



Assessing CATS:
Questions that must be
answered so that No Child is
Left Behind in Kentucky

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A quality education today is more important than ever. Today's increasingly complex and technological job market and the academic gains made by other countries increase the importance of academic achievement of the nation's public schools and each child who attends them.

With implementation of the federal No Child Left Behind (NCLB) law, the validity and reliability of assessments used by states to determine the progress of their public schools and the students who attend them also has never been more important. The NCLB guidelines exist to insure that each child in Kentucky receives an adequate education that will prepare him or her for the future.

At the same time, never has the concern been greater about the Commonwealth Accountability Testing System (CATS), the method by which Kentucky has chosen to meet NCLB standards. CATS integrates results from several academic tests, a writing portfolio and non-academic data including attendance rates into one final assessment score for each public school in Kentucky. According to the Department of Education Web site, CATS is designed to "tell parents and schools how students are performing and where students need help."

Yet while the state's education department praises CATS as providing "a picture of a student's level of learning," the Bluegrass Institute questions whether this "picture" is in focus given the apparent inflation of scores and less-than-rigorous material. As discussed below, the evidence points to a need for a thorough and independent investigation into the approach and standards being used to assess the performance of Kentucky's public-school students.

Scoring inflation

Kentucky's education establishment paints a rosy picture of education progress by pointing to higher scores from the state's assessments. However, as will be shown, these increases seem illusory, artifacts of an undemanding test rather than results from real improvements in learning.

Scores appeared inflated right from the time the state began using CATS in 1999 after a failed experiment with the Kentucky Instructional Results Information System (KIRIS). KIRIS, which was the state's assessment system created by the Kentucky Education Reform Act in 1990, drew unfavorable reviews from parents, teachers and school administrators from the time it was first used in 1992. By 1998, professional researchers had issued several reports seriously challenging the validity of the controversial assessment. In response to the public pressure and unfavorable reports, the General Assembly decided to replace KIRIS with CATS as the state's assessment system.

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CATS did implement a few changes from KIRIS, including adding nationally normed standardized tests. CATS also added custom-made multiple-choice questions to existing open response questions to create a separate assessment element known as the Kentucky Core Content Test (KCCT). However, the new components receive relatively small weight in each school’s overall score known as the “School Accountability Index.” Instead, elements left over from KIRIS that were also made a part of KCCT continue to receive the heaviest weight in the grading formula. As a result, problems from the previous assessment continue to impact the newer program’s final accountability scores.

The KCCT accounts for 90 percent of elementary schools’ accountability indexes and 84 percent of the overall scores of middle and high schools, making KCCT the most important element of CATS.¹ Thus, if KCCT is deficient, it weakens the overall validity of CATS more than other less-influential parts would.

Initially, CATS used the old KIRIS scoring standards. When the first CATS results were issued in September 1999, proficiency rates (see Table 1 below) remained flat, continuing a trend that developed during KIRIS. This was not surprising considering how KIRIS’ leftover elements received the most scoring weight in determining CATS proficiency. As Table 1 shows, a decline in proficiency rates started occurring in some subjects between 1998 and 1999.

Such mediocrity was particularly unflattering for members of the education establishment...

Table 1.
Comparison of Elementary School Proficiency Rates,
1998 KIRIS to 1999 CATS
Old Scoring Standards for CATS
 Data Source: See Endnote²

	1998 KIRIS Percent Proficient or Better	1999 KCCT Percent Proficient or Better
Reading	33%	32.29%
Math	20%	21.56%
Science	8%	5.62%
Social Studies	15%	12.63%

Such mediocrity was particularly unflattering for members of the education establishment who, in their push for passage of the Kentucky Education Reform Act (KERA) and the flood of funding it would bring, had promised significant improvements. These results were uninspiring, at best.

The response of the education establishment, whose members have staked their careers on the success of KERA, was unfortunate. Instead of concentrating on ways to improve the education of Kentucky’s children – a need now revealed and confirmed by both CATS and KIRIS – the Kentucky Department of Education instead weakened the scoring standards for CATS. Then, the de-

partment applied these weaker standards retroactively to the 1999 CATS test booklets and published the revised scores.

