Stage 1 Desired Results School Driven	
Established Goals/Transfer Goal: What do students need to learn and be able to do? Include essential standards. Students need to learn and be able to apply mathematical modeling and problem-solving skills to real-world situations. Essential standards include proficiency in geometry, algebraic thinking, numerical operations, data analysis, and mathematical modeling principles.	
Enduring Understandings: What understandings are desired about the big ideas of this unit? - Mathematical modeling enables students to analyze real-world situations, make informed decisions, and solve complex problems. - Problem-solving strategies are essential for navigating mathematical challenges and applying mathematical concepts in various contexts.	**Essential Questions:** What questions(s) will guide inquiry and point toward the big ideas and transfer goals of the unit? - How can mathematical concepts be applied to solve real-world problems? - What strategies can we use to approach complex mathematical challenges? - Why is mathematical modeling important in various fields of study and professions?
Students will know… - Geometric shapes, angles, and spatial relationships. - Algebraic concepts such as equations, functions, and variables. - Numerical operations including addition, subtraction, multiplication, and division. - Data analysis techniques and concepts of probability and statistics. - Mathematical modeling principles and their applications.	**Students will be able to…** What will students know and be able to do by the end of the unit? - Design mathematical models to solve real-world problems. - Analyze and interpret data from various sources. - Apply problem-solving strategies to tackle complex mathematical challenges. - Communicate mathematical ideas effectively through written and verbal explanations.

	- Utilize technology tools for mathematical exploration and inquiry. List the few most important discrete knowledge and skill goals that are separate from the transfer goals. - Proficiency in geometric concepts such as angles, shapes, and spatial relationships. - Understanding of algebraic equations, functions, and variables. - Ability to perform numerical operations accurately and efficiently. - Competence in data analysis techniques and interpreting statistical data. - Familiarity with mathematical modeling principles and their applications in real-world scenarios.

Stage 2 **Assessment Evidence:** **Teacher and School Driven** **How will we know if students have learned?**

Formative Assessments:	Summative
- Class discussions and debates on mathematical concepts and problem-solving strategies. - Quizzes and exit tickets to gauge understanding of key mathematical concepts. - Peer evaluations and self-assessments to reflect on problem-solving process and progress.	Goal(s): Design a mathematical model to solve a real-world problem. Role: Student Audience: Teacher Situation: Working individually or in groups, students will apply mathematical concepts and problem-solving strategies to analyze a given real-world scenario and design a mathematical model to address the problem. Performance: Students will present their mathematical models and solutions through written reports or multimedia presentations. Standards: The criteria for success include the accuracy and effectiveness of the mathematical model, the clarity of explanations, and the depth of understanding demonstrated.
Key Criteria to reflect performance task (rubric, checklist) - Accuracy and effectiveness of the mathematical model. - Clarity and coherence of explanations. - Depth of understanding demonstrated in applying mathematical concepts and problem-solving strategies.	**Other Evidence (essay, work sample)** What other evidence (formative, observations. Home learning, etc.) will be collected to determine whether or not Desired Results have been achieved? - Essays or work samples demonstrating understanding of mathematical concepts and problem-solving strategies. - Observations of student participation in class discussions and group activities. - Home learning assignments or projects related to mathematical modeling and problem-solving.

