



Work Sheet 2 - Practical Exercise Questions on

Selection Flow Controls

Part I – General Questions

Instruction: all your programs must provide some mechanisms of validating appropriate input entries.

1. For each of the following problems write a C++ code to perform the required task.
 - a) Obtain two numbers from the keyboard, and determine and display the larger of the two numbers.
 - b) Check whether a number is prime or not
 - c) Find an average, maximum, minimum, and sum of three numbers given by user.
 - d) Determine whether the value of the variable count is greater than 10. If it is, print "Count is greater than 10."
2. Write a complete c ++ that asks the user to enter their day and month of birth. If the user's birth just says day is March 14th the program wishes the user a happy birthday, otherwise it just says Hello.
3. Write a program to check whether a number is divisible by 5 and 11 or not.
4. Write a program that tells whether a number entered from the keyboard is an even or an odd number. Write the program twice; using if/else and switch.
5. Write a program that tells whether a number entered from the keyboard is a positive number or a negative number or zero.
6. Write a complete c ++ program that does the following: - It asks the user to enter +ve even integer. The program reads the number entered by the user. If the value is illegal, the program should terminate, else it print out the square of the number.
7. Write a program that tells whether a character entered from the keyboard is in upper case or in lower case or digit or special character.
8. Write a program that classifies people as a child, young or old by accepting age and as well as determine if he/she can vote or not in election.



9. Write a program that allows the user to enter the grade scored in a programming class (0-100). If the user scored a 100 then notify the user that they got a perfect score.
10. Write a program to input week number and print week day.
11. Write a program to input month number and print number of days in that month.
12. Use either a switch statement or an if-else statement and display whether a vowel or a consonant character is entered by the user. The program should work for both lower case and upper case letters.
13. Write a program to check whether a triangle is valid or not when the user input
 - a) The three angles of the triangle.
 - b) All sides of a triangle.

Note: A triangle is valid if the sum of all the three angles is equal to 180 or/and the sum of any two sides are greater than the third side.

14. Write a program that requests the user to input his/her height in cms and weight in kg from the keyboard and tells the user whether he/she is balanced, underweight or overweight. A balanced person must weight in the range of $x + (10 \text{ percent of } x)$. Where x = height in cms.
15. Weekly salary of a person is determined by the following condition. If he works greater than 50hr, he receives 60birr per hour. Else he/she works less than or equal to 50hr, he receives 12 birr. Write a program which displays his weekly salary.
16. Write a C program to input basic salary of an employee and calculate its Gross salary according to following:
Basic Salary ≤ 10000 : HRA = 20%, DA = 80%
Basic Salary ≤ 20000 : HRA = 25%, DA = 90%
Basic Salary > 20000 : HRA = 30%, DA = 95%
17. Write a C program to input electricity unit charges and calculate total electricity bill according to the given condition:
For first 50 units Rs. 0.50/unit
For next 100 units Rs. 0.75/unit
For next 100 units Rs. 1.20/unit
For unit above 250 Rs. 1.50/unit
An additional surcharge of 20% is added to the bill



18. Write a program that implements the following algorithm

Step 1: Start

Step 2: Read the total hours the employee has worked, TotalHours

Step 3: Read the hourly rate of pay for the employee, HourlyRate

Step 4: Computer gross salary as follow

- $GrossSalary = TotalHours * HourlyRate$
- $Tax = GrossSalary * 0.1$
- $NetSalary = GrossSalary - Tax$

Step 5: Display NetSalary

Step 6: Stop

19. Write a program that converts a temperature given in Fahrenheit into Celsius and vice versa.

The program should distinguish temperature entered from the keyboard as in degree centigrade or as in degree Fahrenheit by the letters 'c/C' or 'f/F' that must be written in front of the numeric values of temperatures. *For example:-* If the user enters 10 c or 10 C, the program must understand that the input is in degree centigrade so it should change to degree Fahrenheit and must display the temperature as 50 f or 50 F.

20. Write a program that computes and displays the next date of a European calendar date entered from the keyboard. Your program must consider leap year condition, along with other conditions. *For example:-* The next date of 24/11/07 must be computed and displayed as 25/11/07.

21. Write a program that tells the number of days found in the months of a European calendar. Where the month and the year are to be entered from the keyboard. Your program must consider leap year condition along with other conditions.

