SUMMER SCHOOL TEACHER GUIDE

Applied Mathematical Concepts

Summer School – Table of Contents

Summer School Teacher Guide

The Summer High School Program will be 20 days for full credit and 10 days for semester / half (½) credit). First Semester will be days 1-10 and Second Semester will be days 11-20. Breakdown of days will have the following per semester / half (½) credit:

- Nine (9) days of daily lessons
- One (1) day post-test review and post-test

All Students and staff will use Grade Results for their summer curriculum. Each lesson will open daily, and students will not be able to work ahead; however, students can work on previously opened lessons per semester. Students can retake a daily post-test 3 times before it locks. If a student needs to retake a daily lesson post-test for a 4th time, then the teacher will have to open the lesson post-test again. Teachers should not delete any prior lesson post-test. Grade Results will post the highest grade from each students' lesson post-test.

Classroom Schedule – *Time below is an approximate breakdown of time.*

- **Attendance in Powerschool**-5 min
- **Lesson Introduction (I Do)** – 5 minutes
- **Lesson Activities (We Do)** – 60 minutes
- **Break – 10 Minutes** *(Site Administrator will work with teachers on breaks)*
- **Teacher Lesson Review** – 5 minutes
- **Independent Work** – Student Lesson Review*/Post-test (They Do) – 40 minutes
- **Closing/Wrap Up**– 5 minutes
- **Total Time: 2 hours 10 minutes**

***Lesson Review** – Students will review lessons for essential knowledge/information prior to the daily test.

The following will be used within **Grade Results**:

- Lessons with Content Area, Videos, and Activities
- Supplemental Teacher Resources App– Some lessons will have a Supplemental resource (Example – Flocabulary)
- Post-Test – Each lesson will have a daily post-test.

Graded Work – The Posttest will be the daily graded work. Graded work is automatically calculated by the Grade Results Software.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 1**

Topic/Lesson Title & Grade Results #: Lesson 1 - Forming and Solving Equations and Inequalities

Objective(s): SWBAT:

- Form linear equations from the given situations and solve them.
- Form linear inequalities from the given situations and solve them.
- Form non-linear equations from the given situations and solve them.

Guiding Question(s):

- What is a system of equations and inequalities and how can they be used to model real-life situations?
- How can a system of equations or inequalities be solved algebraically and graphically?
- What does it mean to look for a solution(s) of a system of equations or inequalities?

TN Curriculum Standard(s):
A2.A.REI.C.4 Write and solve a system of linear equations in context.
A2.A.REI.B.3 Solve quadratic equations and inequalities in one variable.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in PowerSchool (5 min)

Key Vocabulary/Terms Slide 23 – Ask for a volunteer to read the vocabulary words.
Linear Equation: An equation in which the highest power of any variable is one.

- **Linear Inequality**: An inequality which involves a linear function.
- **Quadratic Equation**: A polynomial equation in which the highest power of the variable is two.
- **Rational Function:** A function which can be defined by an algebraic fraction.

Lesson Introduction (I Do): 5 min
Teacher Introduction Script: Today, we will investigate linear equations and linear inequalities. We will begin with linear equations and then continue to linear inequalities. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Work the examples on the following slides:

- **Slide 2 –** Scenario: Victor has a total of 24 oranges—some in a basket, and 6 on the table. He is unsure of the number of oranges in the basket. How can this be represented in algebraic form?
    - **Have the students discuss the given scenario to determine an equation and how algebra is used in the real-world.**
    - **Ask the students to come up with a different scenario and have others determine the equation represented by the scenario.**

- **Slide 3** – Complete Example 1 - Four less than four times a number, *N*, is twelve. Translate the verbal phrase to algebraic form.
- **Slide 4 –** Complete Example 2 - Cindy celebrated her 25th birthday three years ago. Her current age is two times Fred's age. Model this situation using a linear equation.
- **Slide 5 –** Complete Example 3 - Three years from now, Jenny's age will be one plus two times her current age. What is Jenny's current age?
- **Slide 6.** Ask students if they have any questions. If there are no questions, please proceed to the next slide.
- **Slides 7, 8 and 9** – Linear Inequalities - Examples 1 and 2
- **Slide 10.** Ask students if they have any questions. If there are no questions, please proceed to the next slide.
- **Slides 11-12 –** Solving Linear Inequalities using Distribution property.
- **Slide 13**. Ask students if they have any questions. If there are no questions, please proceed to the next slide.
- **Slides 14 – 17** - Solving Linear Inequalities - Examples 5 – 7 and Video (video is 19 minutes)
- **Slides 18 – 20 –** Solving Rational Functions, Solving Quadratic Equations, Solving Exponential Functions
- **Slides 21-23-** Ask students if they have any questions. If there are no questions, please proceed to the lesson review and restate the vocabulary (found on the last slide).

Lesson Activities (We Do):60 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on **Slides 6, 10, 13, and 21.** Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concept(s) needing further explanation.

Supplemental: (Optional)

- **Supplementary –** Review Linear Pair and Supplementary prior to the students watching the video. The video will take approximately five minutes to watch. After the student's finish watching the video, ask the following questions:
    - **What did the instructor find for the value of a in the first example? (the answer is a=20)**
    - **How old were Charlie and Ann? (Charlie, who is represented by x, is 4. Ann is 11.**

Additional Teacher Resources:

N/A

Lesson Review: 5 min

Teacher Closure Script: Today, we covered a lot of information. Let us review what we have learned. Please turn to Slide 22 and follow along as I read the Lesson Review slide. As I read each statement, please give me a thumbs up if you understand what I have read. If much of the class does not understand the material, I will move to the supplementary section of the lesson. Follow along as I read the lesson review:

- **Slide 22 – Lesson Review -**
    - A statement which equates two expressions by an equal sign is called an algebraic equation.
    - A linear equation is an equation in which the highest power of any variable is one.
    - Inequality is a mathematical sentence that compares two quantities with any one of the four symbols: <, >, ≤, or ≥.
    - If the inequality is < or >, then the graph should have an open dot.
    - If the inequality is ≤ or ≥, then the graph should have a solid dot.
    - When an inequality is multiplied or divided by a negative number, its inequality sign gets reversed.
    - Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do): 40 min
Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min
Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 2**

Topic/Lesson Title & Grade Results #: Lesson 2 - Solving Equations

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): SWBAT:
Part A: Solving Two-Step Equations

- Solve equations in the form of $p(x + q) = r$
- Compare arithmetic and algebraic solutions to word problems
- Solve real world problems where the formed equations are in the form of $p(x + q) = r$

Part B: Solving Literal Equations

- Solve literal equation for a specified variable

Guiding Question(s):

- How can you solve one variable equations using inverse operations?
- How can you analyze, model, and solve mathematical situations using algebraic equations?

TN Curriculum Standard(s):
AM.A.LP.A.1 - Use mathematical models involving equations and systems of equations to represent, interpret, and analyze quantitative relationships, change in various contexts, and other real-world phenomena.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in PowerSchool (5 min)

Key Vocabulary/Terms
Ask for a volunteer to read the vocabulary words (Slide 20)

- **Variables:** Variables are (usually) letters or other symbols that represent unknown numbers or values.
- **Distributive property:** $a(b + c) = ab + ac$, where a, b, and c are real numbers.
- **Rational numbers:** The set of numbers that can be written in the form a/b, where a and b are integers and b is not equal to 0.

Lesson Introduction (I Do): 5 min
Teacher Introduction Script: Today, we will solve equations. We will begin with traditional equations and continue to literal equations. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) :30 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 6, 9, 12, 17, and 18. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

Work the examples on the following slides:

- **Slides 2 and 3 –** Lesson Introduction
- **Slide 4 – Model Examples 1-3**
  - **Example 1 -** Use the distributive property to solve 4 (-2 + 5)
  - **Example 2 -** Use the distributive property to solve 2.3 (1.2 + 1.1)
  - **Example 3 -** Simplify the expression $\frac{1}{2}\left(\frac{1}{3}+\frac{1}{4}\right)$.
- **Slide 5 –** Equivalent Expressions (demonstrate and explain Example 1)
- **Slides 7-8** - Solving Equations of the Forms x + p = q and px = q (demonstrate and explain Examples 1 and 2)_
- **Slides 10 – Demonstrate and explain the question:** A ticket booking site charges a processing fee of $2.45 for every ticket purchased. Clarke bought 5 tickets for a science exhibition and paid a total of $195.75. How much each ticket cost?
- **Slide 11 – Demonstrate and explain the following examples:**
  - **Example 1** - Sarah's age is 5 years more than 6 times Lia's age. If Sarah is 29 years old, write an equation to represent this situation. What is Lia's age?
  - **Example 2** - Solve: $\frac{1}{5}x+4=-1$
- **Slides 13 – 16** – Three (3) additional examples and video (video is 30 minutes)

Please complete the activity on Slides 17 and 18. Ask students if they have any questions. If there are no questions, please proceed to the lesson review and restate the vocabulary (found on the last slide).

Supplemental: (Optional)

Supplemental activity does not address Part A. Rather, the supplementary activity addresses Part B only.

Additional Teacher Resources:
See Supplemental Section

Lesson Review: 5 min
Slide 19 – Lesson Review

- Variables are (usually) letters or other symbols that represent unknown numbers or values.
- Distributive property: a (b + c) = ab + ac, where a, b, and c are real numbers.
- In the expression p(*x* + q), (*x*+ q) is both a factor and a sum.
- To solve an equation, we must isolate the variable terms and constants. To isolate, we use inverse operations.

Transition to Lesson B Script: Now that we have finished the first lesson, we will now begin on Lesson B. Please select the tab for Lesson B. Once you have opened Lesson B, please select "thumbs up" icon.

Part B:
Lesson Introduction (I Do) 5 min:

- **Slide 2 –** Lesson Introduction

- **Slides 3-6 – Model Examples 1-4**
    - **Example 1 -** The area of a triangle is $A = \frac{1}{2}bh$ square units, where "b" is the base and "h" is the height of the triangle. Solve the formula for "b".
    - **Example 2 -** The area of a rectangle is 24 square cm and its length is 10 cm. Find the width of the rectangle.
    - **Example 3 -** Solve $V = \pi r^2 h$ for h
    - **Example 4 -** Solve for x: $y = 4x + 9$
- **Slide 7 –** Converting from Fahrenheit to Celsius (12-minute video included in this slide)
- **Slides 8-9** – Finding an Expression for Rate of Interest by Solving a literal equation. Speed of the Train. Two (2) additional examples

Please complete the activities on Slides 10 and 11. Ask students if they have any questions. If there are no questions, please proceed to the next slide.

