Overarching Essential Questions for Mathematics

General Mathematics Thinking & Problem-Solving

• How can we use mathematics to solve real-world problems?

• Why is it important to estimate or approximate answers?

• How do we decide which mathematical tools or strategies to use in a given situation?

• What does it mean for a mathematical solution to be 'reasonable' or 'efficient'?

• How can patterns help us understand and predict mathematical relationships?

• What do effective problem solvers do when they get stuck?

• How do mistakes help us learn in mathematics?

Numbers & Operations

• How does our number system work?

• Why do we need different types of numbers (whole numbers, fractions, decimals, negative numbers)?

• What are the different ways we can represent numbers, and why does it matter?

• How do operations affect numbers, and how are they related to one another?

• How can we use number relationships to make calculations easier?

• Why do we use different strategies to compute numbers mentally and on paper?

Algebra & Functions

• How do patterns help us make predictions in mathematics?

• What does it mean to say that two things are 'equal' in mathematics?

• How can we use symbols and expressions to describe relationships?

• How does changing one quantity affect another?

• How do graphs, tables, and equations all represent the same mathematical idea in different ways?

• How can we determine if a mathematical relationship is linear, exponential, or quadratic?

Geometry & Spatial Reasoning

• How do geometric shapes and structures appear in the world around us?

• What do transformations (rotations, reflections, translations) tell us about shapes?

• How do we use measurement and estimation in geometric reasoning?

• Why do we classify shapes, and how do their properties help us solve problems?

• How is geometry used in art, nature, and architecture?

• How does perspective affect the way we see and interpret space?

Measurement & Data

• Why do we measure things, and how do we decide what unit to use?

• How can we estimate measurements without using tools?

• What do graphs and charts tell us about data?

• How can we use data to make predictions or inform decisions?

• How does probability help us understand chance and uncertainty in everyday life?

• What makes a data representation clear, misleading, or useful?

Statistics & Probability

• How can data be represented in multiple ways, and why does it matter?

• How do we determine if data supports a claim or argument?

• What makes a fair or biased sample in statistics?

• How do probability and statistics help us make decisions in everyday life?

• How do we compare different data sets effectively?

• What is randomness, and how do we measure uncertainty?

Mathematical Communication & Connections

• How do different cultures use and understand mathematics?

• How can we communicate mathematical ideas clearly and effectively?

• What makes a mathematical argument valid?

• How does mathematics connect to other subjects and the real world?

• How has mathematics changed over time?

• Why is mathematical notation useful, and how does it help us communicate complex ideas?

COMMON CORE MATHEMATICS PRACTICES, K-12		
Practice Standard	**Overarching Understanding**	**Overarching Question**
Make sense of problems and persevere in solving them.	• Mathematicians analyze givens, constraints, and relationships in order to make sense of and solve problems.	• How do I use the language of math (i.e. symbols, words) to make sense of/solve a problem? • What do I already know? What do I still need to find out? How do I get there? What do I do when I get stuck?
Reason abstractly and quantitatively.	• Math is a language of patterns and relationships that can be generalized to a range of given situations and problems.	• How do we use symbolic representations to apply and extend patterns and relationships? • What mathematical symbols, language and materials should we use to communicate with others about numbers and number relationships? • Why generalize a relationship/pattern?
Construct viable arguments and critique the reasoning of others.	• Mathematicians make conjectures and build a logical progression of statements to explore the truth of their conjectures. • The soundness of a mathematical argument is grounded in the application and articulation of theorems, postulates, rules and/or properties that led to the given conclusion. • Mathematicians examine and critique arguments of others to determine validity.	• What makes a mathematical argument/conjecture/it true? • How do I construct an effective (mathematical) argument? • How do I develop a conjecture/rule (to represent this pattern, situation, context)? • How do I prove something? • Is the argument valid?
Model with mathematics.	• Mathematical models can be used to interpret and predict the behavior of real world phenomena being clear about the limitations of that model.	• What do we use in addition to mathematical modeling to accurately predict results? • To what extent can we model and analyze change?

	• Mathematicians create models to interpret and predict the behavior of real world phenomena being clear about the limitations of that model. • Recognizing the predictable patterns in mathematics allows the creation of functional relationships.	• How reliable are our predictions? • When does the model work (or not work)? • What makes a pattern? How do I find it? How do I show it? Does it always work? • How do I create a mathematical model?
Use appropriate tools strategically.	• Mathematicians use a variety of tools to analyze and solve problems and explore concepts. • Estimating the answer to a problem helps mathematicians predict and evaluate the reasonableness of a solution.	• What is an effective tool/technology to solve the problem or understand the concept? • Does my answer/solution make sense?
Attend to precision.	• Clear and precise notation enables effective communication and comprehension. • Level of accuracy is determined based on the context/situation.	• How do I show my math thinking? • How do I effectively represent quantities and relationships through mathematical notation? • How accurate do I need to be? What's at stake?
Look for and make use of structure.	• Recognizing the predictable patterns in mathematics allows the creation of functional relationships. • Mathematical structures can be interchangeable while preserving the relationship (i.e. part to whole, substitution).	• What makes a pattern? How do I find it? How do I show it? Does it always work? • What is the best/most effective way to represent this number, concept, or relationship?
Look for and express regularity in repeated reasoning.	• Mathematicians make conjectures looking for both general methods (for abstractions) and shortcuts (for efficiency).	• What is a faster/more efficient way to do this? • What is the best way to get an accurate answer? • How do I know which way is best? • Why generalize a relationship/pattern?