22. A bank in your town updates its customers' accounts at the end of each month. The bank offers two types of accounts: savings and checking. Every customer must maintain a minimum balance. If a customer's balance falls below the minimum balance, there is a service charge of \$10.00 for savings accounts and \$25.00 for checking accounts. If the balance at the end of the month is at least the minimum balance, the account receives interest as follows: (a) Savings accounts receive 4% interest. (b) Checking accounts with balances of up to \$5,000 more than the minimum balance receive 3% interest; (c) otherwise, the interest is 5%. Write a program that reads a customer's account number, account type (S : for savings, and C: for checking), minimum balance that the account should maintain, current balance and find the interest that person can get.



23. A milk carton can hold 3.78 liters of milk. Each morning, a dairy farm ships cartons of milk to a local grocery store. The cost of producing one liter of milk is \$0.38, and the profit of each carton of milk is \$0.27. Write a program that prompts the user to enter the total amount of milk produced in the morning and (a) the number of milk cartons needed to hold mil; (b) the cost of producing milk; (c) the profit for producing milk.

24. Write a program that allow you to know if a given formula is a formula of a circle, triangle or rectangle.

25. Write a program that tells you Zodiac sign after you input your birth date and month,

Aries (March 21-April 19)

Taurus (April20-May 20)

Gemini (May 21-June20)

Cancer (June21-July22)

Leo (July 23 – August22)

Virgo (August23-September 22)

Libra (September 23- October 22)

Scorpio (October 23 – November21)

Sagittarius (November22-December 21)

Capricorn (December 22-January 19)

Aquarius (January 20-February 18)

Pisces (February 19-March 20)

26. Write a program that converts a mark of a course entered from the keyboard to its corresponding letter-grade based on the following scales.

Mark	>=90	>=80	>=75	>=60	>=55	>=45	>=30	< 30
Mark Grade	A+	A	B+	B	C+	C	D	F

27. Write a program that calculates and displays the income tax of a salary entered from the keyboard. Your program must calculate taxes according to the following rates:

Up to 200Br	0%
200Br – 600Br	10%
600Br – 1200Br	15%
1200Br – 2000Br	20%
2000Br – 3500Br	25%
3500Br & above	30%

For example: - The income tax of a gross salary of 900 Birr is 85 Birr, which is calculated as $(200*0\% + 400*10\% + 300*15\%)=85$ Birr.



Part II – Case Study

28. The sales manager at Warren Company wants a program that displays a price based on a product ID she enters. The valid product IDs and their corresponding prices are shown here. If the product ID is not valid, the program should display the “Invalid product ID” message.

Product ID	Price
1	50.55
2	12.35
5	11.46
7	11.46
9	12.35
11	11.46

29. A selection structure should display the message “Great score!” when a student’s test score is at least 90. When the test score is 70 through 89, the selection structure should display the message “Good score”. When the test score is 0 through 69, the selection structure should display the message “Retake the test”. For all other test scores, the selection structure should display the message “Invalid test score”. Write the appropriate C++ code using the more convenient form of selection statement.
30. Create a program that adds, subtracts, multiplies, or divides two integers. The program will need to get a letter (A for addition, S for subtraction, M for multiplication, or D for division) and two integers from the user. If the user enters an invalid letter, the program should not ask the user for the two integers. Instead, it should display an appropriate error message before the program ends. If the letter is A (or a), the program should calculate and display the sum of both integers. If the letter is S (or s), the program should display the difference between both integers. When calculating the difference, always subtract the smaller number from the larger one. If the letter is M (or m), the program should display the product of both integers. If the letter is D (or d), the program should divide both integers, always dividing the larger number by the smaller one.
31. Write a C++ program that accepts a character as input data and determines whether the character is an uppercase, lowercase letter, digits or special character. The program should display an appropriate message based in the input from the user. For example if the entered character is an uppercase letter, display the message “The character just entered is an uppercase letter”.



32. Mr. Kahsay Kidanu is the owner of KAKI Private Limited Company Sales Office, of an Ethiopian company that sells locally manufactured dry cargo body, heavy truck trailer fabrication dry land freight service and parts, assembled vehicles with the motto of quality customer service, and, export best quality organic coffee, sesame, pulses, grains and other oil seeds both domestically and abroad. He wants a program that read sales amount, compute and displays the amount of a salesperson's commission. If the sales are less than zero, the program should display the message "The sales cannot be less than 0." A commission of the salesperson based on the sales he/she made is given below:

Sales range	Commission
\$0 - 100,000	multiply the sales by 2%
\$100,001 – 400,000	multiply the sales over 100,000 by 5% and then add 2000 to the result
\$400,001 and over	multiply the sales over 400,000 by 10% and then add 17000 to the result

33. An employee is paid at a rate of \$16.78 per hour for the first 40 hours worked in a week. Any hours over that are paid at the overtime rate of one and- one-half times that. From the worker's gross pay, 6% is withheld for Social Security tax, 14% is withheld for federal income tax, 5% is withheld for state income tax, and \$10 per week is withheld for union dues. If the worker has three or more dependents, then an additional \$35 is withheld to cover the extra cost of health insurance beyond what the employer pays. Write a program that will read in the number of hours worked in a week and the number of dependents as input and will then output the worker's gross pay, each withholding amount, and the net take-home pay for the week.