- **Slide 12 – Additional Example**

Please complete the activity on Slide 12. Ask students if they have any questions. If there are no questions, please proceed to the next slide.

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on **Slides 10, 11, and 13.** Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concept(s) needing further explanation.

Supplemental: (Optional)

The supplementary activity gives an additional example of solving literal equations involving a trapezoid.

Additional Teacher Resources:
See Supplemental Section

Lesson Review 5 min:
Teacher Closure Script: Today, we covered a lot of information. Let us review what we have learned. Please turn to Slide 22 and follow along as I read the Lesson Review slide. As a I read each statement, please give me a thumbs up if you understand what I have read. If majority of the class does not understand the material, I will move to supplementary section of the lesson. Follow along as I read the lesson review:

Slide 12 – Lesson Review

- A literal equation contains more than one variable.
- Literal equations are usually formulas or expressions which contain other variables too.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) :30 min

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min
Ask for a volunteer to restate the objective(s). Then, review each vocabulary word. Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 3**

Topic/Lesson Title & Grade Results #: Lesson 3 – Systems of Linear Equations

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): SWBAT:
Part A: Solving System of Linear Equations

- List the types of solution of system of linear equations.
- Solve a system of equations by elimination method.

Part B: Solving System of Equations by Graphical Method

- Use graphs and tables to relate the system of linear equations.
- Identify the point of intersection of two lines as the solution to the system.
- Verify by computation that a point of intersection is a solution to each equation in the system by graphical method.
- Determine the number of solutions using the slope and y-intercepts.
- Write a second equation to create a specified solution.

Guiding Question(s):

- What does the number of solutions (none, one or infinite) of a system of linear equations represent?
- What are the advantages and disadvantages of solving a system of linear equations graphically versus algebraically?
- How can systems of equations be used to represent situations and solve problems?

TN Curriculum Standard(s):

- **A2.A.REI.C.4**: Write and solve a system of linear equations in context.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in PowerSchool(5 min)

Key Vocabulary/Terms
Part A: Ask for a volunteer to read the vocabulary words (last slide)

- **Coefficient:** The number that appears along with the variable.
- **Coordinate Plane:** A two-dimensional surface on which points are plotted and located by their *x*- and *y*-coordinates.
- **Linear Equation:** An algebraic equation in which the highest exponent of the variable or variables is one.
- **System of Linear Equations:** A collection of linear equations involving the same set of variables.

Part B: Ask for a volunteer to read the vocabulary words (last slide)

- **Coefficient:** The number that appears along with the variable.
- **Coordinate plane:** A two-dimensional surface on which points are plotted and located by their *x*- and *y*-coordinates.
- **Linear equation:** An algebraic equation in which the highest exponent of the variable or variables is one.
- **System of linear equations:** A collection of linear equations involving the same set of variables.

Part A:

Lesson Introduction (I Do): 5 min

Teacher Introduction Script: Today, we will solve systems of linear equations. We will use multiple approaches to solve each system. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do): 30 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 9, 10, and 12. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 2 and 3 –** Lesson Introduction
- **Slides 4-6 – Model Methods to Solving Systems of Equations**
    - **Slide 4 -** Solving Systems of Equations by Elimination
    - **Slide 5 -** Solving Systems of Equations by Elimination with video
    - **Slide 6 -** Solving Systems of Equations by Elimination with video
- **Slides 7-8** – Real-World Examples of Solving Systems of Equations_

Please complete the activities on Slides 9 and 10. Ask students if they have any questions. If there are no questions, please proceed to the next slide.

- **Slide 11 –** Additional Examples

Please complete the activity on Slide 12. Ask students if they have any questions. If there are no questions, please proceed to the next slide.

Supplemental: (Optional)

Supplemental activity does not address Part A. Rather, the supplemental activity addresses substitution. However, this may assist students pass their assessment.

Additional Teacher Resources:

See Supplemental Section

Lesson Review: 5 min

Slide 11 – Lesson Review

- The solution of a system of linear equations can be of three types. They are:
    - One solution
    - Infinitely many solutions
    - No solution
- If the system has exactly one solution, then the equations are said to be independent.

- If the system has infinite number of solutions, then the equations are said to be dependent.
- If the system of equations has at least one solution, then the system is consistent.
- If the system has no solution, then the system is inconsistent.
- The three different methods in solving a system of linear equations are:
  - Substitution method
  - Elimination method
  - Graphing method
- The coordinates of the intersection point of two equations become the solution to the system of equations.

Part B:
Lesson Introduction (I Do): 5 min

- **Slides 1 and 2 –** Lesson Introduction
- **Slides 3-10, 12-17, and 19 – Demonstrate and explain the examples 1-7 located on the slides involving solving inequalities.**

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on **Slides 11 and 18.** Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

Supplemental: (Optional)
The supplemental activity addresses substitution and includes a video

Additional Teacher Resources:
See Supplemental Section

Lesson Review :5 min
Slide 20 – Lesson Review

- The solution of a system of linear equations can be of three types. They are:
  - One solution
  - Infinitely many solutions
  - No solution
- If the system has exactly one solution, then the equations are said to be independent.
- If the system has an infinite number of solutions, then the equations are said to be dependent.
- If the system of equations has at least one solution, then the system is consistent.
- If the system has no solution, then the system is inconsistent.
- The three different methods in solving a system of linear equations are:
  - Substitution method
  - Elimination method
  - Graphing method
- The coordinates of the intersection point of two equations become the solution to the system of equations.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do): 30 min
Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min
Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 4**

Topic/Lesson Title & Grade Results #: Lesson 4 - Solving System of Linear Equations and Linear Inequalities

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Solving System of Two or More Linear Inequalities

- Define linear inequality and system of linear inequalities.
- Write and solve system of linear inequalities for real-life situations.
- Solve system of linear inequalities by graphing method and interpret the solutions.

Part B: Application of Solving System of Equations

- Define linear equation and system of equations.
- Write and solve system of equations in two variables for real-life situations.
- Solve system of equations by graphing method and interpret solutions.

Guiding Question(s):

- How can systems of equations be used to represent situations and solve problems?
- Why are linear inequalities useful?
- How are systems of linear equations and inequalities useful?

TN Curriculum Standard(s):
AM.A.LP.A.1: Use mathematical models involving equations and systems of equations to represent, interpret, and analyze quantitative relationships, change in various contexts, and other real-world phenomena.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in PowerSchool(5 min)

Key Vocabulary/Terms
Part A: Ask for a volunteer to read the vocabulary words (last slide)

- **Constraint:** A condition that imposes a limit.
- **Coordinate Axes:** Two mutually perpendicular axes that intersect at the origin (0, 0). Another name for coordinate axes is Cartesian axes.
- **Half-plane:** A planar region consisting of all points on one side of an infinite straight line, and no points on the other side.
- **Inequality:** The relation between two unequal expressions.
- **Linear Inequality:** An inequality which involves a linear expression.
- **System of Linear Inequalities:** A set of two or more inequalities with the same variables.
- **Test Point:** A point that determines whether a region is included or not included in an inequality.
- **Viable Region:** The region in which the solutions are successful.

Part B:

Ask for a volunteer to read the vocabulary words (last slide)

- **Coordinate Plane:** A plane which contains two mutually perpendicular axes that intersect at the origin (0, 0).
- **Linear Equation:** An equation in which the highest power of any variable is one.
- **Variable:** A letter or a symbol that is used to represent an unknown value.
- **System of Equations:** A set of two or more equations that involve the two or more variables.
- **Solution:** A set of values that satisfy the given equation.
- ***x*-intercept:** The point at which a line crosses the *x*-axis.
- ***y*-intercept:** The point at which a line crosses the y-axis

Part A:

Lesson Introduction (I Do) 5 min:

Teacher Introduction Script: Today, we will continue with solving systems of linear equations. We will use multiple approaches to solve each system. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 4, 7, 10, 11, 23, and 25. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 26 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slides 2 –** Lesson Introduction
- **Demonstrate and explain the following slides:**
  - **Slides 3 and 4 –** Linear Inequality
  - **Slide 5-**Graph a Linear Inequality on a Coordinate Axes
  - **Slide 6 –** Graphing Inequalities
  - **Slide 7--**Activity-Linear Inequality
  - **Slides 8 and 9–** Graphing a Linear Inequality in Two Variables, Graphing Linear Inequality
  - **Slides 10 –** Activity-Graphing Linear Inequality
  - **Slides 11**-Activity Identifying Inequality
  - **Slides 12 -**System of Linear Inequalities
  - **Slides 13-**Graphing the System of Inequalities
  - **Slides 14-**Video Solving System of Linear Inequalities
  - **Slides 15-17 –** Solving System of Linear Inequalities
  - **Slides 18-19-** Solving System of Linear Inequalities for Real Life Situations
  - **Slides 19-22** – Real-World Examples of Solving Systems of Inequalities
  - **Slides 23-24**- Activity-Steps in Solving System of Linear Inequalities

- ***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional):

Supplemental activity does not address Part A. Rather, the supplemental activity addresses substitution. However, this may assist students pass their assessment.

Additional Teacher Resources:
See Supplemental Section

Lesson Review: 5 min
Slide 25 – Lesson Review

- A linear inequality contains only linear expressions, and the highest power of any variable is one.
- A system of linear inequalities is two or more linear inequalities with the same variables.
- An ordered pair (x, y) that satisfies each inequality in the system is a solution of a system of linear inequalities.
- To solve a system of inequalities, graph each inequality on the grid, and identify the common region for all the inequalities. The common region is the solution region of the given system.
- When there is no common region, then the system has no solution.
- Steps to solve a system of inequalities for real-life situations:
  1. Identify the unknowns.
  2. Name each unknown.

Part B:
Lesson Introduction (I Do) 5 min:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 12 and 13. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 2-7–** Demonstrate and explain Solving System of Equations by Graphing
- **Slides 8 – 11** – Application of Concept with two videos (on slides 9 and 10)

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)
The supplemental activity provides a 26-minute video further explaining the concept.

