Week 2: In-Class Exercises

Resource: http://blue.smu.edu.sg/cs101/ice2-resource.zip

1. **[Difficulty: *]** Write a program that prompts the user for 2 integers, n1 and n2. The program states whether n1 is a factor of n2. **Note:** every integer is a factor of 0.

```
cwarrior:/mnt/c/cs101/quiz2$./q1
Enter n1:4
Enter n2:12
4 is a factor of 12

cwarrior:/mnt/c/cs101/quiz2$./q1
Enter n1:7
Enter n2:13
7 is not a factor of 13
```

2. **[Difficulty: *]** Write a program that prompts the user for an integer, and displays odd or even if the integer is odd or even, respectively.

```
cwarrior:/mnt/c/cs101/quiz2$./q2
Enter num:2
2 is even

cwarrior:/mnt/c/cs101/quiz2$./q2
Enter num:7
7 is odd
```

3. **[Difficulty: *]** Write a program that prompts the user for 3 integers, and displays the smallest and largest of these 3 integers.

```
Enter n1:77
Enter n2:88
Enter n3:99
Smallest is 77
Largest is 99
```

4. **[Difficulty: **]** Write a program that prompts the user for his/her weight and height, and prints the bmi and status .

$$BMI = \frac{weight\ in\ kilograms}{(height\ in\ meters)^2}$$

BMI	Status
less than 18.5	underweight
between 18.5 and 24.9	normal
between 25 to 29.9	overweight
30 or greater	obese

```
Enter weight(kg):70
Enter height(m):1.78
BMI is 22.093170
You are considered normal.
```

5. **[Difficulty: **]** Write a program that prompts the user for a character, ch. The program displays
   a. "digit" if the character is either '0', '1', '2', ..., '9'
   b. "lowercase letter" if the character is either 'a', 'b', 'c', ..., 'z'
   c. "uppercase letter" if the character is either 'A', 'B', 'C', ..., 'Z'
   d. "special character" if it is neither a digit, lowercase letter or uppercase letter.

```
cwarrior@battle:/mnt/c/cs101/ice2$>.\q5
Enter char:1
1 is a digit

cwarrior@battle:/mnt/c/cs101/ice2$>.\q5
Enter char:b
b is a lowercase letter

cwarrior@battle:/mnt/c/cs101/ice2$>.\q5
Enter char:Z
Z is an uppercase letter

cwarrior@battle:/mnt/c/cs101/ice2$>.\q5
Enter char:#
Z is a special character
```

6. **[Difficulty: **]** Write a program that prompts the user for the 3 sides of the triangle. The program then prints if the triangle is valid/invalid. A triangle is valid if the sum of its two sides is greater than the third side.

```
Enter side a:7
Enter side b:10
Enter side c:5
It is a valid triangle.
```

7. **[Difficulty: **]** Write a program that prompts the user for a year, and then prints whether it is a leap year or not. Leap years are years that can be evenly divided by 4 (such as 2012, 2016) except for those years which are divisible by 100 (such as 2100, 2200). Exceptions to the latter rule are years such as 2000, 2400 that are divisible by 400 - they are leap years though they are also divisible by 100.

```
Enter year:2017
2017 is not a leap year
```

8. **[Difficulty: **]** Write a program that prompts the user to enter a month (1 for January, 2 for February, … , 12 for December). The program displays the number of days in that month. You can assume that there are always 28 days in February. There are 31 days in the following months: 1, 3, 5, 7, 8, 10 and 12. There are 30 days in the remaining months.

```
cwarrior@battle:/mnt/c/cs101/ice2$>clang q6.c -o q6
cwarrior@battle:/mnt/c/cs101/ice2$>.\q8
Enter month as a number:14
Enter a number between 1 and 12 only.

cwarrior@battle:/mnt/c/cs101/ice2$>.\q8
Enter month as a number:8
There are 31 days in this month.

cwarrior@battle:/mnt/c/cs101/ice2$>.\q8
Enter month as a number:4
There are 30 days in this month.
```

9. **[Difficulty: **]** A shop pays its sales staff based on each salesperson's monthly sales. Each salesperson is paid a basic monthly salary of $2000 plus commission based on the following table:

Monthly sales ($)	Commission rate (%)
<10,000	5
10,000 to <15,000	10
15,000 to <18,000	15
18,000 and above	18

Write a program called PayCalculator which does the following:
  A. Prompt for the salesperson's monthly sales amount
  B. Calculate the salesperson's commission
  C. Calculate the salesperson's pay (i.e. $2000 + commission)
  D. Display salesperson's commission rate in percentage and monthly pay formatted to the nearest 2 decimal places

```
Enter the amount of monthly sales($): 12250.5
Commission rate for the monthly sale of $12250.5 is 10%
The monthly pay for the salesperson is $3225.05
```

