



What Are Standards for Mathematical Practice? There are eight Standards for Mathematical Practice. These standards describe the processes and proficiencies students must develop as they experience the different grade-level content standards. This month we will focus on Mathematical Practice 4: *Model with Mathematics*.

What is a Model? In Kindergarten and 1st Grade, students often use toothpicks, coins, beans, blocks, and other objects to model their thinking. As students move to higher grade levels, their models become drawings, tally marks, charts, and graphs.

What Do Models Look Like? You may find your own students creating models as part of homework assignments. They may be asked to solve a problem to which they have already memorized the answer ($4 \times 3 = 12$) and to include a model to show what 4×3 actually means. The models they create show how well they understand a concept.

- If a student has memorized $4 \times 3 = 12$, but he or she creates this model, it is clear that the student is not modeling the concept.

$$\star\star\star\star \times \star\star\star = \star\star\star\star\star\star\star\star\star\star\star\star\star\star$$

- If the student has memorized $4 \times 3 = 12$, and creates the model shown here, it is clear that the student understands the concept.

$$\begin{array}{ccc} \star\star & \star\star & \star\star \\ \star\star & \star\star & \star\star \end{array}$$

What Are the Keys to Using Models Successfully? Students who use models well:

- Create models that make sense to them:
 - Use circles, tally marks, graphs, or objects
- Make connections between the problem, its solution, and the model:
 - If the problem is $3 + 5$, students draw three objects and five more objects.
 - Students count to find the solution 1, 2, 3, 4, 5, 6, 7, 8.
- Explain orally, or in writing, how the model supports the solution:
 - Students explain that 3 objects added to 5 objects results in a total of 8 objects.
 - Students may label their model to help connect the problem and the model.
- Change their models to reflect feedback or new understandings:
 - Students erase, X-out, add to, or re-label their model to show there was a problem with their original model.