Additional Teacher Resources:
See Supplemental Section

Lesson Review: 5 min
Slide 14 – Lesson Review

- A linear equation is an equation in which the highest power of any variable is one. It contains more than one variable.
- A system of equations is a set of two or more equations that involve the same variables.
- Steps involved in graphing a system of equations:
  - Find the x- and y-intercepts of each equation.

    - Graph all the equations in the same coordinate plane.
    - Find the point of intersection for which all the lines intersect.
    - The intersection point is the solution of the system of equations.
- If a system of equations has at least one solution, then the system is consistent.
- If a system of equations has no solution, then the system is inconsistent.
- If a system has exactly one solution, then the system is independent.
- If a system has infinitely many solutions, then the system is dependent.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 30 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 5**

Topic/Lesson Title & Grade Results #: Lesson 5 - Solving and Interpreting Linear Programming

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Solving and Interpreting Linear Programming

- Define linear programming.
- Explain the process involved in solving linear programming problems.
- Solve linear programming by graphical method and computational methods.
- Interpret the meaning of maximum and minimum value in linear programming.

Part B: Linear Programming Optimization

- Define optimization.
- Define linear programming.
- Explain how linear programming is used in solving optimization problems.

Guiding Question(s):

- Define linear equation and system of equations.
- Write and solve system of equations in two variables for real-life situations.
- Solve system of equations by graphing method and interpret solutions.

TN Curriculum Standard(s):

AM.A.LP.A.2 - Read, interpret, and solve linear programming problems graphically and by computational methods.
AM.A.LP.B.4 - Interpret the meaning of the maximum or minimum value in terms of the objective function.
AM.A.LP.B.3 - Use linear programming to solve optimization problems.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool (5 min)

Key Vocabulary/Terms:
Part A: Ask for a volunteer to read the vocabulary words (last slide)

- **Constraints:** The conditions or limitations on the decision variables.
- **Feasible region:** The region that contains a set of possible solutions that satisfy the problem's conditions.
- **Inequalities:** The relationship between two unequal expressions.
- **Non-negativity restriction:** The value for decision variables should be greater than or equal to zero.
- **Optimal solution:** The solution where the objective function reaches its maximum or minimum value.
- **Pivot element:** The element in the matrix which is first selected to perform certain calculations.
- **Simplex method:** The method of maximizing or minimizing a linear function of different variables under different conditions on other linear functions.

Part B: Ask for a volunteer to read the vocabulary words (last slide)

- **Feasible Region:** The set of all possible points.
- **Inequalities:** The relation between two unequal expressions.
- **Linear:** The progression from one stage to another in a single series of steps.
- **Optimization:** The action of making the best or most effective use of a situation or resource.
- **Variable:** A letter or symbol which represents an unknown value

Part A:
Lesson Introduction (I Do) 5 min:
Teacher Introduction Script: Today, we will apply what we have learned over the last two days involving solve systems of linear equations. We will solve linear programming problems. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 14, 17, and 18. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 20 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slide 2 –** Lesson Introduction
- **Demonstrate and explain the following slides:**
    - **Slides 3 and 4 –** Linear Programming and Process to Solve Linear Programming Problems
    - **Slides 5 -7 –** Graphical Method (slide 7 includes a video for further explanation)
    - **Slides 8 - 10–** Computational and Simplex Method
    - **Slides 11-13 –** Interpreting the Maximum and Minimum Value
    - **Slides 14-**Activity Linear Programming by Graphical Method
    - **Slides 15-16** – Additional Examples
    - **Slides 17-18 -**Activity-Finding the Maximum Value
- ***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are included for this lesson.

Additional Teacher Resources:
N/A

Lesson Review: 5 min
Slide 19 – Lesson Review

- Linear programming is the simplest technique to find the optimal solution.
- Feasible region will have a set of possible solutions that satisfy a problem's conditions.
- Optimal solution is also known as a feasible solution. It is a solution where the objective function reaches its maximum or minimum value.
- Simplex method is a method of maximizing or minimizing a linear function of different variables under different conditions on other linear functions

Part B:
Lesson Introduction (I Do) 5 min:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 7 and 11. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 3 -6 –** Demonstrate and explain Optimization. Then review Linear Programming
- **Slides 7-** Activity: Linear Programming Using Graphical Method
- **Slides 8 -10, 12 –** Additional Examples involving Linear Programming (slide 8 includes a video for further explanation of the concept).
- **Slides 11-**Linear Optimization

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental (Optional):

No supplemental activities are included in this module.

Additional Teacher Resources:
N/A

Lesson Review 5 min:
Slide 12– Lesson Review

- Optimization problems seek to maximize or minimize a linear function subject to certain constraints as determined by a set of linear inequalities.
- Linear programming (LP) problems are ones in which the objective and all of the constraints are linear functions of the decision variables.
- The common region determined by all the constraints including the non-negative constraints of a linear programming problem is called the feasible region or solution region of the problem.
- Points within and on the boundary of the feasible region are called the feasible solutions of the constraints.
- Any point outside the feasible region is called the infeasible solution.

- Any point in the feasible region that gives the optimal value (maximum or minimum) of the objective function is called an optimal solution.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 30 min:
Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min
Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 6**

Topic/Lesson Title & Grade Results #: Lesson 6 - Measures of Central Tendency

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Measures of Central Tendency (Mean, Median, and Mode)

- Define measures of central tendency.
- Define mean and find the mean of a set of data.
- Define the median and find the median for the given data.
- Explain mode and range and find it in the given set of data.

Part B: Interpret Statistical Problems Using Measures of Central Tendency

- Find the mean, median, and mode of a set of data.
- Solve statistic problems using mean, median, and mode.
- Interpret statistical problems using graph.

Guiding Question(s):

- How can you tell when to use each measure of central tendency to represent a data set?
- What influences our decision when choosing the best graph for a data set?
- How can we make sure a sample is valid and does not display bias?

TN Curriculum Standard(s):

AM.D.ID.A.4 - Calculate and interpret statistical problems using measures of central tendency and graphs.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in PowerSchool (5 min)

Key Vocabulary/Terms
Part A: Ask for a volunteer to read the vocabulary words (last slide)

- **Mean:** The ratio between the sum of the values and the total number of values in the data. It is also called an arithmetic mean or average.
- **Median:** The middle number in a set of data when the data is arranged in numerical order.
- **Mode:** The number or item that appears most frequently in a data set.
- **Range:** The difference between the greatest and the least values in the given data.

Part B: Ask for a volunteer to read the vocabulary words (last slide)

- **Mean:** The arithmetic average of a set of numbers.

- **Measure of central tendency:** A single value that attempts to describe a set of data by identifying the central position within that set of data.
- **Median:** The middle value of a data set when data is arranged in ascending or descending order.
- **Mode:** The number or item that appears most frequently in a set of data.

Part A:
Lesson Introduction (I Do): 5 min
Teacher Introduction Script: Today, we will analyze data. We will investigate the mean, median, and mode. In addition, we will investigate additional mathematical processes involving central tendency. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 4, 8, 13, 18, 22, and 23. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 25 –** Ask for a volunteer to read the vocabulary words.

Demonstrate and explain the following slides:

  - **Slides 2 –** Central Tendency (overview)
  - **Slides 3-7 and 9 –** Mean (slides 5 and 9 include a video for further explanation)
  - **Slides 10 -12 & 14–** Median (slide 14 includes a video for further explanation)
  - **Slides 15 – 17 –** Mode (video included)
  - **Slides 19 - 21** – Range

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

Central Tendency at the Oscars (26-minute video)

Additional Teacher Resources:
See Supplemental Section

Lesson Review 5 min:
Slide 24 – Lesson Review

- The three measures of central tendency are mean, median, and mode.
- Mean is the sum of the numbers in a set of data divided by the total number of data in the set.
- Median is the middle number of the data when the data is arranged in increasing order.
- The mode is the number or item that frequently appears in a set of data. A data set can be no mode, unimodal, bimodal, and multimodal.

- The range is the difference between the greatest and least values in a data set.

Part B:
Lesson Introduction (I Do) 5 min:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 9 and 12. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 3 -9 –** Mean, Median, and Mode (videos included for each concept)
- **Slides 10 – 11 –** Statistical Problems Using Graph

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

Central Tendency at the Oscars (26-minute video)

Additional Teacher Resources:
Refer to Supplemental Section

Lesson Review 5 min:
Slide 13– Lesson Review

- To find the mean of a set of data, add the data and divide the sum by the number of addends.
- Mean = $\frac{Sum\ of\ the\ numbers}{Number\ of\ addends}$
- To find the median of an odd set of data, order the numbers and find the middle value.
- To find the median of an even set of data, order the numbers and find the mean of the two middle values.
- To find the mode, find the item that appears most frequently in a data.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 30 min:
Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min
Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 7**

Topic/Lesson Title & Grade Results #: Lesson 7 - Confidence Interval and Data Distributions

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Confidence Interval for Population Mean

- Explain the confidence interval.
- Find the confidence interval for population mean using z distribution.
- Determine the margin of error.

Part B: Interpreting and Comparing Data Distributions

- Define spread and center of data, and explain how to measure them.
- Define the shape of the data and classify its type.
- Know the difference between the symmetric and skewed distribution of data.
- Interpret the possible effects of the extreme data points (outliers) on the data set.

Guiding Question(s):

- What is a confidence interval and how do I compute one for the mean of a population?

TN Curriculum Standard(s):

A2.S.IC.A.2 - Use data from a sample survey to estimate a population mean or proportion; use a given margin of error to solve a problem in context.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms
Part A: Ask for a volunteer to read the vocabulary words (last slide)

- **Confidence Interval (CI):** An interval estimate of a population parameter which is used to indicate the reliability of an estimate.
- **Critical Value:** The value corresponding to a given significance level.
- **Sample Size:** The act of choosing the number of observations to include in a statistical sample.
- **Standard Error:** The measure of the variability of a statistic

Part B: Ask for a volunteer to read the vocabulary words (last slide)

- **Interquartile Range:** Difference between the third quartile and the first quartile.
- **Mean:** Sum of the data divided by the total number of data.
- **Mean Deviation:** Mean of the absolute deviations taken from the mean of the data set.
- **Median:** Middle value of the data arranged in an order.
- **Mode:** Most occurred data.

- **Outlier:** An observation point that is away from other observations.
- **Quartiles:** The three values that divide the given data into four equal parts.
- **Range:** The difference between the minimum and maximum values of the data.
- **Symmetry:** A symmetric distribution is one in which the shape on the left of the distribution is a "mirror image" of the right.

