Assignment 1

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Section C
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Q1) Your library need your help. Given the expected and actual return dates for a library book, create a program that calculates the fine (if any). The fee structure is as follows:
a. If the book is returned on or before the expected return date, no fine will be charged i.e. fine=0.
b. If the book is returned after the expected return day but still within the same calendar month and year as the expected return date, fine= Rs. (15*number of days late)
c. If the book is returned after the expected return month but still within the same calendar year as the expected return date, fine= Rs. (50*number of months late)
d. If the book is returned after the calendar year in which it was expected, there is a fixed fine of Rs. 1000.

```
#include <iostream>
#include <ctime>

int getFees(int day, int month, int year, int day_input, int month_input, int year_input);


int main(){

// Getting time
time_t now = time(0);
tm *ltm = localtime(&now);


// Variables to store the date, month and year
int date = ltm->tm_mday;
int month = ltm->tm_mon + 1;
int year = ltm->tm_year + 1900;

std::cout << "The current year is " << year << '\n';
std::cout << "The current month is " << month << '\n';
std::cout << "The date is " << date << '\n';
// Getting the input from the user
int day_input = date;
int month_input = month;
int year_input = year;

std::cout << "Enter the return day: ";
std::cin >> day_input;
std::cout << "Enter the return month: ";
std::cin >> month_input;
std::cout << "Enter the return year: ";
std::cin >> year_input;
if (year_input <= year){
getFees(date,month,year,day_input,month_input,year_input);
```

```
}

else
{
std::cout << "Please pay: 0 as late fees \n";
}
return 0;
}

int getFees(int day, int month, int year, int day_input, int month_input, int year_input){
int fees{};

if (year > year_input){

fees = 1000*(year-year_input);
std::cout << "Please pay: " << fees << " as late fees.\n";
return 0;
}

if (year <= year_input && month > month_input){

fees = 50*(month - month_input);
std::cout << "Please pay: " << fees << " as late fees.\n";
return 0;
}

if (day >= day_input && year >= year_input && month >= month_input){

fees = 15*(day - day_input);
std::cout << "Please pay: " << fees << " as late fees.\n";
return 0;
}

if (day_input >= day && month_input >= month){

std::cout << "Please pay: 0 as late fees \n";
return 0;
}

else{

std::cout << "Please enter a valid date!";

}
return 0;
}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.1
The current year is 2020
The current month is 12
The date is 31
Enter the return day: 12
Enter the return month: 1
Enter the return year: 2021
Please pay: 0 as late fees
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.1
The current year is 2020
The current month is 12
The date is 31
Enter the return day: 24
Enter the return month: 12
Enter the return year: 2020
Please pay: 105 as late fees.
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.1
The current year is 2020
The current month is 12
The date is 31
Enter the return day: 11
Enter the return month: 11
Enter the return year: 2020
Please pay: 50 as late fees.
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.1
The current year is 2020
The current month is 12
The date is 31
Enter the return day: 12
Enter the return month: 4
Enter the return year: 2019
Please pay: 1000 as late fees.
```

