

## SCHOOL OF COMPUTING

### ST0523 Fundamentals of Programming

# Practical 3a: Selection (if ... else & switch)

#### What you will learn / do in this lab

- Use if ... else statements
- Use switch statements

- 1) Identify and fix the errors in the following code segment:

```
var isWalking = true;

if (isWalking = true) {
    console.log("Walking");
} else (isWalking = false) {
    console.log("Not walking");
}
```

- 2) What is the output of the following statements?

	Program	Output
(a)	<pre>var a = 4, b = 1, c = 5; a += b; if (a % c == 0) {     console.log("Hello"); } else if (b &lt; c) {     console.log("Monkey"); } else {     console.log("Zoo"); } console.log("Lion");</pre>	
(b)	<pre>var d = true, e = 0, f = 2; d = false; if (d) {     if (f &gt; e) {         console.log("Zebra");     } else {         console.log("Kangaroo");     } } else {     if (e++ &gt; f) {         console.log("Tiger");     } else {         console.log("Giraffe");     }      console.log("Liger"); }</pre>	

(c)	<pre>var g = 3, h = 1; if (h++ + ++h &gt;= ++g)     console.log("Red"); console.log("Yeet");</pre>	
(d)	<pre>var v = 1, w = 2;  switch (v) {     case 1: w += v;             break;     case 2: w -= v;             break; } console.log ('Value of w is ' + w);</pre>	
(e)	<pre>var x = 1;  switch (x) {     case 1: x += 2;      case 2: x = 5;             break;     case 3: x = 2;             break;     case 5: x -= 2;             break; } console.log ('Value of x is ' + x);</pre>	
(f)	<pre>var z = '3';  switch (z) {     case 1: z += 2;             break;     case 2: z = 5;     case 3: z = 2;      case 4: z *= 2;             break;     default: z += 3; } console.log ('Value of z is ' + z);</pre>	

(g)	<pre> /* isNaN() function can be used to test if a number is not-a-numeric.  E.g isNaN(5) will be false E.g isNaN('FOP') will be true  */ var rank = 1; var ranktxt = "Captain";  if (isNaN(ranktxt))     console.log('Rank is : ' + ranktxt) else     console.log('Rank is : ' + rank); </pre>	
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**You may open up your Visual Studio Code (VSC) and work from there for the remaining questions.**

- 3a) Write a program that will take in 2 numeric values and display the bigger of the 2 numbers as shown below. The program should also display relevant message when the 2 numbers are equal.

Check for **invalid data entry** ie validation should be coded. For e.g input should not allow alphabets or special characters & %, < > etc. You may design your own display messages.

Have you tested your program thoroughly? You should test using all possible both valid and invalid input data. Below are some sample testings:

Sample output:

```

Please enter 1st number: 7
Please enter 2nd number: $
Sorry wrong input. Please try again. Good bye!

```

Sample output:

```

Please enter 1st number: 12
Please enter 2nd number: 7

1st number is bigger

```

- b) Before you run your program, use Table 3.1 to draft all possible test cases to test your program. If your test cases are not comprehensive enough, there may still be bugs in your program. Testing **MUST be VERY** thorough in programming. Invest time to draft out good test cases.

**Table 3.1 Test Cases for Testing**

Test Cases	Input 1st number	Input 2nd number	What to test?	Expected Results
1	x	30	Non numeric 1 <sup>st</sup> number	Error message, program exit
2	:			
3	:			
4				
5				
:				
:				

- 4a) The following table illustrates the cutoff scores for the various academic grades in SP. Write a program **Grade** that will prompt the student for his score and your program should display his grade. You should include data validation in your codes.

score	grade
80 and above	A
70 to less than 80	B
60 to less than 70	C
50 to less than 60	D
Less than 50	F

Sample program output:

```
Please enter score: 73
Your grade is B
```

- 4b) Create a test plan indicating all possible test cases and the expected results.
- 5) Company X revises the increment to the salary of a staff based on the following criteria. For example, if a staff has worked for less than 10 years and is earning a salary of \$1999, he would get an increment of \$200.

Years	Salary	Increment
Less than 10	Less than \$1000	\$100
	\$1000 or less than \$2000	\$200
	\$2000 or more	\$300

- a) Write a program ***IncrementCalculator*** that will prompt for 2 **integer** values which represent years of service and salary of a staff. The program will then display the increment of the staff. You are to implement the logic using **if** statements.
- Program must provide data validation
  - You may design your own display messages
  - Test all possible cases.

Sample output:

```
Please enter your year(s) of service: x
Please enter your salary: 2000
Sorry invalid input(s). Please try again. Good bye!
```

Sample output:

```
Please enter your year(s) of service: 0
Please enter your salary: 1500
Sorry invalid input(s). Please try again. Good bye!
```

Sample output:

```
Please enter your year(s) of service: 5
Please enter your salary: a
Sorry invalid input(s). Please try again. Good bye!
```

Sample output:

```
Please enter your year(s) of service: -6
Please enter your salary: 350
Sorry invalid input(s). Please try again. Good bye!
```

Sample output:

```
Please enter your year(s) of service: 10
Please enter your salary: 350
Sorry invalid input(s). Please try again. Good bye!
```

Sample output:

```
Please enter your year(s) of service: 7
Please enter your salary: 800
Congratulations, your increment is : $100
```

Sample output:

```
Please enter your year(s) of service: 9
Please enter your salary: 7500
Your increment is $300
```

- b) Amend the program to cater for years of service 10 and above as shown in the following table.

