http://www.childtrendsdatabank.or /sites/default/files/09_Mathematics_Proficiency_2012.pdf
January 2012

Competence in mathematics is essential for functionin in everyday life, as well as for success in our increasin ly technolo y-based workplace. Students who take hi her-level mathematics and science courses which require stron fundamental skills in mathematics are more likely to attend and to complete colle e. One study of hi h school females found that one difference between those who later dropped out of hi h school and those who raduated was lower math scores amon the former roup.

The importance of mathematics extends beyond the academic domain. Youn people who transition to adulthood with limited mathematics skills are likely to find it difficult to function in society. Basic arithmetic skills are required for everyday computations, and sometimes for job applications. Additionally, competence in mathematics skills is related to hi her levels of employability. Since 1976, the influence of hi h school students' mathematics skills on later earnin s has rown steadily.

Scores have been risin for all race and ethnicity roups, althou h white students continue to outscore their black, Hispanic, and American Indian peers. These aps widen between fourth and ei hth rades, then moderate somewhat in twelfth rade. In 2011, Asian/Pacific Islander students had hi her math proficiency scores than white, black, and Hispanic students at all rade levels. For example, amon ei hth- rade students, Asian students had an avera e scale score of 303, compared with 293 for white students, 262 for black students, and 270 for Hispanic students.

Children of parents with hi h levels of education have hi her math proficiency scores than do other children. In 2011, ei hth- raders whose parents had raduated colle e had an avera e score 30 points hi her than students whose parents had not finished hi h school, and 24 points hi her than students whose parents had a hi h school de ree only. (Appendix B) In 2009, twelfth- rade students whose parents raduated colle e had an avera e scale score of 164, compared to 142 for students of parents with a hi h school de ree and 135 for students of parents with less than a hi h school de ree.

