OVERARCHING ESSENTIAL QUESTIONS

I. How is mathematics used to quantify and compare situations, events and phenomena?

II. What are the mathematical attributes of objects or processes and how are they measured or calculated?

III. How are spatial relationships, including shape and dimension, used to draw, construct, model and represent real situations or solve problems?

IV. How is mathematics used to measure, model and calculate change?

V. What are the patterns in the information we collect and how are they useful?

VI. How can mathematics be used to provide models that help us interpret data and make predictions?

VII. In what ways can data be expressed so that its accurate meaning is concisely presented to a specific audience?

VIII. How do the graphs of mathematical models and data help us better understand the world in which we live?

IX. What do effective problem solvers do, and what do they do when they get stuck?

Essential Questions for the CCSS Mathematical Practice Standards

1. Make sense of problems and persevere in solving them.
What kind of a problem is this? What must be found? What is known? What is unknown? What counts as an adequate solution? Does my answer make sense? Does my approach make sense? What should I do if I'm stuck solving it? What similar problems does this remind me of? What simpler or special cases can help me?

2. Reason abstractly and quantitatively.
What's the abstract relationship between these specific quantities? What does this quantitative relationship mean? How can I decontextualize the numbers to find a mathematical relationship? Have I represented the relationships between the quantities appropriately? Which operations and equivalences will simplify and help me solve the problem? Does my abstract representation of these quantities make sense in context?

3. Construct viable arguments and critique the reasoning of others.
Has this been proven? What is assumed? On what assumptions does that inference depend? Where might this assumption logically lead? Is the conclusion logical? Is the conclusion plausible? Have I sufficiently supported my answer and shown my work? Which of these solutions is more plausible? Does this argument make sense? What might be counter-evidence and counter arguments to what I have concluded?

4. Model with mathematics.
What mathematics applies to this situation and this data? What simplifications or approximations, should I make in order to make a mathematical model of this phenomena/data/experience? How might the model be refined to be less simplistic and crude? Does this model make sense in this context? How might I test this model? What are the limits of this (or any) mathematical model? How might this model be improved?

5. Use appropriate tools strategically.
What tools should I use here to be most efficient and effective? What are the strengths and weaknesses of the tools at hand, and might there be better ones for the task? Where might I find more helpful resources when needed?

Essential Questions for the CCSS Mathematical Practice Standards

(continued)

6. Attend to precision.

What is the appropriate degree of precision for this particular data and solution? Have I made my data, reasoning, and conclusion sufficiently clear (for this audience and purpose)? What terms need to be clearly defined? Have I tested the accuracy of my answer? How sure am I? How much statistical confidence should we have in the answer?

7. Look for and make use of structure.

What's the underlying pattern here? What's the whole, if that's a part? What are the parts, if that's the whole? What type of problem is this? What equivalences or re-constitutions of the problem are likely to help me see a pattern or structure? What shift of perspective might make the solution path more evident?

8. Look for and express regularity in repeated reasoning.

What regularities suggest a constant relationship at work? What is a summary or shorthand way of expressing these recurring patterns? What patterns are evident? Am I sure that the general pattern recurs or is my sample too small? Is that a reasonable way to describe the perceived patterns?

From: McTighe, Jay and Wiggins. Grant *Essential Questions: Doorways to Student Understanding* (ASCD, in press)

Overarching Essential Questions
MATHEMATICS

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V. What are the patterns in the information we collect and how are they useful?

VI. How can mathematics be used to provide models that help us interpret data and make predictions?

VII.   What are the limits of mathematical modeling/representation?

VIII. In what ways can data be expressed so that its accurate meaning is concisely presented to a specific audience?

IX. How do the graphs of mathematical models and data help us better understand the world in which we live?

X. What does it mean to reason mathematically?

XI. How can mathematics support effective communication?

XII. What do effective problem solvers do? What do they do when they get stuck?

– adapted from Pomperaug Region #15 Schools, CT