LSU Dual Enrollment Program for Math

COURSE PROFILE with LMS

Content Revised 7-12-2021

**COURSE NAME: Algebra II**

**HIGH SCHOOL COURSE CODE: 160322**

**PRIMARY ONLINE CONTENT SOURCE: *Algebra II in MyMathLab****,* **Elayn Martin-Gay, with**

**contributions from Robert Blitzer**

**COURSE/UNIT CREDIT: 1 Carnegie Unit for full year**

**GRADE(S): 9, 10, or 11**

**CHAPTERS**

**4 – Systems of Equations**

**6 – Exponents, Polynomials, and Polynomial Functions**

**7 – Rational Expressions**

**8 – Rational Exponents, Radicals, and Complex Numbers**

**9 – Quadratic and Higher Degree Equations and Functions**

**10 – Exponential and Logarithmic Functions**

**12 – Sequences and Series**

**14 – Trigonometric Functions and Identities**

**X – Statistics (from another book)**

| **SECTION NAMES (NUMBER OF EXERCISES) AND LEARNING OBJECTIVES** | **LMS #** |
| --- | --- |
| **CHAPTER 4: Systems of Equations** | no data |
| **4.1 Solving Systems of Equations in Two Variables (30)**  Determine whether an ordered pair is solution of a system of two linear equations  Solve a system by graphing  Solve a system by substitution  Solve a system by elimination  Solve applications | A-REI.C.6 |
| **4.2 Solving Systems of Equations in Three Variables (13)**  Determine whether an ordered triple is a solution of system of three linear equations  Solve a system of three linear equations in three variables | A-REI.C.6 |
| **4.3 Systems of Linear Equations and Problem Solving (18)**  Solve problems that can be modeled by a system of two linear equations  Solve problems with cost and revenue functions  Solve problems that can be modeled by a system of three linear equations | F-BF.A.1a  A-REI.C.6 |
| **CHAPTER 6: Exponents, Polynomials, and Polynomial Functions** | No data |
| **6.5 The Greatest Common Factor and Factoring by Grouping (17)**  Factor out the GCF of a polynomial’s terms  Factor polynomials by grouping | A-SSE.A.2 |
| **6.6 Factoring Trinomials (31)**  Factor trinomials of the form  Factor trinomials of the form  by trial and check or by grouping  Factor by substitution | A-SSE.A.2 |
| **6.7 Factoring by Special Products (30)**  Factor a perfect square trinomial  Factor the difference of two squares  Factor the sum or difference of two cubes | A-SSE.A.2 |
| **6.8 Solving Equations by Factoring and Problem Solving (22)**  Solve polynomial equations by factoring  Solve problems that can be modeled by polynomial equations  Find the *x*-intercepts of a polynomial function | A-APR.B.3  A-REI.B.4b |
| **CHAPTER 7: Rational Expressions** | No data |
| **7.1 Rational Expressions (20)**  Find the domains of rational expressions  Simplify rational expressions | A-APR.D.6 |
| **7.4a Dividing Polynomials (23)**  Divide a polynomial by a monomial  Divide by a polynomial  Use synthetic division to divide a polynomial by a binomial | A-APR.D.6 |
| **7.4b Dividing Polynomials (11)**  Use the remainder theorem to evaluate polynomials  Use the factor theorem | A-APR.B.2  A-APR.D.6 |
| **7.5 Solving Equations Containing Rational Expressions (28)**  Solve equations containing rational expressions | A-REI.A.2 |
| **7.6 Rational Equations and Problem Solving (23)**  Solve equations that contain radical expressions  Use the Pythagorean Theorem to model problems  Solve application problems | A-REI.A.2  A-CED.A.1 |
| **CHAPTER 8: Rational Exponents, Radicals, and Complex Numbers** | No data |
| **8.1 Radicals and Radical Functions (31)**  Find square roots  Approximate roots  Find cube roots  Find *n*th roots  Find the *n*th root of , where *a* is a real number  Graph square root and cube root functions | N-RN.A.1  N-RN.A.2  F-IF.B.2  F-IF.C.7b  F-BF.B.3 |
