

Problem Sets: Introduction

In this section we present 5 problem sets focussed on particular areas of K-12 mathematics. These problem sets are designed to reflect and expand on aspects of our recommendations for state standards. They do not attempt to provide a systematic account of the curriculum, but instead focus on particular issues that are among those we believe are most important. The sets are as follows.

Set One concerns Problems for Pencil and Paper. In this set we give benchmarks for computational fluency, benchmarks that we believe are crucial if students are to be able to use mathematics effectively. A key recommendation of our group is that students develop the ability to compute fluently without use of a calculator. In our experience, students who cannot do numerical calculations without a calculator do not have an adequate base of knowledge and intuition for further studies of mathematics or science. This section focuses primarily on computations in arithmetic, but includes a few selected problems in algebra as well.

Set Two concerns Patterns and Sequences. The study of patterns is widespread, providing a way to begin to develop concepts such as function. However, we are concerned that many of the problems in circulation, including ones on state tests, are actually misleading. We explain our concern and contrast harmful and helpful problems in this area.

Set Three concerns Logical Reasoning in Mathematics. The ability to reason mathematically in a grade-appropriate fashion is of great value in understanding and using mathematics effectively. One aspect of such reasoning is contextual reasoning. Though such reasoning is certainly of importance, we recommend that the standards include material on mathematical reasoning that goes far beyond this. We describe what we have in mind in some detail and illustrate it with problems.

Set Four concerns Data, Statistics, and Probability. These are mathematical topics of widespread utility. We offer problems on data and statistics, and on probability. We recommend that in state standards concerning data and its analysis, the emphases be on the representation and statistical description of data and on critical reasoning in the context of data analysis.

Set Five concerns Lengthy Calculations. Here we describe calculations, too long for state tests, which nonetheless could be a valuable addition to the curriculum, reinforcing basic concepts and skills. Implicit in this section is our belief that classroom work should not be limited to material that will directly appear on state assessments.

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