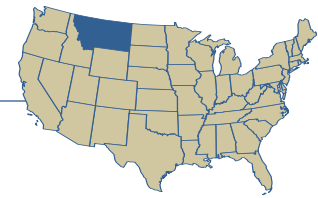


# Montana



## Introduction

This study linked data from the 2004 and 2006 administrations of Montana’s reading and math tests to the Northwest Evaluation Association’s Measures of Academic Progress (MAP) assessment, a computerized adaptive test used in schools nationwide. We found that Montana’s definitions of proficiency are relatively consistent with the standards set by the other 25 states in the study with respect to reading, but relatively difficult compared with other states with respect to mathematics. In other words, Montana’s reading tests are about average and its math tests are harder than average.

The level of difficulty changed some from 2004 to 2006—the No Child Left Behind era. Montana’s reading tests became easier at both the fourth- and eighth-grade levels, while its math test became easier in fourth grade and much harder in eighth grade. There are many possible explanations for these declines in our estimates of Montana’s cut scores (see pp. 34–35 of the main report), which were caused by learning gains on the state test not being matched by learning gains on the Northwest Evaluation Association test. As a result, Montana’s cut scores are less difficult in the early grades than they are for eighth-grade pupils, especially in mathematics (taking into account the differences in subject content and children’s development). Montana policymakers might consider adjusting their cut scores to ensure equivalent difficulty at all grades so that parents and schools can be assured that elementary school students scoring at the proficient level are truly prepared for success later in their educational careers. Furthermore, state leaders need to be aware of the disparity between math and reading standards when evaluating differences in teacher and student performance across these domains.

### What We Studied: Montana Criterion-Referenced Test (Montana CRT)

Montana currently uses an assessment called the Montana Criterion-Referenced Test (Montana CRT) which tests mathematics and reading in grades 3 through 8 and grade 10. The same sets of tests were used in spring 2004 to test students in mathematics and reading in grades 4, 8, and 10. The current study linked data from spring 2004 and spring 2006 administrations to a common scale also administered in the 2004 and 2006 school years.

To determine the difficulty of Montana’s proficiency cut scores, we linked reading and math data from Montana’s tests to the NWEA assessment. (A “proficiency cut score” is the score a student must achieve in order to be considered proficient.) This was done by analyzing a group of elementary and middle schools in which almost all students took both the state’s assessment and the NWEA test. (The methodology section of this report explains how performance on these two tests was compared.)

### Part 1: How Difficult are Montana’s Definitions of Proficiency in Reading and Math?

One way to evaluate the difficulty of a standard is to determine how many people attempting to attain it are likely to succeed. How do we know that a two-foot high jump bar is easy to jump over? We know because, if we asked 100 people at random to attempt such a jump, perhaps 80 percent would make it. How do we know that a six-foot high jump bar is challenging? Because only one (or perhaps none) of those same 100 individuals would successfully meet that challenge. The same principle can be applied to academic standards. Common sense tells us that it is more difficult for students to solve algebraic equations with two unknown variables than it is for them to solve an equation with only one unknown variable. But we can figure out exactly how much more difficult by seeing how many eighth graders nationwide answer both types of questions correctly.

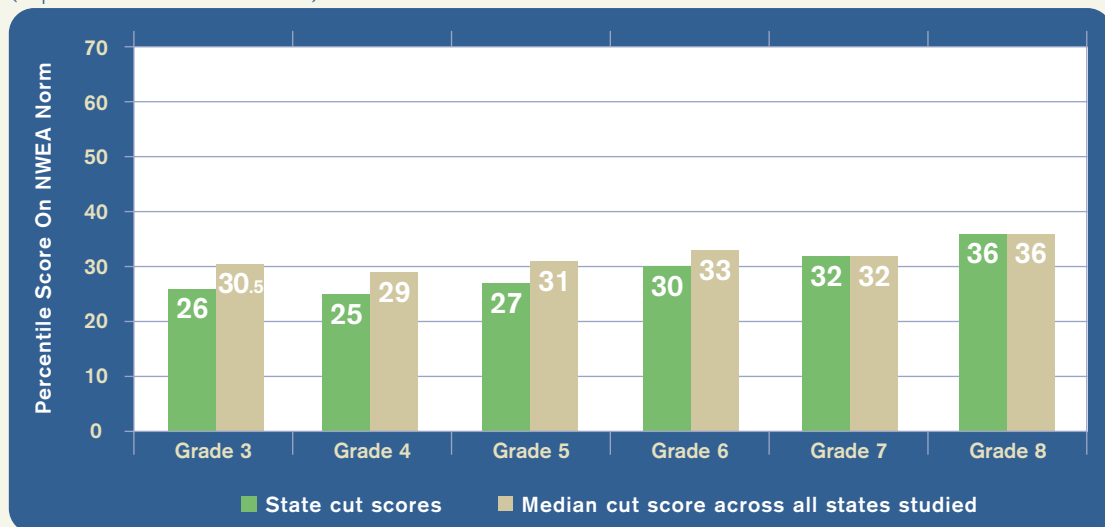
Applying that approach to this assignment, we evaluated the difficulty of Montana’s proficiency cut scores by estimating the proportion of students in NWEA’s norm group who would perform above the Montana cut score on a test of equivalent difficulty. The following two figures show the difficulty of Montana’s proficiency cut scores for reading (Figure 1) and mathematics (Figure 2) in 2006 in relation to the median cut score for all states in the study. The proficiency cut scores for **reading** in Montana ranged between the 25th and 36th percentiles for the norm group, with the eighth-grade cut score being most challenging. In **mathematics**, the proficiency cut scores ranged between the 40th and 60th percentiles, with eighth grade again being most challenging.