As examples in Table 2 (below) indicate, weaker standards caused CATS scores to increase dramatically from the previous KIRIS (and earlier CATS) results, thus raising doubts about the validity of Kentucky’s entire assessment process. Student proficiency rates appear dramatically higher when the revised 1999 results are compared to the previous year’s KIRIS achievements. It’s doubtful that the state experienced a 412 percent improvement in the proficiency rate of fourth-grade science students or that the number of eighth-graders who became proficient readers increased by 333 percent in a year. These very large, one-year jumps in proficiency rates invite investigation.

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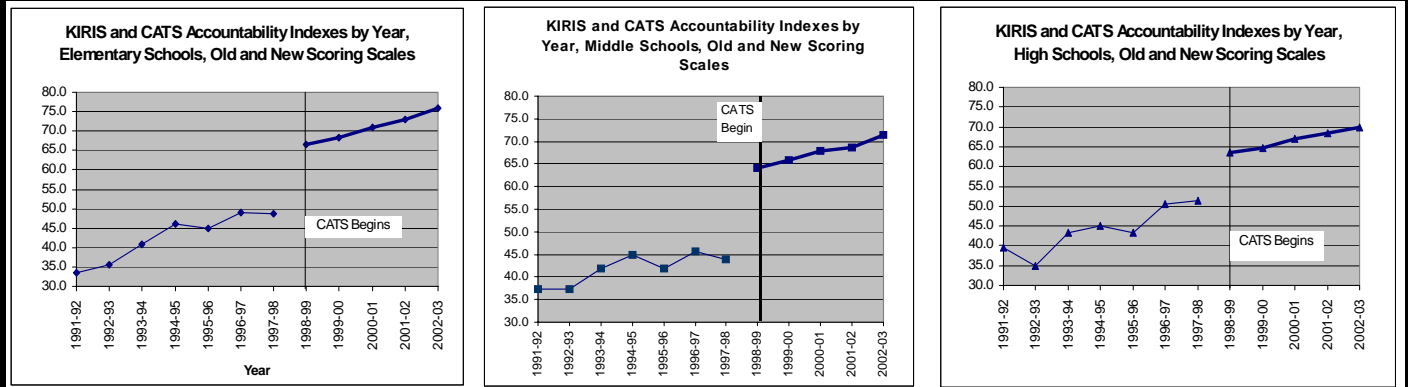
Table 2. Example Comparisons of School Proficiency Rates, 1998 KIRIS to 1999 CATS New Scoring Standards for CATS Data Source: See Endnote ³			
	1998 KIRIS	1999 CATS (Rescored)	Percent Increase
Elementary School Science	8%	33%	412%
Middle School Reading	15%	50%	333%
High School Practical Living and Vocational Studies	6%	48%	800%

Not only do the new scoring standards seem to be far less demanding than the state’s former ones, but the lower standards also provide less incentive for Kentucky students to improve. The revised scoring standards appear to make attainment of a “proficient” rating much less of an accomplishment under the CATS system than with KIRIS.

The inflation in individual subject scores caused by the new scoring standards is reflected in overall school assessments, which also showed questionable increases between the last year of KIRIS and first year of re-scored CATS results. The rise in accountability indexes for elementary and high schools between 1998 and 1999 equaled the entire amount of improvement made between 1992 and 1998 using the KIRIS system. Inflation was even more dramatic in middle schools where increases equaled three times the amount of progress under KIRIS.

As shown in Figure 1 (below), it is clear that progress was tapering off during KIRIS’ final year. Figure 1 shows how academic index lines flattened in the mid-1990s, only to rise at a faster rate after the new CATS scoring was implemented. This created a dubious appearance of progress.

Figure 1
KIRIS and CATS Accountability Indexes By School Level and Year
KIRIS Scale from 1992 to 1998
Rescored CATS from 1999 to 2003
 Data Source: See Footnote ⁴



Kentucky Department of Education officials excused this questionable change in progress by claiming that since CATS had severed its ties to the old KIRIS, results from the two assessments were not comparable.⁵ However, along with maintaining many of the same elements in the part of the test that was weighted the heaviest, CATS maintained the same scoring scale of 0 to 140 and the same end goal of an accountability index of 100 or more for all schools by 2014. These similarities make the department’s claims that CATS and KIRIS results could not be compared seem unconvincing at best.