Part A: Ask for a volunteer to read the vocabulary words (last slide)

Lesson Introduction (I Do) 5 min:
Teacher Introduction Script: Today, we will build on the data analysis skills obtained in yesterday's lesson. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do): 30 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 17 and 18. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 26 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slide 1 –** Lesson Introduction
- **Demonstrate and explain the following slides:**
    - **Slides 3 - 5 –** Confidence Interval and Confidence Interval (formula is located on slide 5)
    - **Slide 6 –** Margin of Error
    - **Slides 7- 9 –** Confidence Interval for Population Mean
    - **Slides 10 -13 –** Examples on how to find the confidence intervals
    - **Slides 14 -16** – Finding Margin of Error and Confidence Interval (additional examples)

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this lesson

Additional Teacher Resources:
N/A

Lesson Review: 5 min
Slide 20 – Lesson Review

- If an estimate of a population parameter is given by a single value, then the estimate is called a point estimate. It is used in hypothesis testing.

- The level of confidence is the probability that the interval estimate contains the population parameter. It is denoted by *c*.
- Confidence interval is also called the degree of confidence or confidence coefficient.
- The maximum probability with which we would be willing to take a risk is called the level of significance and is denoted by α.
- The relation between the confidence level (*c*) and the significance level (α) is given by *c* = 1- α.
- Confidence levels usually employed are 90%, 95%, and 99%.
- 99% confidence interval: $\bar{x} \pm 2.58 \times \frac{s}{\sqrt{n}}$
- 95% confidence interval: $\bar{x} \pm 1.96 \times \frac{\sigma}{\sqrt{n}}$
- 90% confidence interval: $\bar{x} \pm 1.65 \times \frac{\sigma}{\sqrt{n}}$
- The general form of the confidence interval is given as Statistic ± (Critical value × Standard error).
- The margin of error (or) error bound is given as (Critical value × Standard error).

Part B: Ask for a volunteer to read the vocabulary words (last slide)

Lesson Introduction (I Do) :5 min

Please model and explain the following slides:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do): 30 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 9 and 17. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 3**
- **Slides 5 -8 –** Exploring Data
- **Slides 10 -16 –** Quartiles, Interquartile Range, and Data Shape

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this module.

Additional Teacher Resources:
N/A

Lesson Review: 5 min
Slide 18– Lesson Review

- Mean, median, and mode are the measures of the center of the data.
- Distributions that have the same shape on both sides of the center are called symmetric distribution. In symmetric distribution, mean, median, and mode are equal.

- Distributions that have a different shape on both sides of the center are called skewed distribution. Here, the mean, median, and mode will be different.
- In positively skewed distribution, mode < median < mean, whereas in negatively skewed distribution, mean < median < mode.
- When the given data is symmetric, there is no effect of an outlier at the center of the data.
- When the given data is skewed left or right, there is a change in the effect of an outlier at the center of the data.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do): 30 min
Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min
Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 8**

Topic/Lesson Title & Grade Results #: Lesson 8 – Independent, Dependent, and Conditional Events

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Probability of Independent and Dependent Events

- Define probability.
- Explain dependent and independent events with examples.
- Find the probability of independent and dependent events.

Part B: Conditional Probability

- Define conditional probability.
- Find the conditional probability of an event.
- Interpret the problems on conditional probability in terms of a model.

Guiding Question(s):

- What makes conditional probability different from normal probability?

TN Curriculum Standard(s):

- **A2.S.CP.A.2** - Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
- **A2.S.CP.A.3** - Know and understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
- **A2.S.CP.B.5** - Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in terms of the model.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms
Part A: Ask for a volunteer to read the vocabulary words (last slide)

- **Compound events:** Two or more single events happening at the same time.
- **Dependent events:** The outcome of the first event does have an effect on the probability of the second event.
- **Event:** An outcome or set of outcomes (a subset of the sample space) of an experiment or situation.
- **Experiment:** In probability, any activity based on chance.
- **Independent event:** The outcome of one event does not affect the probability of a second event.
- **Outcome:** A possible result of a probability experiment.
- **Probability:** How likely an event is to occur

Part B: Ask for a volunteer to read the vocabulary words (last slide)

- **Interquartile Range:** Difference between the third quartile and the first quartile.
- **Mean:** Sum of the data divided by the total number of data.
- **Mean Deviation:** Mean of the absolute deviations taken from the mean of the data set.
- **Median:** Middle value of the data arranged in an order.
- **Mode:** Most occurred data.
- **Outlier:** An observation point that is away from other observations.
- **Quartiles:** The three values that divide the given data into four equal parts.
- **Range:** The difference between the minimum and maximum values of the data.
- **Symmetry:** A symmetric distribution is one in which the shape on the left of the distribution is a "mirror image" of the right.

Part A:
Lesson Introduction (I Do): 5 min
Teacher Introduction Script: Today, we will investigate probability. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do): 30 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 7, 13, 19, and 20. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 22 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slides 1 and 2 –** Lesson Introduction
- **Model and explain the following slides:**
    - **Slides 3 - 4 –** Compound Events
    - **Slides 5 – 6 & 8 –** Independent and Dependent Events (video on slide 8)
    - **Slides 12, 14, 16 -18 –** Finding the Probability of Independent and Dependent Events

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this lesson.

Additional Teacher Resources:
N/A

Lesson Review: 5 min
Slide 21 – Lesson Review

- A compound event is a combination of two or more simple events. It may be dependent or independent events.
- When the outcome of one event does not affect the outcome of another event, then the two events are said to be independent.
- If *A* and *B* are independent events, then the probability that both the events occur is given by $P(A \text{ and } B) = P(A) \times P(B)$.
- When the outcome of one event affects the outcome of another event, then the two events are said to be dependent.
- If *A* and *B* are dependent events, then the probability that both the events occur is given by $P(A \text{ and } B) = P(A) \times P(B|A)$, where $P(B|A)$ is the probability of the second event given that event *A* has occurred.

Part B:
Lesson Introduction (I Do): 5 min

Model and explain the following slides: **1-10 and 12-19.**

Lesson Activities (We Do) :30 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 11, 20, 21, and 22. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.

Supplemental: (Optional)

No supplemental activities are available for this module.

Additional Teacher Resources:
N/A

Lesson Review: 5 min
Slide 23– Lesson Review

- A conditional probability is the probability of an event occurring, given that some other event has already occurred.
- If A and B are two dependent events, then their conditional probabilities are given as:
- $P(A|B) = \frac{P(A \cap B)}{P(B)}$, [A given B]
- $P(B|A) = \frac{P(A \cap B)}{P(A)}$, [B given A]
- If A and B are two independent events, $P(A \cap B) = P(A) \times P(B)$.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do): 30 min

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 9**

Topic/Lesson Title & Grade Results #: Lesson 9 – Permutations and Combinations

Please note the students have three lessons embedded into one module. The first lesson is indicated as Part A, the second lesson is referred to as Part B, and the third lesson is referred to as Part C.

Objective(s): Students will be at to:
Part A: Permutations

- Compute permutation.
- Use permutations in determining probability of events.

Part B: Combinations

- Calculate permutations and combinations.
- Use permutations and combinations in determining the probability of events.

Guiding Question(s):

- How do we find outcomes with the counting principle, permutations and combinations?

TN Curriculum Standard(s):

AM.D.CR.A.1 - Use permutations, combinations, and the multiplication principle to solve counting problems
AM.D.CR.A.2 - Design and interpret simple experiments using tree-diagrams, permutations, and combinations.
AM.D.CR.A.5 - Use permutations and combinations to compute probabilities of compound events and solve problems

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms
Part A: Ask for a volunteer to read the vocabulary words (last slide)

- **Permutation**: The order of arrangement of "n" items choosing "r" items at a time.
- **Factorial:** Factorial of a number "n" is the product of all numbers from 1 to n.
- **Probability**: The ratio of the number of favorable outcomes to the total number of outcomes.

Part B: Ask for a volunteer to read the vocabulary words (last slide)

- **Permutation:** The order of arrangement of "*n*" items choosing "*r*" items at a time.
-
- **Combination:** The selection of "*r*" items from "*n*" items where the order of selection does not matter.
- **Probability:** The ratio of the number of favorable outcomes to the total number of outcomes.
- **Factorial:** Factorial of a number "*n*" is the product of all numbers from 1 to *n*.

Part A:
Lesson Introduction (I Do) 5 min:
Teacher Introduction Script: Today, we will investigate permutations and combinations. We will use multiple approaches to solve each system. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please

have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).
- **Slide 7 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slide 1 –** Lesson Introduction
- **Demonstrate and explain the following slides:**
    - **Slides 2 -4 –** Permutations

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on **Slide 5.** Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

Supplemental: (Optional)

No supplemental activities are available for this lesson

Additional Teacher Resources:
N/A

Lesson Review: 5 min
Slide 6 – Lesson Review

- Permutation means an ordered arrangement of objects.
- The expression ${}_nP_r$ represents the number of permutations of n objects arranged r at a time.
    - ${}_nP_r = n\ (n - 1)\ (n - 2)...$ up to r factors
- Probability = (Number of favorable outcomes)/(Total number of outcomes). Here, the number of favorable outcomes and total number of outcomes can be found by using the formula for permutations.

Part B:
Lesson Introduction (I Do):5 min

Please model and explain the following slides:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do): 30 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slide 8. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 3 and 4 –** Combination Notation
- **Slides 5 and 6 –** Permutations in Probability

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this module.

Additional Teacher Resources:
N/A

Lesson Review: 5 min
Slide 9– Lesson Review

Factorial of a number *n* is given by, $n! = n(n - 1)(n - 2) \times \ldots \times 3 \times 2 \times 1$.

The number of combinations taken "*r*" items at a time from "*n*" objects is represented by ${}_nC_r$ and given as ${}^nC_r = \frac{n!}{r!(n-r)!}$

The number of permutations taken "*r*" items at a time from "*n*" objects is ${}^nP_r = \frac{n!}{(n-r)!}$.
Probability = (Number of favorable outcomes)/(Total number of outcomes).