In most grades, Montana’s cut scores for reading proficiency are close to the median level of difficulty, compared with the other states in the study. For mathematics, however, Montana’s proficiency cut scores are generally above the median. Note, also, that Montana’s cut scores for reading are relatively lower than for math. Thus, reported differences in achievement

between the two subjects may be more a product of differences in cut scores than in actual student achievement. In other words, Montana students may be performing worse in reading and better in mathematics than is apparent by just looking at the percentages of pupils passing state tests in those subjects.

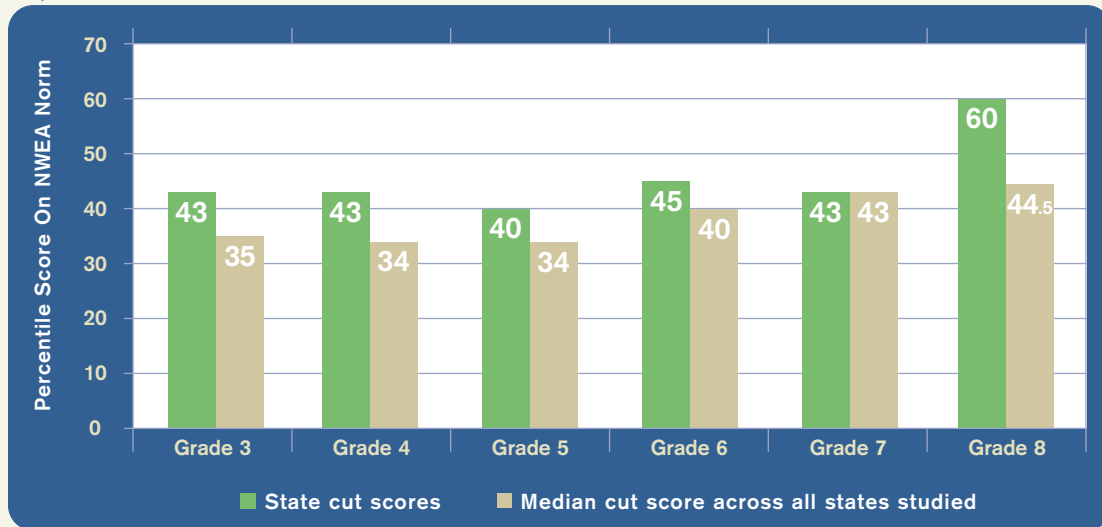
Another way of assessing difficulty is to evaluate how Montana’s proficiency cut scores rank relative to other states. Table 1 shows that the Montana reading cut scores generally rank in the lower half in difficulty among the 26 states studied, and the upper half for mathematics. Its eighth-grade math cut score ranks among the top three across all states studied.

Figure 1 – Montana Reading Cut Scores in Relation to All 26 States Studied, 2006  
(Expressed in MAP Percentiles)



**Note:** This figure compares reading test cut scores (“proficiency passing scores”) as percentiles of the NWEA norm. These percentiles are compared with the median cut scores of all 26 states reviewed in this study. Montana’s cut scores are slightly below the median except in seventh and eighth grades where the state’s cut scores are at the median.