Such a dramatic change in scoring results suggests that the new CATS scores had significantly reduced academic standards. Not only did those reset scores suddenly place schools much closer to their goals, but the increased rate of progress during the years since CATS began do not match the flat performance of Kentucky students on the KIRIS test and the earlier version of CATS.

Comparing CATS with NAEP

The new CATS scores also diverge sharply from other tests, including Kentucky’s elementary school proficiency rates on the National Assessment of Educational Progress (NAEP). While NAEP is a federal program limited in the number of subjects, grades and frequency with which it tests, it nevertheless provides some additional indication that the results of Kentucky’s new scoring standards are questionable.

NAEP deemed only 30 percent of fourth-grade students were proficient in reading in 2002 versus the 60 percent determined to have reached proficiency by KCCT results.⁶ Seventeen percent of Kentucky’s fourth-graders in 2000

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were proficient in math, according to NAEP. While the KCCT does not test fourth-graders for math, it did record a 34 percent proficiency rate for the fifth grade in 2001.⁷ It seems unlikely that the same group of fourth-graders tested by NAEP in 2000 would *double* their math proficiency within a year as KCCT claims.

Newly released 2003 NAEP trends (Table 3, below) show continuing disparity with the results of 2003 CATS proficiency rates for reading and math. While NAEP’s process of determining proficiency rates is still developing and is in a trial status, it is highly unlikely that it is in error by more than 100 percent. Thus, the gaps between NAEP and KCCT proficiency shown in Table 3 seem unreasonable.

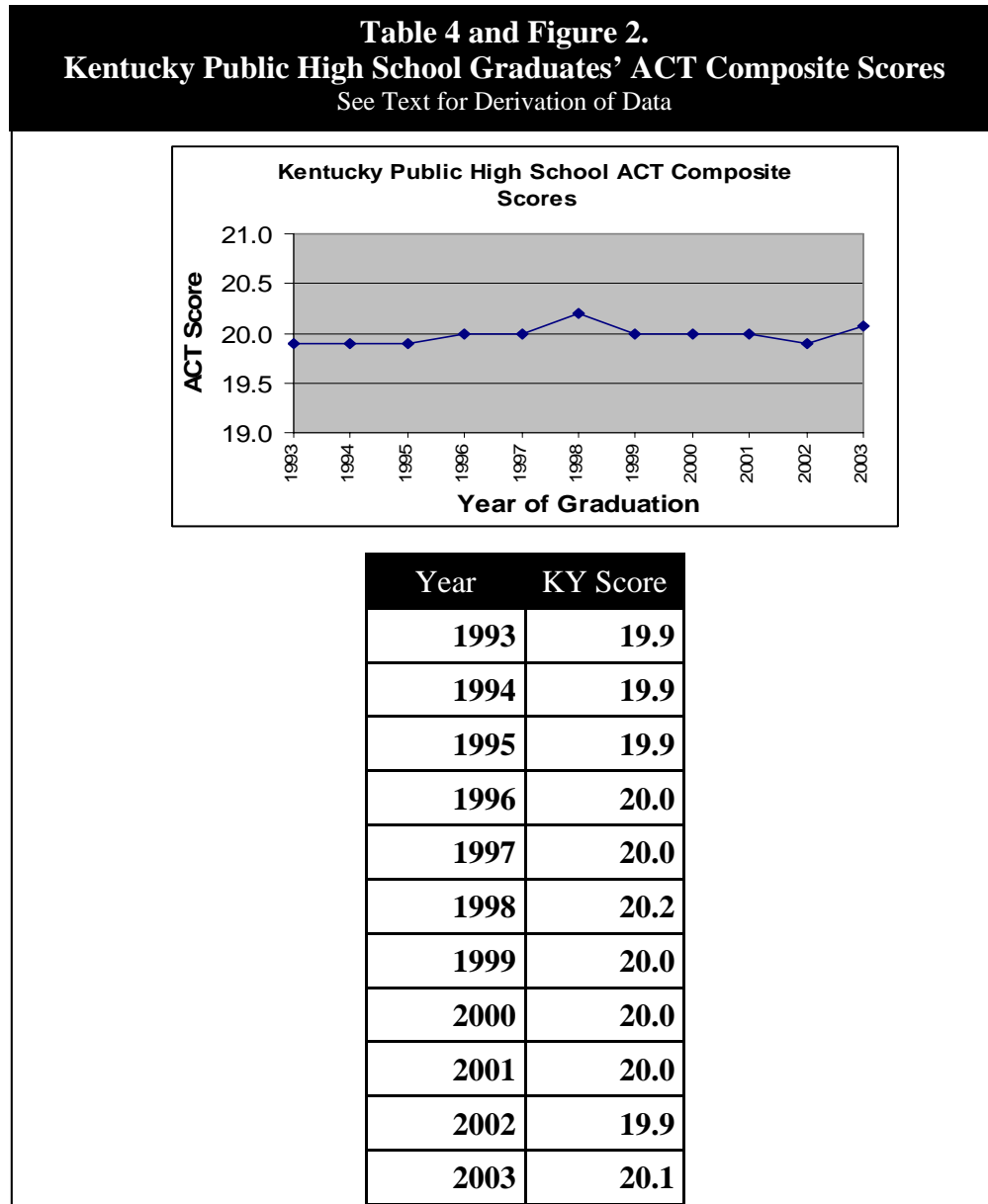
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Table 3.			
NAEP and CATS Proficiency Rates			
2003 Administrations			
Data Sources: See Endnote ⁸			
Elementary Schools		Middle Schools	
NAEP Math Grade 4*	22%	NAEP Math Grade 8	24%
CATS Math Grade 5*	38.07%	CATS Math Grade 8	30.88%
NAEP Reading Grade 4	31%	NAEP Reading Grade 8*	34%
CATS Reading Grade 4	62.71%	CATS Reading Grade 7*	57.25%
*As explained in the body of the paper, NAEP does all testing at fourth grade and eighth grade. In Kentucky the closest grade for elementary math testing is fifth grade and the closest middle school grade for reading testing is seventh grade.			

