

## Computer Science 1510 Assignment #4

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- This assignment requires electronic submission of your source code files. Follow the directions under “Submission Details for All Assignments” on the “Links” tab on the course webpage to submit your assignment.
  - It is not necessary to submit hard (printed) copies of your assignment.
  - Be sure to include sufficient comments in your code, and labels in your output.
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1. (a) Write a Fortran subroutine that accepts four arguments: the principal amount of a loan ( $p$ ); the annual interest rate ( $r_{annual}$ ); the number of months ( $m$ ) in which the loan is to be paid off; and a filename. The monthly payment is given by the formula:

$$\text{payment} = \frac{rp(1+r)^m}{(1+r)^m - 1}$$

where the monthly interest rate  $r = r_{annual}/12$ . The subroutine should write out a monthly schedule of the interest, principal paid, and the remaining balance. Note that a month’s interest is charged before the first payment. Write the output to a file, with the name of the file passed in as an argument.

- (b) Write a Fortran program to test your subroutine above.
2. A *prime number* is an integer greater than 1 whose only positive divisors are 1 and the integer itself. One method for finding all the prime numbers in the range 2 through  $n$  is known as the *Sieve of Eratosthenes*. Consider the list of numbers from 2 through  $n$ . Here 2 is the first prime number, but the multiples of 2 (4, 6, 8, ...) are not, and so they are “crossed out” in the list. The first number after 2 that was not crossed out is 3, the next prime. We then cross out all higher multiples of 3 (6, 9, 12, ...) from the list. The next number not crossed out is 5, the next prime; we cross out all higher multiples of 5 (10, 15, 20, ...). We repeat this procedure until we reach the first number in the list that has not been crossed out and whose square is greater than  $n$ . Then all the numbers that remain in the list are the primes from 2 through  $n$ . Write a Fortran program that uses this sieve method to find all the prime numbers from 2 through 100.