34. As a part-time student, you took two courses last term. Write, run, and test a C++ program that calculates and displays your grade point average (GPA) for the term. Your program should prompt the user to enter the grade and credit hours for each course. This information should then be displayed with the lowest grade first, and the GPA for the term should be calculated and displayed. A warning message should be printed if the GPA is less than 2.0 and a congratulatory message if the GPA is 3.5 or above.



35. In structural engineering the three of the most commonly used beams are the I-beam, rectangular beam, and cylindrical beam, shown in Figures below. In determining the stress a given weight places on a symmetrical beam, an important design parameter is the beam's rectangular moment of inertia, I , which is typically given in units of in^4 . The computation of I depends on the beam's geometry, and for the three beam types shown, the values of I are calculated as follows:

$$\begin{array}{ll} \text{For an I-beam:} & I = \frac{BH^3 - bh^3}{12} \\ \text{For a rectangular beam:} & I = \frac{bh^3}{12} \\ \text{For a cylindrical beam:} & I = \frac{\pi r^4}{4}, \quad \text{where all measurements are in inches} \end{array}$$

Using this information, design an algorithm that prompts (ask) the user for the type of beam and the necessary data (based on the input), and then computes and displays the beam's rectangular moment of inertia.

36. The **Harris–Benedict** equation estimates the number of calories your body needs to maintain your weight if you do no exercise. This is called your basal metabolic rate, or BmR.

- The formula for the calories needed for a woman to maintain her weight is:

$$\text{BmR} = 655 + (4.3 \times \text{weight in pounds}) + (4.7 \times \text{height in inches}) - (4.7 \times \text{age in years})$$

- The formula for the calories needed for a man to maintain his weight is:

$$\text{BmR} = 66 + (6.3 \times \text{weight in pounds}) + (12.9 \times \text{height in inches}) - (6.8 \times \text{age in years})$$

A typical chocolate bar will contain around 230 calories. Write a program that allows the user to input his or her weight in pounds, height in inches, age in years, and the character M for male and F for female. The program should then output the number of chocolate bars that should be consumed to maintain one's weight for the appropriate gender of specified *age*, *weight*, and *height*.

37. The payroll clerk at Techno Company wants a program that calculates and displays an employee's gross pay and net pay. There are two types of employee in the company; salaried employee and hourly waged employee. The clerk will enter the hours worked (which is never over 40), hourly pay rate, federal withholding tax (FWT), Social Security and Medicare (FICA) tax, state income tax rate. Write algorithms and draw a flow chart for this problem. And also test the correctness of your algorithm using your own set of data.



38. The accountant at Typing Haven wants a program that will help her prepare a customer's bill. She will enter the number of typed envelopes and the number of typed pages, as well as the charge per typed envelope and the charge per typed page. The program should calculate and display the amount due for the envelopes, the amount due for the pages, and the total amount due. Design algorithms and draw a flow chart for this problem. And also test the correctness of your algorithm using your own set of data.
39. The Paper-Tree store wants a program that calculates and displays the number of single rolls of wallpaper needed to cover a room. The salesclerk will provide the room's length, width, and ceiling height, in feet. He or she also will provide the number of square feet a single roll will cover. Design algorithms and draw a flow chart for this problem. And also test the correctness of your algorithm using your own set of data.
40. Rent A Van wants a program that calculates the total cost of renting a van. Customers pay a base fee plus a charge per mile driven. Write algorithms and draw a flow chart for this problem. And also test the correctness of your algorithm using your own set of data.
41. Kaldis Coffee sells individual hot/cold cups and dessert plates for party events they prepared. The manager wants a program that allows her to enter the price of a cup and dessert plate, as well as the number of cups and dessert plates purchased, and the sales tax rate. The program should calculate and display the total cost of the purchase and the profit. Plan algorithms using both pseudo code and draw a flow chart for this problem. And also test the correctness of your algorithm using your own set of data. (Hint: - total purchase cost = [(total cost of cups + total cost of plates) * sales tax rate] + [(total cost of cups + total cost of plates).
42. Jenna Williams is paid based on an annual salary rather than an hourly wage. She wants a program that calculates the amount of her gross pay for each pay period. Write algorithms and draw a flow chart for this problem. And also test the correctness of your algorithm using your own set of data.