National Taiwan Normal University
CSIE Computer Programming I

Instructor: Po-Wen Chi
Due Date: Nov 2, 2021, PM 11:59

Assignment 2

Policies:

- Zero tolerance for late submission.
- Please pack all your submissions in one zip file. **RAR is not allowed!!**
- For convenience, your executable programs must be named following the rule hwXXYY, where the red part is the homework number and the blue part is the problem number. For example, hw0102 is the executable program for homework #1 problem 2.
- I only accept **PDF**. MS Word is not allowed.
- Do not forget your Makefile. For convenience, each assignment needs only one Makefile.
- Please provide a README.

2.1 Discriminant (20 pts)

Given a quadratic polynomial $ax^2 + bx + c$, please determine whether the polynomial has two distinct real roots, one real root or no real roots.

```
$ ./hw0201
Please enter a quadratic polynomial (a,b,c): 2,3,-4
Two distinct real roots.
$ ./hw0201
Please enter a quadratic polynomial (a,b,c): 1,-4,4
One real root.
$ ./hw0201
Please enter a quadratic polynomial (a,b,c): 1,2,3
No real roots.
```

All inputs are guaranteed as 32-bits integers.

2.2 Perimeter and Area (20 pts)

Given across points of a rectangle, please write a program to calculate its perimeter and area.

```
$ ./hw0202
First point (x,y): 1, 1
Second point (x,y): 0, 0
Perimeter --> 4
Area --> 1
```

Note that if there is any problematic input, that is, the given line is vertical or horizontal, please print an error message and terminate the program. All inputs are 32-bits integers.

2.3 Working Hours (20 pts)

Please write a program to calculate a worker's working hours. Suppose the worker's office hour is from 9:00 to 18:30 and there is a lunch break from 12:00 to 13:30. Undoubtedly, you do not need to work on Saturday and Sunday.

```
$ ./hw0203
From: 2021/9/30 11:00
To: 2021/9/30 18:00
Working Hours : 5 hours 30 mins.
```

Note that if there is any problematic input, please print an error message and terminate the program. For your convenience, you do not need to consider holidays. BTW, I promise that the input follows the format and all numbers are 32-bits integers. You do not need to consider the BC case.

2.4 Proofreading Fee (20 pts)

Proofreading is the reading of a galley proof or an electronic copy of a publication to find and correct production errors of text. In is very common for non-native speakers to use this service before publishing official works. Of course, you need to pay for the service. In this assignment, I want you to implement a program to calculate the required fee for the proofreading service based on the table 2.1.

Table 2.1: Proofreading Fee

Delivery Time	Advanced Service	Standard Service	Basic Service
Economic	\$3.4/word	\$1.4/word	\$1.1/word
Standard	\$3.8/word	\$2.0/word	\$1.2/word
Fast	\$4.2/word	\$2.3/word	\$1.5/word
Deadline	\$4.6/word	\$2.6/word	\$2.0/word
Discount	25% off if word $\geq$ 2000	10% off if word $\geq$ 6000	5% off if word $\geq$ 6000

```
$ ./hw0204
Word Count
  Please enter the word count : 1000
Service Level
  1) Advanced service
  2) Standard service
  3) Basic service
  Your choice : 3
Delivery Time
  1) Economic
  2) Standard
  3) Fast
  4) Deadline
  Your choice : 1
Proofreading fee --> 1100
```

Note that if there is any problematic input, please print an error message and terminate the program. For your convenience, all inputs are assumed to be 32-bits integers. If the output fee is a floating point number, just round down to an integer.

2.5 Bidding System for Contract Bridge (20 pts)

Do you know how to play the contract bridge game? Contract bridge, or simply bridge, is a trick-taking card game using a standard 52-card deck. In its basic format, it is played by four players in two competing partnerships, with partners sitting opposite each other around a table.

The game consists of a number of deals, each progressing through four phases. The cards are dealt to the players, and then the players **call** (or **bid**) in an auction seeking to take the contract, specifying how many tricks the partnership receiving the contract (the declaring side) needs to take to receive points for the deal. During the auction, partners endeavor to exchange information about their hands, including overall strength and distribution of the suits. The cards are then played, the declaring side trying to fulfill the contract, and the defenders trying to stop the declaring side from achieving its goal. The deal is scored based on the number of tricks taken, the contract, and various other factors which depend to some extent on the variation of the game being played.

The purpose of bidding during the auction phase of each deal is to disclose information which one' s partner may employ in order to arrive at an optimal contract while concurrently contending with the opponents' attempts to do likewise. A bidding system is a set of agreements about the meanings of the different bids that the players use. Each bid provides information about the hand' s high-card strength and suit distribution

based on hand evaluation techniques.

In this assignment, I want you to implement the opening biding rule for the Standard American biding system (自然制). The user inputs 13 cards and your program will output the opening choice. Do not worry, I will simplify the Standard American biding system and introduce the system for you.

First I will show the poker card encoding rule here:

- 1-13: ♠ A, 2, ..., 9, 10, J, Q, K
- 14-26: ♡ A, 2, ..., 9, 10, J, Q, K
- 27-39: ♢ A, 2, ..., 9, 10, J, Q, K
- 40-52: ♣ A, 2, ..., 9, 10, J, Q, K

Then, I will teach you how to compute High Card Points (HCP):

- A: 4 points.
- K: 3 points.
- Q: 2 points.
- J: 1 points.

The simplified Standard American biding system for the opening is as follows:

- 2♣: HCP ≥ 22.
- 1♠, 1♡: $13 \leq$ HCP ≤ 21 and you have at least a five-card and most holding in that suit. If the numbers of these two suits are equal, call 1♠.
- 1NT: $16 \leq$ HCP ≤ 18
- 2NT: $20 \leq$ HCP ≤ 21
- 1♢, 1♣: $13 \leq$ HCP ≤ 21 and you have at least a three-card and most holding in that suit. If the numbers of these two suits are equal, call 1♢.
- 3♠, 3♡, 3♢, 3♣: $10 \leq$ HCP ≤ 12 and you have at least a seven-card and most holding in that suit.
- 2♠, 2♡, 2♢: $10 \leq$ HCP ≤ 12 and you have at least a six-card and most holding in that suit.

- Pass: Otherwise.

If there are multiple matching rules, follow the first matching rule. There is an example for the following card:

- ♠: A, 2, 3, 4
- ♡: A, 2, 3
- ♢: A, 2, 3
- ♣: A, 2, 3

```
$ ./hw0205
1st card: 1
2nd card: 14
3rd card: 27
4th card: 40
5th card: 2
6th card: 15
7th card: 28
8th card: 41
9th card: 3
10 th card: 16
11 th card: 29
12 th card: 42
13 th card: 4
---
HCP: 16 pts
Suit: 4-3-3-3
The bidding choice : 1NT
```

Note that if there is any problematic input, please print an error message and terminate the program. For your convenience, currently you can ignore the following cases:

1. The input is not an integer.
2. Repeated cards.

2.6 Bonus: Colorful Output (5 pts)

I want you to develop a program to print "hello world". Are you kidding me? So simple!! Wait a moment. Please see Figure 2.1. You can see the second message is Red. How could it be? Please write a program to print a colorful "Hello World". Any colors are welcomed. Of course, you get nothing if you use white as the normal case. Please also write a document to show me how to do this.

Hint: ANSI escape sequences.

FIGURE 2.1: Colorful Printf.