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this lesson

Additional Teacher Resources:
N/A

Independent Work – Posttest (They Do): 30 min
Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min
Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 10**

Topic/Lesson Title & Grade Results #: Final Post-Test Review & Post-Test

Objective(s):

- Students will review lessons to prepare for final Post-Test.
- Final Post-test will open. All students must complete the final Post-Test

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Lesson Introduction (I Do):
Identify the purpose of the course
Connect the course to missing or future coursework and Post-test

Lesson Activities/Supplemental (We Do) – 30-60 minutes

Lesson Activities and Review (We Do):
Check Grade Results and have students to review activities/lesson that they have not completed or need assistance with. Hold an open Q&A for students to ask questions regarding the activities/lessons they are reviewing.

Independent Work – Posttest (They Do):
Students will review and complete any incomplete/missed/failed coursework.

Closing/Wrap Up:

SEMESTER 2

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 11**

Topic/Lesson Title & Grade Results #: Lesson 1 – Normal Distribution and Standard Deviation

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Expected Value and Standard Deviation

- Define a random variable.
- Calculate the mean (expected value) and standard deviation of a random variable.
- Define a linear transformation and apply it to a random variable.
- Calculate the expected value and standard deviation of a linear transformation of a random variable.

Part B: Normal Distribution

- Define normal distribution.
- Find area or probability using the normal curve and cumulative distribution table.
- Discuss the different technologies used to determine the area under normal curve.
- Apply standard deviation to create a normal distribution that models a real-world scenario.
- Interpret data given in a graphic display.

Guiding Question(s):

- How do you find percent of data and probabilities of events associated with normal distributions?
- How is the mean of a sampling distribution related to the population mean or proportion?
- How can you use shape, center and spread to characterize a data distribution?

TN Curriculum Standard(s):

AM.D.ND.A.1 - Calculate the mean (expected value) and standard deviation of both a random variable and a linear transformation of a random variable.
AM.D.ND.A.2 - Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms Ask for a volunteer to read the vocabulary words (last slide of each lesson)

Part A:

- **Deviation:** The difference between a value in a frequency distribution and a mean value.
- **Expected Value:** The calculated value of a variable that most likely occurs.
- **Random:** Without order or sequence.
- **Transformation:** A rule that changes one quantity into another.

Part B:

- **Mean:** The ratio between the sum of the data divided by the total number of data.
- **Probability:** The measure of the likeliness that an event will occur.
- **Standard Deviation:** A measure that is used to quantify the amount of variation or dispersion of a set of data values.

Part A:

Lesson Introduction (I Do) :5 min

Teacher Introduction Script: Today, we will solve systems of linear equations. We will use multiple approaches to solve each system. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do): 30 min

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 4, 6, 10, 14 and 17. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 19 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slides 1 and 2 –** Lesson Introduction
- **Slide 3 –** Play 5-minute video about random variables
- **Demonstrate and explain the following slides:**
    - **Slides 5 –** Expected Value of a Random Variable
    - **Slide 7 –** Standard Deviation of a Random
    - **Slides 8- 9 –** Standard Deviation (video available on slide 8)
    - **Slides 14-15 –** Recap of all concepts

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

YouTube Video available about the expected value (14 minutes)

Additional Teacher Resources:
See Supplemental section

Lesson Review 5 min:
Slide 18 – Lesson Review

- A quantity having a numerical value for each element of the sample space of a statistical experiment is called a random variable.

- The mean (expected value) of a random variable is $E(X) = \mu = \Sigma[x_i \times P(x_i)]$.
- The standard deviation of a random variable is $\sigma = \sqrt{\sum \left[x_i - E(X)\right]^2 \times P(x_i)}$.
- A linear transformation is a change to a variable by adding or subtracting a constant or multiplying or dividing the variable by a constant.
- If the transformed random variable $Y = mX + a$, then $E(Y) = m \times E(X) + a$ and $\sigma_Y = m \times \sigma_X$.

Part B:
Lesson Introduction (I Do) 5 min:

Please model and explain the following slides:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slide 20. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 3 -14 –**Normal Distribution and Finding the Area of the Standard Normal Distribution
- **Slides 15 -19 –** Using the TI Calculator to find the value (since some students may not have TI Calculators, you may opt to omit this section or have the students use www.demos.com)

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

The supplemental addresses concepts taught in Part A but not Part B.

Additional Teacher Resources:
www.desmos.com (scientific calculator)

Lesson Review 5 min:
Slide 21– Lesson Review

- A normal distribution has data that vary randomly from the mean. The graph of a normal distribution is a normal curve.
- The central limit theorem states that the sums of random variables are approximately normally distributed if the number of observations is large.
- A random variable whose probability histogram is N (0, 1) curve is called a standard normal random variable. It is denoted by the letter Z.
- The normal distribution with mean (μ) = 0 and standard deviation (σ) = 1 is called as the standard normal distribution.
- The normal curve with μ = 0 and σ = 1 is called the standard normal curve.
- Cumulative Normal Table is used to calculate the area (or) probability under a curve.

- Standard Normal Cumulative Table provides the area under the normal curve for values of Z less than the identified values.
- The area under a normal curve can be calculated using the following technologies namely:
    - TI calculator
    - Spreadsheet
- The empirical rule states that for a normal distribution:
    - $P(\mu - \sigma < X < \mu + \sigma) = 0.6826$
    - $P(\mu - 2\sigma < X < \mu + 2\sigma) = 0.9544$
    - $P(\mu - 3\sigma < X < \mu + 3\sigma) = 0.9973$
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 30 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 12**

Topic/Lesson Title & Grade Results #: Lesson 2 – Confidence Intervals

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Confidence Interval for Population Mean

- Explain the confidence interval.
- Find the confidence interval for population mean using z distribution.
- Determine the margin of error.

Part B: Confidence Interval for Proportions

- Define confidence interval.
- Find the confidence interval for large sample proportions.
- Find the confidence interval for the difference between two proportions.

Guiding Question(s):

- What is a confidence interval and how do I compute one for the mean of a population?

TN Curriculum Standard(s):

A2.S.IC.A.2 - Use data from a sample survey to estimate a population mean or proportion; use a given margin of error to solve a problem in context.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms:
Ask for a volunteer to read the vocabulary words (last slide of each lesson)
Part A:

- **Confidence Interval (CI):** An interval estimate of a population parameter which is used to indicate the reliability of an estimate.
- **Critical Value:** The value corresponding to a given significance level.
- **Sample Size:** The act of choosing the number of observations to include in a statistical sample.
- **Standard Error:** The measure of the variability of a statistic

Part B:

- **Confidence interval:** An interval estimate of a population parameter used to indicate the reliability of an estimate.
- **Critical value:** The value corresponding to a given significance level or confidence level.

- **Proportion:** A number sentence that states that two ratios are equal.
- **Sample size:** The number of observations in a statistical sample.
- **Standard error:** The measure of the variability of a statistic.

Part A:
Lesson Introduction (I Do) 5 min:
Teacher Introduction Script: Today, we will analyze data. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 17 and 18. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 26 –** Ask for a volunteer to read the vocabulary words.

Demonstrate and explain the following slides:

  - **Slides 3 - 5 –** Confidence Interval and Confidence Interval (formula is located on slide 5)
  - **Slide 6 –** Margin of Error
  - **Slides 7- 9 –** Confidence Interval for Population Mean
  - **Slides 10 -13 –** Examples on how to find the confidence intervals
  - **Slides 14 -16** – Finding Margin of Error and Confidence Interval (additional examples)

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this lesson

Additional Teacher Resources:
Calculators: www.socscistatistics.com, www.calculator.net/confidence-interval-calculator.html, www.desmos.com

Lesson Review 5 min:
Slide 20 – Lesson Review

- If an estimate of a population parameter is given by a single value, then the estimate is called a point estimate. It is used in hypothesis testing.
- The level of confidence is the probability that the interval estimate contains the population parameter. It is denoted by *c*.
- Confidence interval is also called the degree of confidence or confidence coefficient.
- The maximum probability with which we would be willing to take a risk is called the level of significance and is denoted by α.
- The relation between the confidence level (*c*) and the significance level (α) is given by $c = 1 - \alpha$.
- Confidence levels usually employed are 90%, 95%, and 99%.

- 99% confidence interval: $\bar{x} \pm 2.58 \times \frac{s}{\sqrt{n}}$
- 95% confidence interval: $\bar{x} \pm 1.96 \times \frac{\sigma}{\sqrt{n}}$
- 90% confidence interval: $\bar{x} \pm 1.65 \times \frac{\sigma}{\sqrt{n}}$
- The general form of the confidence interval is given as Statistic ± (Critical value × Standard error).
- The margin of error (or) error bound is given as (Critical value × Standard error).

Part B:
Lesson Introduction (I Do) 5 min:

Please model and explain the following slides:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 7, 10, 13, and 14. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 3 -5 –** Confidence Interval in Proportion
- **Slide 6 –** Margin of Error
- **Slides 8 – 9:** Confidence Intervals for Lage Sample Proportion
- **Slide 11 –** An additional example via a 5-minute YouTube video
- **Slide 12 –** Confidence Interval for a Difference Between Proportions

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental:

No supplemental activities are available for this module.

Additional Teacher Resources:
Calculators: www.socscistatistics.com, www.calculator.net/confidence-interval-calculator.html, www.desmos.com

Lesson Review 5 min:
Slide 15– Lesson Review

- The range of values of a sample statistic that is likely to have a population parameter is called the confidence interval.
- The probability that the population parameter lies in an interval is expressed by confidence level. It is denoted by *c*.
- The confidence level is also called as level of confidence, or degree of confidence, or confidence coefficient.
- The left end point of the interval is called the lower confidence limit, and the right end point of the interval is called the upper confidence limit.
- The difference between the upper confidence limit and lower confidence limit is called the width of the confidence interval.
- If the finite population is given, then the confidence interval is $N[p \pm z^{\sigma} p]$.

- Standard error, (σ_p) = $\sqrt{\frac{pq}{n}}$, and in case of finite population (*N*) it is given as, $\sigma_p = \sqrt{\frac{pq}{n}}\sqrt{\frac{N-n}{N-1}}$.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 30 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 13**

Topic/Lesson Title & Grade Results #: Lesson 3 – Simple and Compound Interest

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Simple Interest

- Determine simple interest.

Part B: Solve Problems in Finance Involving Compound Interest

- Define compound interest.
- Enumerate the different types of compound interest.
- Calculate compound interest using exponential and logarithmic techniques

Guiding Question(s):

- How can you find the balance in an account that earns simple interest or compound interest?

