SCHOOL OF COMPUTING

ST0523 Fundamentals of Programming

Practical 2: Operators and Selections(I)

What you will learn / do in this lab

- Using of operators for the various data types
- Capturing user input using readline-sync library
- Perform simple computations
- Identifying errors in program
- Applying one-way if statements given specific requirements

1) A program contains the following declarations and initializations of variables.

```
var a1 = 1, a2 = 3, a3 = 5, a4 = 7;
var b1 = 7.7;
```

Determine the value of the variable **a1** in each of the following <u>independent</u> statements ie use the initial values above for each part (a), (b)….etc

a)
```
a2 = ++a1;
a1 += a1 + a2;
```

b)
```
a3 = a2/a4;
a1 = a3 + ++a1;
```

c)
```
a4 = a3 % a2;
a1 -= a4--;
```

d)
```
a1 = ++a1 + a2++;
a1 *= a1;
```

e) `a1 = parseInt(b1) % a2;`
f) `a1 = a4 % a2 + a3 / a2;`
g) `a1 = ++a1 + --a4 - a2++;`
h) `a1 += a2++ % a4;`

2) What is the output of the following statements?

	Program	Output
(a)	`console.log(5 * 20 + 7 % 6);`	
(b)	`console.log("FOP" + "is" +"fun!");`	
(c)	`console.log(1 + "abcd");`	
(d)	`console.log("abcd " + 1);`	
(e)	`console.log(1 + 1 + " abcd ");`	
(f)	`console.log(1 + " abcd " + 1);`	
(g)	`console.log("abcd " + 1 + 1);`	
(h)	`console.log(1 + "ab" + (1+1));`	

April 2023

3) What value would *x* have after each of the following statements is executed **independently** (if the expression is valid)?

Assume that *h, i, j, k* is reinitialized to *4, 10, 5* and *2* respectively before each statement.

```
var x; //to be a boolean
var h = 4, i = 10, j = 5, k = 2;
```

a.	x = 4 > 4;
b.	x = 6 <= 9;
c.	x = k >= i;
d.	x = h >= k**2 ;
e.	x = (i == j * 2) || (h % k == i % j) && (h == i);
f.	x = !(true && (k == j));
g.	x = true || true && false;
h.	x = false && true || true;
i.	x = (false || false && true) && (true || false)

4) What will be the output of the following program?

```
var b1 = true, b2 = false, b3 = true;
var a1 = 1, a2 = 2, a3 = 3;

console.log (b1 && b2 || b3);
console.log (++a2 >= a3--);
console.log (a1 == a2++ % a3);

console.log ("a1 = " + a1);
console.log ("a2 = " + a2);
console.log ("a3 = " + a3);
```

5) Identify the error(s) in each of the following program:

	Program	Error(s)

(a)	`var _them = 'true',`
	`_them = 5;`
	`console.log(' them);`
		never close '

(b)	`var n1 = 5, n2 = 0;`
	`n1 /= n2;`
	`console.log(n1);`
		by 0 = infinity

(c)	`const pi = 3.14159;`
	`pi = 3.142;`
	`console.log(pi);`
		const cannot change

6) What is the output of the following code segments?

	Program	Output
| (a) | ```javascript
var num = 10;

if (num > 10) {
    console.log("a");
}
if (num > 5) {
    console.log("b");
}
``` | b |
| (b) | ```javascript
if (4 >= 4) {
    console.log("c");
}
if (2 > 5 || 3 < 6) {
    console.log("d");
}
if (true) {
    console.log("e");
}
``` | c<br>d<br>e |
| (c) | ```javascript
if (15 % 4 == 3 && 2 * 2 > 3) {
    console.log("f");
}
if (true || false) {
    console.log("g");
}
if (! false && 11 % 3 >= 3) {
    console.log("h");
}
``` | f<br>g |

You may open up your Visual Studio Code (VSC) and write your codes there to complete the remaining questions.

7) Write a program to implement the following algorithm:

```
Step 1: declare a variable x and assign 20 to it
Step 2: declare a variable y and assign 5 to it
Step 3: compute the product of x and y, store it in
        variable z
Step 4: display the value of x, y and z
```

Sample output:
```
x    : 20
y    : 5
z    : 100
```

8a)   Write a program that prompts the user for his name and displays a personalized message to the user as shown below:

Program output:

