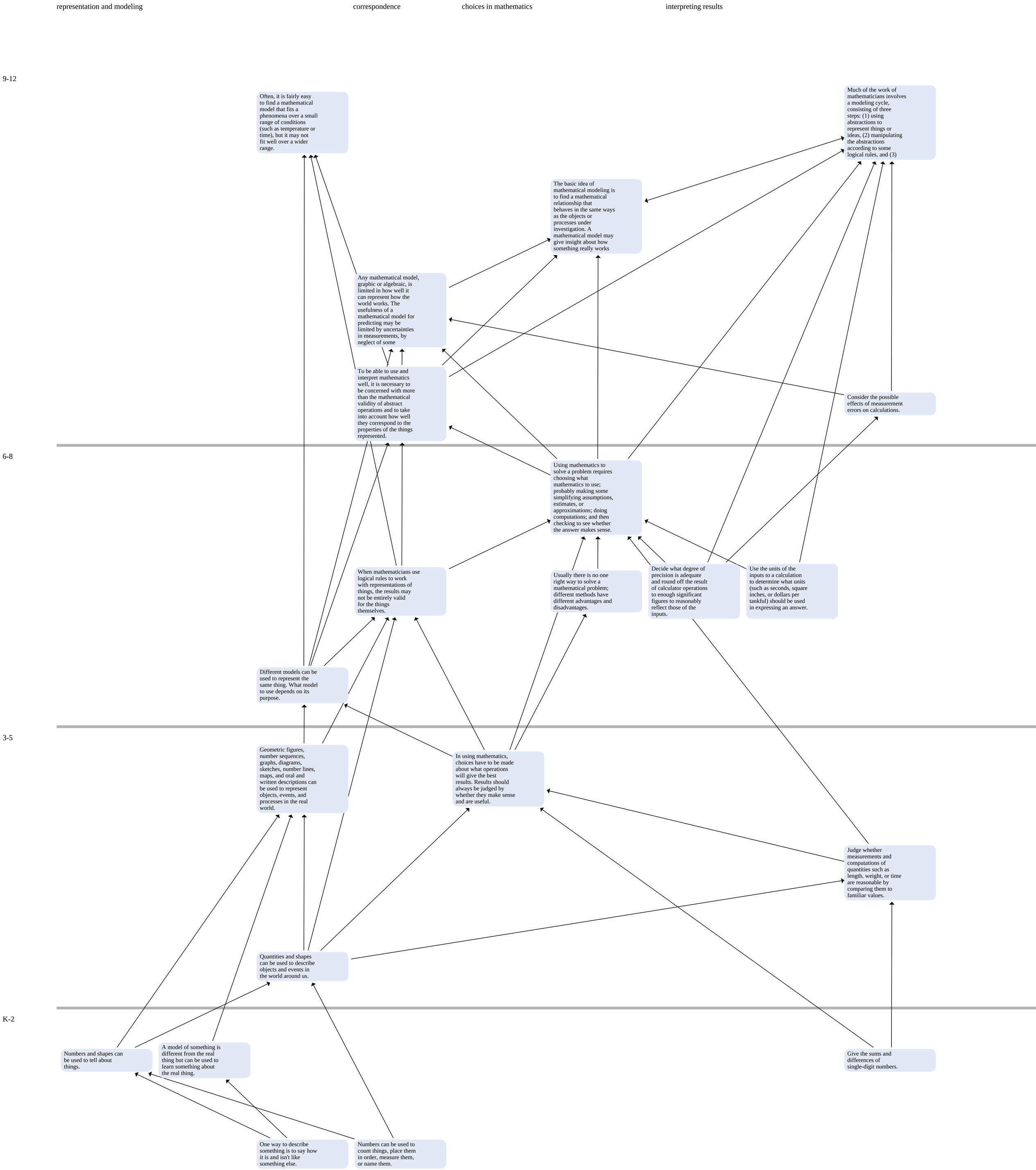
representation and modeling
correspondence
choices in mathematics
interpreting results
9-12
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K-2
Often, it is fairly easy to find a mathematical model that fits a phenomena over a small range of conditions (such as temperature or time), but it may not fit well over a wider range.
Much of the work of mathematicians involves a modeling cycle, consisting of three steps: (1) using abstractions to represent things or ideas, (2) manipulating the abstractions according to some logical rules, and (3)
The basic idea of mathematical modeling is to find a mathematical relationship that behaves in the same ways as the objects or processes under investigation. A mathematical model may give insight about how something really works
Any mathematical model, graphic or algebraic, is limited in how well it can represent how the world works. The usefulness of a mathematical model for predicting may be limited by uncertainties in measurements, by neglect of some
To be able to use and interpret mathematics well, it is necessary to be concerned with more than the mathematical validity of abstract operations and to take into account how well they correspond to the properties of the things represented.
Consider the possible effects of measurement errors on calculations.
Using mathematics to solve a problem requires choosing what mathematics to use; probably making some simplifying assumptions, estimates, or approximations; doing computations; and then checking to see whether the answer makes sense.
When mathematicians use logical rules to work with representations of things, the results may not be entirely valid for the things themselves.
Usually there is no one right way to solve a mathematical problem; different methods have different advantages and disadvantages.
Decide what degree of precision is adequate and round off the result of calculator operations to enough significant figures to reasonably reflect those of the inputs.
Use the units of the inputs to a calculation to determine what units (such as seconds, square inches, or dollars per tankful) should be used in expressing an answer.
Different models can be used to represent the same thing. What model to use depends on its purpose.
Geometric figures, number sequences, graphs, diagrams, sketches, number lines, maps, and oral and written descriptions can be used to represent objects, events, and processes in the real world.
In using mathematics, choices have to be made about what operations will give the best results. Results should always be judged by whether they make sense and are useful.
Judge whether measurements and computations of quantities such as length, weight, or time are reasonable by comparing them to familiar values.
Quantities and shapes can be used to describe objects and events in the world around us.
Numbers and shapes can be used to tell about things.
A model of something is different from the real thing but can be used to learn something about the real thing.
Give the sums and differences of single-digit numbers.
One way to describe something is to say how it is and isn't like something else.
Numbers can be used to count things, place them in order, measure them, or name them.