786$

2 minutes
A technology company is comparing two plans for speeding up its technical support time. Plan A can be modeled by the function \( A(x) = 15.7(0.98)^x \) and plan B can be modeled by the function \( B(x) = 11(0.99)^x \) where \( x \) is the number of customer service representatives employed by the company and \( A(x) \) and \( B(x) \) represent the average wait time, in minutes, of each customer.

Graph \( A(x) \) and \( B(x) \) in the interval \( 0 \leq x \leq 100 \) on the set of axes below.

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

**Score 0:** The student did not show enough correct work to receive any credit.
Question 37 continued

To the nearest integer, solve the equation $A(x) = B(x)$.

\[\begin{align*}
15.7 \cdot 0.98^x &= 11 \cdot 0.99^x \\
15.7x - 11x &= 10y \cdot 0.99 - 10y \cdot 0.99 \\
x &= 0.1053
\end{align*}\]

Determine, to the nearest minute, $B(100) - A(100)$. Explain what this value represents in the given context.
Regents Examination in Algebra II – August 2022
Chart for Converting Total Test Raw Scores to Final Exam Scores (Scale Scores)
(Use for the August 2022 exam only.)

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<th>Performance Level</th>
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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 rescoring 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.