# **Multiplication Discussion Guide (for use during or after reading)**

1. Use your own words to describe and define multiplication. (What Is Multiplication?, p. 4-5)
   1. Multiplication is represented by the x symbol and can be used to quickly add up equal numbers of groups. Multiplication is the same as repeated addition, just more efficient.
2. How are addition and multiplication related? (Grouping Numbers, Regrouping with Addition, p. 6-9)
   1. Addition and multiplication are related because they can be used to complete the same tasks. Multiplication can be seen as adding the same group together multiple times. This is often called repeated addition. For example, 5 x 3 = 15 can be thought of using addition: 3 + 3 + 3 + 3 + 3, which shows 5 groups of 3, or 15. Likewise, 3 x 5 = 15 can be thought of as 5 + 5 + 5, which shows 3 groups of 5, or 15.
3. Explain how the addition strategy of doubling was used to solve the problem 4 x 4. (Drawing on Doubles, p. 10-11)
   1. In order to solve the problem 4 x 4, we need to think about the numbers in a new way. We know that 4 is the same as double 2. We can use that knowledge to help think about things differently. First, we can rethink of the problem as 2 groups of double 4. We know double 4 is 8, so we need 2 groups of 8. We can use doubles again here! Double 8 is 16, so 4 x 4 = 16.
4. Use the examples on pages 12-17 to help you describe how multiplication is the same as repeated addition of equal groups. (How Groups Work, p. 12-17).
   1. Multiplication is the same as repeated addition of equal groups. Many people think multiplication is a more efficient strategy. (You probably will, too, once you get the hang of it!) Repeated addition can be used to show the same value as multiplication. For example, 3 groups of 4 can be represented as 4 + 4 + 4 = 12 as well as 3 x 4 = 12.
5. What is skip counting? How does it relate to multiplication? (How Groups Work, p. 12-17)
   1. Skip counting is a strategy by which you count by that number. For example, we can skip count by 5 to 30: 5, 10, 15, 20, 25, 30. Skip counting relates to multiplication because it demonstrates counting by groups.
6. Look closely at the arrays on pages 16 and 17. One array shows 6 groups of 5 while the other shows 5 groups of 6. What does this tell you about the order of numbers when multiplying? (How Groups Work, p. 12-17)
   1. Even though one array shows 6 groups of 5 and the other shows 5 groups of 6, they both show the same total amount of items. This can be written as and thought of as 5 x 6 = 6 x 5 and shows that the order of the numbers does not matter when you multiply. This is also true for addition! 5 + 6 = 6 + 5.
7. Describe the two strategies used on pages 18 and 19. Which strategy do you believe is the most efficient? Why? (Change Is Good, p. 18-19).
   1. Pages 18 and 19 illustrate two strategies that can be used to solve the problem 4 x 7. The first strategy shows how to skip count by 4s seven times to get a product of 28. The second strategy shows an extension of the doubling strategy called double doubles. Here, 4 x 7 is thought of as two groups of 2 x 7. Double 7 is 14 and double 14 is 28, so 4 x 7 = 28.
8. How can addition be used to multiply a larger number, as described on pages 20 and 21? Why would skip counting not be as efficient in this situation? (Multiplying Larger Numbers, p. 20-23)
   1. In order to multiply a larger number mentally, it can be helpful to think about the problem as repeated addition. Instead of 27 x 2, the problem can be thought of as 27 + 27. We can use addition strategies such as finding tens and doubling to find the sum of 27 + 27 (or the product of 27 x 2) as 54. This is more efficient than skip counting because we do not know how to skip count by 27s mentally.
9. Extend your thinking: describe how the addition strategy of doubling as well as the number sense strategy of finding friendly numbers is used in the example on pages 22 and 23. (Multiplying Larger Numbers, p. 20-23)
   1. Although the strategy of doubling can be an efficient way to add mentally, it can be tricky with larger numbers. Using friendly numbers can make doubling easier! It is easy to double 25, especially when we think of money. One quarter is worth 25 cents; if we double it, we have 50 cents. Using a friendly number, even though may not be a group of ten, can help make doubling and mental math easier.
10. Who was Pythagoras and what was his claim to fame? (Who’s Who: Pythagoras, p. 32-33)
    1. Pythagoras was a famous mathematician and philosopher. He was born in 850 B.C. in Greece and is best known for the famous Pythagorean Theorem, a mathematical formula about the sides of right triangles.