Introduction to problem solving

Exercise:

1. **Write pseudocode that reads two numbers and divide one by another and display the quotient.**

```
INPUT first number
INPUT second number
COMPUTE quotient = first number // second number (prints only integer, discards decimal)
PRINT quotient
```

2. **Two friends decide who gets the last slice of a cake by flipping a coin five times. The first person to win three flips wins the cake. An input of 1 means player 1 wins a flip, and a 2 means player 2 wins a flip. Design an algorithm to determine who takes the cake?**

```
Step 1: Start
Step 2: i = 1, player1 = 0, player2 = 0
Step 3: while i <= 5 do
            input coin
            if coin = 1 then
                  player1 = player1 + 1
            else
                  player2 = player2 + 1
            end if
            if player1 = 3 then
                  print 'player 1 won the last slice.'
                  break
            end if
            if player2 = 3 then
                  print 'player 2 won the last slice.'
                  break
            end if
      i=i+1
end while
Step 4: Stop
```

3. **Write the pseudocode to print all multiples of 5 between 10 and 25.**

```
for i = 10 to 25 do
      if i % 5= = 0 then
            print i
      end if
end loop
```

4. **Give an example of a loop that is to be executed a certain number of times.**

```
for i = 1 to 5 do
      print i
end loop
```

5. **Suppose you are collecting money for something. You need `200 in all. You ask your parents, uncles and aunts as well as grandparents. Different people may give either ` 10, ` 20 or even ` 50. You will collect till the total becomes 200. Write the algorithm.**

```
Step 1: START
Step 2: TOTALMONEY = 0
Step 3: WHILE TOTALMONEY < 200 DO
            INPUT MONEY
            TOTALMONEY = TOTALMONEY + MONEY
    END WHILE
    Step 4: STOP
```

6. **Write the pseudocode to print the bill depending upon the price and quantity of an item. Also print Bill GST, which is the bill after adding 5% of tax in the total bill.**

```
INPUT QTY
INPUT PRICEPERITEM
COMPUTE BILL = QTY * PRICEPERITEM
PRINT BILL
COMPUTE TAX = BILL * (5 / 100)
COMPUTE GSTBILL = BILL + TAX
PRINT GSTBILL
```

7. **Write pseudocode that will perform the following: a) Read the marks of three subjects: Computer Science, Mathematics and Physics, out of 100 b) Calculate the aggregate marks c) Calculate the percentage of marks.**

```
INPUT CS, MATHS, PHY
COMPUTE TOT = CS + MATHS + PHY
COMPUTE PERCENTAGE = TOT / 3
PRINT TOT, PERCENTAGE
PRINT PERCENTAGE
```

8. **Write an algorithm that performs the following: Ask a user to enter a number. If the number is between 5 and 15, write the word GREEN. If the number is between 16 and 25, write the word BLUE. If the number is between 26 and 35, write the word ORANGE. If it is any other number, write that ALL COLOURS ARE BEAUTIFUL.**

```
Step 1: Start
Step 2: INPUT num
Step 3: if num >=5 AND  num <= 15 then
                print 'green'
        elif  num >= 16 AND  num < =25 then
                print 'blue'
        elif  num >= 26  AND  num <= 35 then
                print 'orange'
        else
                print 'all colors are beautiful.'
        end if
Step 4: Stop
```

9. **Write an algorithm that accepts four numbers as input and find the largest and smallest of them.**

```
Step 1:Start
Step 2:input a, b, c, d
Step 3:set min = a, max = a
Step 4: if b < min then
        min = b
end if
if c < min then
        min = c
end if
if d < min then
        min = d
end if
if b > max then
        max = b
end if
if c > max then
        max = c
end if
if d > max then
        max =d
end if
Step 5:print  min, max
Step 6:Stop
```

10. Write an algorithm to display the total water bill charges of the month depending upon the number of units consumed by the customer as per the following criteria:

- **for the first 100 units @ 5 per unit**
- **for next 150 units @ 10 per unit**
- **more than 250 units @ 20 per unit**
- **Also add meter charges of 75 per month to calculate the total water bill.**

```
Step 1: input units
Step 2: set bill = 0
Step 3: :if units < = 100
                bill = units * 5
        else  if units < = 150
                bill = units * 10
        else
                 bill = units * 20
    end if
     totalbill = bill + 75
Step 4: print totalbill
Step5: Stop
```

11. What are conditionals? When they are required in a program?

- In computer science, conditionals are features of a programming language, which perform different computations or actions depending on whether a programmer-specified Boolean condition evaluates to true or false.
- Selection of the statements is done for execution based on the condition.
- They are required in a program when we need to calculate a result on the basis of specified condition(s).

12. Write a pseudocode to calculate the factorial of a number

```
input number
set factorial = 1, i = 1
while i <= number do
        compute factorial = factorial * i
        i=i+1
end loop
print factorial
```

17. Following is an algorithm to classify numbers as “Single Digit”, “Double Digit” or “Big”. INPUT Number

```
Step 1:Start
Step 2:INPUT Number
Step 3:if Number <= 9
                "Single Digit"
        else if Number <= 99
                "Double Digit"
        else
                "Big"
Step 4: Stop
```

18. For some calculations, we want an algorithm that accepts only positive integers up to 100. Accept_1to100_Algo INPUT Number IF (0<= Number) AND (Number <= 100) ACCEPT Else REJECT a) On what values will this algorithm fail? b) Can you improve the algorithm?

```
input number
if (0<number) and (number<=100)
        accept
else
        reject
```

16. Draw a flowchart to check whether a given number is an Armstrong number. For example, 371 is an Armstrong number since 33 + 7**3 + 1**3 = 371. (153, 370, 371, 407)**