4th Grade Mathematics Level (Percent) – 2022

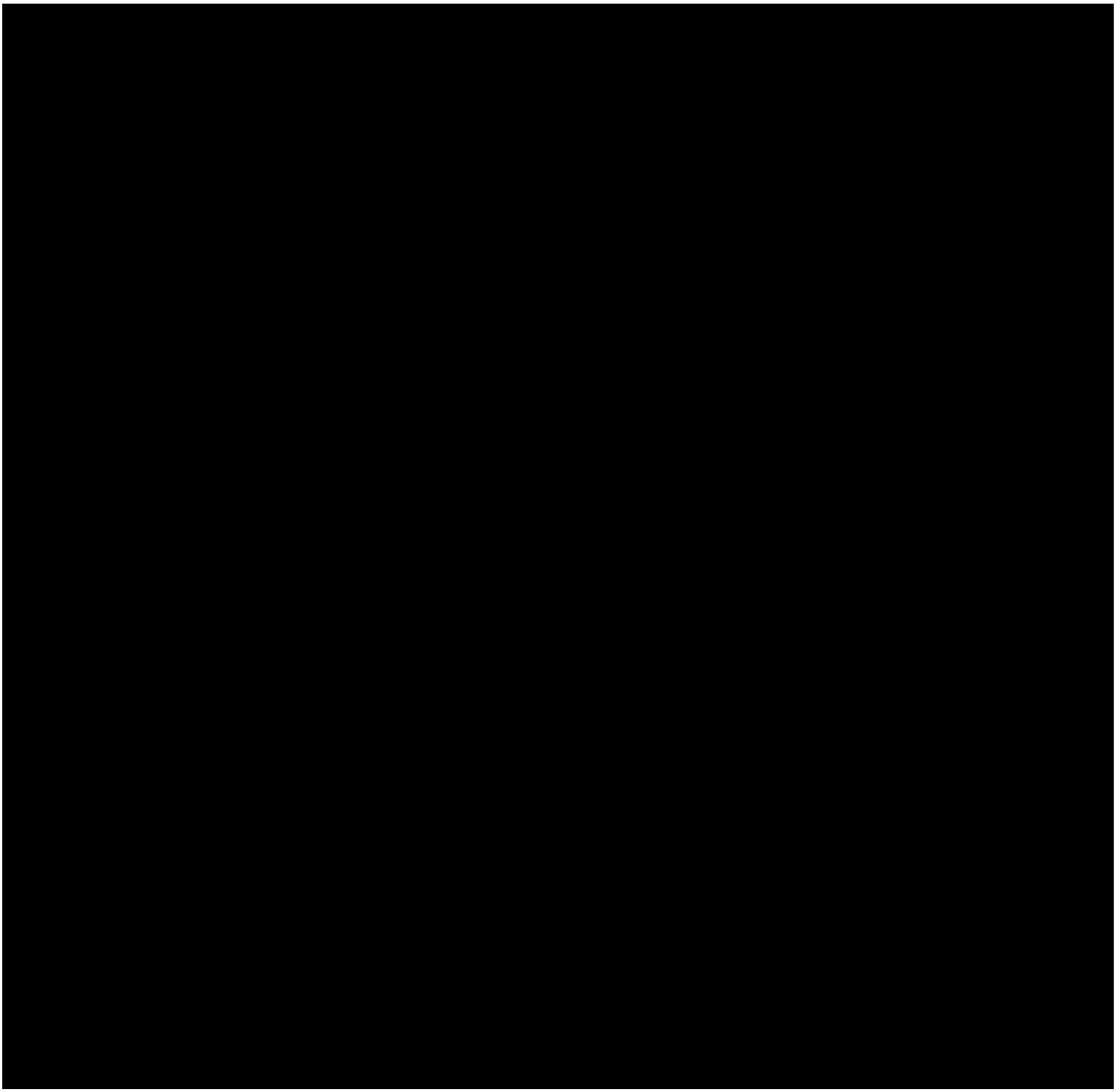
Scale: 7% - 93%

California	
Below basic	26%
At or above basic	74%
Below proficient	66%
At or above proficient	34%

8th Grade Mathematics Level (Percent) – 2022

Scale: 14% - 86%

California	
Below basic	39%
At or above basic	61%
Below proficient	75%
At or above proficient	25%



Number competence also predicts later mathematics outcomes over and above IQ variables. Kinder arten competence with simple arithmetic calculations involvin   addition and subtraction is most predictive of later mathematics achievement. Because early number competencies are achievable in most children their intermediate effects provide direction for early intervention.

[illegible]

Difficulties with mathematics are pervasive and can have lifelon   consequences. Foundational number competencies develop before Grade 1 and are hi hly predictive of mathematics achievement and difficulties. Hi her levels of kinder arten number competence predict statistically si nificant and substantively meanin ful performance in mathematics applications and computation at the end of Grade 3. Symbolic number competencies associated with whole number relations, and operations are particularly important. Number competence depends on lan ua e abilities (e. ., knowin   number names), as well as on quantitative and spatial knowled e (combinin   and separatin   sets). Althou h there are poorer lon -term outcomes for low-income children than for middleincome children, mathematics achievement is moderated by early number competencies. Low-income children enter school with relatively few number-related experiences, which contributes to their disadvanta e. The intermediate effect of number competence on mathematics achievement su   ests that it should be emphasized in preschool and kinder arten. Overall, early number sense is critical for settin mathematics trajectories in mathematics throu hout elementary school.

[illegible]

In today's schools, mathematics learnin   difficulties and disabilities often are not identified before Grade 4. Early interventions in mathematics are far less common than are those for readin . Kinder arten teachers should screen students for numeracy difficulties, similar to the way that most screen for early literacy difficulties. Preschools and kinder artens should provide mathematics experiences and instruction in number, number relations and number operations. This number core should emphasize the number word list, countin   principles related to cardinality and one-to-one correspondence, comparin   set sizes, and joinin   and separatin   sets. Number lists and simple board   ames usin   number lists can help children make sense of quantities. Curriculum developers in early childhood should focus their materials on these core number foundations. Children in schools servin low-income communities are especially at risk for learnin   difficulties with mathematics. Low-income children enter kinder arten well behind their middle-income counterparts. Early interventions can help all children build the foundations they need to achieve in mathematics.