TN Curriculum Standard(s):

A2.S.IC.A.2 - Use data from a sample survey to estimate a population mean or proportion; use a given margin of error to solve a problem in context.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms: Ask for a volunteer to read the vocabulary words (last slide of each lesson)
Part A:

- **Interest:** The percentage of a sum of money charged for its use.
- **Simple interest:** Interest paid only on the original principal, not on the interest accrued.
- **Rate:** The percentage of the principal charged as interest each year.
- **Principal:** The total amount borrowed or lent.
- **Percentage:** Per-cent which means parts per hundred.

Part B:

- **Compound:** Compute a charge, fee, or increment on an amount to which another charge, fee, or increment has already been added.
- **Domain of a function:** The complete set of possible values of the independent variable.
- **Exponential function:** A function whose value is a constant raised to the power of the argument, especially the function where the constant is *e*.
- **Interest:** A fee paid for the use of another party's money.
- **Inverse function:** A function that reverses another function.
- **Natural logarithm:** A logarithm to the base *e* of a number.

- **Range of a function:** The complete set of all possible resulting values of the dependent variable after substituting the domain.
- **Return:** Amount due on a principal after a time period of deposit at a rate of interest.

Part A:
Lesson Introduction (I Do) : 5 min
Teacher Introduction Script: Today, we will investigate percent and logarithms. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slide 6. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 6 –** Ask for a volunteer to read the vocabulary words.

Demonstrate and explain the following slides:

  - **Slides 3 and 4 –** Simple Interest and the formula
  - **Slide 5 –** Additional Example

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this lesson.

Additional Teacher Resources:
N/A

Lesson Review 5 min:
Slide 5 – Lesson Review

- Simple interest is the amount charged as interest on money borrowed or lent (known as the principal) for a specific time period, usually in years.
- Simple interest is calculated using the formula, I = PRT, where
  - *P* is the amount of money borrowed or lent.
  - *I* is the interest amount charged for borrowing money.
  - *R* is the rate of interest charged.
  - *T* is the time in years of the loan.

Part B:
Lesson Introduction (I Do) 5 min:
Please model and explain the following slides:

- **Slides 1 and 2 –** Lesson Introduction
- **Lesson Activities (We Do) 30 min:**

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 3, 5, 7, 9, and 16. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 4 & 11-13, and 18 –** Compound Interest
- **Slides 6 & 8 –** Natural Log
- **Slide 14 –** YouTube video further explaining natural logarithms (3-min)

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)
No supplemental activities are available for this module.

Additional Teacher Resources:
http://www.desmos.com/ (for calculator)

Lesson Review 5 min:
Slide 17– Lesson Review

- Interest is the amount the borrower has to pay to use the money.
- Banks accept deposits and pay interest, simple or compound, to the depositor.
- The word "compound" in "compound interest" suggests, the interest paid compounds, that is, the interest is accrued to the deposit and the next interest is calculated on this sum.
- Interest may be compounded annually, semi-annually (every 6 months), quarterly (every 3 months), monthly, and even more frequently.
- As the frequency of compounding increases, the total amount A increases, but ever more slowly—in fact, it approaches a limit with continuous compounding.
- Continually compounded interest is given in the general form as $A = Pe^{rt}$. The interest accrued is given by $A - P$.
- The natural logarithmic function is $y = \ln x$ or $y = \log_e x$, where the base "e" is a constant whose value is 2.7182.
- The exponential function with the natural log base is $y = e^x$.
- The exponential function with the natural log base, $y = e^x$ and the natural log function, $y = \ln x$ are inverses of each other.
- The rate of interest can be calculated from the formula: $r = \frac{\ln\left(\frac{A}{P}\right)}{t}$.
- The time period of deposit can be calculated from the formula: $t = \frac{\ln\left(\frac{A}{P}\right)}{r}$.

Independent Work – Posttest (They Do) 30 min:
Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min
Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 14**

Topic/Lesson Title & Grade Results #: Lesson 4 – Financial Modeling, Annuities, and Sinking Fund

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Importance of Financial Modeling to take Decisions

- Define financial modeling.
- Enumerate various types of financial models.
- Describe the importance of financial modeling.
- Analyze the benefits of financial modeling to business decisions.

Part B: Amortization, Annuities, and Sinking Fund

- Calculate the compound interest.
- Work out amortizations and annuities.
- Define sinking funds.
- Analyze the future value and present value

Guiding Question(s):

- What is financial modeling?
- How do you build a financial model?

TN Curriculum Standard(s):

AM.N.NQ.A.2 - Recognize the importance of applying a financial model to business.
AM.N.NQ.A.1 - Define interest, compound interest, annuities, sinking funds, amortizations, annuities, future value, and present value.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms Ask for a volunteer to read the vocabulary words (last slide of each lesson)
Part A:

- **Amortization:** It refers to the process of allocating the costs of intangible assets or repayment of a loan over a period of time.
- **Budgeting:** A process of calculating the allocation of income toward various expenses.
- **Capital allocation:** It is a process of allocating financial resources for maximizing the profit.
- **End users:** People who are the final consumers of a product.
- **Financial model:** A summary of a company's performance, based on certain variables.
- **Forecasts:** Predicting the future or estimating future benefits.
- **Leverage:** Usage of borrowed capital.
- **Merger:** One company joins with another company.

- **Option pricing:** The amount per share that an option buyer pays to the seller.
- **Scenario:** A description of possible future actions or events.
- **Variables:** A factor or an element that is liable to change.

Part B:

- **Amortization:** Periodical settlement of a loan with interest.
- **Annuities:** A fixed stream of payments.
- **Compound interest:** The interest on interest.
- **Future value:** Value that may occur in the future for the current amount.
- **Interest:** The cost of the capital or loan borrowed.
- **Present value:** Current value.
- **Sinking funds:** A periodical setting aside of amount for specific purposes.

Part A:

Lesson Introduction (I Do) 5 min:

Teacher Introduction Script: Today, we will continue with applying interest. We investigate sinking funds, today as well. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slide 10. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 12–** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

Please model and explain the following slides:

- **Slides 1 and 2 –** Lesson Introduction
- **Slides 3 -7 –** Financial Modeling and Scenarios
- **Slides 8 -9 –** Profitability Index and Benefits of Financial Models

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this module.

Additional Teacher Resources:

This lesson is brief, so I have included the following YouTube Video link: https//www.youtube.com/watch?v=iLF3kLE6hDo The video is approximately 40 minutes – you may show the entire video or portions.

Lesson Review 5 min:

Slide 11 – Lesson Review

- Financial models help measure the company's performance based on variables.
- It forecasts the future growth of the corporation.
- It helps the management to take various business decisions.
- It helps the company to analyze the situations quantitatively.
- The different tools of financial model handled by the company are corporate finance, excel spreadsheet, accounting, and corporate performance.
- The triple statements that help the management in evaluating the business performance are the income statements, the balance sheet, and the cash flow statements.
- The areas in which the financial models perform effectively are at the time of raising the capital needed for the company.
- At the time of setting up of the business, or merger of two companies, capital allocation, budgeting and forecasting, and valuing the business are the areas in which the financial model is used effectively.
- The various types of financial models are discounted cash flow model, comparative company analysis model, sum-of-the-parts model, leveraged buyout model (LBO), merger and acquisition model (M & A), and option pricing model.
- The financial model helps determine the market potential for the company.
- Profitability index is one that compares the net present value of the future cash inflows of a project with the initial investment.

Part B:
Lesson Introduction (I Do) 5 min:

Please model and explain the following slides:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slide 9. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 3 -5 –** Simple, Compound Interest, and Annuities
- **Slides 6 - 8 –** Sinking Funds and Amortization

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this module.

Additional Teacher Resources:
This lesson is brief, so I have included the following YouTube Video link: https//www.youtube.com/watch?v=iLF3kLE6hDo The video is approximately 40 minutes – you may show the entire video or portions.

Lesson Review 5 min:
Slide 10– Lesson Review

- Interest is the cost of a loan borrowed.

- The rate of interest differs with the risk attached to it.
- The higher the risk, the higher is the rate of interest and vice versa.
- Interest can be calculated in two ways: simple interest and compound interest.
- Simple interest would be calculated upon the principal.
- Compound interest would be calculated upon the principal and previous year's interest.
- A fixed stream of payment is called as annuities.
- Annuities income offer security, reliability, and comfort for retirees.
- The current value of the future amount is known as the present value.
- A strategic method of saving money is sinking fund.
- A sinking fund can be created for two purposes: for replacement of assets and redemption of a loan.
- Amortization refers to the scheduled periodic payments of principal with interest.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 30 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 15**

Topic/Lesson Title & Grade Results #: Lesson 5 – Amortization and Depreciation Schedules

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Amortization Schedule for an Annuity

- Recall annuity and amortization.
- Define amortization schedule.
- Determine the amortization schedule for an annuity and home mortgage.

Part B: Depreciation Schedules

- Define depreciation.
- Solve real-world problems involving the mathematics of finance.

Guiding Question(s):

- What is a confidence interval and how do I compute one for the mean of a population?

TN Curriculum Standard(s):

AM.N.NQ.A.4- Determine the amortization schedule for an annuity and a home mortgage
AM.N.NQ.B.5 - Apply financial mathematics to depreciation schedules

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms Ask for a volunteer to read the vocabulary words (last slide of each lesson)
Part A:

- **Amortization:** Paying off a loan with regular equal payments.
- **Annuity:** A plan involving payments made at regular intervals.
- **Amortization schedule:** A table that details the payments, principal paid, interest paid, and remaining principal balance for a loan.
- **Future value:** The sum of all the payments and the interest those payments earn.
- **Present value:** The current value of a future stream of income.

Part B:

- **Accumulated depreciation:** A long-term asset account with a credit balance that is reported on the balance sheet under the heading Property, Plant, and Equipment.
- **Asset:** An item or property owned by a person or company.
- **Book value:** The value of an asset as entered in a company's book.

- **Depreciation:** A term used to describe the reduction in the value of an asset over a period of time.
- **Salvage value:** An estimated resale value of an asset at the end of its useful life.
- **Schedule:** A plan for carrying out a process or procedure which contains a list of planned activities and times.
- **Symmetry:** A symmetric distribution is one in which the shape on the left of the distribution is a "mirror image" of the right.