Q2) If you want to go to your house at Hyderabad, there are three options for you: Train, Bus, and Car.
If you go by bus, you need to get down at 'Uppal' and from there you can either by auto or bike.
If you go by car, you will directly reach your house.
If you go by train, you need to go by cab/bike/auto. But if you use cab, after getting down once again you need to go by bike.
Write a program to cover all the options nested switch.

```
#include <iostream>

int main(){
int x{};
std::cout << "How are you going to travel? \n 1. Bus \n 2. Car \n 3. Train\n Enter your mode of transportation(1-3):\n";
std::cin >> x;
switch(x){

default:
std::cout << "Please enter a valid input!\n";
break;

case 1:
std::cout << "Get out at Uppal, and then take an Autorikshaw or a Bike.\n";
break;

case 2:
std::cout << "You will directly reach your destination\n";
break;

case 3:
std::cout << "You need to go by \n 1. Cab \n 2. Bike \n 3. Autorikshaw\n";
int y{};
std::cin >> y;
switch (y){
case 1:
std::cout << "After getting down, you will need to go by Bike.\n";
break;
case 2 ... 3: // Please read the next comment
std::cout << "You can reach normally\n";
break;
default:
std::cout << "Please enter a valid input!\n";
break;
}
}
}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.2
How are you going to travel?
 1. Bus
 2. Car
 3. Train
 Enter your mode of transportation(1-3):
1
Get out at Uppal, and then take an Autorikshaw or a Bike.
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.2
How are you going to travel?
 1. Bus
 2. Car
 3. Train
 Enter your mode of transportation(1-3):
2
You will directly reach your destination
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.2
How are you going to travel?
 1. Bus
 2. Car
 3. Train
 Enter your mode of transportation(1-3):
3
You need to go by
 1. Cab
 2. Bike
 3. Autorikshaw
2
You can reach normally
```

Q3) If you have two fractions, a/b and c/d, their sum can be obtained from the formula: for example, 1/4 plus 2/3 is (1/4)+(2/3) = 11/12 Write a program that encourages the user to enter two fractions and the display their sum in fractional form. The interaction with the user might look like this:
Enter first fraction: 1 / 2, Enter second fraction: 2 / 5, sum = 9 / 10

```
#include <iostream>


int main(){

double num1{};
double den1{};

double num2{};
double den2{};
char waste{};

std::cout << "Please enter the first fraction: ";
std::cin >> num1 >> waste >> den1 ;

std::cout << "Please enter the second fraction: ";
std::cin >> num2 >> waste >> den2;

std::cout << num1 << waste << den1 << '\n' ;
std::cout << num2 << waste << den2 << '\n' ;

double sum_num{};
sum_num = (num1*den2 + num2*den1);
double sum_den{};
sum_den = (den1*den2);
std::cout << "The sum of the fractions is: " << sum_num << waste << sum_den << '\n';
return 0;
}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.3
Please enter the first fraction: 3/60
Please enter the second fraction: 8/70
3/60
8/70
The sum of the fractions is: 690/4200
```

Q4) Write a program to evaluate the fuel consumption of a car. The mileage at the start and end of the journey should be read, and also the fuel level in the tank at the start and end of the journey. Calculate fuel used, kilometers travelled, and hence the overall fuel consumption in kilometers travelled per liter of fuel (i.e. mileage).

```
#include <iostream>


int main(){

// Initializing empty variables for storing data.
double fuel_start{};
double fuel_end{};

double mileage_start{};
double mileage_end{};

// Getting data from the user.
std::cout << "Please enter the amount of fuel at the start of the journey. (In Litres) \n";
std::cin >> fuel_start;

std::cout << "Please enter the amount of fuel left at the end of the journey. (In Litres) \n";
std::cin >> fuel_end;

std::cout << "Please enter the mileage at the start of the journey. (In Kilometres) \n";
std::cin >> mileage_start;

std::cout << "Please enter the mileage left at the end of the journey. (In Kilometres)\n";
std::cin >> mileage_end;

// Calculating the mileage and fuel consumption
double out = ((mileage_end - mileage_start)/(fuel_start - fuel_end));
double mile = (mileage_end - mileage_start);
if (out >= 0 && mile >= 0){
std::cout << "The number of Kilometres travelled is: " << mile;
std::cout << "\nThe average fuel consumption is: " << out << " Kilometres/Litre\n";
}
else{

std::cout << "Please enter valid values\n";

}
return 0;
}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.4
Please enter the amount of fuel at the start of the journey. (In Litres)
65
Please enter the amount of fuel left at the end of the journey. (In Litres)
22
Please enter the mileage at the start of the journey. (In Kilometres)
500
Please enter the mileage left at the end of the journey. (In Kilometres)
1000
The number of Kilometres travelled is: 500
The average fuel consumption is: 11.6279 Kilometres/Litre
```

