Home Assignment – 2  Deadline – 20/09/2016

(Note few things are compulsory, e.g., use of IMPLICIT NONE, FORMAT, KIND etc.)

1. Write a program that reads an integer number and prints out the sum and product of its digits.

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3. Write a program that reads an integer \( N \) \((N = 1000)\) and prints the sum of the following:
   
   - i. \( 1 + 2 + 3 + 4 + 5 + \ldots \ldots \ldots \ldots \ldots \ldots N \)
   - ii. \( 1^2 + 2^2 + 3^2 + 4^2 + 5^2 + \ldots \ldots \ldots \ldots \ldots \ldots N^2 \)
   - iii. \( 1^3 + 2^3 + 3^3 + 4^3 + 5^3 + \ldots \ldots \ldots \ldots \ldots \ldots N^3 \)
   - iv. \( 1 + 3 + 5 + 7 + 9 + \ldots \ldots \ldots \ldots \ldots \ldots (2N - 1) \)
   - v. \( 2 + 4 + 6 + 8 + 10 \)

4. Write a program that reads an integer \( N > 2 \), and determines if \( N \) is a prime number.

5. Write a program that reads an integer \( N \) and computes \( N! \).

6. Create a data set of 50 elements and then write a program to calculate mean, median, mode, range and standard deviation of that data set. Find the minimum and the maximum number from the data set.

7. Write a program that can search a particular value in a data set (first create a data set for 1000 numbers). Note that particular value may have repeated occurrence.

8. Construct an algorithm to determine if a point \((x, y)\) lies within a circle of radius \(r\), centered at the origin. Use the condition that if \((x^2 + y^2)^{1/2} < r\), then the point is within the circle. If the point lies within the circle print out a message and the distance, \(Z\), of the point from the center of the circle.

9. Find the dot product of two vector \(x(-2, -3, -6)\) and \(y(-1, 2, 5)\).

10. Arrange the following number in ascending and descending order – 3, 45, 76, 25,
11. Write a program to find all integers that are divisible by three and lie between two integers that you enter at execution time.

12. An Armstrong number of three digits is an integer such that the sum of the cubes of its digits is equal to the number itself. For example, 371 is an Armstrong number, since $3^3 + 7^3 + 1^3 = 371$. Write a program using MODULE subprogram to find all Armstrong numbers in the range of 0 and 999.

13. Write a program to compute the value of $b$ given by the series shown below. Continue computing the sum of the terms until the absolute value of any individual term falls below 0.001.

   $$b = 1 - 1/2 + 1/3 - 1/4 + 1/5 - 1/6 \ldots$$

14. One of the most famous series is that due to Fibonacci (may be you can recall from The Vinci Code)

   $$1, 1, 2, 3, 5, 8, 13, 21 \ldots$$

   This series is known to describe many naturally occurring phenomena. The first two terms are 1 and 1. All the additional terms of the series are the sum of the two previous terms. Write a program to calculate the first n (> 50) terms of the series.

15. A projectile is fired at an angle $\theta$, let us consider $R$, $T$ and $H$ is the range, total time of flight and maximum height respectively. Write a program that can produce a table of the following form for all angles from 30 to 60 degrees in 5-degree increment and initial velocities from 500 to 1000 m/sec in 100 m/sec increments:

   i. (INITIAL VELOCITY = 500 M/SEC)

   ii. ANGLE RANGE TIME HEIGHT

16. Write a program that reads three positive numbers $A$, $B$, and $C$ and determines if $A$, $B$, and $C$ can form the sides of a triangle. If yes, determine if the triangle will be an obtuse angle or a right angle or an acute angle triangle. If the triangle is an acute angle triangle then determine if it is an equilateral triangle, an isosceles triangle or a scalene triangle.