Also to be considered when looking at NAEP scores is the issue of exclusions. Because Kentucky excludes an abnormally high number of students with learning disabilities from taking the test, the state’s NAEP scores are inflated on most recent NAEP assessments. It seems evident that excluding more of the weakest-performing students will offer a less-than-accurate indication of true educational achievement. The disparities between CATS and NAEP in Table 3 would certainly be even more dramatic if proper adjustments were made for exclusions.

... and ACT results

Table 4 and Figure 2 below show that while the KCCT scores were making steady progress, the state’s public high school students’ performance on the ACT college entrance test remained essentially flat.



The state’s education department...often makes inappropriate comparisons using ACT results...

The information in Table 4 and Figure 2 is based on the author’s analysis of Kentucky’s public high school achievements prepared by ACT for the Kentucky Office of Education Accountability.⁹

Kentucky’s education reform only impacts public schools. Therefore, it is far more appropriate to examine public school only ACT data, when available. The state’s education department, on the other hand, often makes inappropriate comparisons using overall ACT results that include the scores of students

in private schools who also took this college entrance test. This can create misconceptions as part of the author's ACT analysis discussed above shows that Kentucky's non-public school students outperform their public school counterparts on the ACT. In addition, this analysis shows that there are now enough private school students to definitely impact the overall state average.

A new report by the Human Resources Research Organization (HumRRO) provides more evidence concerning the ACT and KCCT scores. This report compares the KCCT and ACT scores of Kentucky public high school graduates from 1999 through 2002. The report shows that KCCT scores increased for these recent graduates while their ACT scores actually declined slightly.¹⁰

Summarizing to this point

Comparisons of trends and proficiency rates between the KCCT and other assessments reinforce concerns about the validity of CATS. The rates of progress shown on the KCCT are not reflected in the ACT, or even in the last years of KIRIS. CATS proficiencies are generally out of line with the NAEP. Thus, CATS stands alone in showing notable rates of improvement and proficiency in Kentucky.