Figure 2 – Montana Mathematics Cut Scores in Relation to All 26 States Studied, 2006  
(Expressed in MAP Percentiles)



**Note:** Montana's math test cut scores are shown as percentiles of the NWEA norm and compared with the median cut scores of all 26 states reviewed in this study. Montana's cut scores are consistently 5 to 15.5 percentile points above the median except for seventh grade, which is at the median.

Table 1 – Montana Rank for Proficiency Cut Scores Among 26 States in Reading and Mathematics, 2006

Ranking (Out of 26 States)						
	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
Reading	16	17	17	17	13	9
Mathematics	6	8	10	8	12	3

**Note:** This table ranks Montana's cut scores relative to the cut scores of the other 25 states in the study, with 1 being highest and 26 lowest.

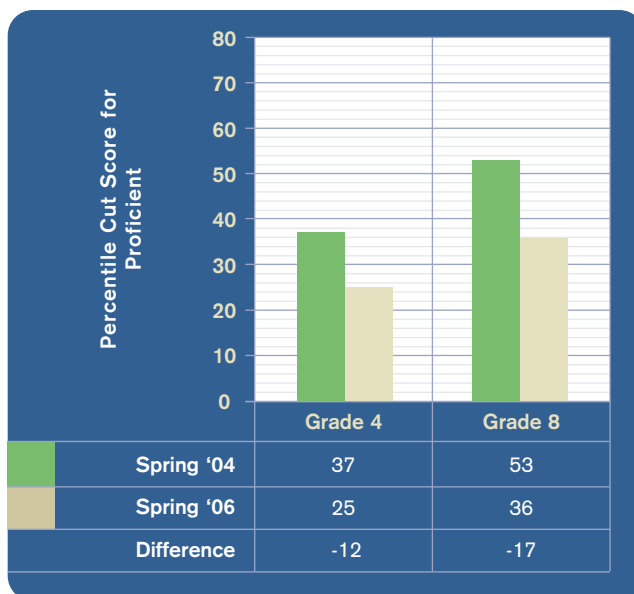
## Part 2: Differences in Cut Scores over Time

In order to measure their consistency, Montana's proficiency cut scores were mapped to their equivalent scores on NWEA's MAP assessment for the 2004 and 2006 school years. Information about proficiency cut scores for both school years was available for grades 4 and 8.

States may periodically re-adjust the cut scores they use to define proficiency in reading and math or may update the exams used to test student proficiency. Such changes can impact proficiency ratings, not necessarily because student performance has changed, but because the measurements and criteria for success have changed. Unintentional drift can occur even in states, such as Montana, that maintained their proficiency levels.

Is it possible, then, to compare the proficiency scores between earlier administrations of Montana tests and today's? Yes. Assume that we're judging a group of fourth graders on their high-jump prowess and that we measure this by finding how many in that group can successfully clear a three-foot bar. Now assume that we change the measure and set a new height. Perhaps students must now clear a bar set at one meter. This is somewhat akin to adjusting or changing a state test and its proficiency requirements. Despite this, it is still possible to determine whether it is more difficult to clear one meter than three feet, because we know the relationship between the measures. The same principle applies here. The Montana CRT in 2004 and Montana CRT in 2006 can both be linked to the MAP, which has remained consistent over time. Just as one can compare three feet to one meter and know that a one-meter jump is slightly more difficult than a three-foot jump, one can estimate the cut score needed to pass the CRT in 2004 and 2006 on the MAP scale and ascertain whether the state test may have changed in difficulty.

Figure 3 – Estimated Differences in Montana's Proficiency Cut Scores in Reading, 2004-2006 (Expressed in MAP Percentiles)



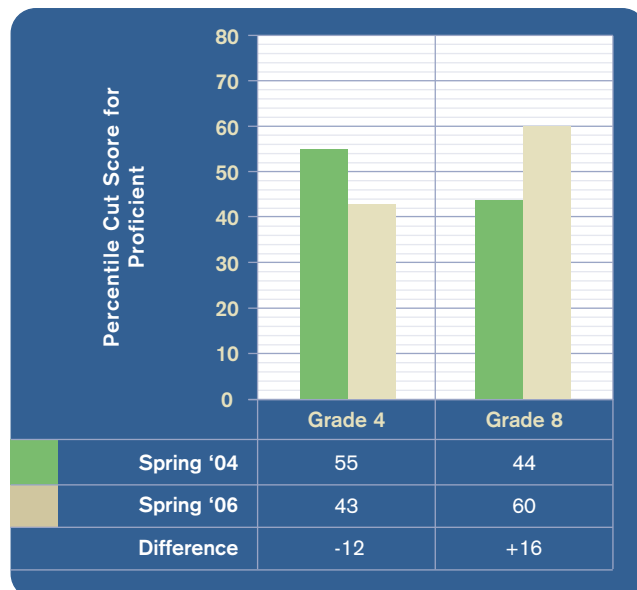
**Note:** This graphic shows how the difficulty of achieving proficiency in reading has changed. For example, fourth-grade students in 2004 had to score at the 37th percentile on the NWEA norm in order to be considered proficient, while in 2006 fourth graders had only to score at the 25th percentile to achieve proficiency.

