

PROGRAMMING PROBLEMS WHOSE SOLUTIONS REQUIRE THE USE OF COUNTED OR CONDITIONAL LOOPS

Complete the following table. Then write VB programs to solve each problem.

- Please note that the “**For...Next**” looping structure exists only as a convenience! For situations in which the number of repetitions is known beforehand, “**For...Next**” loops allow for easier coding. However, *any* loop logic, including situations in which the number of repetitions is known beforehand, *can* be expressed using a conditional loop! (More on this later...)
- Also note that VB allows “**For...Next**” loops to be *quasi-conditional*. Such loops can be terminated prematurely using an “**Exit For**” statement embedded within an “**If**” statement. Although this kind of loop construction is often very convenient, it should not be used excessively! It is very difficult or even impossible to verify the correctness of programs that contain such structures.
- Finally, you will solve many of the problems given below using what is known as an *exhaustive search* or a *brute-force search* algorithm. An algorithm that employs an exhaustive search systematically checks *all possible candidates* for the solution to see which of them, if any, satisfies the statement of the problem. Exhaustive search is guaranteed to find a solution if one exists. However, when the number of possible candidates is very large, brute-force methods are excruciatingly slow. Shortly we’ll be investing a better solution to (g) to help us understand the limitations of brute-force algorithms.

<i>Programming Problem</i>	<i>Can you write a solution that only requires a counted loop that does not contain an “Exit For” statement? Explain.</i>
(a) Write a program to calculate the <i>sum</i> of all positive even integers less than or equal to 1000.	Yes / No (Circle One) Why?
(b) Write a program to calculate the <i>sum</i> of all positive odd integers until the sum exceeds 1000.	Yes / No (Circle One) Why?
(c) Write a program to calculate the <i>product</i> of all positive integers divisible by 5 and less than or equal to 645. (What happens if you try a value greater than or equal to 650?)	Yes / No (Circle One) Why?
(d) Write a program to calculate the <i>product</i> of all positive integers divisible by 5 while the sum is less than or equal to 1000000.	Yes / No (Circle One) Why?
(e) An integer is called <i>prime</i> if it has exactly two divisors, one and itself. The following is a list of the first 10 prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 Write a program that determines whether a given number is prime. (Exhaustive Search)	Yes / No (Circle One) Why?

Programming Problem	Can you write a solution that only requires a counted loop that does not contain an "Exit For" statement? Explain.
<p>(f) A proper divisor of an integer is any integer that divides evenly into the integer, except for the number itself. For example, the proper divisors of 12 are 1, 2, 3, 4 and 6. A number is called perfect if the sum of its proper divisors is equal to the number itself. Two examples of perfect numbers are 6 and 28 because $6 = 1 + 2 + 3$ and $28 = 1 + 2 + 4 + 7 + 14$.</p> <p>Write a program that determines whether a given number is perfect. (Exhaustive Search)</p>	<p>Yes / No (Circle One)</p> <p>Why?</p>
<p>(g) Write a program that finds the greatest common divisor of any two integers. For example, the greatest common divisor (GCD) of 24 and 40 is 8. (Exhaustive Search)</p>	<p>Yes / No (Circle One)</p> <p>Why?</p>
<p>(h) Write a program that finds the least common multiple of any two integers. For example, the least common multiple (LCM) of 24 and 40 is 120. (Exhaustive Search)</p>	<p>Yes / No (Circle One)</p> <p>Why?</p>
<p>(i) The numbers 220 and 284 are called an amicable pair because the sum of the proper divisors of 220 is 284 and the sum of the proper divisors of 284 is 220. Write a program that finds all amicable pairs within the range of an Integer variable. (Exhaustive Search)</p>	<p>Yes / No (Circle One)</p> <p>Why?</p>
<p>(j) Horses cost \$10, pigs cost \$3 and rabbits cost only \$0.50. A farmer buys 100 animals for \$100. How many of each animal did he buy? Write a program to search for the solution to this problem. (Exhaustive Search)</p>	<p>Yes / No (Circle One)</p> <p>Why?</p>