1. **Introduction to Programming: Algorithms & Flow charts (10 examples each)**

1. Write a program that asks the user to enter the width and length of a room. Once the values have been read, your program should compute and display the area of the room.

The length and the width will be entered as floating point numbers. Include units in your prompt and output message; either feet or meters, depending on which unit you are

more comfortable working with. (M & K -Done)

2. The program that you create for this exercise will begin by reading the cost of a meal ordered at a restaurant from the user. Then your program will compute the tax and tip for the meal. Use your local tax rate when computing the amount of tax owing. Compute the tip as 18 percent of the meal amount (without the tax). The output from your program should include the tax amount, the tip amount, and the grand total for the meal including both the tax and the tip. Format the output so that all the values are displayed using two decimal places. (Edom -Done)

3. Create a program that reads two integers, a and b, from the user. Your program should compute and display:

• The sum of a and b

• The difference when b is subtracted from a

• The product of a and b

• The quotient when a is divided by b

• The remainder when a is divided by b

4. In the United States, fuel efficiency for vehicles is normally expressed in miles-pergallon (MPG). In Canada, fuel efficiency is normally expressed in liters-per-hundred kilometers (L/100 km). Then create a program that reads a value from the user in American units and displays the equivalent fuel efficiency in Canadian units.

5. Many people think about their height in feet and inches, even in some countries that primarily use the metric system. Write a program that reads a number of feet from the user, followed by a number of inches. Once these values are read, your program should compute and display the equivalent number of centimeters.

6. The area of a triangle can be computed using the following formula, where b is the length of the base of the triangle, and h is its height: area = (b × h )/2 Write a program that allows the user to enter values for b and h. The program should then compute and display the area of a triangle with base length b and height h.

7. Write a program that computes the body mass index (BMI) of an individual. Your program should begin by reading a height and weight from the user. Then it should use one of the following two formulas to compute the BMI before displaying it. If you read the height in inches and the weight in pounds then body mass index is computed using the following formula:

BMI =(weight /(height × height)) × 703.

If you read the height in meters and the weight in kilograms then body mass index is computed using this slightly simpler formula:

BMI = weight /( height × height)

8. Develop a program that reads a four-digit integer from the user and displays the sum of the digits in the number. For example, if the user enters 3141 then your program should display 3+1+4+1=9.

9. A bakery sells loaves of bread for $3.49 each. Day old bread is discounted by 60 percent. Write a program that begins by reading the number of loaves of day old bread being purchased from the user. Then your program should display the regular price for the bread, the discount because it is a day old, and the total price. All of the values should be displayed using two decimal places, and the decimal points in all of the numbers should be aligned when reasonable values are entered by the user.

10. In this exercise you will create a program that reads a pressure from the user in kilopascals. Once the pressure has been read your program should report the equivalent pressure in pounds per square inch, millimeters of mercury and atmospheres. Use your research skills to determine the conversion factors between these units.

1. **If statement: Algorithms & Flow charts (10 examples each)**

1. Euclid was a Greek mathematician who lived approximately 2,300 years ago. His algorithm for computing the greatest common divisor of two positive integers, a and b,

is both efficient and recursive. It is outlined below:

If b is 0 then

Return a

Else

Set c equal to the remainder when a is divided by b

Return the greatest common divisor of b and c

Write a program that implements Euclid’s algorithm and uses it to determine the greatest common divisor of two integers entered by the user.

Use the below sections for preparing the tutorial. (Jessica -Done)

2. Write a program that reads an integer from the user. Then your program should display a message indicating whether the integer is even or odd.

3. It is commonly said that one human year is equivalent to 7 dog years. However, this simple conversion fails to recognize that dogs reach adulthood in approximately two years. As a result, some people believe that it is better to count each of the first two human years as 10.5 dog years, and then count each additional human year as 4 dog years. Write a program that implements the conversion from human years to dog years described in the previous paragraph. Ensure that your program works correctly for conversions of less than two human years and for conversions of two or more human years. Your program should display an appropriate error message if the user enters a negative number.

4. Write a program that determines the name of a shape from its number of sides. Read the number of sides from the user and then report the appropriate name as part of a meaningful message. Your program should support shapes with anywhere from 3 up to (and including) 10 sides. If a number of sides outside of this range is entered then your program should display an appropriate error message.

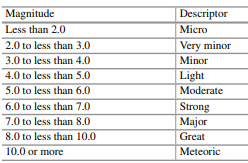
5. The following table lists the sound level in decibels for several common noises.

|  |  |
| --- | --- |
| Noise | Decibel level |
| Jackhammer | 130 |
| Gas lawnmower | 106 |
| Alarm Clock | 70 |
| Quiet Room | 40 |

Write a program that reads a sound level in decibels from the user. If the user enters a decibel level that matches one of the noises in the table then your program should display a message containing only that noise. If the user enters a number of decibels between the noises listed then your program should display a message indicating which noises the level is between. Ensure that your program also generates reasonable output for a value smaller than the quietest noise in the table, and for a value larger than the loudest noise in the table.