Q5)Sridhar, the man who delivers eggs to my home every day, did not turn up one day. So when he came the next morning I demanded an explanation from him. He told me the following story: The previous morning when he just came out of the house carrying a basketful of eggs on his head to start his daily rounds and stepped on to the street, a car going at full speed brushed against him and knocked down his basket destroying all the eggs. The driver, however, a thorough gentleman (Mahesh) admitted his responsibility and offered to compensate him for damages. But Sridhar could not remember the exact number of eggs he had, but he estimated the number between 50 to 100. He was also able to tell Mahesh that if the eggs were counted by 2's and 3's at a time, none would be left, but if counted by 5's at a time, 3 would remain, and that he sold the eggs 50 paise a piece. The Mahesh made some quick calculations and paid Sridhar adequately. How much did the Mahesh pay Sridhar? Write a program for this.

```
#include <iostream>

int main(){
int num{};
for(int i=51; i<100; i++){
if(i % 2==0 && i % 3==0 && i % 5==3){
num=i;
break;
}
}
std::cout<<"The number of eggs were: "<< num << '\n';
std::cout<<"Mahesh reimbursed Rs."<< 0.5*num << '\n';
return 0;

}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.5
The number of eggs were: 78
Mahesh reimbursed Rs.39
```

Q6) A passenger wants to travel through Indian railway for which he wants to book a ticket. Write a program to decide the fare of the passenger based on the following data. The category of railway passengers can be divided into Child (less than 5 years), Adult (5 to 59 years) and Senior citizen (60 years and more) based on their age. The program reads the age and the distance (kilometers) of travel from a source station to a destination station for the passenger as input. If the passenger is a Child, it need not pay any money to travel. If the person is Adult then he has to pay the FULL fare (50 paisa per kilometer). However, for the senior citizens the fare is 40% less than the Adults.

```
#include <iostream>

int main(){
std::cout << R"(
_____________ _____________ .__ .__ __
\_ _____/____ _____ ____ \_ ___ \_____ | | ____ __ __| | _____ _/ |_ _____________
| __) \__ \\_ __ \_/ __ \ / \ \/\__ \ | | _/ ___\| | \ | \__ \\ __\/ _ \_ __ \
| \ / __ \| | \/\ ___/ \ \___/ __ \| |_\ \___| | / |__/ __ \| | ( <_> ) | \/
\___ / (____ /__| \___ > \_____ (____ /____/\___ >____/|____(____ /__| \____/|__|
\/ \/ \/ \/ \/ \/ \/

)" << '\n';


// Initializing empty variables to store input and calculations
double fees{};
int age{}; // Using int here. We are assuming that ages like "6 and a half" equate to 6.
double distance{};

// The fare per kilometre is a constant value.
double fare = 0.5;

std::cout << "Hello. \nPlease enter your age: ";
std::cin >> age;

std::cout << "Please enter the distance you are travelling: ";
std::cin >> distance;
// Using this if statement to make sure that the program only progresses if distance is positive or 0.
if(distance >= 0){

// Calculating fare based on age.
if(0 <= age && age <= 5){
fees=0;
std::cout << "\nYou have to pay " << fees << " Rupees\n";
}
if(5 < age && age < 60){
fees=fare*distance;
std::cout << "\nYou have to pay " << fees << " Rupees\n";
```

```
}
if(age >= 60){
fees= fare*distance*0.6;
std::cout << "\nYou have to pay " << fees << " Rupees\n";
}
// If age is negative or not a double.
else{
std::cout << "Please enter a valid age\n";
}
}

else{
std::cout << "Please enter a valid distance!\n";
}

return 0;

}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.6

_____                    _____          .__               .__          __
\_   _____/___ _______   ____   \_   ___ \_____  |  |   ____  __ __|  | _____ _/  |_  ____________
|    __) \__  \\_  __ \_/ __ \  /    \  \/\__  \ |  | _/ ___\|  |  \  | \__  \\   __\/  _ \_  __ \
|     \   / __ \|  | \/\  ___/  \     \____/ __ \|  |_\  \___|  |  /  |__/ __ \|  | (  <_> )  | \/
\___  /  (____  /__|    \___  >  \______  (____  /____/\___  >____/|____(____  /__|  \____/|__|
    \/        \/            \/          \/     \/          \/                \/
```

```
Hello.
Please enter your age: 67
Please enter the distance you are travelling: 44

You have to pay 13.2 Rupees
```