Montana's estimated **reading** cut scores show large decreases for fourth and eighth grades over this two-year period (see Figure 3). Consequently, even if student performance stayed the same on an equivalent test like NWEA's MAP assessment, one would expect the reading proficiency rate in 2006 to be 12 percent higher than in 2004 for grade 4, and 17 percent higher for grade 8. (Montana reported a 14-point gain for fourth graders and an 18-point gain for eighth graders over this period.)

Montana's estimated **mathematics** cut scores also show a decrease in the difficulty for fourth grade (Figure 4). Consequently, even if student performance stayed the same on an equivalent test like NWEA's MAP assessment, this would likely yield an increased proficiency rate of 12 percent. The eighth-grade cut scores increased dramatically, however, enough to cause a 16 percent drop in the expected proficiency rating for eighth grade. (Montana reported a 19-point gain for fourth graders and a 7-point decline for eighth graders over this period.)

Thus, one could fairly say that Montana's fourth-grade tests in both reading and mathematics were easier to pass in 2006 than in 2004, while the eighth-grade tests were easier in reading and harder in math. As a result, some apparent improvements in state-reported fourth-grade proficiency rates during this period may not be entirely a product of improved achievement, while any improvements in eighth-grade mathematics performance may be masked by the more difficult proficiency cut score.

Figure 4 – Estimated Differences in Montana's Proficiency Cut Scores in Mathematics, 2004-2006 (Expressed in MAP Percentiles)



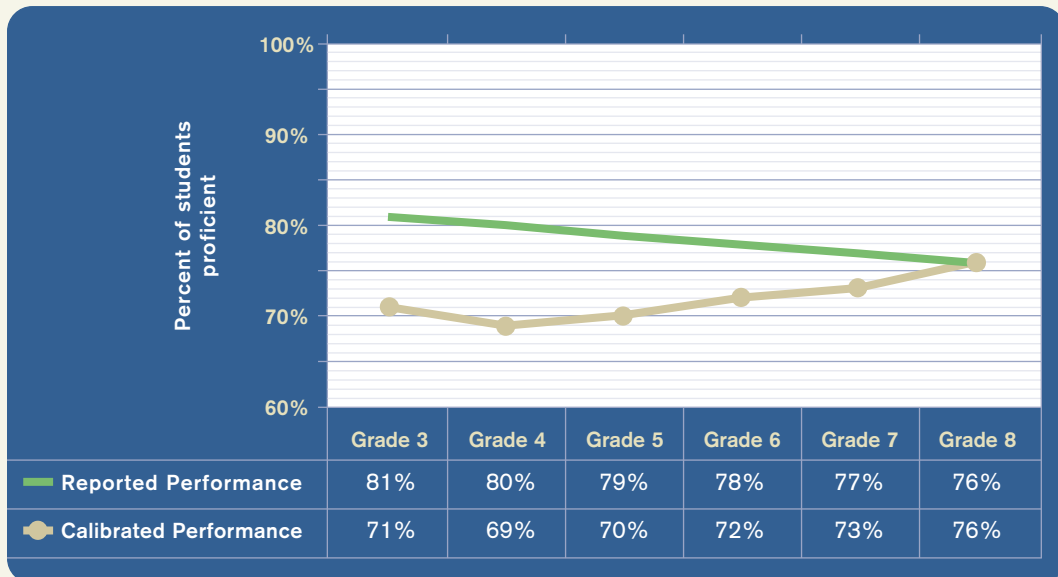
**Note:** This graphic shows how the degree of difficulty in achieving proficiency in math has changed. For example, fourth-grade students in 2004 had to score at the 55th percentile on the NWEA norm in order to be considered proficient, while in 2006 fourth graders only had to score at the 43rd percentile to achieve proficiency.

