Facilitator Notes

The initial slides are overview slides that provide a common language for the Common Core State Standards for Mathematics at the High School Grade levels.

The graphics came from the Arizona Department of Education Overview document (found on the Standards and Assessment webpage at azed.gov)

The Standards targeted by the professional development include 2 domains from the conceptual category, Functions. The domains are Interpreting Functions and Linear, Quadratic, & Exponential Models. There are also Mathematical Practices that would most likely be observed (but are not required).
*Note the parenthetical that states the practices are not required, as the Mathematical Practices should be observed by teachers but not dictated to students.
*Also note that MP1 is typically seen in all problem solving, and was therefore not specifically noted.

The standards were chosen because they look like standards many states already have at this course level, but have nuances that require the student to have a deeper understanding than the ability to flexibly manipulate algebraic expressions.
There are also connections to other standards in CCSS, but the listed standards are the target standards.

HS.F-LE.5 Interpret the parameters in a linear or exponential function in terms of a context

HS.F-IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

b. Use the properties of exponents to y. interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)2, y = (0.97)t, y = (1.01)12t, y = (1.2), and classify them as representing exponential growth or decay.

MP.3 Construct viable arguments and critique the reasoning of others

MP.4 Model with mathematics

MP.7 Look for and make use of structure

The big idea for these standards is that the context must fit the formula that is used, rather than fitting all contexts to a given formula.

After the PowerPoint is completed:

Given extra time, teachers can be taken to Iluminations.nctm.org.
Teachers can open the investigation, Drug Filtering.
This is a typical investigation (pre-CCSSM).

Ask the teachers: Will this take us as far as we need to go with students?
Encourage teachers to include a second page to the investigation.

Some follow up questions on the second page may include:

- How can we describe this relationship algebraically?
- Can we rewrite this into a form that shows the hourly decay rate? Why would that be advantageous?
- What if a child were to be given this medication? What could we reasonably say about the rate of metabolism? How would that impact our algebraic model?
- What if the initial dose was doubled? What would change in our model? What remains invariant? How would this transform the graphical model?
- *Please note that invariant was chosen as it relates to Driscoll's Algebraic Habits of Mind (Driscoll, 1999).

One entry activity for the topic of Exponential Growth might be:

- Have one students group begin with 1 m and m
- Every 2 seconds double that amount.
- Another group also begins with one m and m. Every 10 seconds we will quadruple the amount.
- Have students discuss the results.
- Then change initial amounts. Have students consider the implications of changes made and discuss other changes that can be made—predicting the results and then judging their predications against the actual results.

This activity can be varied in many ways to explore different aspects of exponential functions.

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