In their paper, "Validity Issues for Accountability Systems," professors Robert L. Linn and Eva L. Baker outline a number of requirements for testing validity, including a helpful interpretation of what it should mean for a student to be considered "proficient." In assessments such as the ones used by Kentucky, the achievement of "proficiency" is determined by selecting a "cut score" to be applied to raw student scores. Students scoring above the "cut" are deemed proficient. Linn and Baker write that "... performance above the cut score implies that the student is proficient (passing), and performance below the cut score indicates that the student is not proficient (failing). The validity of these standards-based interpretations, also called criterion-referenced interpretations, depends on the appropriateness of the cut score."¹¹

In other words, the professors imply that the term "proficiency" should mean that a student is doing passing, grade-level appropriate work. The designation should extend beyond a given test. It's reasonable to conclude that a truly proficient student will perform equally as well on other assessments that measure the same subject matter. ACT and NAEP show this is not happening with Kentucky's students.

This important concept of the term "proficient" and the gulf between scores on different assessments raises questions about the rigors of KCCT, which also would influence the determination of validity and toward which we now turn our attention.

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Could the continuing increase in KCCT scores be a result of inadequate questions?

Linn and Baker note that doubts about validity often haunt large-scale, state-wide assessment programs because they use questions that are too easy and too narrow in focus.¹² Kentucky is no exception.

An examination of actual questions is obviously critical to determining a test's validity. However, the Kentucky Department of Education did not release any KCCT sample questions to the public between 1999 and 2003. The last questions released were actually from the old KIRIS assessment. This made it impossible to judge the rigor of CATS. Though claiming to change 20 percent of the KCCT questions every year, the department did not make any of those removed questions available to schools for preparation and to the public as evidence of the real caliber of CATS. For nearly five years, the department's policy made it impossible to investigate the foundation of KCCT's validity – the strength of its questions.

Some KCCT sample questions were finally released in August 2003 as part of a report by the state government's Legislative Research Commission (LRC). The release coincided with the opening of an investigation into CATS by the Kentucky General Assembly's Program Review and Investigations Committee. The LRC's report (<http://www.lrc.state.ky.us/lrcpubs/RR312.pdf>) with its small number of KCCT sample reading, mathematics, science and social studies questions, provides the first public glimpse at Kentucky assessment questions in many years.¹² The types of questions in the LRC report are outlined in Table 5.

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Table 5.			
CATS Subject Areas Covered in LRC Report			
<small>*One additional question in body of LRC report on Page 7</small>			
Grade	Subjects With Two Question Samples in Appendix of the LRC Report		
4	Reading	Science	
5	Social Studies	Mathematics*	
7	Reading	Science	
8	Social Studies	Mathematics	
10	Reading		
11	Social Studies	Science	Mathematics

Because they are so general, it is difficult to provide a reasonable analysis of the KCCT reading and social studies questions in the LRC report. An accurate appraisal of the reading questions is further hindered because the related passages that students were to read are not included with the LRC's samples.

However, a comparison of Kentucky's sample math questions to those of some other states strongly implies that the Commonwealth uses tests that rank below grade level requirements in other states.

Consider the following sample math question for Kentucky's fifth-graders taken from the body of the LRC report. This KCCT test question asks Kentucky's *fifth-graders* to determine the value of 37 nickels.

Distinguishing between different coins and adding them up is required of *third-graders* in Virginia and California.

Kentucky KCCT Fifth-Grade Math Problem:

Anton has saved 37 nickels. What is the total value of the nickels he saved?

- A. \$1.35 B. \$1.55 C. \$1.85 D. \$10.35

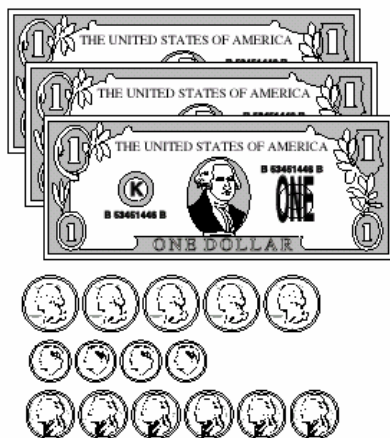
In sharp contrast, distinguishing between different coins and adding them up is required of *third-graders* in Virginia and California. The following is a similar difficulty question from the *third-grade* portion of the Virginia Standards of Learning Assessments:

Virginia SOL 2002 Third-Grade Math Problem 21:

Mr. Colton paid Alice the money shown for shoveling the snow from his sidewalk.