| **8.2 Rational Exponents (41)**  Understand the meaning of  Understand the meaning of  Understand the meaning of  Use rules for exponents to simplify expressions that contain rational exponents  Use rational exponents to simplify radical expressions | N-RN.A.1  N-RN.A.2 |
| **8.3 Simplifying Radical Expressions (27)**  Use the product rule for radicals  Use the quotient rule for radicals  Simplify radicals | N-RN.A.1 |
| **8.4 Adding, Subtracting, and Multiplying Radical Expressions (34)**  Add or subtract radical expressions  Multiply radical expressions | N-RN.A.2  A-SSE.A.2 |
| **8.5 Rationalizing Denominators and Numerators of Radical Expressions (23)**  Rationalize denominators  Rationalize denominators having two terms  Rationalize numerators | A-SSE.A.2 |
| **8.6 Solving Radical Equations (28)**  Solve equations that contain radical expressions  Use the Pythagorean Theorem to model problems  Solve application problems | A-REI.A.2 |
| **8.7 Complex Numbers (46)**  Write square roots of negative numbers in the form  Add or subtract complex numbers  Multiply complex numbers  Raise *i* to powers | N-CN.A.1  N-CN.A.2 |
| **This row intentionally left blank.** | No data |
| **CHAPTER 9: Quadratic and Higher Degree Equations and Functions** | **No data** |
| **9.1 Solving Quadratic Equations by Completing the Square (32)**  Use the square root property to solve quadratic equations  Complete and factor a perfect square trinomial  Solve quadratic equations by completing the square  Use quadratic equations to solve problems | A-REI.B.4b  A-CED.A.1  N-CN.C.7 |
| **9.2 Solving Quadratic Equations by the Quadratic Formula (23)**  Solve quadratic equations by using the quadratic formula  Determine number and type of solutions of quadratic equations using discriminant  Solve geometric problems modeled by quadratic equations | A-REI.B.4b  N-CN.C.7 |
| **11.7 Solving Nonlinear Systems of Equations (14)**  Solve a nonlinear system by substitution  Solve a nonlinear system by elimination  Verify solutions to nonlinear systems found using graphs | A-REI.C.7 |
| **9.3 Solving Equations by Using Quadratic Methods (24)**  Solve quadratic equations by squaring both sides  Solve quadratic equations by multiplying by the lowest common denominator  Solve higher degree equations in quadratic form  Solve equations by converting to a quadratic with substitution  Solve various equations that are quadratic in form  Solve problems that lead to quadratic equations | A-REI.B.4b  N-CN.C.7 |
| **9.4 Zeros of Polynomial Functions (19)**  Find zeros of a polynomial function and their multiplicities  Use the factor theorem and synthetic division  Find polynomials with given zeros | F-IF.C.7c  A-APR.B.2  A-APR.B.3 |
| **9.5 Graphs of Polynomial Functions (33)**  Graph even and odd power functions  Describe the end behavior of a polynomial function  Find the *x*-intercepts of a polynomial function  Find the maximum number of real zeros, *x*-intercepts, and turning points of a polynomial equation  Graph polynomial functions | A-APR.B.3  F-BF.B.3  F-IF.C.7c |
| This row intentionally left blank | **No data** |
| **CHAPTER 10: Exponential and Logarithmic Functions** | **No data** |
| **10.2 Inverse Functions (22)**  Determine whether a function is a one-to-one function  Find the inverse of a function  Use the horizontal line test to decide whether a function is a one-to-one function  Find the equation of the inverse of a function  Graph functions and their inverses | F-BF.B.4a |
| **10.3 Exponential Functions (47)**  Evaluate exponential expressions  Graph exponential functions  Graph exponential functions using transformations  Solve equations of the form  Solve problems modeled by exponential equations  Use compound interest formulas to find investment values | F-IF.C.7e  F-BF.B.3  A-CED.A.1  F-LE.A.2 |