Q7) The table below shows the normal boiling points of several substances. Write a program that prompts the user for the observed boiling point of substance in Celsius and identifies the substance if the observed boiling point is within 5% of the expected boiling point. If the data input in more than 5% higher or lower than any of the boiling points in the table, the program should output the message “Unknown substance”.

Substance	Normal boiling point(°c)
Water	100
Gold	2660
Mercury	357
Copper	1187
Silver	2193

```
#include <iostream>

bool checktypes(double n){

if ( 95 <= n && n < 105.01){
std::cout << "The substance is Water.\n";
return true;
}
if ( 2527 <= n && n < 2793.01){
std::cout << "The substance is Gold.\n";
return true;
}
if ( 339.15 <= n && n < 374.85){
std::cout << "The substance is Mercury.\n";
return true;
}
if ( 1127.65 <= n && n < 1246.35){
std::cout << "The substance is Copper.\n";
return true;
}
if (2083.35 <= n && n < 2302.65){
std::cout << "The substance is Silver.\n";
return true;
}

else {
std::cout << "Unknown Substance. Please Enter a valid input.\n";
return false;
}


}
```

```
int main(){

double n{0.0};
std::cout << "Please enter the Boiling Point: \n";
std::cin >> n;
checktypes(n);

return 0;}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.7
Please enter the Boiling Point:
2528
The substance is Gold.
```

Q8) Write a program that that reads the following two parameters – (i) Type of the vehicle, (‘M’ or ‘m’ for motorbike, ‘C’ or ‘c’ for car, and ‘B’ or ‘b’ for Bus), and (ii) Number of hours that a vehicle spent in the parking lot. The program should compute the parking charge based on the following parking rates – Rs. 5, Rs. 10 and Rs. 50 per hour respectively for motorbike, car and bus.

```
#include <iostream>

int parkingcharge(int hours, std::string vehicle);


int main(){

std::string vehicle{};
std::cout << "Enter the vehicle you own \n(C or c for Car)\n(M or m for Motorbike)\n(B or b for Bus)\n";
std::cin >> vehicle;

int hours{};

std::cout << "Enter the number of hours you parked for: ";
std::cin >> hours;

std::cout << "You must pay: " << parkingcharge(hours,vehicle) << "as parking fees. \n";

return 0;
}

int parkingcharge(int hours, std::string vehicle){

if ( vehicle == "c" or vehicle == "C" ){

return hours*10;

}

if ( vehicle == "m" or vehicle == "M" ){

return hours*5;

}


if ( vehicle == "b" or vehicle == "B" ){

return hours*50;

}
```

```
else{

std::cout << "ERROR: Please enter your vehicle.\n";

}
return 0;

}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.8
Enter the vehicle you own
(C or c for Car)
(M or m for Motorbike)
(B or b for Bus)
C
Enter the number of hours you parked for: 4
You must pay: 40 as parking fees.
```