What is the total value of the money?

- A \$3.95
B \$4.16
C \$4.95
D \$6.15



Question 21 from "Virginia Standards of Learning Assessments, Spring 2002 Released Test, Grade 3 Mathematics," Page 9, Copyright Commonwealth of Virginia Department of Education, reproduced by permission.

Clearly, Virginia’s test requires third graders to be conversant with the United States monetary system.

Virginia also expects much younger students to handle multiplication problems on the order of difficulty required in the Anton fifth grade question. The following Virginia question indicates that state’s third-graders are required to do multiplication problems with a level of difficulty Kentucky’s state tests don’t include until the fifth-grade.

Virginia SOL 2002 Third-Grade Math Problem 18:

Sara bought 3 boxes of crackers. There were 48 crackers in each box. How many crackers did she buy in all?

F 45

G 51

H 124

J 144

Question 18 from: “Virginia Standards of Learning Assessments, Spring 2002 Released Test, Grade 3 Mathematics,” Page 9, Copyright Commonwealth of Virginia Department of Education, reproduced by permission.

Thus, no element in the solution of the problem involving Anton’s nickels on Kentucky’s fifth-grade math test exceeds the level of subject skill and knowledge required of third-graders in Virginia.

Is it fair to assume that the sample questions released by the Kentucky Department of Education are at least representative of the entire KCCT test? If so, it is possible that KCCT’s entire math test for fifth-graders could be taken – and passed – by Virginia’s third-graders. What does this suggest about the “improvements” in the KCCT’s test scores?

Virginia isn’t the only state that has much more challenging requirements than Kentucky. Kentucky’s Anton question also could be easily given to *third-graders* in California, where students are expected to “solve simple problems involving multiplication of multi-digit numbers by one-digit numbers (For example: $3,671 \times 3 = \underline{\quad}$).¹⁴

A familiarity with our monetary system is required even earlier in California, where *second-graders* are expected to be able to “model and solve problems by representing, adding, and subtracting amounts of money.” Specifically, the Golden State’s second-grade students are expected to “solve problems using combinations of coins and bills,” and “know and use the decimal notation and the dollar and cent symbols for money.”¹⁴

No element in the solution of the problem involving Anton’s nickels on Kentucky’s fifth-grade math test exceeds the level of subject skill and knowledge required of third-graders in Virginia.

Similar comparisons can also be made using the following question, which was included in LRC's report and taken from the fifth-grade KCCT math test:

Kentucky KCCT 5th Grade Math Problem:

Brittany set a school record by jumping rope 3,618 times. Andrew is trying to tie her record. So far, he has jumped 1,909 times. How many more times must he jump to tie her record?

- A. 1,709 B. 1,711 C. 2,309 D. 2,311**

Neither do Kentucky's testing problems appear to be limited to math problems in elementary schools.

Again, it appears that a math question required of Kentucky's *fifth-graders* lags in difficulty behind Virginia, which requires *third-graders* to subtract a four-digit number from another four-digit number, as demonstrated in the following problem:

Virginia SOL 2002 3rd Grade Math Problem 20:

Lisa learned that the Caribbean Sea is 8,173 feet deep and the Black Sea is 3,826 feet deep. How many feet deeper is the Caribbean Sea than the Black Sea?

- F 5,753 G 5,357 H 4,947 J 4,347**

Question 20 from: "Virginia Standards of Learning Assessments, Spring 2002 Released Test, Grade 3 Mathematics," Page 9, Copyright Commonwealth of Virginia Department of Education, reproduced by permission.

Neither do Kentucky's testing problems appear to be limited to math problems in elementary schools. The two sample science questions released by the LRC on tests taken by Kentucky's *seventh-graders* were no more challenging than material presented to *fourth-graders* in Virginia and *fifth-graders* in California.

One of KCCT's seventh grade science questions asks, "In which part of a plant does photosynthesis take place?" Virginia's fourth-grade science standards stipulate that students "investigate and understand basic plant anatomy and life processes" and identify photosynthesis as one of the key elements of this comprehension.¹⁵

Kentucky's 11th-graders are asked a question (below) that requires understanding the geometry of squares, which is a concept expected of Virginia's seventh-grade students.

