Object-Oriented Programming Exercise

Ex13.

需求說明：

建立一個程式讓使用者輸入隨機生成的次數 times。程式將隨機產生兩個介於-2 和 2 之間的數值 x1 與 x2，共 times 次。每次生成的 x1 和 x2 都需代入 Shubert Function 計算求解，並在每次生成後：

1. 計算當前 x1 和 x2 對應的 Shubert Function 值。
2. 比較當前結果與已知的最大值，更新最大值及其對應的 x1、x2 值。
3. 輸出當前結果及更新後的已知最大解，包括 x1、x2 和 Shubert Function 值。

Shubert Function 定義:

$$f(x_1, x_2) = \left(\sum_{i=1}^{5}\left(i\ \cos\left((i+1)x_1 + i\right)\right)\right)\left(\sum_{i=1}^{5}\left(i\ \cos\left((i+1)x_2 + i\right)\right)\right)$$

執行結果(灰底部分為使用者輸入，使用 Ctrl+Z 或 Ctrl+D 終止輸入)：

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Enter number of random generations (times): 10
Iteration 1:
    Current Solution: shubertFunction(x1 =   1.8394, x2 =   1.4362) =  -5.7095
    Maximum Solution: shubertFunction(x1 =   1.8394, x2 =   1.4362) =  -5.7095
Iteration 2:
    Current Solution: shubertFunction(x1 =  -1.7738, x2 =  -0.6189) =   0.9451
    Maximum Solution: shubertFunction(x1 =  -1.7738, x2 =  -0.6189) =   0.9451
Iteration 3:
    Current Solution: shubertFunction(x1 =   1.8105, x2 =   1.4287) =  -6.1005
    Maximum Solution: shubertFunction(x1 =  -1.7738, x2 =  -0.6189) =   0.9451
Iteration 4:
    Current Solution: shubertFunction(x1 =   0.9307, x2 =   0.8548) =  10.8538
    Maximum Solution: shubertFunction(x1 =   0.9307, x2 =   0.8548) =  10.8538
Iteration 5:
    Current Solution: shubertFunction(x1 =  -0.0606, x2 =   0.0168) =  24.7473
    Maximum Solution: shubertFunction(x1 =  -0.0606, x2 =   0.0168) =  24.7473
Iteration 6:
    Current Solution: shubertFunction(x1 =  -0.0226, x2 =  -0.3373) =  30.4765
    Maximum Solution: shubertFunction(x1 =  -0.0226, x2 =  -0.3373) =  30.4765
Iteration 7:
    Current Solution: shubertFunction(x1 =  -0.4015, x2 =   0.5299) =  -3.1446
    Maximum Solution: shubertFunction(x1 =  -0.0226, x2 =  -0.3373) =  30.4765
Iteration 8:
    Current Solution: shubertFunction(x1 =  -0.0221, x2 =   0.0227) =  19.0254
    Maximum Solution: shubertFunction(x1 =  -0.0226, x2 =  -0.3373) =  30.4765
Iteration 9:
    Current Solution: shubertFunction(x1 =  -1.0057, x2 =  -1.8201) =  16.7476
    Maximum Solution: shubertFunction(x1 =  -0.0226, x2 =  -0.3373) =  30.4765
Iteration 10:
    Current Solution: shubertFunction(x1 =  -0.2053, x2 =   1.4370) = -18.1452
    Maximum Solution: shubertFunction(x1 =  -0.0226, x2 =  -0.3373) =  30.4765
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