

The Newport News Computer Challenge

March 6, 2002

Pascal and C++ Divisions

Problems 2002

1. "Population Growth" (10 points)

Project name: Population

Assume that in 1960 the population figures for the United States and Mexico were 180,000,000 and 85,000,000 respectively and that the annual rate of growth of the U.S. is 1.23% and of Mexico, 2.23%. If these growth rates remain constant, in what year will the population of Mexico equal or exceed that of the United States?

To store the large population values, use a variable of type longint (Pascal) or long (C++).

Output a table with column headings for year, US population, and Mexican population. Display only years that are multiples of 5, except the last year should be displayed regardless.

Sample beginning output:

Year	US	Mexico
Rate	1.23%	2.23%
1960	180000000	8500000
1965	191345692	94909729
1970	203406522	105974784
1975	216227565	118329858
1980	229856739	132125350

2. "Twin Primes" (20 points)

Project name: TwinPrimes

"Twin Primes" are two consecutive primes that differ by two. For example, 5 and 7, 11 and 13, 41 and 43 are twin primes. Find the number of twin primes in each of the intervals 3-100, 101-200, 201-300, ..., 901-1000. Print the results in tabular form. In case of pairs that overlap intervals, place the pair based on its smaller prime.



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3. "Russian Peasant Method" (30 points)

Project name: RussianPeasant

A novel method of multiplying two integers is the "Russian peasant method".

For example, to find the project of 19 and 23, write these numbers at the top of two columns. Each number on the left is divided by two, ignoring any remainder (truncating). Each time division takes place, the corresponding number on the right is multiplied by two. This procedure continues until the number on the left is reduced to 1. The procedure is shown below in Table 1.

Table		1:	I	Table		2:
19	Х	23	1	.9	Х	23
9		46		9		46
4		92		4		0
2		184		2		0
1		368		1		368

437

Now each time an even number appears on the left, its corresponding number on the right is replaced by a zero. The columns would now appear as shown above in Table 2.

The sum of the numbers in the right column is 437, which is 19 x 23.

For any two positive integers the user inputs, you are to display both tables SIDE BY SIDE. Underneath them, display the answer (which may NOT be computed using conventional multiplication). You must add the numbers represented by the right column of Table 2.