CS2022 ASSIGNMENT 13 (Due Date: Dec 16, 2022)

Instructions: You have to answer all of them.

Question 1

Program A is a C program demonstrating how to read contents from the command line. You need to edit the Program A and compile it. The name of the program is called 'command_argument.c' or 'command_argument.cpp'. If your compiler is DevC, its extension will be automatically set to 'cpp'. Once your program has been compiled without error, answer the following questions.

(a) What will you see if the following command has been entered on the command prompt.

```
C:\>command_argument john 100 peter 200
```

(b) What will you see if the following command has been entered on the command prompt.

```
C:\>command_argument 90 18 93 45
```

(c) What will you see if the following command has been entered on the command prompt.

```
C:\>command_argument 90_18 93_45
```

(d) From the results obtained in (a), (b) and (c), how is an argument defined?

Question 2

From Question 1, it is clear that the content of the first argument, argv[0], is the program name. Now, suppose the arguments besides the program name are all numbers for certain mathematical manipulations. One addition step is to convert the strings in argv[1] and so on to integers. Program B is a sample program demonstrating this conversion. A key C function is atoi meaning ASCII to integer.

(a) What will you see if the following command has been entered on the command prompt.

```
C:\>command_argument_numbers 9 30
```

(b) What will you see if the following command has been entered on the command prompt.

```
C:\>command_argument_numbers 9. 30
```

(c) What will you see if the following command has been entered on the command prompt.

```
C:\>command_argument_numbers 9 30
```

Moreover, the second $\%d$ in the last printf() is changed to $\%f$ and *stoi* is changed to *stof*.

(d) Write a program with name 'sum' which is able to calculate the total sum of the numbers being input. The following is an example.

```
C:\>sum 1 2 3 4 5
Total sum is 15.00.

C:\>sum 1.2 2 3.5 4.1 5.6
Total sum is 16.40.
```

Note that the number displayed in the results is with two decimal digits.

Question 3

Write a C program to solve the abnormal ball problem with the program name called 'abnormal_ball'.

(a) It is assumed that the total number of balls is 7 and two of them are abnormal. Once your program has been compiled successfully, it is expected that your program will outcome the following.

```
C:\>abnormal_ball 4 3 4 4 5 4 4
No.2 and No.5 are abnormal.

C:\>abnormal_ball 16 16 15 15 16 16 16
No.3 and No.4 are abnormal.
```

(b) Write a program with program name 'abnormal_ball_N' which is able to find two abnormal balls from N ($N \geq 5$) balls.

(c) Write a program with program name 'abnormal_ball_M_N' which is able to find M abnormal balls from N ($N \geq 5$) balls, where $M < N/2$.

Program A

```
/**************************************************************************
command_argument.cpp
**************************************************************************
   Description:
   This program demonstrates how c program inputs variables
   from the command line.

   argc, argv are two default variables.
   argc = total number of arguments.
   argv = argument values.

   Example
   =======
   c:> command_argument john 100 peter 200 okay

   argc = 6.
   argv[0] = 'command_argument'.
   argv[1] = 'john'.
   argv[2] = '100'.
   argv[3] = 'peter'.
   argv[4] = '200'.
   argv[5] = 'okay'.

   Note that argv is an array of strings, i.e. argv[0] ... argv[5]
   are all strings.

   History:
   December 29, 2019. John Sum
   December 09, 2022. John Sum
    Add an example in the comment.
**************************************************************************/
#include<stdio.h>
#include<stdlib.h>

main(int argc, char *argv[])
{
    int i; /* Declare index i as integer */

    printf("There are %d arguments.\n", argc);
    for(i=0; i<argc; i++)
    {
     printf("Content in argv[%d] is %s.\n", i, argv[i]);
    }
}
```

Program B

```
/***************************************************************************
command_argument_numbers.cpp
***************************************************************************
   Description:
   This program demonstrates how c program inputs variables
   from the command line.

   Note that argv is an array of strings, i.e. argv[0] ... argv[5]
   are all strings.

   History:
   December 09, 2022. John Sum (Creation)
***************************************************************************/
#include<stdio.h>
#include<stdlib.h>

main(int argc, char *argv[])
{
    int i; /* Declare index i as integer */

    printf("There are %d arguments.\n", argc);
    for(i=0; i<argc; i++)
    {
        printf("Content in argv[%d] is %d.\n", i, atoi(argv[i]));
    }
}
```