Homework 3

1. Write programs to accumulate and print the following:
(where *n* reads from the keyboard)

(a). $20 + 22 + 24 + \ldots + 2n$

(b). $1 + \frac{1}{3} + \frac{1}{5} + \ldots + \frac{1}{101}$

(c). $1 + \frac{1}{2!} + \frac{1}{3!} + \ldots + \frac{1}{n!}$

(d). $1 - 2 + 3 - 4 + 5 + \ldots + (-1)^{n+1} n$

(e). **1+ (1+2) + (1+2+3) +(1+2+3+4) +…+(1+2+3+…+ *n*)**

2. Write a program that displays the ASCII chart. Display numeric codes as well as characters so that there are four columns and as many rows as it takes. For an extra bonus, display the chart so that its outside borders are made up of double line ASCII characters, and separate each column with a single vertical ASCII character.

3. A polynomial $a_n x^n + a_{n-1} x^{n-1} + \ldots + a_0$ can be evaluated(計值)

方法(A). In a straightforward way by performing the indicated operations and using power function.

方法(B). An alternative method is to factor the polynomial according to the following formula, known as HORNER'S Rule:

$$(\ldots((a_n x + a_{n-1}) x + a_{n-2}) x + \ldots + a_1) + a_0$$

(1). Write two programs to evaluate polynomials by these two different methods.

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(2). Please compare these two methods.

(方法 A,B 需幾次的乘算及加算)

Ex: f(x)=5x^4+4x^3+3x^2+2x+1 (input x from keyboard)

方法(B): let a_0=1, a_1=2, a_2=3, a_3=4, a_4=5

We have : $f_0 = a_4$, $f_1 = f_0 * x + a_3$, $f_2 = f_1 * x + a_2$, $f_3 = f_2 * x + a_1$

$f_4 = f_3 * x + a_0$ = 5x^4+4x^3+3x^2+2x+1 ------->Answer

(In general form $f_i = f_{i-1} * x + a_{n-i}$, $f_0 = a_n$)

4. A common highway patro speed-detection radar unit emits a beam of microwaves at a frequency f_0. The beam is reflected off an approaching car, and the reflected beam is picked up and analyzed by the radar unit. The frequency of the reflected beam is shifted slightly from f_0 to f_1 due to the motion of the car. The relationship between the speed of the car, *v*, in miles per hour and the two microwave frequencies is

$$v = (6.685 \times 10^8) \times \frac{f_1 - f_0}{f_1 + f_0}$$

Where the emitted waves have a frequency of $f_0 = 2 \times 10^{10}$ $\sec^{-1}$.

(a).Using this formula, write a program to calculate and display the speed corresponding to a received frequency of 2.0000004×10^{10} $\sec^{-1}$

(b). Modify the above program to determine the frequency that will be returned by a car traveling at 55 miles per hour.