Kentucky KCCT 11th Grade Math Problem:

Jamie, Chris, and Pat are outlining a square foundation for a storage building. They have a string, tape measure, and a protractor. Each person's method for forming a square is given below:

Jamie's method: "Cut four strings that have the same length as the sides of the square storage building. Place these strings to form a quadrilateral. That quadrilateral will be a square."

A. Will Jamie's method **always** form a square?

Justify your reasoning using the properties of squares.

Chris' method: "Cut four strings that have the same length as the sides of the square storage building. Place these strings to form a quadrilateral, making sure that two of the adjacent sides form a right angle."

B. Will Chris' method **always** form a square? Justify your reasoning using the properties of squares.

Pat's method: "Cut two strings the same length as the diagonals of the square base of the storage building. Fold them in half, marking the center of each string. Unfold the strings and place them on the ground so they intersect at their centers to form an X. Connect the endpoints of the strings to form a quadrilateral. That quadrilateral will be a square."

Will Pat's method **always** form a square? Justify your reasoning using the properties of squares.

It also appears that the gaps in testing requirements are getting wider at higher grade levels.

Virginia's seventh-grade Standards of Learning for geometry requires students to be able to "... determine if geometric figures – quadrilaterals and triangles – are similar and write proportions to express the relationships between corresponding parts of similar figures."¹⁶

Are Virginia's standards too high?

An obvious reaction on the part of some is to claim that Virginia's standards are simply unrealistically hard. Kirk T. Schroder, who just completed a term as president of the Virginia Board of Education, admits his state's Standards of Learning tests were indeed considered too difficult at first. However, by the end of his term, 65 percent of Virginia's public school students were performing well ahead of the requirements to reach the target scores that schools must meet by 2007. Only 22 percent of Virginia's schools were having some problems and just 5 percent were in the "crisis" category.¹⁷

Virginia's students and schools met the challenges of high standards and are moving toward meeting – and exceeding – their educational goals. Raising the bar in Kentucky also would likely result in higher expectations and better performances by our public schools and their students.

A proper response

Kentuckians deserve an honest appraisal of what's happening in their increasingly costly public schools. That appraisal should include a thorough and unbiased investigation of the state's testing system, including questions and scoring standards, by independent experts. This group should include unbiased experts from outside the Commonwealth who can objectively evaluate the rigor of Kentucky's testing practices.

A check of the Kentucky Department of Education's web site in January 2004 showed that, other than the few samples in the LRC report, the latest released questions still date from 1999. If, as the department claims, 20 percent of questions really were pulled from each year's tests, why haven't these also been released to the public? Kentuckians need assurances that the questions pulled from tests will be released to schools for practice and to the public for independent confirmation of quality.

In closing

Determining the true validity, rigor and overall effectiveness of state testing is essential to the Commonwealth. Evidence in this paper indicates the state has considerable room for improvement, and the current assessment may be significantly inflating the real performance of Kentucky's public schools. However, only a thorough analysis will reveal the exact situation. Such an analysis is essential to creating a more effective education program for Kentucky students and a brighter future for the entire Commonwealth.

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Endnotes:

¹ Calculated from Commonwealth Accountability Testing System proposed weight graphs for elementary, middle and high schools from the Kentucky Department of Education's web site.

² Data Sources for Table 1: 1998 KIRIS scores: "Kentucky School and District Accountability Results, Accountability Cycle 3 (1994-95 to 1997-98), State and Regional Scores by Subject," Dec. 3, 1998, Kentucky Department of Education, Table 4. 1999 CATS scores: "Briefing Packet, State and Regional Release, Commonwealth Accountability Testing System, 1998-1999, Kentucky Core Content Tests, Sept. 16, 1999, Kentucky Department of Education, p. 14.