```
Enter your name: Jes
Jes loves Programming!
```

8b)   Continue to prompt the user for his favourite color and display the next message to the user as shown below:

Program output:

```
Enter your favourite color: White
Jes loves Programming & white color!
```

9)   Write a program that converts Fahrenheit to Celsius. The formula for the conversion is as follows:

Celsius = 5/9 * (Fahrenheit - 32)

Your program reads a Fahrenheit degree from the console using the readline-sync function, then converts it to Celsius and displays the result in the console.

Here are steps involved:
a)   Prompt the user to enter the temperature in Fahrenheit.
b)   Compute the temperature in Celsius. Remember to apply the appropriate type casting for the conversion formula.
c)   Display the message "The current room temperature is ___ degrees Celsius." if the temperature in Celsius is between 20 to 25 (inclusive).
d)   You may either use the test cases below to test your program or create your own.

Fahrenheit	67.82	68	75	77	77.18
Celsius	19.9	20	24	25	25.1
Message displayed?	No	Yes	Yes	Yes	No

Program output: (text in **bold** denotes user's input)

```
Enter Temperature in Fahrenheit: 75
The current room temperature is 24 degrees Celsius.
```

(Extra note: You may use .toFixed(x) to print up to x number of decimal places. For example console.log(weight.toFixed(2)) will print weight up to 2 decimal places.)

10) Write a program that prompts the user for two integers. The 2 integers are added and the result is displayed. Your program should also be able to determine if the 1st integer is divisible by the 2nd integer.

Program output: (text in **bold** denotes user's input)

```
Enter first number: 21
Enter second number: 7

Here are the results…

21 + 7 = 28
21 divisible by 7? true
```

11) A year is a leap year if it is divisible by 4 but not by 100, or it is divisible by 400.

In other words, a leap year can be evaluated using the boolean expression:

((divisible by 4) **and** (not divisible by 100) **)** **or** (divisible by 400)

Write a program that does the following:

a) Declare integer variables *year1* and *year2* and assign 1996 and 1900 to the 2 variables respectively.

b) Declare a boolean variable *isLeapYear*.

c) Evaluate whether *year1* is a leap year and assign the boolean result to *isLeapYear*.

d) Display the result for *year1.*

e) Repeat the previous 2 steps for *year2.*

Program output:

```
1996 is a leap year? true
1900 is a leap year? false
```

April 2023

12. Company X revises the increment to the salary of a staff based on the following criteria. For example, if the salary is less than $1000, the employee would get an increment of 20%.
You may assume that salary is always an integer number.

Salary	Increment
Less than $1000	20%
Less than $2000	15%
$2000 or more	10%

Write a program that does the following:

a) Prompts the user for the name of the employee.

b) Prompts the user for the current salary.

c) Calculate the new salary.

d) Display the current salary, increment and new salary in a tabular format as shown in the output sample below.

e) Test your codes for all possible cases e.g salary $600, $1000, $1500, $2000 etc…You may want to test for non numeric input, special characters (e.g $,% etc) and negative numeric.

Program output: (text in **bold** denotes user's input)

```
Welcome to this apps for computing new salary.
Please enter your name : IronMan


Hello IronMan!


Please enter your current salary : $15000
Here's the result…
Current Salary        Increment          New Salary
$15000                $1500              $16500
```

[Optional Questions]

13. Write a program that computes distance between 2 coordinates.

THE DISTANCE FORMULA

$$d = \sqrt{\left(x_2 - x_1\right)^2 + \left(y_2 - y_1\right)^2}$$

Program output:

```
Enter X1: 25
Enter Y1: 15
Enter X2: 35
Enter Y2: 10

The distance between (25,15) and (35,10) is 11.1803.
```

14. Write a program to find the third angle (in degree) of a triangle if two angles are given.

Program output:

```
First Angle:  33
Second Angle:  56

The third angle is 91 degrees.
```

15. Write a program to read an amount of money (integer value) and break the amount into smallest possible number of bank notes. *Assume that $1 notes still exist today*.

Program output:

```
Enter Amount ($): 3378

3 Note(s) of 1000.00
3 Note(s) of 100.00
1 Note(s) of 50.00
2 Note(s) of 10.00
1 Note(s) of 5.00
1 Note(s) of 2.00
1 Note(s) of 1.00
```

-- End --