### Part 3: Calibration across Grades

Calibrated proficiency cut scores are relatively equal in difficulty across all grades. Thus, the eighth-grade cut score is no more or less difficult for eighth graders to achieve than the third-grade cut score is for third graders. When cut scores are so calibrated, parents and educators have some assurance that achieving the third-grade proficiency cut score puts a student on track to achieve the standards at eighth grade. It also provides assurance to the public that reported differences in performance across grades are a product of differences in actual educational attainment and not simply differences in the difficulty of the test.

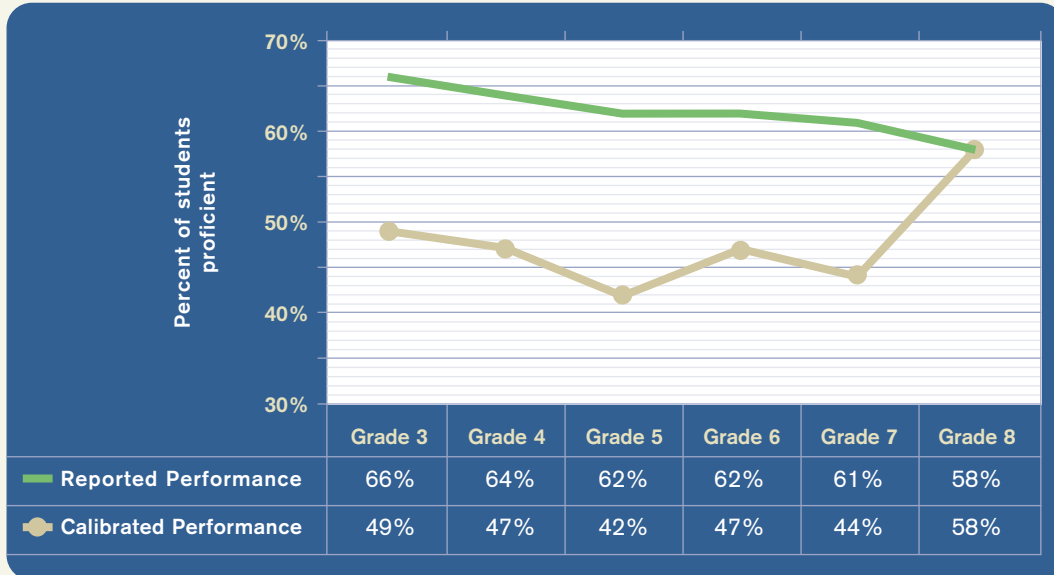
Figures 1 and 2 gave the relative difficulties of the reading and mathematics cut scores across grades, showing that the upper-grade cut scores in reading and mathematics were more difficult than those in the lower grades. The following two figures show Montana's reported performance in reading (Figure 5) and mathematics (Figure 6) on the state test and the rate of proficiency that would be achieved if the cut scores were all calibrated to the grade-8 standard. When differences in grade-to-grade difficulty of the cut score are removed, student performance at the lower grades is less likely to overestimate the percentage of students on track to meet eighth-grade expectations.

Figure 5 – Montana Reading Performance as Reported and as Calibrated to the Grade-8 Standard, 2006



**Note:** This graphic shows, for example, that if Montana's grade-3 reading cut score were set at the same level of difficulty as its grade-8 cut score, 71 percent of third graders would achieve the proficient level, rather than 81 percent, as was reported by the state.

Figure 6 – Montana Mathematics Performance as Reported and as Calibrated to the Grade-8 Standard, 2006



**Note:** This graphic shows, for example, that if Montana’s grade-3 mathematics cut score were set at the same level of difficulty as its grade-8 cut score, 49 percent of third graders would achieve the proficient level, rather than 66 percent, as was reported by the state.

### Policy Implications

When setting its cut scores for what it takes for a student to be considered proficient, Montana is relatively high for mathematics and in the middle of the pack for reading, compared with the other states in the study. In recent years, the state has adjusted the difficulty of these cut scores—making them more challenging in mathematics in eighth grade, and less challenging in both reading and math in fourth grade. As a result, Montana’s expectations are not smoothly calibrated across grades; students who are proficient in third grade are not

necessarily on track to be proficient by the eighth grade. Montana policymakers might consider adjusting their cut scores across grades so that parents and schools can be assured that elementary students scoring at the proficient level are truly prepared for success later in their educational careers. Furthermore, state leaders need to be aware of the disparity between math and reading standards when evaluating differences in teacher and student performance across these domains.