Part A:

Lesson Introduction (I Do) 5 min:

Teacher Introduction Script: Today, we will investigate amortization and depreciation. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slide 15. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 20 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slides 1 and 2 –** Lesson Introduction
- **Demonstrate and explain the following slides:**
    - **Slides 3 - 6 –** Annuity
    - **Slides 7 -13 –** Amortization
    - **Slide 14 –** Amortization (video with an additional example)

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are included for this lesson.

Additional Teacher Resources:

N/A

Lesson Review 5 min:

Slide 19 – Lesson Review

- Linear programming is the simplest technique to find the optimal solution.
- Feasible region will have a set of possible solutions that satisfy a problem's conditions.
- Optimal solution is also known as a feasible solution. It is a solution where the objective function reaches its maximum or minimum value.
- Simplex method is a method of maximizing or minimizing a linear function of different variables under different conditions on other linear functions

Part B:
Lesson Introduction (I Do) 5 min:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 7, 11, 13, and 16. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

Demonstrate and Explain the following:

- **Slides 3 -6 –** Depreciation Method
- **Slide 8 –** Straight-line Depreciation Method (video – 3-minutes)
- **Slides 9 & 11 –** Double Declining Balance Depreciation Method (slide 11 contains a video with an additional example)
- **Slide 14 –** Units of Production Depreciation Method (video -3 minutes)

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental:

No supplemental activities are included in this module.

Additional Teacher Resources:
N/A

Lesson Review 5 min:
Slide 17– Lesson Review

Depreciation expense is a term used to describe the reduction in the value of an asset over a number of years.
There are four types of depreciation schedule. They are:

Straight line
Double declining balance
Units of production
Sum of the years' digits

Straight line depreciation is a very common and simple method of calculating the depreciation expense. In straight-line depreciation, the expense amount is the same every year over the useful life of the asset. The depreciation formula for this method is:

$$\textbf{Depreciation expense or annual depreciation cost} = \frac{\text{Cost} - \text{Salvage value}}{\text{Useful life}}$$

In double declining balance depreciation method, the rate of depreciation is applied to every period of time to the beginning book value. The depreciation formula for this method is:

$$\textbf{Double declining balance depreciation} = \frac{2 \times (\text{Cost of the asset} - \text{Accumulated depreciation})}{\text{Useful life of the asset}}$$

Units of production depreciation method is the process of reduction in the value of the asset based on the number of units to be produced or the number of hours used over its useful life. The depreciation formula for this method is:

$$\textbf{Depreciation expense} = \frac{\text{Cost} - \text{Salvage value}}{\text{Number of units produced in the useful life}} \times \textbf{Number of units produced in the period}$$

Sum of the years' digits (SYD) depreciation method is one of the accelerated methods for calculating an asset's depreciation. It takes the expected life of the asset and adds together the digits for each year. The depreciation formula for this method is:

$$\text{Depreciation expense} = \text{Depreciation base} \times \frac{\text{Remaining useful life}}{\text{Sum of the years' digits}}$$

Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 30 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 16**

Topic/Lesson Title & Grade Results #: Lesson 6 – Arithmetic and Geometric Sequence in Financial Math

Objective(s): Students will be at to:

- Recall arithmetic and geometric sequences.
- Recall simple and compound interest, annuity, loan, and amortization.
- Apply arithmetic and geometric sequences to various financial products.

Guiding Question(s):

- How do you apply arithmetic and geometric sequences to various financial products?

TN Curriculum Standard(s):

AM.N.NQ.B.7 - Apply arithmetic and geometric sequences to simple and compound interest, annuities, loans, and amortization.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms: Ask for a volunteer to read the vocabulary words (last slide of each lesson)

- **Amortization:** The process of paying off a loan (with interest) by making a series of regular, equal payments.
- **Annuity:** A form of investment involving a series of periodic equal contributions made by an individual to an account for a specified term.
- **Arithmetic sequence:** A sequence in which the difference between any two consecutive terms is the same.
- **Common difference:** Difference between two consecutive terms in an arithmetic sequence.
- **Common ratio:** A number found by dividing the second term by the first term in a geometric sequence.
- **Compound interest:** The interest calculated on the initial principal which also includes all the accumulated interest from the previous periods of a deposit or loan.
- **Geometric sequence:** A sequence in which each successive term is obtained by multiplying the previous term with a constant.
- **Interest:** Money charged or paid at regular intervals at a particular rate for the use of assets lent.
- **Interest rate:** The amount charged by a lender to a borrower for the use of assets.
- **Principal:** The original sum of money invested or lent.
- **Simple interest:** Interest paid only on the original principal, not on the interest accrued.

Lesson Introduction (I Do) 5 min:
Teacher Introduction Script: Today, we will build on our knowledge of interest. We investigate geometric and arithmetic sequences. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 60 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 10 and 19. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 21 –** Ask for a volunteer to read the vocabulary words.

Demonstrate and explain the following slides:

  - **Slides 3 & 4 –** Arithmetic Sequence (slide 4 provides further explanation via a 11-minute video)
  - **Slide 5 –** Geometric Sequence
  - **Slides 6 - 13 –** Simple and Compound Interest (two videos are available to assist on slides 8 & 13).
  - **Slides 14 - 16 –** Annuities
  - **Slides 17-18** – Amortization

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this lesson

Additional Teacher Resources:
N/A

Lesson Review 5 min:
Slide 20 – Lesson Review

- A plan involving payments made at regular intervals is called an annuity.
- A sequence is an ordered list of numbers where there is a rule behind the arrangement of numbers.
- An arithmetic sequence is one in which the difference between any two consecutive terms is the same (i.e., the difference is a constant).
- The formula to find the n^{th} term in an arithmetic sequence is $a_n = a + (n - 1) \times d$.
- A geometric sequence is one in which each successive term is obtained by multiplying the previous term with a fixed number.
- The formula for finding the n^{th} term of a geometric sequence is $a_n = a_1 r^{(n-1)}$.
- The sum of n terms in the geometric series can be determined using the following formula $S_n = a\left(\frac{1-r^n}{1-r}\right)$.
- Simple interest is the amount paid as interest on money borrowed or lent (known as the principal) for a specific time period, usually in years.
- Simple interest is calculated using the following formula $SI = \frac{PRT}{100}$.
- Compound interest is the interest calculated on the initial principal, which also includes all the accumulated interest from the previous periods of a deposit or loan.
- Compound interest is calculated using the following formula $CI = P\left[\left(1 + \frac{r}{n}\right)^{nt}\right]$.
- An annuity represents a series of equal payments occurring over a particular number of equidistant periods.
- The formula for calculating annuity is $A = \frac{P}{i}\left[\left(1 + i\right)^{n} - 1\right]$.

- Amortization is the process of paying off a loan (with interest) by making a series of regular, equal payments (installments).
- The formula for amortization using the geometric series is $A = P \times \frac{r(1+r)^n}{(1+r)^n - 1}$.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 40 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 17**

Topic/Lesson Title & Grade Results #: Lesson 7 – Describing Logic Circuits Using Boolean Algebra

Objective(s): Students will be at to:

- Describe the symbols and properties of Boolean algebra.
- Construct truth tables to analyze electrical circuits.
- Construct and analyze electrical circuits using Boolean algebra.
- Write Boolean equations for electrical circuits.

Guiding Question(s):

- How is Boolean algebra used as a tool to simplify and design logic circuits?

TN Curriculum Standard(s):

AM.A.LB.A.1 - Develop the symbols and properties of Boolean algebra; connect Boolean algebra to standard logic.
AM.A.LB.B.3 - Analyze basic electrical networks; compare the networks to Boolean Algebra configurations
AM.A.LB.B.4 - Develop electrical networks and translate them into Boolean Algebra equations.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms: Ask for a volunteer to read the vocabulary words (last slide of each lesson)

- **Digital circuit:** A circuit where the signal must be one of two discrete levels.
- **Expression:** A mathematical term or a sum or difference of mathematical terms that may use numbers, variables, or both.
- **Inverse operation:** The operation that reverses the effect of another operation.
- **Logical decision:** A decision that makes sense according to the rules of logic.
- **Node:** A connection point in a network or electrical logic circuit.

Lesson Introduction (I Do) 5 min:
Teacher Introduction Script: Today, we will investigate Boolean algebra and circuits. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).
- **Slide 26 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slide 1 –** Lesson Introduction

Lesson Activities (We Do) 60 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 15 and 26. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Demonstrate and explain the following slides:**
  - **Slides 3 - 5 –** Boolean Constants and Variables
  - **Slide 6 – 9, and 22** Truth Tables, Logic Gates, and Basic Boolean Operators (Truth Table video on slide 22)
  - **Slide 10 –** Further Explanation of Basic Boolean Operators (via 3-minute video)
  - **Slides 11 -14 –** Additional Logic Gates (4-minute video on slide 14)
  - **Slides 16 - 17**– Describing Logic Circuits Algebraically
  - **Slides 18 –21-** Evaluating and Analyzing Logic Circuits
  - **Slides 23 – 25 -** Developing Circuits from Boolean Expressions (2-min. video on slide 25)

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are included in this lesson.

Additional Teacher Resources:
Boolean Calculator: https://www.dcode.fr/boolean-expressions-calculator

Lesson Review 5 min:
Slide 27 – Lesson Review

- George Boole introduced a system of using symbols and operators to describe logical decisions through logical expressions called *Boolean algebra*.
- The relationship between the output (the decision) and the inputs (the circumstances) of a logic circuit can be described using the Boolean expressions.
- Boolean algebra is a tool to create, analyze, and simplify a logic system or circuit.
- Boolean algebra uses only two values, 0 or 1.
- The OR, AND, and NOT are the three basic Boolean operations.
- A truth table describes how the output of a logic circuit depends on the logic levels present at the input of the circuit.
- The number of input combinations and outputs will equal 2^N for an *N*-input truth table.
- The general Boolean expression for a two-input OR gate is $A + B$.
- The general Boolean expression for a two-input AND gate is AB.
- The general Boolean expression for a NOT gate is $\overline{A}$.
- The general Boolean expression for a two-input NOR gate is $\overline{(A+B)}$.
- The general Boolean expression for a two-input NAND gate is $\overline{(AB)}$.
- Using the basic Boolean operations, any logic circuit can be described completely.
- For a digital circuit, the Boolean expression is essential to evaluate the output of the circuit.
- Truth table is the best way to analyze a combinational logic circuit.