Q9) There are three different faculty positions in an educational institute, namely, Professor, Associate Professor and Assistant Professor. The total number of faculties in the organization is 150. The salary structures for different faculty positions are different. A Professor gets Rs 40,000/- basic pay (per month) with 55% dearness allowance (DA), 30% house rent allowance (HRA) and 10% medical allowance (MA). An Associate Professor gets Rs 30,000/- basic pay (per month) with 50% DA, 25% HRA and 10% MA. An Assistant Professor gets Rs 20,000/- basic pay (per month) with 45% DA, 20% HRA and 10% MA. Furthermore, a lady faculty will get 5% travelling allowance. Write a program to display the gross salary (total salary) of each faculty in the institute. Use a switch statement to decide or select a given faculty position.

```
#include <iostream>

int calcSalary(int x);

int main(){

int x{};
std::cout << "Please enter your position: \n1. Professor \n2. Associate Professor \n3. Assistant Professor \n";
std::cin >> x;

calcSalary(x);

}

int calcSalary(int x){

double base{};
double da{};
double hra{};
double ma{};
double ta{};
switch(x){

case 1:{

base=40000;
da= base * 0.55;
hra= base * 0.3;
ma= base * 0.1;
ta = base * 0.05;


}
```

```
case 2:{

base=30000;
da= base * 0.5;
hra = base * 0.25;
ma = base * 0.1;
ta = base * 0.05;
}

case 3:{

base=20000;
da=base * 0.45;
hra = base * 0.2;
ma= base * 0.1;
ta= base * 0.05;
}
}

std::cout << "Your salary is: \n";
std::cout << "Base Salary = " << base <<"\n";
std::cout << "Dearness Allowance = " << da << "\n";
std::cout << "House Rent Allowance = " << hra << '\n';
std::cout << "Medical Allowance = " << ma << '\n';

double total = base + da + hra + ma;

std::string isWoman{};
std::cout << "Are you a woman? (Y/N): ";
std::cin >> isWoman;

if (isWoman == "Y" or isWoman == "y" ){

std::cout << "Travelling Allowance = " << ta << '\n';
std::cout << "Your total salary is: " << total + ta << '\n';
return 0;
}

if (isWoman == "N" or isWoman == "n"){

std::cout << "Your total salary is: " << total << "\n";
return 0;
}

else{
std::cout << "Please enter a valid input! ";
return 0;
}
return 0;
}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.9
Please enter your position:
1. Professor
2. Associate Professor
3. Assistant Professor
2
Your salary is:
Base Salary = 20000
Dearness Allowance = 9000
House Rent Allowance = 4000
Medical Allowance = 2000
Are you a woman? (Y/N): Y
Travelling Allowance = 1000
Your total salary is: 36000
```

Q10) The National Earthquake information center has asked you to write a programimplementing the following decision table to characterize an earth-quake base on its Richter scale number.
Richter Scale Number (n)

Characterization

---

n < 5.0 Little or no damage

5.0 ⩽ n < 5.5 Some damage

5.5 ⩽ n < 6.5 Serious damage: walls may crack or fall

6.5 ⩽ n < 7.5 Disaster; houses and buildings may collapse

Higher Catastrophe: most buildings destroyed

Could you handle this problem with switch statement? If so, use a switch statement; if not explain

why and write a program by using any of your approach.

```
#include <iostream>

int main(){

double n{0.0};
std::cout << "Please enter the Richter scale number \n";
std::cin >> n;

if (0.0 <= n && n < 5.0){
std::cout << "Little or no damage\n";
}
if (5.0 <= n && n < 5.5){
std::cout << "Some damage\n";
}
if (5.5 <= n && n < 6.5){
std::cout << "Serious damage; Walls may crack or fall\n";
}
if (6.5 <= n && n < 7.5){
std::cout << "Disaster; houses and buildings may collapse\n";
}
if (7.5 <= n ){
std::cout << "Catastrophe; Most Buildings Destroyed\n";
}
```

```
if (n < 0.0){
std::cout << "Please Enter a valid input.\n";
}

}
```

```
adrao@adrao-g14:~/Documents/C/PSCP Assignment$ ./PSCP_Assignment_1.10
Please enter the Richter scale number
6.8
Disaster; houses and buildings may collapse
```

We can’t use a switch statement here, as switch statements can only accept ranges in integers (Which is a case range extension of the GNU C Compiler), or accept a range of ASCII Character codes (A-Z). Here, we require the use of decimal numbers, which cannot be accomodated by a switch statement. Hence, we must use other methods.