[illegible]

http://annenber institute.or /pdf/Leadin Indicator Math.pdf

May 2012

There is evidence of a consensus amon   leaders that these demands are   rowin   (Evan, Gray & Olchefske 2006). This implies a shift in what it means to be "job ready" and what schools can do to prepare students for the workforce. Studies show that workers with hi her incomes took more advanced math courses in hi h school than workers with lower incomes (Achieve 2004b, 2006; nmap 2008; Murnane, Willet & Levy 1995). Evan, Gray, and Olchefske (2006) su   est a link between the

number of ei hth rade al ebra students and lobal competitiveness, ur in a dramatic increase in access to ei hth- rade al ebra. Therefore, enrollment in pre-al ebra and al ebra serves as an indicator for job-readiness status at raduation.

[illegible] – Aimee Evan, Tracy Gray, and Joseph Olchefske, The Gateway to Student Success in Mathematics and Science

[illegible] – National Mathematics Advisory Panel, 2008

[illegible]

http://www.air.or /files/Call_for_middle_school_reform_11_1_06_version.pdf
November 2006

Several key themes emer ed from this research review that should inform school district reform strate ies in mathematics and science:

■ The mathematics and science performance of students in the American K–12 system la s substantially behind their international peers, even thou h the 21st century economy is increasin ly demandin reater skills in mathematics and science. This weakness in American student performance exists across all student roups, even amon our hi hest performin students.

■ Al ebra is the key " atekeeper" for student access to the upper-level hi h school courses in mathematics and science that are drivers of hi h school raduation, colle e readiness, and colle e completion.

■ Preparin all students for ri orous mathematics and science coursework in middle school and early in hi h school helps to close the achievement ap amon students from differin ethnic and socioeconomic roups.

However, more than any other, the most compellin implication is this: If we want to dramatically increase the proportion of students raduatin from hi h school with hi h-level, lobally-competitive skills, then we must dramatically increase the number of students who achieve proficiency in Al ebra in their middle school or early hi h school years as a ateway to the advanced hi h school coursework that is the driver of hi h school raduation, colle e readiness, and post-secondary completion rates.

Because the trajectory for takin advanced hi h school coursework is set prior to 9^{th} rade, it is imperative that students be in their academic preparation for advanced mathematics and science coursework in middle school. The middle school years are when students decide which academic path they will take, so that broad-based, ri orous middle school coursework in mathematics and science can be a turnin point for future student performance over the lon term.

[illegible]

http://www.ppic.or_/content/pubs/report/R_701JBR.pdf
2001

The findin s of this study underscore the importance of local school districts' meetin the challen e by recruitin qualified teachers trained in mathematics and by offerin all students the opportunity to take a full ran e of advanced math courses in hi h school. The authors note that schools should not suddenly require that all students take advanced math courses, but they should encoura e and prepare them to do so.

[illegible]

http://schubertcenter.case.edu/synapseweb46/documents/en-US/thompson_brief.pdf
March 2011

Learnin quantitative skills at an early a e is important for children's co nitive development, academic achievement and life success. At the time of school entry, early math abilities are the stron est predictors of academic achievement, even more than readin skills. Mastery of these fundamental computational skills has been associated with increased academic achievement and has also been associated with predictin future wa e earnin s. Furthermore, a failure to teach basic skills in math seems to disproportionally affect disadvanta ed children, thereby leadin to an increase in the achievement ap.

The underlyin skills that serve as buildin blocks for academic success remain lar ely unknown in the area of mathematics. Even less is understood about the relationship between math skills, readin abilities and eneral co nitive abilities. Readin ability and disability has been more extensively studied than math ability and disability.