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

1. What is an algorithm and how is it used in the world of computers? (What Is an Algorithm?, p. 4-7)
   1. An algorithm is a set of step-by-step instructions. Algorithms are used a lot in math but are also used to tell computers what to do. Algorithms must be clear and easy enough for a computer to understand so it can follow the instructions.
2. What is pseudocode? What must programmers do to ensure computers can run programs written in pseudocode? (Writing Algorithms, p. 10-11)
   1. Pseudocode is a description of a computer code written in human language. Pseudocode can be used to help people better read and understand algorithms and what a program wants the computer to do. In order to ensure computers can run programs written in pseudocode, programmers must translate the code into a programming language.
3. Describe how flow charts can be used to write and/or present algorithms. (Writing Algorithms, p. 12-13)
   1. A flow chart is a visual representation of an algorithm. Shapes such as rectangles, diamonds, rhombuses, and arrows are used to represent different types of steps within an algorithm. For example, people can use rectangles to represent a process or an action within an algorithm and arrows to show the order in which instructions should flow.
4. What does “efficient” mean and why is it important for algorithms to be efficient? (Efficient Algorithms, p. 14-17)
   1. An efficient algorithm is one in which the steps allow the program to complete its task in a way that is quick, but also takes up the least amount of the computer’s power. It is important for algorithms to be efficient because this allows programs to run with fewer errors and allows a device to run multiple programs without running out of power.
5. Describe what search algorithms are used for and how they function. (Search Algorithms, p. 18-21)
   1. Search algorithms are used to find specific information within a set of data. Often, search algorithms are used to find data in a spreadsheet. There are two types of searches: sequential searches and interval searches.
6. Compare sequential searches to interval searches. (Search Algorithms, p. 18-21)
   1. In a sequential search, the computer checks each item on the list individually to find the correct piece of data. This type of search involves checking each piece of data one at a time and might not always be the most efficient. An interval search, on the other hand, narrows down the options by eliminating portions of the list until only the correct item remains. Often, interval searches are considered more efficient than sequential searches because the program does not have to perform as many tasks to find the correct item.
7. Describe what sorting algorithms are used for and how they function. (Sorting Algorithms, p. 22-27)
   1. Sorting algorithms are used to organize data in a particular set of information. Sorting algorithms make it easier for us to make sense of the data we have. Different sorting algorithms are beneficial in different situations. For example, a bubble sort algorithm sorts data by comparing pairs and organizing them appropriately. An insertion-sort algorithm is often seen as more efficient than a bubble sort algorithm. In an insertion sort, each item is checked one by one and placed back into the correct position.
8. Historically, where did the word “algorithm” originate? (Algorithms in History, p. 28-29)
   1. The word algorithm comes from the name of an important Persian mathematician named al-Khwarizmi. At the time, algorithms were used by ancient Indian, Arabic, and Greek mathematicians to solve problems. Al-Khwarizmi helped spread the concepts of mathematics, including those of algorithms, around the world!
9. Who was Ada Lovelace and what was her claim to fame? (Algorithms in History, p. 28-29)
   1. Ada Lovelace was an English noblewoman who, in the 1800’s, wrote an algorithm for programming a computing machine. She is known for writing one of the very first computer programs every written!
10. How are the algorithms discussed in this book related to algorithms you use to do math, like addition, subtraction, multiplication, or division? (General Application)
    1. Even though this text is all about computers and programming code, the algorithms described here are not all that different from those we use in math class. Algorithms are just a set of steps to follow in order to get a desired outcome. In math, we use algorithms to make sure we add, subtract, multiply, divide, and more correctly.