| **10.4 Logarithmic Functions (46)**  Convert between logarithmic and exponential notation  Find the value of logarithmic expressions  Solve logarithmic equations by using exponential notation  Simplify using the properties of logarithms  Identify and graph logarithmic functions | A-CED.A.1  F-IF.C.7e  F-BF.B.3 |
| **10.5 Properties of Logarithms (38)**  Use the product property of logarithms  Use the quotient property of logarithms  Use the power property of logarithms  Use the properties of logarithms together | A-SSE.A.2 |
| **10.6 Common Logarithms, Natural Logarithms, and Change of Base (33)**  Identify and approximate common logarithms  Identify and approximate natural logarithms  Evaluate common logarithms of powers of 10  Evaluate natural logarithms of powers of *e*  Solve logarithmic equations  Use the change of base formula  Solve applications | A-CED.A.1 |
| **10.7 Exponential and Logarithmic Equations and Applications (34)**  Solve exponential equations  Solve logarithmic equations  Solve problems that can be modeled by exponential and logarithmic equations | A-CED.A.1  F-LE.A.2  F-LE.A.4  F-LE.B.5 |
| **This row intentionally left blank** | **No data** |
| **CHAPTER 12: Sequences and Series** | **No data** |
| **12.2 Arithmetic and Geometric Sequences (22)**  Identify arithmetic sequences and their common differences.  Identify geometric sequences and their common ratios.  Determine if a sequence is arithmetic or geometric.  Find the *n*th term of a geometric sequence.  Solve applications. | F-BF.A.2  F-LE.A.2 |
| **12.3 Finite Geometric Sequences (9)**  Find the sum of a geometric series  Solve applications | A-SSE.B.4 |
| **CHAPTER 14: Trigonometric Functions and Identities** | **No data** |
| **14.1 Angles and Radian Measure (42)**  Use radian measure  Convert between degrees and radians  Draw angles in standard position  Find coterminal angles  Find the length of a circular arc. | F-TF.A.1  F-TF.A.2 |
| **14.2 Right Triangle Trigonometry (20)**  Use right triangles to evaluate trigonometric functions  Find trigonometric function values for 30°  , 45° , and 60°  Recognize and use fundamental identities  Evaluate trigonometric functions with a calculator | F-TF.C.8  G-SRT.C.6 |
| **14.3 Trigonometric Functions of Any Angle (51)**  Use the definitions of trigonometric functions of any angle  Use the signs of the trigonometric functions  Find reference angles  Use reference angles to evaluate trigonometric functions | F-TF.A.2  F-TF.C.8 |
| **14.4 Trig Functions of Real Numbers; Periodic Functions (25)**  Use a unit circle to define trigonometric functions of real numbers  Use even and odd trigonometric functions  Use periodic properties  Solve application problems | F-TF.A.2  F-IF.B.4 |
| **14.5 Graphs of Sine and Cosine Functions (39)**  Understand the graph of  Graph variations of  Understand the graph of  Graph variations of  Use vertical shifts of sine and cosine curves  Solve Application problems | F-TF.B.5  F-IF.C.7e |
| **CHAPTER X: Statistics** |  |
| **X.1 Observational Studies, Designed Experiments, and Sample Surveys (14)**  Identify characteristics of the design of an experimental study  Describe effects of an experimental study design on its outcome  Define terms relating to experiments and studies  Explain the sources of bias in sampling | S-IC.A.1  S-IC.B.3  S-IC.B.6 |
| **X.2 Standard Deviation (19)**  Determine the standard deviation for a data set  Compare two data sets using measures of dispersion | S-ID.A.4 |
| **X.3 Normal Distribution (22)**  Use and interpret margins of error  Find scores at a specified standard deviation from the mean  Use the 68–95–99.7 Rule  Solve applied problems involving normal distributions  Understand percentiles and quartiles  Convert a data item to a *z*-score | S-ID.A.4  S-IC.B.4 |