Years	Salary	Increment
Less than 10	Less than \$1000	\$100
	\$1000 or less than \$2000	\$200
	\$2000 or more	\$300
10 or more	Less than \$1000	\$200
	\$1000 or less than \$2000	\$300
	\$2000 or more	\$400

- c) Use Table 5.1 to plan all possible test cases to test your program. If the test cases are not comprehensive enough, you may not be able to flag out bugs in the program. Testing **MUST be VERY** thorough in programming. Invest time to draft out good test cases.

**Table 5.1 Test Cases Testing**

Test Cases	Input Years	Input Salary	What to test?	Expected Results
1	z	3000	Invalid years	Error message, program exit
2				
3				
4				
5				
:				
:				

- 6) Write an *IncomeTax* program to calculate the tax based on the information shown below.

Status	Annual Income	Tax
C ( citizen )	Less than \$10000	\$100
	\$10000 to \$25000	5% of the Annual Income
	Beyond \$25000	15% of the Annual Income
F ( foreigner )	Less than \$8000	\$150
	\$8000 to \$15000	10% of the Annual Income
	Beyond \$15000	20% of the Annual Income

**Notes :**

- Test for all possible income levels especially the borderline ones e.g \$1000, \$2500 etc
- Accept only valid data ie program should not accept negative income, 0, non numeric characters such as alphabets, \$, & etc
- You should validate status to accept only 'C', 'F', 'c' or 'f', all other characters should **NOT** be allowed.
- You may include additional data validation to challenge yourself!
- Prepare a set of Test cases for thorough testing.

**Sample output:**

```
Please enter C for Citizen or F for Foreigner : R
Please enter your annual income: 8000
Sorry wrong input. Please try again. Good bye!
```

**Sample output:**

```
Please enter C for Citizen or F for Foreigner: &
Please enter your annual income: 8000
Sorry wrong input. Please try again. Good bye!
```

**Sample output:**

```
Please enter C for Citizen or F for Foreigner: C
Please enter your annual income: 8000
Tax computed for Citizen status for $8000 is $100.
```

**HINT :** Refer to Annex A for hints if you need help.



- 7) Write a program ***CheckNumber*** that prompts the user to enter an integer and checks whether the number is divisible by both 5 and 6, either or just one of them.

Where appropriate, you may include data validation in your program.  
Prepare a set of Test cases for thorough testing.

Sample output:

```
Enter an integer: 10
10 is divisible by 5 or 6, but not both.

Enter an integer: 30
30 is divisible by both 5 and 6.

Enter an integer: 27
27 is not divisible by either 5 or 6.
```

- 8) The following table shows the prize money for the SP Idol contestants.

Rank	Prize Money (\$)
1	1000
2	800
3	700
4	400
5	300
Others	20

Write a program ***PrizeMoney*** that will prompt for the rank of the contestant and your program should display his prize money. **You are to implement the logic using *switch* statements.**

Prepare a set of Test cases for thorough testing.

Sample output:

```
Please enter your rank: 3
Your prize money is $700.
```

**[Optional Questions]**

- 9) A bicycle rental company “Speed Wheels” charges the rental according to the type of bicycle customers rent (1: single seater, 2: double seater) and the number of hours rented.

There will be a 30% discount if the customer rented the bicycle for more than or equals to 3 hours. The hourly rental rate for a single seater bicycle is \$5.5 and the rental rate for a double seater bicycle is \$7.8.

You are required to :

- Write a rental calculator to compute the rental fee for a customer of a given bicycle type and number of hours rented.
- You may include data validation where necessary.
- Prepare a comprehensive Test plan to test all possible scenario.

Sample outputs :

```
Enter bicycle type:
(1) Single Seater   (2) Double Seater
>> 1
Enter number of hours rented: 2
Total Rental Fee: $11.0
```

```
Enter bicycle type:
(2) Single Seater   (2) Double Seater
>> 1
Enter number of hours rented: 5
Total Rental Fee: $19.25
```

## ANNEX A

- 6) The following provides breakdown steps to help code/manage the complex problem.

Complete the *IncomeTax* program so that it is capable of calculating the tax based on status.

```
var annualIncome = 100000, tax = 0;
var status = "F";

//missing codes
```

- a) Display the status according to the user input. You should validate status to only allow 'C' or 'F' to be entered or the lower caps ie 'c' or 'f'

Sample output:

```
Please enter C for Citizen or F for Foreigner: R
Sorry wrong input. Please try again. Good bye!
```

Sample output:

```
Please enter C for Citizen or F for Foreigner: C
Your status is Citizen. Please proceed.
```

- b) Amend the program to write the codes to compute the tax based on the following criteria specified in the table below. You should make use of the variables declared in the program.

**Notes :**

- i) Only Citizen needs to pay income tax. Foreigners are exempted.
- ii) Test for all possible income levels especially the borderline ones e.g \$1000, \$2500
- iii) Accept only valid data ie programm should not accept negative income, 0, non numeric characters such as alphabets, \$, & etc

Status	Annual Income	Tax
C ( citizen )	Less than \$10000	\$100
	\$10000 to \$25000	5% of the Annual Income
	Beyond \$25000	15% of the Annual Income
F ( foreigner )	~ Tax exempted ~	0

Sample output:

```
Please enter C for Citizen or F for Foreigner: C
Your status is Citizen. Please proceed.

Please enter your annual income: 8000
Tax computed for Citizen status for $8000 is $100.
```

Sample output:

```
Please enter C for Citizen or F for Foreigner: F
You are exempted from tax.
```

- c) Amend the program further to compute tax for foreigner using the criteria below. Tax details for citizen is the same as earlier part.

Status	Annual Income	Tax
C ( citizen )	Less than \$10000	\$100
	\$10000.00 to \$25000	5% of the Annual Income
	Beyond \$25000	15% of the Annual Income
F ( foreigner )	Less than \$8000	\$150
	\$8000.00 to \$15000	10% of the Annual Income
	Beyond \$15000	20% of the Annual Income