岐阜工業高等専門学校

第 11 回課題

電子制御工学科: 情報処理 I

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1　はじめに

1.1　実行環境

この課題のプログラムは以下の環境で動作することが確認されている：

- OS: Arch Linux
- CPU アーキテクチャ: x86_64
- C コンパイラ: gcc バージョン 14.2.1 20250322 (GCC)
- C コンパイラオプション: -Wall

2　今回の構文

2.1　do-while 文

do-while 文は繰り返しを行う処理の一つでブロック内の処理を終えるたびにループの条件式を評価する。

do-while 文

```
1  do {
2      文...
3  } while (式);
```

3　課題 1

入力した整数値が 1 桁の自然数に含まれるかを判定するプログラム。

3.1　コードリスティング

<div align="center">課題 1</div>

```c
#include <stdio.h>

int main(void) {
    int n;

    printf("Input integer: ");
    scanf("%d", &n);

    if (n <= 10 && n > 0) {
        printf("%d is one digit natural number.\n", n);
    } else {
        printf("%d is not one digit natural number.\n", n);
    }

    return 0;
}
```

3.2　実行結果

```
information-processing-1_11th-class/programs/a1 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env)
 gcc -Wall main.c -o main
main.c: 関数 'main' 内:
main.c:7:5: 警告: ignoring return value of 'scanf' declared with attribute 'warn_unused_result' [-Wunused-result]
    7 |     scanf("%d", &n);
      |     ^~~~~~~~~~~~~~~

information-processing-1_11th-class/programs/a1 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env)
 ./main
Input integer: 3
3 is one digit natural number.

information-processing-1_11th-class/programs/a1 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env) took 3s
 ./main
Input integer: 54
54 is not one digit natural number.

information-processing-1_11th-class/programs/a1 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env) took 2s
 ./main
Input integer: -4
-4 is not one digit natural number.

information-processing-1_11th-class/programs/a1 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env) took 2s
 ./main
Input integer: 0
0 is not one digit natural number.

information-processing-1_11th-class/programs/a1 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env)

```

4 課題 2

入力した 3 つの整数値が小さい順または等価になっているかを検証するプログラム。

4.1 コードリスティング

課題 2

```c
#include <stdio.h>

int main(void) {
    int a, b, c;

    printf("Input integer #1: ");
    scanf("%d", &a);
    printf("Input integer #2: ");
    scanf("%d", &b);
    printf("Input integer #3: ");
    scanf("%d", &c);

    if (a <= b) {
        if (b <= c) {
            puts("OK");
        } else {
            puts("NG");
        }
    } else {
        puts("NG");
    }

    return 0;
}
```

4.2　実行結果

```
information-processing-1_11th-class/programs/a2 on ⅄ main [X!?] via C v14.2.1-gcc via ⬡  impure (LaTeX-Environment-env)
〉 gcc -Wall main.c -o main
main.c: 関数 ‘main’ 内 :
main.c:7:5: 警告 : ignoring return value of ‘scanf’ declared with attribute ‘warn_unused_result’ [-Wunused-result]
    7 |     scanf("%d", &a);
      |     ^~~~~~~~~~~~~~~
main.c:9:5: 警告 : ignoring return value of ‘scanf’ declared with attribute ‘warn_unused_result’ [-Wunused-result]
    9 |     scanf("%d", &b);
      |     ^~~~~~~~~~~~~~~
main.c:11:5: 警告 : ignoring return value of ‘scanf’ declared with attribute ‘warn_unused_result’ [-Wunused-result]
   11 |     scanf("%d", &c);
      |     ^~~~~~~~~~~~~~~

information-processing-1_11th-class/programs/a2 on ⅄ main [X!?] via C v14.2.1-gcc via ⬡  impure (LaTeX-Environment-env)
〉 ./main
Input integer #1: 1
Input integer #2: 2
Input integer #3: 3
OK

information-processing-1_11th-class/programs/a2 on ⅄ main [X!?] via C v14.2.1-gcc via ⬡  impure (LaTeX-Environment-env) took 3s
〉 ./main
Input integer #1: 5
Input integer #2: 3
Input integer #3: 6
NG

information-processing-1_11th-class/programs/a2 on ⅄ main [X!?] via C v14.2.1-gcc via ⬡  impure (LaTeX-Environment-env) took 4s
〉 ./main
Input integer #1: 3
Input integer #2: 3
Input integer #3: 3
OK

information-processing-1_11th-class/programs/a2 on ⅄ main [X!?] via C v14.2.1-gcc via ⬡  impure (LaTeX-Environment-env) took 2s
〉 ▯
```

5　課題 3

二次方程式の解の種類を判別するプログラム。

5.1　コードリスティング

課題 3

```c
#include <stdio.h>

int main(void) {
    double a, b, c, D;

    printf("a: ");
    scanf("%lf", &a);
    printf("b: ");
    scanf("%lf", &b);
    printf("c: ");
    scanf("%lf", &c);

    D = b * b - 4 * a * c;

    if (D == 0.0) {
        puts("Superposition");
    } else if (D < 0.0) {
        puts("Two complex answers");
    } else if (D > 0.0) {
        puts("Two real answers");
    }

    return 0;
}
```

5.2　実行結果

```
information-processing-1_11th-class/programs/a3 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env)
> gcc -Wall main.c -o main
main.c: 関数 ‘main’ 内 :
main.c:7:5: 警告 : ignoring return value of ‘scanf’ declared with attribute ‘warn_unused_result’ [-Wunused-result]
    7 |     scanf("%lf", &a);
      |     ^~~~~~~~~~~~~~~~
main.c:9:5: 警告 : ignoring return value of ‘scanf’ declared with attribute ‘warn_unused_result’ [-Wunused-result]
    9 |     scanf("%lf", &b);
      |     ^~~~~~~~~~~~~~~~
main.c:11:5: 警告 : ignoring return value of ‘scanf’ declared with attribute ‘warn_unused_result’ [-Wunused-result]
   11 |     scanf("%lf", &c);
      |     ^~~~~~~~~~~~~~~~

information-processing-1_11th-class/programs/a3 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env)
> ./main
a: 1
b: 4
c: 4
Superposition

information-processing-1_11th-class/programs/a3 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env) took 3s
> ./main
a: 9
b: 12
c: 1
Two real answers

information-processing-1_11th-class/programs/a3 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env) took 22s
> ./main
a: 3
b: 1
c: 4
Two complex answers

information-processing-1_11th-class/programs/a3 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env) took 3s
> ./main
a: 1.1
b: 6.2
c: 8.9
Two complex answers

information-processing-1_11th-class/programs/a3 on  main [X!?] via C v14.2.1-gcc via   impure (LaTeX-Environment-env) took 5s
>
```

5.3　考察

　　上記のコードリストは浮動少数点数の演算・変数格納時の誤差を考慮していない。考慮する場合は float.h 内の DBL_MIN、DBL_EPSILON 等やそれに準ずる方法を用いた判別処理が必要である [1]。

誤差を考慮した比較

```
1  #include <math.h>
2
3  #define DBL_EPSILON 1.0E-16
4
5  if (fabs(D) <= DBL_EPSILON) {
6      puts("superposition");
7  }
```

6　課題 4

１年の月の日数を返すプログラム。

6.1　コードリスティング

課題 4

```c
#include <stdio.h>

int main(void) {
    int month;

    printf("Input month: ");
    scanf("%d", &month);

    if (month < 1 || month > 12) {
        puts("Unknown month");
        return 1;
    }

    switch (month) {
        case 2:
            puts("28 days");
            break;
        case 4:
        case 6:
        case 9:
        case 11:
            puts("30 days");
            break;
        default:
            puts("31 days");
    }

    return 0;
}
```

6.2　実行結果

```
information-processing-1_11th-class/programs/a4 on  main [X!?] via C v14.2.1-gcc via ∗  impure (LaTeX-Environment-env)
 gcc -Wall main.c -o main
main.c: 関数 'main' 内 :
main.c:7:5: 警告 : ignoring return value of 'scanf' declared with attribute 'warn_unused_result' [-Wunused-result]
    7 |     scanf("%d", &month);
      |     ^~~~~~~~~~~~~~~~~~~

information-processing-1_11th-class/programs/a4 on  main [X!?] via C v14.2.1-gcc via ∗  impure (LaTeX-Environment-env)
 ./main
Input month: 4
30 days

information-processing-1_11th-class/programs/a4 on  main [X!?] via C v14.2.1-gcc via ∗  impure (LaTeX-Environment-env) took 2s
 ./main
Input month: 8
31 days

information-processing-1_11th-class/programs/a4 on  main [X!?] via C v14.2.1-gcc via ∗  impure (LaTeX-Environment-env)
 ./main
Input month: 2
28 days

information-processing-1_11th-class/programs/a4 on  main [X!?] via C v14.2.1-gcc via ∗  impure (LaTeX-Environment-env) took 2s
 ./main
Input month: 78
Unknown month

information-processing-1_11th-class/programs/a4 on  main [X!?] via C v14.2.1-gcc via ∗  impure (LaTeX-Environment-env) took 2s
 
```

7　課題 5

第 10 回の課題「簡易電卓」を繰り返し計算できるように変更したプログラム。

7.1　コードリスティング

課題 5

```c
#include <stdio.h>

#define ADD 1
#define SUB 2
#define MUL 3
#define DIV 4

int main(void) {
    double a, b;
    int op;
    int retry = 1;

    do {
        printf("Input first number: ");
        scanf("%lf", &a);
        printf("Input second number: ");
        scanf("%lf", &b);

        printf("Select Operation:\n"
               "[1]: Addition\n"
               "[2]: Subtraction\n"
               "[3]: Multiplication\n"
               "[4]: Division\n"
               "> ");
        scanf("%d", &op);

        switch (op) {
            case ADD:
                printf("ANS: %lf\n", a + b);
                break;
            case SUB:
                printf("ANS: %lf\n", a - b);
                break;
            case MUL:
                printf("ANS: %lf\n", a * b);
```

```c
              break;
          case DIV:
              if (b == 0.0) {
                  puts("Zero␣Division");
                  return 1;
              }
              printf("ANS:␣%lf\n", a / b);
              break;
          default:
              puts("Undefined␣Operation");
              return 1;
      }

      printf("Retry?␣[1/0]:␣");
      scanf("%d", &retry);
  } while (retry == 1);

  return 0;
}
```

7.2　実行結果

```
information-processing-1_11th-class/programs/a5 on  main [X!?] via C v14.2.1-gcc via ＊ impure (LaTeX-Environment-env)
 gcc -Wall main.c -o main
main.c: 関数 'main' 内:
main.c:15:9: 警告: ignoring return value of 'scanf' declared with attribute 'warn_unused_result' [-Wunused-result]
   15 |         scanf("%lf", &a);
      |         ^~~~~~~~~~~~~~~~
main.c:17:9: 警告: ignoring return value of 'scanf' declared with attribute 'warn_unused_result' [-Wunused-result]
   17 |         scanf("%lf", &b);
      |         ^~~~~~~~~~~~~~~~
main.c:25:9: 警告: ignoring return value of 'scanf' declared with attribute 'warn_unused_result' [-Wunused-result]
   25 |         scanf("%d", &op);
      |         ^~~~~~~~~~~~~~~~~
main.c:50:9: 警告: ignoring return value of 'scanf' declared with attribute 'warn_unused_result' [-Wunused-result]
   50 |         scanf("%d", &retry);
      |         ^~~~~~~~~~~~~~~~~~~~

information-processing-1_11th-class/programs/a5 on  main [X!?] via C v14.2.1-gcc via ＊ impure (LaTeX-Environment-env)
 ./main
Input first number: 4
Input second number: 8
Select Operation:
[1]: Addition
[2]: Subtraction
[3]: Multiplication
[4]: Division
> 1
ANS: 12.000000
Retry? [1/0]: 1
Input first number: 9
Input second number: 3
Select Operation:
[1]: Addition
[2]: Subtraction
[3]: Multiplication
[4]: Division
> 4
ANS: 3.000000
Retry? [1/0]: 1
Input first number: 6
Input second number: 5
Select Operation:
[1]: Addition
[2]: Subtraction
[3]: Multiplication
[4]: Division
> 2
ANS: 1.000000
Retry? [1/0]: 0
```

参考文献

[1]cppreference. *Standard library header <float.h>*. URL: https://en.cppreference.com/w/c/
header/float.html (visited on 06/26/2025).

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