LMS for Algebra II that are not reflected in *MyMathLab* course exercises:

| **LMS#** | **Standard Description** |
| --- | --- |
| N-Q.A.2 | Define appropriate quantities for the purpose of descriptive modeling. |
| A-SSE.B.3c | Use the properties of exponents to transform expressions for exponential functions. |
| A-APR.C.4 | Prove polynomial identities and use them to describe numerical relationships. |
| A-REI.A.1 | Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. |
| A-REI.D.11 | Explain why the *x*-coordinates of the points where the graphs of the equations  and  intersect are the solutions of the equation ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. |
| F-IF.B.6 | Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. |
| F-IF.C.8b | Use the properties of exponents to interpret expressions for exponential functions. |
| F-IF.C.9 | Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). |
| S-ID.B.6a | Fit a function to the data; use functions fitted to data to solve problems in the context of the data. |
| S-IC.A.2 | Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. |
| S-IC.B.5 | Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. |

LSU College Readiness Program for Math

MML Algebra II Supplemental Activities

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| **Standard # and Description** | N-Q.A.2  Define appropriate quantities for the purpose of descriptive modeling. |
| **Source** | Illustrative Mathematics  https://www.illustrativemathematics.org/content-standards/tasks/1850 |

**Giving raises**

A small company wants to give raises to their 5 employees. They have $10,000 available to distribute. Imagine you are in charge of deciding how the raises should be determined.

1. What are some variables you should consider?
2. Describe mathematically different methods to distribute the raises.
3. What information do you need to compute the raises for each employee?
4. Make up the information you need to compute specific raises for 2 different methods and apply them to the situation. Compute the specific dollar amount each employee receives as a raise.
5. Choose one your methods that you think is most fair and construct an argument that supports your decision.

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| **Standard # and Description** | A-SSE.B.3c  Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.  c. Use the properties of exponents to transform expressions for exponential functions*. For example the expression* *can be rewritten as* *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.* |
| **Source** | Illustrative Mathematics  https://www.illustrativemathematics.org/content-standards/HSA/SSE/B/3/tasks/1305 |

**Forms of Exponential Expressions**

Four physicists describe the amount of radioactive substance, *Q* in grams, left after *t* years:

1. 
2. 
3. 
4. 
5. Show that the expressions describing the radioactive substance are all equivalent (using appropriate rounding).
6. What aspect of the decay substance does each of the formulas highlight?

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| **Standard # and Description** | A-APR.C.4  Use polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* *can be used to generate Pythagorean triples.* |
| **Source** | PARCC Performance Based Assessment Released Items |

**Part A**

Let *x* and *y* represent natural numbers. Prove that the following equation is true for all x and *y* values. Show your work or explain your answer.



**Part B**

Jenna claims that , , and  can be used to find the side lengths for right triangles. Explain why Jenna is correct. Also, explain what restrictions, if any, must be placed on the values of x and y when they are being used to find side lengths for triangles.

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| **Standard # and Description** | A-REI.A.1  Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. |
| **Source** | Louisiana Student Standards: Companion Document for Teachers (Algebra II)  https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning |

Show that *x* = 2 and *x* = -3 are solutions to the equation Write the equation in a form that shows these are the only solutions, explaining each step in your reasoning.

Explain the steps involved in solving each of the following:











Placeholder space





















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| **Standard # and Description** | A-REI.D.11  Explain why the *x*-coordinates of the points where the graphs of the equations  and  intersect are the solutions of the equation ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where  and/or  are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. |
| **Source** | Illustrative Mathematics  https://tasks.illustrativemathematics.org/content-standards/HSA/REI/D/11/tasks/618 |

**Two Squares are Equal**

Solve the quadratic equation

using as many different methods as possible.

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| **Standard # and Description** | F-IF.B.6  Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. |
| **Source** | Louisiana Student Standards: Companion Document for Teachers (Algebra II)  https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning |

1. Use the following table to find the average rate of change of *g* over the intervals and :

| ***x*** | ***g(x)*** |
| --- | --- |
| -2 | 2 |
| -1 | -1 |
| 0 | -4 |
| 2 | -10 |

1. The plug is pulled in a small hot tub. The table gives the volume of water in the tub from the moment the plug is pulled, until it is empty. What is the average rate of change between
2. 60 seconds and 100 seconds?
3. 0 seconds and 120 seconds?
4. 70 seconds and 110 seconds?