Stage 3 Learning Plan Activities: (Teacher Driven) How will students engage in learning?	
Consider the WHERETO Elements: W Where are we going? What is expected? - Students will understand the purpose and goals of the unit, including the importance of mathematical modeling and problem-solving in real-world contexts. They will know the specific learning outcomes and expectations for the unit. H How will we hook (Introduce this to) the students? - Engage students with a real-world scenario or problem that requires mathematical modeling and problem-solving skills. Use multimedia resources, storytelling, or interactive activities to pique students' curiosity and interest in the unit. E How will we equip students for expected performances? - Provide students with the necessary knowledge, skills, and resources to succeed in the unit. This may include direct instruction, guided practice, hands-on activities, and access to technology tools and manipulatives. R How will you rethink or revise? What are likely or predictable student misunderstandings and/or performance weaknesses in this unit? - Anticipate common student misconceptions and performance	**Resources** What print and web resource best supports the unit? Also provide additional resources used in planning for activities or during instruction. - Textbooks: Select textbooks that align with the curriculum standards and provide comprehensive coverage of mathematical concepts related to geometry, algebra, numerical operations, data analysis, and mathematical modeling. Examples include "Mathematics: Applications and Concepts" by Glencoe and "Big Ideas Math: Modeling Real Life" by Larson et al. - Khan Academy: Khan Academy offers a wide range of interactive math tutorials, practice exercises, and instructional videos covering topics relevant to mathematical modeling and problem-solving. The platform provides personalized learning experiences and allows students to progress at their own pace. - Virtual Manipulatives: Online tools and apps that provide virtual manipulatives, such as Geogebra, Desmos, and National Library of Virtual Manipulatives, can enhance hands-on exploration of mathematical concepts and support visual and kinesthetic learners. - Interactive Simulations: Websites like PhET Interactive Simulations and ExploreLearning Gizmos offer interactive simulations and virtual labs

weaknesses related to mathematical concepts and problem-solving strategies. Use formative assessment data, research findings, and teacher experience to identify potential challenges and develop strategies to address them. E How will students self-evaluate and reflect on their learning? - Implement regular opportunities for students to self-evaluate and reflect on their learning progress. This may include journaling, peer feedback, self-assessment rubrics, and structured reflection activities. T How will we tailor learning to varied needs, interests, and learning styles? - Differentiate instruction to accommodate diverse student needs, interests, and learning styles. Provide alternative learning activities, flexible grouping options, and varied instructional approaches to meet individual student needs and preferences. O How will we organize the sequence of learning? - Structure the learning experiences in a logical sequence that builds upon prior knowledge and scaffolds new concepts and skills. Start with foundational concepts and gradually increase complexity and challenge as students progress through the unit. Use clear learning objectives and instructional cues to guide students through the sequence of learning activities.	that allow students to explore mathematical concepts through dynamic, inquiry-based activities. - Real-World Data Sources: Access to real-world data sets from sources like the U.S. Census Bureau, National Center for Education Statistics, and Gapminder can provide authentic contexts for mathematical modeling and data analysis activities.

Reflection:
- Were the lessons successful? How do you know? The lessons were successful overall. Student engagement was high during hands-on activities and collaborative problem-solving tasks. Formative assessments indicated that most students grasped the key mathematical concepts and demonstrated proficiency in applying problem-solving strategies. Additionally, student reflections and self-evaluations showed increased confidence and understanding of mathematical modeling principles. Summative assessments, such as presentations and written reports, showcased students' ability to design effective mathematical models to solve real-world problems. - What would you do differently next time? Next time, I would provide more opportunities for student-led inquiry and exploration. While the lessons were effective in building foundational knowledge and skills, I believe that allowing students more autonomy in selecting and investigating real-world problems would further enhance their motivation and ownership of learning. Additionally, I would incorporate more formative assessment strategies throughout the unit to monitor student progress more closely and provide timely feedback for improvement. Intervention (What will we do if students don’t learn it?) If students don't learn the material, I would implement targeted interventions such as small-group instruction, reteaching sessions, and additional practice opportunities. I would also provide personalized support and differentiated learning experiences to address specific areas of misunderstanding or weakness. Collaborating with colleagues and utilizing research-based instructional strategies would inform the development of effective intervention plans tailored to meet individual student needs. Enrichment (What will we do if students master the material quickly?) If students master the material quickly, I would offer enrichment activities to deepen their understanding and extend their learning. This may include advanced problem-solving challenges, independent research projects, or opportunities to apply mathematical concepts in interdisciplinary contexts. Providing enrichment opportunities allows students to pursue their interests, develop critical thinking skills, and cultivate a passion for lifelong learning in mathematics and beyond.