10. **[Difficulty: **]** Write a program that simulates a simple jackpot machine. You are given the program's partial code that generates 3 random numbers (between 1 and 9, including 1 and 9). Complete the program to display one of the following messages: "Try again!", "2 of a kind" or "Jackpot!" depending on the 3 numbers generated.

```
01   #include <stdio.h>
02   #include <stdlib.h>
03   #include <time.h>
04
05   int main() {
06       // code needed to generate different random numbers
07       srand (time(0));
08
09       int num1 = rand() % 9 + 1;
10       int num2 = rand() % 9 + 1;
11       int num3 = rand() % 9 + 1;
12
13       printf("Press <enter> key to start");
14       // to pause and wait for user input
15       // grab the "enter" character and discard it
16       getchar();
17
18       printf("*****************");
19       printf("** %d ** %d ** %d", num1, num2, num3);
20       printf("*****************");
21
22       // complete your code below
23   }
```

```
cwarrior@battle:/mnt/c/cs101/ice2$>.\q10
Press <enter> key to start

****************
** 3 ** 2 ** 7 **
****************
** Try again! **

cwarrior@battle:/mnt/c/cs101/ice2$>.\q10
Press <enter> key to start

****************
** 7 ** 4 ** 7 **
****************
** 2 of a kind **

cwarrior@battle:/mnt/c/cs101/ice2$>.\q10
Press <enter> key to start

****************
** 9 ** 9 ** 9 **
****************
** Jackpot!! **
```

11. **[Difficulty: **]** The annual premiums to be paid for a particular medical insurance plan is calculated based on the insured's age and sex as shown in this table:

Age	Male ($)	Female ($)
Below 25	20.50	30.60
25 to below 30	30.40	50.70
30 to below 65	60.70	99.80
65 and above	70.70	120.30

Write a program called PremiumCalculator which:
   a. Prompts the user for his sex (F, M, f or m) and age (an integer)
   b. Displays the premium to be paid.

Here is a sample run of the class:

```
cwarrior@battle:/mnt/c/cs101/ice2$.\q11
Enter your gender (M or F) :F
Enter your age :25
Your premium is $50.70


cwarrior@battle:/mnt/c/cs101/ice2$.\q11
Enter your gender(M or F) :M
Enter your age :25
Your premium is $30.40
```

12. **[Difficulty: **]** Singapore has coins in denominations of dollar one, and cents 50, 20, 10, 5 and 1 (though 1 cent coins are not minted any more). Write a program that takes in a floating point value representing an amount, for example 2.8 indicating 2 dollars and 80 cents. The program should then display the minimum number of coins required to repay the amount in coins. Assume that the user enters a value above 0 and below 10.

```
cwarrior@battle:/mnt/c/cs101/ice2$.\q12
Enter amount:5.1

Number of 1$: 5
Number of 10c: 1

cwarrior@battle:/mnt/c/cs101/ice2$.\q12
Enter amount:3.95

Number of 1$: 3
Number of 50c: 1
Number of 20c: 2
Number of 5c: 1
```

13. **[Difficulty: **]** In Singapore, personal income tax rate for residents is progressive. To make the exercise simpler, we ignore tax rebates and group all chargeable income above $200,000 into one category with an income tax rate of 20% as shown in the table below:

Chargeable Income	Income Tax Rate (%)	Gross Tax Payable ($)
First $20,000 Next $10,000	0 2	0 200
First $30,000 Next $10,000	- 3.50	200 350
First Next $40,000	- 7	550 2,800
First $80,000 Next $40,000	- 11.5	3,350 4,600
First $120,000 Next $40,000	- 15	7,950 6,000
First $160,000 Next $40,000	- 18	13,950 7,200
First $200,000 In excess of 200,000	- 20	21,150

The actual tax rate applicable for personal income as of 2019 can be found here:
https://www.iras.gov.sg/irashome/Individuals/Locals/Working-Out-Your-Taxes/Income-Tax-Rates/

Write a program that gets input from the user for personal annual chargeable income and displays the income tax payable by the person.

```
cwarrior@battle:/mnt/c/cs101/ice2$.\q13
Enter personal income :50000
Tax payable: $1250.0

cwarrior@battle:/mnt/c/cs101/ice2$.\q13
Enter personal income :80000
Tax payable: $3350.0

cwarrior@battle:/mnt/c/cs101/ice2$.\q13
Enter personal income :225000.50
Tax payable: $26150.1

cwarrior@battle:/mnt/c/cs101/ice2$.\q13
Enter personal income :300000
Tax payable: $41150.0
```