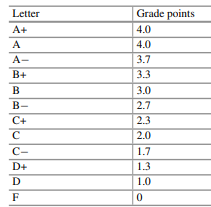
6. A triangle can be classified based on the lengths of its sides as equilateral, isosceles or scalene. All 3 sides of an equilateral triangle have the same length. An isosceles triangle has two sides that are the same length, and a third side that is a different length. If all of the sides have different lengths then the triangle is scalene. Write a program that reads the lengths of 3 sides of a triangle from the user. Display a message indicating the type of the triangle.

7. The following table contains earthquake magnitude ranges on the Richter scale and their descriptors:



Write a program that reads a magnitude from the user and displays the appropriate descriptor as part of a meaningful message. For example, if the user enters 5.5 then your program should indicate that a magnitude 5.5 earthquake is considered to be a moderate earthquake.

8. At a particular university, letter grades are mapped to grade points in the following manner:



Write a program that begins by reading a letter grade from the user. Then your program should compute and display the equivalent number of grade points. Ensure that your program generates an appropriate error message if the user enters an invalid letter grade.

9. A particular cell phone plan includes 50 minutes of air time and 50 text messages for $15.00 a month. Each additional minute of air time costs $0.25, while additional text messages cost $0.15 each. All cell phone bills include an additional charge of $0.44 to support 911 call centers, and the entire bill (including the 911 charge) is subject to 5 percent sales tax. Write a program that reads the number of minutes and text messages used in a month from the user. Display the base charge, additional minutes charge (if any), additional text message charge (if any), the 911 fee, tax and total bill amount. Only display the additional minute and text message charges if the user incurred costs in these categories. Ensure that all of the charges are displayed using 2 decimal places.

10. A particular zoo determines the price of admission based on the age of the guest. Guests 2 years of age and less are admitted without charge. Children between 3 and 12 years of age cost $14.00. Seniors aged 65 years and over cost $18.00. Admission for all other guests is $23.00. Create a program that begins by reading the ages of all of the guests in a group from the user, with one age entered on each line. The user will enter a blank line to indicate that there are no more guests in the group. Then your program should display the admission cost for the group with an appropriate message. The cost should be displayed using two decimal places.

1. **Loops: Algorithms & Flow chart**

Write a program that displays a temperature conversion table for degrees Celsius and degrees Fahrenheit. The table should include rows for all temperatures between 0 and 100 degrees Celsius that are multiples of 10 degrees Celsius. Include appropriate headings on your columns. The formula for converting between degrees Celsius and degrees Fahrenheit can be found on the internet.

1. A string is a palindrome if it is identical forward and backward. For example “anna”, “civic”, “level” and “hannah” are all examples of palindromic words. Write a program that reads a string from the user and uses a loop to determines whether or not it is a palindrome. Display the result, including a meaningful output message.
2. In this exercise you will create a program that displays a multiplication table that shows the products of all combinations of integers from 1 times 1 up to and including 10 times 10. Your multiplication table should include a row of labels across the top of it containing the numbers 1 through 10. It should also include labels down the left side consisting of the numbers 1 through 10.
3. The greatest common divisor of two positive integers, n and m, is the largest number, d, which divides evenly into both n and m. There are several algorithms that can be used to solve this problem, including: Initialize d to the smaller of m and n. While d does not evenly divide m or d does not evenly divide n do Decrease the value of d by 1 Report d as the greatest common divisor of n and m Write a program that reads two positive integers from the user and uses this algorithm to determine and report their greatest common divisor.
4. The prime factorization of an integer, n, can be determined using the following steps: Initialize factor to two While factor is less than or equal to n do If n is evenly divisible by factor then Conclude that factor is a factor of n Divide n by factor using integer division Else Increase factor by one Write a program that reads an integer from the user. If the value entered by the user is less than 2 then your program should display an appropriate error message. Otherwise your program should display the prime numbers that can be multiplied together to compute n, with one factor appearing on each line.
5. Write a program that converts a decimal (base 10) number to binary (base 2). Read the decimal number from the user as an integer and then use the division algorithm shown below to perform the conversion. When the algorithm completes, result contains the binary representation of the number. Display the result, along with an appropriate message. Let result be an empty string Let q represent the number to convert repeat Set r equal to the remainder when q is divided by 2 Convert r to a string and add it to the beginning of result Divide q by 2, discarding any remainder, and store the result back into q until q is 0