Roscommon Area Public Schools – Curriculum Framework
Course: 8th Grade Math; CPM
Unit Number: 10 Unit Title: Surface Area and Volume
Timeframe: May and June (12 days)

Stage 1: Identify Desired Results	
Essential Question: *What thought-provoking questions will foster inquiry, meaning making and transfer?* • *An essential question is open-ended; it has no simple "right answer."* • *Is meant to be investigated, argued, looked at from different points of view* • *Encourages active "meaning making" by the learner about important ideas.* • *Raises other important questions.* • *Naturally arises*	How can you determine surface area and volume of three dimensional figures?
Scaffold Questions: *What questions can we ask students that break the essential question into smaller pieces of content?*	Guiding Questions Think about these questions throughout this chapter: How much will it hold?

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	Am I measuring in one, two, or three dimensions? How are they related?
Brief Summary of Unit:	Section 10.1 You will begin by learning how to find the cube root of a number. Then you will learn how to find the surface areas of cylinders and pyramids and the volumes of cylinders, pyramids, cones, and spheres. Course Closure and Reflection (Section 10.2) You will work with your team to solve challenging problems using your learning from the entire course. You will reflect about your learning and how you have been thinking as you have solved problems this year.
Desired Understanding: *The long-term accomplishments that students should be able to do with knowledge and skill, on their own. Frames Standards as long-term performance accomplishments.*	The geometry you explored in Chapter 9 focused on triangles and angles. In this chapter, you will continue to explore geometry concepts but now you will focus on surface areas and volumes. In Section 10.1, you will explore how to find the side length of a cube when you already know the volume. You will measure the surface area and volume of a cylinder, a three-dimensional solid that has a circle as the base. Finally, you will look at the surface areas and volumes of shapes that cannot be sliced into equal layers, such as pyramids, cones, and spheres.

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Answer the questions Why? And What can you do with this?	In the course closure and reflection (Section 10.2), you will work with your team to solve challenging problems that allow you to reflect about your learning throughout the course. In this chapter, you will learn: ● Find the cube root of a number. ● Find the surface areas of cylinders and pyramids. ● Find the volumes of non-rectangular shapes, including cylinders, pyramids, cones, and spheres.
Common Core State Standards (CCSS) - Mathematics *List all of the standards in this unit.*	10.1 10.1.1 Cube Roots 8.EE.2 CCSS.MATH.CONTENT.8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. 10.1.2 Surface Area and Volume of a Cylinder 8.G.9 Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. CCSS.MATH.CONTENT.8.G.C.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. 10.1.3 Volumes of Cones and Pyramids 8.G.9

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	10.1.4 Volume of a Sphere 8.G.9 10.1.5 Applications of Volume 8.G.9
Mathematical Practices *Which of the mathematical practices will be focused on during this unit?*	The 8 Mathematical Practices are listed below. A "kid friendly" version of each standard is also included. 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others 4. Model with mathematics 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning Kid-Friendly Version of Standards 1. I never give up on a problem and I do my best to get it right 2. I can solve problems in more than one way 3. I can explain my math thinking and talk about it with others 4. I see the math in everyday life and I can use math to solve everyday problems 5. I know how to choose and use the right tools to solve a math problem 6. I can work carefully and check my work 7. I can use what I know to solve new problems 8. I can solve problems by looking for rules and patterns

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Essential Standards* *List the Essential Standards that will be taught and assessed in this unit.*	CCSS.MATH.CONTENT.8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. CCSS.MATH.CONTENT.8.G.C.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.
Crossover standards* *Connection to other content areas (Option)*	
Alignment to the Vision of High Quality	Teacher Actions: - Teacher establishes clear goals for the mathematics that students are learning, situates targets within learning progressions, and uses the targets to guide instructional decisions. - Teacher engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allows multiple entry points and varied solution strategies.

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Instruction in Mathematics *(How do the instructional targets in this unit align to the district's vision of high quality instruction?)*	- Teacher engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving. - Teacher facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments. - Teacher uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships. - Teacher builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems. - Teacher consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships. - Teacher uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning. - Teacher provides instructional scaffolding with the gradual release model of instruction to ensure students are able to construct meaning of mathematics. Student Actions: - Students solve problems without giving up. - Students think about numbers in many different ways. - Students explain and justify their thinking and understand the thinking of others. - Students show, analyze and revise their work in many different ways. - Students use math tools and explain why they chose them. - Students calculate accurately and efficiently, evaluate their work, and clearly communicate their thinking. - Students use what they know to solve new problems. - Students solve problems by looking for rules and patterns and evaluate their result.

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	- Students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.

Stage 2: Determine Acceptable Evidence

(With the exception of formative assessments, all assessments listed in this section are required elements of the district's curriculum and the data associated will be collected in the district's performance management driver system.)

Measure of Understanding (Performance Task) *(How will students demonstrate their attainment of the desired understanding?)*	Chapter Closure: Part 1: Students answer a series of standards based questions and reflect upon their level of understanding for each. Part 2: WHAT TOOLS CAN I USE? You have several tools and references available to help support your learning – your teacher, your study team, your math book, and your Toolkit, to name only a few. At the end of each chapter you will have an opportunity to review your Toolkit for completeness as well as to revise or update it to better reflect your current understanding of big ideas.

