Assignment 2 - Section 2

Here we will test sin(x) and cos(x) functions from sin_cos.cpp through various test cases. In sin(int x) function we have multiple conditional statements thus we perform test cases accordingly and test all the branches and statements of these functions.

sin(int x) function :

```
int sin(int x) {
  if (x < 0) {
    x = -x;           // Test Case 1
  }
  x = x % 360;
  if (0 <= x && x <= 45) {           //Test Case 2,3 and 4
    return sin0to45(x);
  }
  else if (45 <= x && x <= 90) {       // Test case 5 and 6
    return sin45to90(x);
  }
  else if (90 <= x && x <= 180) {  // Test case 7 and 8
    return sin(180 - x);
  }
  else {                          // Test case 9
    return -sin(x - 180);
  }
}
```

cos(int x) function :

```
int cos(int x) {           // Test case 10 - 18
  return sin(x + 90);
}
// cos(x) function calls sin(x) itself and hence will be
tested accordingly with all possible test cases.
```

Test case #1 :

Here input is less than 0 and hence it will traverse through this branch `if (x < 0)` if statement.

Input value given to the function : -15
Expected Output : -2588
`Actual Output : 2588

Test case **not** passed!

```
Test case 1 :
        Test Case : input < 0
        Input value : -15
        Function : sin
        Expected Output : -2588
        Actual Output : 2588
        Test case not passed!
```

Test case #2 :

Here input is 0 and hence it will traverse through this branch `if (0 <= x && x <= 45)` if statement.

Input value : 0
Expected Output : 0
Actual Output : 0

Test case **passed**!

```
Test case 2 :
        Test Case : input = 0
        Input value : 0
        Function : sin
        Expected Output : 0
        Actual Output : 0
        Test case passed!
```

Test case #3 and #4 :

Here input was given 40 and 45 and it will traverse the branch `if (0 <= x && x <= 45)`. As per below screenshot, here expected and actual output matches. Hence both test cases are passed.

Test case #5 and #6 :

Here input was given 60 and 90 and it will traverse the branch `if (45 <= x && x <= 90)`. However, for input value 60, the test case is passed but for 90, actual output doesn't exactly match the expected output. And hence the test case is not passed.

```
--------------------------------------------------------------------------------
Test case 3 :
       Test Case : input >= 0 and input <= 45
       Input value : 40
       Function : sin
       Expected Output : 6428
       Actual Output : 6428
       Test case passed!

--------------------------------------------------------------------------------
Test case 4 :
       Test Case : input <= 45
       Input value : 45
       Function : sin
       Expected Output : 7071
       Actual Output : 7071
       Test case passed!

--------------------------------------------------------------------------------
Test case 5 :
       Test Case : input >= 45 and input <= 90
       Input value : 60
       Function : sin
       Expected Output : 8660
       Actual Output : 8660
       Test case passed!

--------------------------------------------------------------------------------
Test case 6 :
       Test Case : input <= 90
       Input value : 90
       Function : sin
       Expected Output : 1
       Actual Output : 9999
       Test case not passed!

--------------------------------------------------------------------------------
```

Test case #7 and #8 :

Here input was given 145 and 180 and it will traverse the branch `if (90 <= x && x <= 180)`. As per below screenshot, here expected and actual output matches. Hence both test cases are passed.

Test case #9 :

Here input greater than 180 was given i.e. 220 and it will traverse below “else” branch. Here expected and actual output matches and hence the test case is passed.

```
else {
   return -sin(x - 180);
 }
```

```
--------------------------------------------------------------------------------
Test case 7 :
       Test Case : input >= 90 and input <= 180
       Input value : 145
       Function : sin
       Expected Output : 5736
       Actual Output : 5736
       Test case passed!

--------------------------------------------------------------------------------
Test case 8 :
       Test Case : input = 180
       Input value : 180
       Function : sin
       Expected Output : 0
       Actual Output : 0
       Test case passed!

--------------------------------------------------------------------------------
Test case 9 :
       Test Case : input > 180
       Input value : 220
       Function : sin
       Expected Output : -6428
       Actual Output : -6428
       Test case passed!

--------------------------------------------------------------------------------
```

Cosine function Test Cases :

As the cos(x) function calls sin(x) itself and hence it will be tested accordingly with all similar possible test cases as with sin(int x) function test cases.

Test case #10 to #14 :

Here input values are given as per below screenshot and and all test cases are **passed** except for the input value 0 where actual output doesn't match with expected output, hence test case 11 is **not** passed.

```
Test case 10 :
       Test Case : input < 0
       Input value : -30
       Function : cos
       Expected Output : 8660
       Actual Output : 8660
       Test case passed!

--------------------------------------------------------------------------------
Test case 11 :
       Test Case : input = 0
       Input value : 0
       Function : cos
       Expected Output : 10000
       Actual Output : 9999
       Test case not passed!

--------------------------------------------------------------------------------
Test case 12 :
       Test Case : input >= 0 and input <= 45
       Input value : 30
       Function : cos
       Expected Output : 8660
       Actual Output : 8660
       Test case passed!

--------------------------------------------------------------------------------
Test case 13 :
       Test Case : input = 45
       Input value : 45
       Function : cos
       Expected Output : 7071
       Actual Output : 7071
       Test case passed!

--------------------------------------------------------------------------------
Test case 14 :
       Test Case : input >= 45 and input <= 90
       Input value : 80
       Function : cos
       Expected Output : 1736
       Actual Output : 1736
       Test case passed!

--------------------------------------------------------------------------------
```

Test case #15 to #18

Here input values are given as per below screenshot and and all test cases are **passed** except for the input value 180 where actual output doesn't match with expected output, hence test case 17 is **not** passed.

```
--------------------------------------------------------------------------------
Test case 15 :
       Test Case : input = 90
       Input value : 90
       Function : cos
       Expected Output : 0
       Actual Output : 0
       Test case passed!

--------------------------------------------------------------------------------
Test case 16 :
       Test Case : input >= 90 and input <= 180
       Input value : 130
       Function : cos
       Expected Output : -6428
       Actual Output : -6428
       Test case passed!

--------------------------------------------------------------------------------
Test case 17 :
       Test Case : input = 180
       Input value : 180
       Function : cos
       Expected Output : -10000
       Actual Output : -9999
       Test case not passed!

--------------------------------------------------------------------------------
Test case 18 :
       Test Case : input >= 180
       Input value : 230
       Function : cos
       Expected Output : -6428
       Actual Output : -6428
       Test case passed!

--------------------------------------------------------------------------------
```