³ Calculated from percentages of Proficient and Distinguished students for these subjects published the following documents: KIRIS data from "Kentucky School and District Accountability Results, Accountability Cycle 3 (1994-95 to 1997-98), State and Regional Scores by Subject," Kentucky Department of Education, Dec. 3, 1998, Table 4. CATS data from "Briefing Packet, State and Regional Release, Commonwealth Accountability Testing System (CATS), Accountability Cycle 2002, Baseline 1998-1999 – 1999-2000, Biennium 1: 2000-2001 – 2001-2002," Kentucky Department of Education, Sept. 19, 2002, pp. 10-12.

⁴ Data sources for Figure 1: KIRIS, 1991-92: "Accountability Cycle I Technical Manual," July 10, 1995, p. 149. KIRIS, 1993-94 to 1994-95: "KY School and District Accountability Results, Accountability Cycle II (1992-93 to 1995-96) Briefing Packet," Table 6. KIRIS, 1994-95 to 1997-98: "Accountability Cycle III (1994 to 1997-98), State and Regional Scores By Subject," Tables 5,6,7. Old CATS, 1998-99 and 1999-2000: "Briefing Packet, State and Regional Release, CATS Interim Accountability Cycle (1996-1997 to 1999-2000), Sept. 28, 2000, p. 9. New CATS, 1998-99 to 2002-03, "Briefing Packet, State Release, CATS Accountability Cycle 2004, Midpoint Report," Oct. 7, 2003, p. 8. All from Kentucky Department of Education.

⁵ "Briefing Packet, State and Regional Release, Commonwealth Accountability Testing System Interim Accountability Cycle (1996-97 to 1999-2000), Kentucky Department of Education, Sep 28, 2000, Page 4.

⁶ U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, "The Nation's Report Card: State Reading 2002, Report for Kentucky," NCES 2003-526 KY, Washington: 2003, 1C.

⁷ "Briefing Packet, State and Regional Release, Commonwealth Accountability Testing System (CATS), Accountability Cycle 2002, Baseline 1998-1999 – 1999-2000, Biennium 1: 2000-2001 – 2001-2002, Kentucky Department of Education, Sept. 19, 2002, p. 10.

⁸ Sources for NAEP proficiency rates: NAEP Math: "The Nation's Report Card, Mathematics Highlights 2003," Figures 3 and 4; NAEP Reading: "The Nation's Report Card, Reading Highlights 2003," Figures 3 and 4; both from the National Center for Education Statistics, Washington, Nov. 2003. Sources for CATS rates: "Briefing Packet, State Release, CATS Accountability Cycle 2004, Midpoint Report," Kentucky Department of Education, Oct. 7, 2003, pp. 9-10.

⁹ ACT annually releases a data disk to the Kentucky Office of Education Accountability that contains the ACT scores and participation numbers for the state's public high schools and their students. This author has performed a number of different analyses of this data, which now covers 1993 and later graduating classes. Statewide public school only scores shown in Table 4 and Figure 2 are developed from a weighted average analysis of composite scores from these disks.

¹⁰ Bacci et al, "Relationships among Kentucky's Core Content Test, ACT Scores, and Students' Self-Reported High School Grades For Classes of 2000 through 2002, HumRRO, Louisville, April 2003, first page of Summary.

¹¹ Eva L. Baker and Robert L. Linn, "Validity Issues for Accountability Systems," CRESST Technical Report 585, National Center for Research on Evaluation, Standards and Student Testing, University of California, Los Angeles, December 2002, p.4.

¹² Baker, p. 9.

¹³ Hager et al, "The Commonwealth Accountability Testing System, (Aug. 13, 2003 draft adopted with minor change by the Kentucky Legislature's Program Review and Investigations Committee in August 2003), Kentucky Legislative Research Commission, 2003.

¹⁴ California State Board of Education, "Mathematics Content Standards for California Public Schools, Kindergarten Through Grade Twelve," Sacramento, Calif., December 1997 (available online).

¹⁵ Commonwealth of Virginia, Board of Education, "Science Standards of Learning for Virginia Public Schools, Richmond, Va. January 2003. (available online)

¹⁶ Commonwealth of Virginia, Board of Education, "Mathematics Standards of Learning for Virginia Public Schools," Richmond, Va. October 2001, (available online), p. 31.

¹⁷ Kirk T. Schroder, "Standards, accountability, and education reform...from the president of a state board of education," Southern Regional Education Board release 03E49, September 2003, p. 2.

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