- A logic circuit diagram can be drawn if the operation of the circuit is defined by a Boolean expression.
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 40 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 18**

Topic/Lesson Title & Grade Results #: Lesson 8 – Construct Truth Table for Making Conclusion

Please note the students have two lessons embedded into one module. The first lesson is indicated as Part A and the second lesson is referred to as Part B.

Objective(s): Students will be at to:
Part A: Construct Truth Table for Making Conclusion

- Define logical operators.
- Apply order of operations on logical operators.
- Define and construct a truth table.
- Draw conclusions about a statement using a truth table.
- Determine the validity of an argument using a truth table.

Guiding Question(s):

- What is a truth table and how do I draw conclusions from it?

TN Curriculum Standard(s):

AM.A.LB.A.2 - Construct truth tables to determine the validity of an argument.
AM.G.L.A.1 - Define the order of operations for the logical operators.
AM.G.L.A.4 - Construct and use a truth table to draw conclusions about a statement.
AM.G.L.A.3 - Solve a variety of logic puzzles.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms: Ask for a volunteer to read the vocabulary words (last slide of each lesson)

- **Biconditional:** The combination of two conditional statements.
- **Conjunction:** The compound statement formed by joining two statements with the connector AND.
- **Conclusion:** A final decision reached by reasoning.
- **Conditional:** A statement formed by the if-then conditions.
- **Disjunction:** The compound statement formed by joining two statements with the connector OR.
- **Negation:** The opposite of a given mathematical statement.
- **Premises:** The statement that is assumed to be true.

Lesson Introduction (I Do) 35 min:
Teacher Introduction Script: Today, we will continue with logic problems. We will use our higher-order thinking skills to solve various puzzles and problems. . I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 10 and 18. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slide 20 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

- **Slide 1 –** Lesson Introduction

Lesson Activities (We Do) 30 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 10 and 18. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Demonstrate and explain the following slides:**
  - **Slides 3 - 5 –** Logical Operators and Order Precedence
  - **Slides 6 - 9 & 11 - 14–** Truth Tables (video on slide 11)
  - **Slides 15 - 17 –** Determining the Validity of an Argument

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

No supplemental activities are available for this lesson

Additional Teacher Resources:
N/A

Lesson Review 10 min:
Slide 19 – Lesson Review

- A *premise* is a statement that is assumed to be true.
- A *conclusion* is a final decision reached by reasoning.
- A logical operator is a symbol or a function that denotes a logical operation.
- Types of operators: OR, AND, NOT, IF-THEN, and IF-AND-ONLY-IF.
- Order of precedence is a rule used to identify the operation/term which is to be performed first in a logical expression.
- Order of precedence: Parentheses, NOT, AND, OR, IF-THEN, and IF-AND-ONLY-IF.
- A truth table is a logically-based mathematical table that represents all the combinations of values for input and their corresponding outputs or all the possible outcomes of a scenario that are considered factual..
- A truth table contains rows and columns representing how the truth and falsity of a proposition vary with its component.

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Independent Work – Posttest (They Do) 35 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5 min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 19**

Topic/Lesson Title & Grade Results #: Lesson 9 – Solve Logic Puzzles

Objective(s): Students will be at to:

Part B: Solve Logic Puzzles

- Define a logic puzzle.
- Explain the different types of logic puzzles.
- Solve different types of logic puzzles.

Guiding Question(s):

- How can laws of logic be applied to test the validity of arguments?

TN Curriculum Standard(s):

AM.G.L.B.5 - Apply the laws of logic to judge the validity of arguments.

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Attendance in Powerschool(5 min)

Key Vocabulary/Terms: Ask for a volunteer to read the vocabulary words (last slide of each lesson)

- **Arithmetic puzzle:** Arithmetic puzzle consists of empty spaces in which single digit integers should be fitted, such that they satisfy the given constraints.
- **Cryptogram:** A cryptogram is a puzzle in which numerical digits are replaced with characters.
- **Deductive reasoning:** A deductive reasoning is the process of reasoning from one or more statements to obtain a logically certain conclusion.
- **Predicate logic:** A formal language in which prepositions are expressed in terms of predicates, variables, and quantifiers.
- **Propositional logic:** A branch of mathematical logic. It is a logical relationship between propositions (statements, sentences, or assertions) and connected via logical connectives.
- **Syllogism:** A syllogism is one of the simplest types of logical puzzles. In this puzzle, we are given a set of statements, and we need to determine the truth from those statements.

Lesson Introduction (I Do) 30 min:
Teacher Introduction Script: Today, we will continue with logic. We work on justifying arguments and solving truth tables. I will ask for volunteers to read the first and last slide. The first slide contains the objectives and last slide contains the vocabulary. I will demonstrate the examples and together we will complete the activities. Please have paper and pencil available to take notes and to work out the examples. Please remember to ask questions when clarification is needed. Let's get started – today is going to be great!

- **Slide 1 –** Ask for a volunteer to read the objective(s).

- **Slide 21 –** Ask for a volunteer to read the vocabulary words.

Work the following examples on the following slides:

Please model and explain the following slides:

- **Slides 1 and 2 –** Lesson Introduction

Lesson Activities (We Do) 40 min:

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, complete the Practice Activities on Slides 7, 10, 13, 15, and 19. Please have the students assist you to correctly complete each activity. Engage the class in a discussion at the end of each activity. Prompt the students to ask questions regarding any concepts needing further explanation.

You should have completed this section as you completed the "I Do" section. However, if not, please follow the instructions as written. As a whole group, review the lesson review slide (slide 22). Then, play the jeopardy game (link is in the supplemental and additional teacher resources' section). Please have the students divide into teams and complete the jeopardy game. Engage the class in a discussion at the end of the game. Prompt the students to ask questions regarding any concepts needing further explanation.

- **Slides 3 -4 –** Logic Puzzles (video on slide 4)
- **Slides 5 – 6** - Syllogisms
- **Slides 8 -9 –** Solving Logic Puzzles
- **Slides 11 – 12 -** Cryptograms
- **Slides 14 & 16 –** Arithmetic Puzzle (video on slide 16)
- **Slides 17 & 18 –** Tour Puzzle

***Please complete the activities as they appear in the lesson. Please find the list of the activity slides in the "We Do" section. After each activity, ask students if they have any questions. If there are no questions, please proceed to the next slide.**

Supplemental: (Optional)

Jeopardy Game – website: https://jeopardylabs.com/play/logic-review-jeopardy2

Additional Teacher Resources:
Jeopardy Game – website: https://jeopardylabs.com/play/logic-review-jeopardy2

Lesson Review 10 min:
Slide 22 – Lesson Review

- A logic puzzle is a problem solved using deductive reasoning
- Deductive reasoning is the process of reasoning from one or more statements to obtain a logically certain conclusion
- A change in an elimination puzzle is a truth-teller and liar puzzle, also know as a "Knight and Knave" puzzle
- In a tour puzzle, we need to traverse the whole graph to find the correct path to reach the destination.
- A cryptogram is a puzzle in which numerical digits are replaced with characters
- A sound argument is necessarily valid, but a valid argument need not be sound.
- Propositions are statements that can be true or false.
- Conditional statements are written as a formula $p \rightarrow q$, where p is the hypothesis and q is the conclusion.

- $p \rightarrow q$ and $q \rightarrow p$ are two very different statements just as "5 - 3" is different from "3 - 5".
- $q \rightarrow p$ is called the converse of $p \rightarrow q$.
- The inverse statement is represented as $\sim p \rightarrow \sim q$, where ~ stands for NOT (negation).
- Suppose you first take the converse of a statement and then take the inverse of the converse statement, we get what is known as a contrapositive statement ($\sim q \rightarrow \sim p$).
- If $p \rightarrow q$ is true and $q \rightarrow p$ is true, then the statement is a biconditional statement ($p \leftrightarrow q$).
- A truth table shows how the truth or falsity of a compound statement depends on the truth or falsity of the simple statements from which it is constructed.
- The logical AND operator is an operator that performs a logical conjunction on two statements. It only yields a value of "true" when both statements are true. It is denoted by $\wedge$.
- The logical OR between statements A and B represented as $A \vee B$ is true if A is true, or if B is true, or both A and B are true.
- If a condition is true, then the logical NOT operator makes it false, and vice-versa. It is used for negation. It is denoted by ~.
- There are three basic laws of logic: 1) the law of identity, 2) the law of contradiction, and 3) the law of excluded middle.
- The "law of identity" states that each thing is identical with itself.
- A statement and its denial cannot both be true at the same time which is known as the law of non-contradiction.
- The law of excluded middle states that for any proposition, there is no middle ground. Every proposition is either true or false.
- De Morgan's laws: $\neg(p \wedge q) \equiv \neg p \vee \neg q$ (Negative of a conjunction) and $\neg(p \vee q) \equiv \neg p \wedge \neg q$ (Negative of a disjunction).
- Have students review the slides and their notes to prepare for the Post-test

Independent Work – Posttest (They Do) 30 min:

Explain that will work independently to complete the post-test. Encourage them to think critically and do their very best on the Posttest. The Posttest will count as the grade for the daily lesson. All students are required to complete student activities as part of their class assignments.

Closing/Wrap Up/Notes Review: 5min

Ask for a volunteer to restate the objective(s). Ask students if there are any objectives and/or vocabulary terms needing further explanation. Allow students to reflect when they would use the concept(s) in the real-world to help the students connect their learning to everyday life.

Summer School Lesson Plan

Subject/Grade: Applied Mathematical Concepts **Day: 20**

Topic/Lesson Title & Grade Results #: Final Post-Test Review & Post-Test

Objective(s):

- Students will review lessons to prepare for final Post-Test.
- Final Post-test will open. All students must complete the final Post-Test

Materials/Resources Needed: Grade Results Online Platform, Grade Results video, paper, pencil or notes in Grade Results

Technology: Computer, Whiteboard, TEAMs meeting (if applicable)

Lesson Introduction (I Do):
Identify the purpose of the course
Connect the course to missing or future coursework and Post-test

Lesson Activities/Supplemental (We Do) – 30-60 minutes

Lesson Activities and Review (We Do):
Check Grade Results and have students to review activities/lesson that they have not completed or need assistance with. Hold an open Q&A for students to ask questions regarding the activities/lessons they are reviewing.

Independent Work – Posttest (They Do):
Students will review and complete any incomplete/missed/failed coursework.

Closing/Wrap Up: