

*CPS 188 Lab 3 : Selection
Control Structures*

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1 Problem Sets

1.1 Problem 1

1.1.1 Computer Program

```
1  /* Program to calculate the Training Heart Rate (THR) */
2
3  #include <stdio.h>
4  #include <math.h>
5  #include <stdbool.h>
6
7  float inputs(void);
8  bool gender_conditional(char gender);
9  int male_training_heart_rate(int age, int resting_heart_rate,
10 float fitness_level);
11 int female_training_heart_rate(int age, int
12 resting_heart_rate, float fitness_level);
13 int conditional(char gender, int age, int resting_heart_rate,
14 float fitness_level);
15 void output(int training_heart_rate);
16
17 void main(void)
18 {
19     float g, a, rhr, fl = inputs();
20     int thr = conditional(g, a, rhr, fl);
21     output(thr);
22 }
23
24 float inputs(void)
25 {
26     char gender;
27     int age;
28     int resting_heart_rate;
29     float fitness_level;
30
31     /* Scanning values for gender selection */
32     printf("Please enter your gender, (M or F): ");
33     do
34     {
35         scanf("%c", &gender);
36     } while (gender == 'M' || gender == 'F');
```

```

37     printf("\nPlease enter your age: ");
38     scanf("%i", &age);
39
40     /* Scanning values for the resting heart rate */
41     printf("\nPlease enter your resting heart rate: ");
42     scanf("%i", &resting_heart_rate);
43
44     /* Scanning values for fitness level */
45     printf("\nPlease enter your fitness level, (0.55 for low,
46     0.65 for medium, and 0.8 for high fitness): ");
47     scanf("%f", &fitness_level);
48
49     return gender, age, resting_heart_rate, fitness_level;
50 }
51 int conditional(char gender, int age, int resting_heart_rate,
52 float fitness_level)
53 {
54     /* Conditional to check male or female */
55     bool binary = gender_conditional(gender);
56
57     /* Conditional for check male or female THR */
58     int training_heart_rate;
59     if (binary == true)
60     {
61         training_heart_rate = male_training_heart_rate(age,
62         resting_heart_rate, fitness_level);
63     }
64
65     else
66     {
67         training_heart_rate = female_training_heart_rate(age,
68         resting_heart_rate, fitness_level);
69     }
70
71     return training_heart_rate;
72 }
73 void output(int training_heart_rate)
74 {
75     printf("\nYour training heart rate is %i\n",
76     training_heart_rate);
77 }
78 bool gender_conditional(char gender)
79 {
80     int binary;
81     if (gender == 'M')
82     {

```

```

81         binary = true;
82     }
83
84     else
85     {
86         binary = false;
87     }
88
89     return binary;
90 }
91
92 int male_training_heart_rate(int age, int resting_heart_rate,
93     float fitness_level)
94 {
95     /* Calculating the maximum heart rate */
96     float maximum_heart_rate = 203.7 / (1 + exp(0.033 * (age
97 - 104.3)));
98
99     /* Calculating the training heart rate */
100     int training_heart_rate = (maximum_heart_rate -
101 resting_heart_rate) * fitness_level + resting_heart_rate;
102
103     return training_heart_rate;
104 }
105
106 int female_training_heart_rate(int age, int
107     resting_heart_rate, float fitness_level)
108 {
109     /* Calculating the maximum heart rate */
110     int maximum_heart_rate = 190.2 / (1 + exp(0.0453 * (age -
111 107.5)));
112
113     /* Calculating the training heart rate */
114     int training_heart_rate = (maximum_heart_rate -
115 resting_heart_rate) * fitness_level + resting_heart_rate;
116
117     return training_heart_rate;
118 }

```

Listing 1.1: *Hello World Program*

1.1.2 Program Output Screenshot

```
aj@Anonymous-User:~/Documents/C-Testing---Learning/CPS 188/Lab_3$ ./thr
Please enter your gender, (M or F): M

Please enter your age: 19

Please enter your resting heart rate: 64

Please enter your fitness level, (0.55 for low, 0.65 for medium, and 0.8 for high fitness): 0.65

Your training heaty rate is 122
```

1.2 Problem 2

1.2.1 Computer Program

```
1  #include <stdio.h>
2  #include <math.h>
3  #include <stdbool.h>
4
5  float weight_input(void);
6  float height_input(void);
7  void output(float weight, float height);
8
9  void main(void)
10 {
11     float w = weight_input();
12     float h = height_input();
13     output(w, h);
14 }
15
16 float weight_input(void)
17 {
18     float weight;
19
20     /* Scanning values for weight */
21     printf("Enter your weight: ");
22     scanf("%f", &weight);
23
24     return weight;
25 }
26
27 float height_input(void)
28 {
29     float height;
30
31     /* Scanning values for height */
32     printf("\nEnter your height: ");
33     scanf("%f", &height);
34 }
```

