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CIS-5

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**Exponentiation and GCD**

Provide an iterative function named **integerPower( base, exponent )** that returns the value of baseexponent and an iterative method named **gcd( number1, number2 )** that returns the greatest common divisor of the numbers, number1 and number2. You may use Euclid's Algorithm to find the gcd.

**Two Functions:**

* integerPower( base, exponent )
* gcd( number1, number2 )

**Euclid’s Algorithm:**

* gcd ( x, y)
* {
  + a = x
  + b = y
  + if a < b then a = y, b = x
  + while ( b! = 0)
    - t = b
    - b = a%b
    - a = t
  + return a
* }

**Exponentiation by Squaring Algorithm:**

* power\_exp\_squaring ( x, n )
  + if n==0 result = 1
  + else
  + {
    - y = 1
    - while n > 1
      * if n is even
        + x = x \* x // x = x^2
        + n = n / 2
      * else
        + y = x \* y
        + x = x \* x
        + n = (n-1)/2
    - result = x \* y
  + }
  + return result

**Exponentiation by Squaring Algorithm Iterative**:

* power\_iterative ( x, n )
  + result = 1
  + for ( i = 0, i < n, i++)
    - result = result \* x
  + return result

**Steps:**

1. Declare variables
2. Output initial program instructions/notes
3. Prompt user for function choice
4. Execute appropriate function
   1. GCD Function
      1. Prompt user for first value (x) and store into appropriate variable
      2. Prompt user for second value (y) and store into appropriate variable
      3. Execute Euclid’s Algorithm
      4. Output results
   2. Exponentiation Function
      1. Prompt user for first value (base) and store into appropriate variable
      2. Prompt user for second value (exponent) and store into appropriate variable
      3. Execute function
      4. Output results
5. End the program