

Discussion Questions for 3-07-12, NMAP Report, first half of chapter 4, pp. 4-1 to 4-40:

1. Why do you think each of the following criteria for studies being considered for inclusion in the Panel's report were chosen: published in English, participants age 3 years to young adult, published in a peer reviewed journal, and use of experimental, quasi-experimental, or correlational methods?
2. How does conceptual understanding promote appropriate transfer of learning to new problems?
3. What roles do attention and working memory play in learning mathematics? How can limitations of working memory and attention be overcome?
4. What is the difference between verbatim and gist memory? Which is more important for reasoning and long term retention, and why? What is the gist of numerical information?
5. What are mastery goals, how are they related to mathematics learning, and how can teachers and parents promote them?
6. How do beliefs about intelligence and learning influence math learning? What is the evidence that these beliefs are important?
7. What is self-regulation, how does it influence math learning, and how can it be improved?
8. Why does math cause more anxiety than other school subjects? How does this anxiety influence math performance? What types of therapy are effective in reducing math anxiety, and what types are ineffective?
9. What are the main principles governing counting of objects with number words? Which would you anticipate is the hardest principle for young children to understand?
10. What types of experiences do you think are especially important causes of preschoolers from middle-income backgrounds having greater number sense than preschoolers from low-income backgrounds?
11. Why do children in East Asia show greater mathematical understanding even before they enter school than children in the U. S.? What do you think their parents and other adults do differently that leads to this difference in understanding? Are there other reasons for their superior knowledge?
12. Why are such large gains possible in response to preschool mathematics instruction; why are gains in response to language instruction far smaller?
13. Describe the main changes that occur with age and experience in the development of arithmetic proficiency? Why do some children gain proficiency more rapidly and more completely than others?
14. Why is it difficult for children to learn the algorithms for multi-digit arithmetic, particularly subtraction and division? How can these difficulties be overcome?

15. What are the commutative and associative laws of addition and multiplication? What is the difference between implicit and explicit understanding of these mathematical principles? How and why might they be inappropriately extended to problems where they do not apply?

16. What is the distributive property of addition and multiplication? How and why might it be inappropriately extended to subtraction or division, or to problems with both addition and multiplication?