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Team Members:

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1 Following an Algorithm

We mentioned that one of the first algorithms of history was Euclid's algorithm for finding the greatest common divisor of two numbers. That's the biggest number that divides evenly into both of a pair. The algorithm is given below:

1. Set M to the biggest of our two numbers
2. Set N to the other number
3. If N is equal to 0, the answer is M.
4. Set R to the remainder of M divided by N.
5. Set M to N.
6. Set N to R.
7. Go to step 3.

Follow the steps of this algorithm to find the greatest common divisor for the following pairs of numbers:

- 30 and 12 _____
- 20 and 10 _____
- 5 and 3 _____

2 Writing Algorithms

In grade school you learned an algorithm for adding numbers with any number of digits. Try writing out the algorithm as a set of detailed step-by-step instructions. You can assume that the person following the algorithm can add any 1-digit numbers together (i.e. they can do $7+8$ in their head, but can't add the whole number that way).

3 Algorithm Analysis

Suppose we want an algorithm to add up all the numbers from 1 up to some stopping point. Like if we want to add up all of the numbers from 1 to 100. Below is a simple algorithm for solving this problem – it just adds them all up one by one:

1. Set max to the number we stop at.
2. Set sum to 0.
3. If max is equal to 0, then sum is the answer!
4. Set sum equal to (sum + max)
5. Subtract 1 from max.
6. Go to step 3.

Try going through this algorithm with the number 5 as the stopping point. What is the answer and how many steps did it take?

Answer: _____

Steps: _____

There is another, less obvious algorithm for solving this problem. The algorithm is given below:

1. Set max to the number we stop at.
2. Set sum to $\frac{n \times (n+1)}{2}$.
3. The answer is sum.

Try going through this new algorithm with the number 5 as the stopping point. What is the answer and how many steps did it take?

Answer: _____

Steps: _____

Which algorithm would you want to use if 100 was the stopping point?