| **Time (seconds)** | **Volume (liters)** |
| --- | --- |
| 0 | 1600 |
| 10 | 1344 |
| 20 | 1111 |
| 30 | 900 |
| 40 | 711 |
| 50 | 544 |
| 60 | 400 |
| 70 | 278 |
| 80 | 178 |
| 90 | 100 |
| 100 | 44 |
| 110 | 11 |
| 120 | 0 |

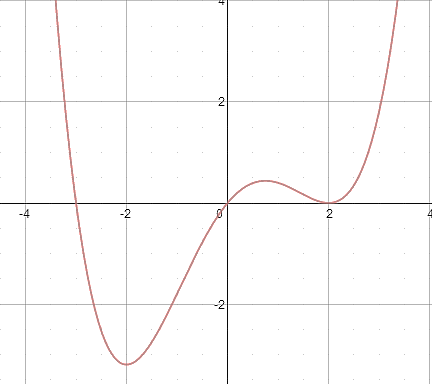
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| **Standard # and Description** | F-IF.C.8b  Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.  b. Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as*  , , , and  *, and classify them as representing exponential growth or decay.* |
| **Source** | Louisiana Student Standards: Companion Document for Teachers (Algebra II)  https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning |

1. The projected population of Delroysville is given by the function where *t* is the number of years since 2010. You have been selected by the city council to help them plan for future growth. Explain what the function  means to the city council members.
2. Suppose a single bacterium lands on one of your teeth and starts reproducing by a factor of 2 every hour. If nothing is done to stop the growth of the bacteria, write a function for the number of bacteria as a function of the number of days.
3. The expression  represents the amount of a drug in milligrams that remains in the bloodstream after *x* hours.
4. Describe how the amount of drug in milligrams changes over time.
5. What would the expression  represent?
6. What new or different information is revealed by the changed expression?

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| **Standard # and Description** | F-IF.C.9  Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.* |
| **Source** | Louisiana Student Standards: Companion Document for Teachers (Algebra II)  https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning |

If  and  is represented on the graph below.

1. What is the difference between the zero with the least value of  and the zero with the least value of ?
2. Which has the largest relative maximum value?
3. Describe the end behaviors of the graphs of each function. Why are they different?



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| **Standard # and Description** | S-ID.B.6a  Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context*. Emphasize exponential models.* |
| **Source** | Illustrative Mathematics  https://tasks.illustrativemathematics.org/content-standards/HSS/ID/B/6/tasks/941 |

**Used Subaru Foresters**

Jane wants to sell her Subaru Forester, but doesn’t know what the listing price should  
be. She checks on craigslist.com and finds 22 Subarus listed. The table below shows  
age (in years), mileage (in miles), and listed price (in dollars) for these 22 Subarus.  
(Collected on June 6th, 2012 for the San Francisco Bay Area.)

**Age Mileage Price**

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| --- | --- | --- |
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a. Make appropriate plots with well-labeled axes that would allow you to see if there is  
a relationship between price and age and between price and mileage. Describe the  
direction, strength and form of the relationships that you observe. Does either mileage  
or age seem to be a good predictor of price?

b. If appropriate, describe the strength of each relationship using the correlation  
coefficient. Do the values of the correlation coefficients agree with what you see in the  
plots?  
c. Pick the stronger relationship and use the data to find an equation that describes  
this relationship. Make a residual plot and determine if the model you chose is a good  
one. Write a few sentences explaining why (or why not) the model you chose is  
appropriate.  
d. If Jane’s car is 9 years old with 95000 miles on it, what listing price would you  
suggest? Explain how you arrived at this price.

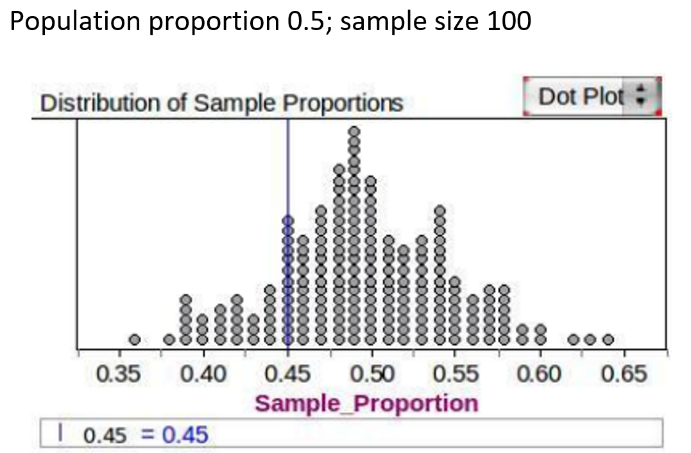
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| **Standard # and Description** | S-IC.A.2  Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin will fall heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?* |
| **Source** | Illustrative Mathematics  https://tasks.illustrativemathematics.org/content-standards/HSS/IC/A/2/tasks/125 |