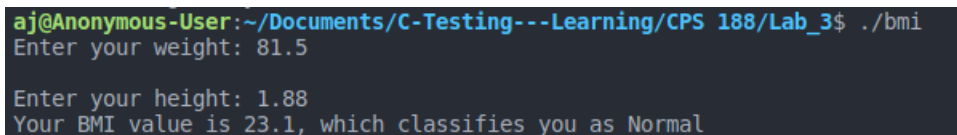
```

35     return height;
36 }
37
38 void output(float weight, float height)
39 {
40     /* Calculating BMI */
41     height *= height;
42     float body_mass_index = weight / (height);
43
44     /* Conditional */
45     if (body_mass_index < 18.5)
46     {
47         printf("Your BMI value is %.1f, which classifies you
48 as Underweight\n", body_mass_index);
49     }
50     else if (body_mass_index <= 24.9)
51     {
52         printf("Your BMI value is %.1f, which classifies you
53 as Normal\n", body_mass_index);
54     }
55     else if (body_mass_index <= 29.9)
56     {
57         printf("Your BMI value is %.1f, which classifies you
58 as Overweight\n", body_mass_index);
59     }
60     else
61     {
62         printf("Your BMI value is %.1f, which classifies you
63 as Obese\n", body_mass_index);
64     }
65 }

```

Listing 1.2: *Program to Calculate the Body Mass Index (BMI) of a person*

1.2.2 Program Output Screenshot



```

aj@Anonymous-User:~/Documents/C-Testing---Learning/CPS 188/Lab_3$ ./bmi
Enter your weight: 81.5
Enter your height: 1.88
Your BMI value is 23.1, which classifies you as Normal

```

1.3 Problem 3

1.3.1 Computer Program

```

1  /* Program to Calculate the Overall grades of a Course */
2

```

```

3 #include <stdio.h>
4 #include <math.h>
5
6 float quiz(void);
7 float midterm(void);
8 float final(void);
9 float conditional_output(float quiz, float midterm, float
    final);
10
11 void main(void)
12 {
13     float q = quiz();
14     float m = midterm();
15     float f = final();
16     conditional_output(q, m, f);
17 }
18
19 float quiz(void)
20 {
21     float quiz[10];
22     float lowest;
23     float sum = 0;
24
25     printf("Enter your quiz marks (0 to 10):\n");
26     for (int i = 0; i < 10; i++)
27     {
28         do
29         {
30             scanf("%f", &quiz[i]);
31             printf("\n");
32         } while (quiz[i] < 0 || quiz[i] > 10);
33     }
34
35     for (int i = 0; i < 10; i++)
36     {
37         if (quiz[i] < quiz[i+1])
38         {
39             lowest = quiz[i];
40         }
41     }
42
43     for (int i = 0; i < 10; i++)
44     {
45         sum += quiz[i];
46     }
47
48     float average = (sum - lowest) / 9;
49
50     return average;

```



```

51 }
52
53 float midterm(void)
54 {
55     float marks;
56
57     printf("Enter your midterm marks (0 to 100):\n");
58     do
59     {
60         scanf("%f", &marks);
61         printf("\n");
62     } while (marks < 0 || marks > 100);
63
64     return marks;
65 }
66
67 float final(void)
68 {
69     float marks;
70
71     printf("Enter your final marks (0 to 100):\n");
72     do
73     {
74         scanf("%f", &marks);
75         printf("\n");
76     } while (marks < 0 || marks > 100);
77
78     return marks;
79 }
80
81 float conditional_output(float quiz, float midterm, float
82 final)
83 {
84     quiz *= 0.25;
85
86     if (midterm >= final)
87     {
88         midterm *= 0.35;
89         final *= 0.4;
90     }
91     else
92     {
93         midterm *= 0.25;
94         final *= 0.5;
95     }
96
97     float grade = quiz + midterm + final;

```

```

98     printf("The overall grade of the course is %.2f\n", grade
99     );
100 }
101

```

Listing 1.3: *Program to Calculate the Overall grades of a Course*

1.3.2 Program Output Screenshot

```

aj@Anonymous-User:~/Documents/C-Testing---Learning/CPS 188/Lab_3$ ./grades
Enter your quiz marks (0 to 10):
9.5
6
4
10
7.8
3.4
9
5.6
9
10
Enter your midterm marks (0 to 100):
73
Enter your final marks (0 to 100):
84
The overall grade of the course is 62.06%

```