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The main elements of your Toolkit should be your Learning Logs, Math Notes, and the vocabulary used in this chapter. Math words that are new to this chapter appear in bold in the text. Refer to the lists provided below and follow your teacher's instructions to revise your Toolkit, which will help make it a useful reference for you as you complete this chapter and prepare to begin the next one.

earning Log Entries

- Lesson 10.1.1 – Cube Roots
- Lesson 10.1.2 – Surface Area and Volume of a Cylinder
- Lesson 10.1.3 – Volumes of Cones and Pyramids
- Lesson 10.1.4 – Volume of a Sphere

Math Notes

- Lesson 10.1.2 – Volume of a Cylinder
- Lesson 10.1.3 – Surface Area of a Cylinder
- Lesson 10.1.4 – Volume of a Pyramid and a Cone
- Lesson 10.1.5 – Volume of a Sphere

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Assessing the Performance Task *(How will we evaluate quality student work in the performance task? How will we determine that students can use their learning independently?)*	• In the first part of the closure activity, students answer a series of questions. Answers are provided for students to have immediate feedback on their level of understanding. They rate their level using a reflection rubric. • In the second part, students review the tools provided during their investigations and classwork. Math notes and tools are outlined.
Summative Assessments *(How will we know if students can demonstrate mastery of the unit's content, skills, and common core state standards?) Can overlap the performance-based evidence, thereby increasing the reliability of the overall assessment (especially if the performance task was done by a group)*	Individual Assessment Course FInal Exam
Interim Assessments	Quizzes Learning Log Entries Team Tests
	Review/Preview

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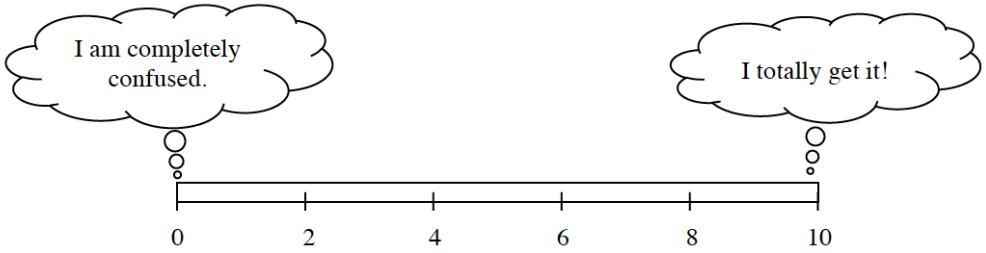
Formative Assessments	Stoplight Questions Calculator/No calculator Check Learning Log Entries Math Notes extension Exit Tickets Whiteboarding Desmos Think-Pair-Share Constructed Response Journals Teacher observation/notes Versatiles Station Remediation
Student Self-Reflection and Self-Regulation **(Student-Centered)** *(How will we measure students' ability to think meta-cognitively?)*	Students will reflect upon their level of understanding for questions in the chapter closure, using the following:  • Draw a bar or number line that represents 0 to 10 • Color or shade in a portion of the bar that represents your level of understanding and comfort with

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	completing that problem on your own. If any of your bars are less than a 5, choose *one* of those problems and complete one of the following tasks: ● Write two questions that you would like to ask about that problem. ● Brainstorm two things that you DO know about that type of problem. If all of your bars are a 5 or above, choose *one* of those problems and do one of these tasks: ● Write two questions you might ask or hints you might give to a student who was stuck on the problem. ● Make a new problem that is similar and more challenging than that problem and solve it.
State Assessment Practice *(How will we measure students' ability to interact with content and skills in an MSTEP-like or SAT-like format?)*	Illuminate standards-based assessment

Stage 3: Learning Plan

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(Summary of Key Learning Events and Instruction)	
What activities, experiences and lessons will lead to achievement of the desired results and success at the assessments? *The learning events –* • *should be derived from the goals of Stage 1 and the assessments of Stage 2 to ensure alignment and effectiveness of the activities.* • *should match the level of rigor within the standard* • *support student Acquisition, Meaning Making, and Transfer.*	**Chapter 10 Surface Area and Volume** Students will work in collaborative teams using problem solving strategies to investigate mathematical concepts. Daily Lessons will include: 1. Bell Work: scaffolded independent practice that reinforces or extends upon previous learning 2. Collaborative Lesson Investigation: team roles are used as a platform for students to work together to make new meaning; focused on daily lesson objectives 3. Review/Preview: spiraling practice that reinforces past and current standards, as well as introduces students to upcoming material 4. Lesson Closure: whole group discussion of learning objectives, often including a reflective writing component Activities: • Daily investigations • Modeling • Using measurement tools and manipulatives • Desmos/computer based etools • Remediation stations as necessary

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Learning Targets *What will students be taught? What should they know? What should they be able to do?*	I can find the cube root of a number I can find the surface areas of cylinders and pyramids I can find the volumes of non-rectangular shapes, including cylinders, pyramids, cones, and spheres.
How will the unit be sequenced and differentiated to optimize achievement for all learners? *Teaching -* • *should reflect the instructional approaches most appropriate to the goals (not what is easiest or most comfortable for the teacher).* • *should employ resources most appropriate to the goals (not simply march through a textbook or commercial program).* • *be responsive to differences in learners' readiness,*	10.1.1 Cube Roots, 1 day 10.1.2 Surface Area and Volume of a Cylinder, 1 day 10.1.3 Volume of COnes and Pyramids, 1 day 10.1.4 Volume of a sphere, 1 day 10.1.5 Applications of Volume, 2 days 10.2.1 INdirect Measurement, 2 days 10.2.2 FindingUnknowns, 2 days 10.2.3 Analyzing Data to Identify and Trend, 2 days Activities: • Investigations • Desmos computer investigations • Measuring with tools • Use of manipulatives • Remediation stations • Whiteboarding practice • Versatiles

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interests, and preferred ways of learning.	
Key Vocabulary	base (of a three dimensional figure) circumference cone cube (of a number) cube root cylinder diameter height lateral face perfect cube prism pyramid

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	radius sphere square (a number) square root surface area volume
Resources *Description or link to resources*	eTools Toolkit Parent guide Printable resources ZIP folder of all class notes, quizzes, and tests