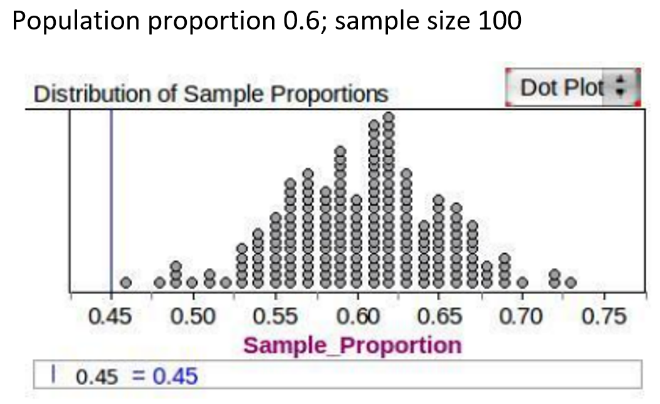
**Block Scheduling**

A random sample of 100 students from a specific high school resulted in 45% of them favoring a plan to implement block scheduling. Is it plausible that a majority of the students in the school actually favor the block schedule? Simulation can help answer the questions.

The accompanying plots show a simulated distribution of sample proportions for samples of size 100 from a population in which 50% of the students favor the plan, and another distribution from a population in which 60% of the students favor the plan. Each simulation contains 200 runs.

1. What do you conclude about the plausibility of a population proportion of 0.50 when the sample proportion is only 0.45?
2. What about the plausibility of 0.60 for the population proportion?





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| **Standard # and Description** | S-IC.B.5  Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. |
| **Source** | Louisiana Student Standards: Companion Document for Teachers (Algebra II)  https://www.louisianabelieves.com/resources/library/k-12-math-year-long-planning |

1. Sal purchased two types of plant fertilizer and conducted an experiment to see which fertilizer would be best to use in his greenhouse. He planted 20 seedlings and used Fertilizer A on ten of them and Fertilizer B on the other ten. He measured the height of each plant after two weeks. Use the data below to determine which fertilizer Sal should use.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Fertlizer A** | 23.4 | 30.1 | 28.5 | 26.3 | 32.0 | 29.6 | 26.8 | 25.2 | 27.5 | 30.8 |
| **Fertlizer B** | 19.8 | 25.7 | 29.0 | 23.2 | 27.8 | 31.1 | 26.5 | 24.7 | 21.3 | 25.6 |

1. Use the data to generate simulated treatment results by randomly selecting ten plant heights from the twenty plant heights listed.
2. Calculate the average plant height for each treatment of ten plants.
3. Find the difference between consecutive pairs of treatment averages and compare. Does your simulated data provide evidence that the average plant heights using Fertlizer A and Fertilizer B is significant?
4. “Are Starbucks customers more likely to be female?” To answer the question, students decide to randomly select 30-minute increments of time throughout the week and have an observer record the gender of every tenth customer who enters the Starbucks store. At the end of the week, they had collected data on 260 customers, 154 females and 106 males. This data seems to suggest more females visited Starbucks during this time than males.

To determine if these results are statistically significant, students investigated if they could get this proportion of females just by chance if the population of customers is truly 50% females and 50% males. Students simulated samples of 260 customers that are 50-50 females to males by flipping a coin 260 times, and then recording the proportion of heads to represent the number of women in a random sample of 260 customers (e.g., 0.50 means that 130 of the 260 flips were heads). Their results are displayed in the graph below. Use the distribution to determine if the class’s data is statistically significant enough to conclude that Starbucks customers are more likely to be female.

