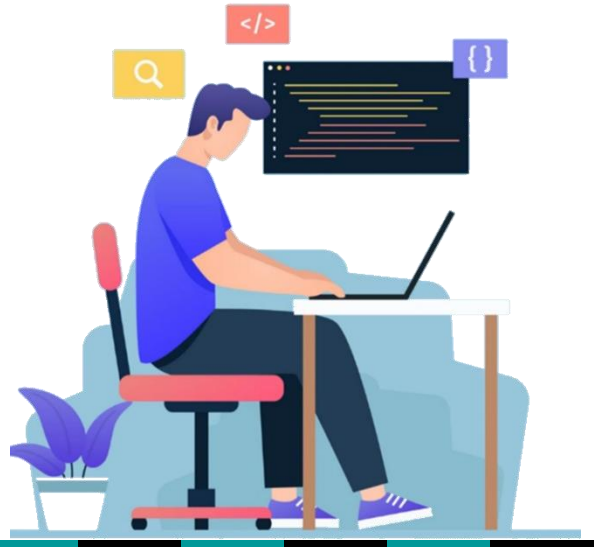
اصول و مبانی برنامه‌نویسی



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تمرینات: تبدیل الگوریتم به کد

تمرینات Loop

۱- چاپ مثلث وارونه

Step 1 - Take number of rows to be printed, n.
Step 2 - Make an iteration for n times
Step 3 - Print " " (space) for in decreasing order from 1 to n-1
Step 4 - Print "* " (start, space) in increasing order from 1 to I
Step 5 - Return

```
procedure upsidedown_triangle

   FOR I = 1 to N DO
      FOR J = 1 to N-I DO
         PRINT " "
      END FOR

      FOR J = 1 to I DO
         PRINT "* "
      END FOR
   END FOR

end procedure
```

۲- چاپ مثلث راست گوشه وارونه

```
* * * * *
* * * *
* * *
* *
*
```

Step 1 - Take number of rows to be printed, n.
Step 2 - Make outer iteration I from N to 1 times to print rows
Step 3 - Make inner iteration for J to I
Step 3 - Print "*" (star)
Step 4 - Print *NEWLINE* character after each inner iteration
Step 5 - Return

```
procedure topdownright_triangle

   FOR I = N to 1 DO
      FOR J = 1 to I DO
         PRINT "*"
      END FOR
      PRINT NEWLINE
   END FOR

end procedure
```

۳- چاپ مثلث فلوید (مثلث راست گوشه با اعداد طبیعی)

```
 1
 2  3
 4  5  6
 7  8  9 10
11 12 13 14 15
```

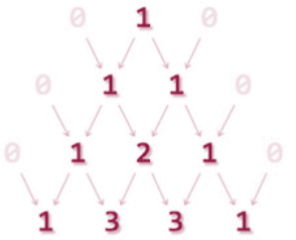
Step 1 - Take number of rows to be printed, n.
Step 2 - Make outer iteration I for n times to print rows
Step 3 - Make inner iteration for J to I
Step 3 - Print K
Step 4 - Increment K
Step 5 - Print *NEWLINE* character after each inner iteration
Step 6 - Return

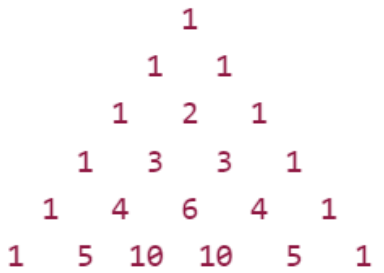
```
procedure floyds_triangle

   FOR I = 1 to N DO
      FOR J = 1 to I DO
         PRINT K
         INCREMENT K
      END FOR
      PRINT NEWLINE
   END FOR

end procedure
```

٤- چاپ مثلث پاسکال (کاربرد در مهندسی و محاسبات معادلات دو جمله ای)






```
START
  Step  1 - Take number of rows to be printed, n.
  Step  2 - Make outer iteration I for n times to print rows
  Step  3 - Make inner iteration for J to (N - 1)
  Step  4 - Print single blank space " "
  Step  5 - Close inner loop
  Step  6 - Make inner iteration for J to I
  Step  7 - Print nCr of I and J
  Step  8 - Close inner loop
  Step  9 - Print NEWLINE character after each inner iteration
  Step 10 - Return
STOP
```

```
procedure pascals_triangle

   FOR I = 0 to N DO
      FOR J = 0 to N-1 DO
         PRINT " "
      END FOR

      FOR J = 0 to I DO
         PRINT nCr(i,j)
      END FOR

      PRINT NEWLINE
   END FOR

end procedure
```

تمرینات List

۵- چاپ عناصر آرایه (معکوس)

```
9 8 7 6 5 4 3 2 1 0
```

```
START
   Step 1 → Take an array A and define its values
   Step 2 → Loop for each value of A in reverse order
   Step 3 → Display A[n] where n is the value of current iteration
STOP
```

```
procedure print_array(A)

   FOR from array_length(A) to 0
      DISPLAY A[n]
   END FOR

end procedure
```

٦- محاسبه میانگین عناصر آرایه

```
START
   Step 1 → Take an array A and define its values
   Step 2 → Loop for each value of A
   Step 3 → Add each element to 'sum' variable
   Step 4 → After loop finishes, divide sum with number of array elements
   Step 5 → Store that result to avg variable and display.
STOP
```

```
procedure avg_array(A)

   Declare sum as integer
   FOR EACH value in A DO
      sum ← sum + A[n]
   END FOR
   avg ← sum / size_of_array
   Display avg

end procedure
```

۷- یافتن عنصر ماکزیمم آرایه

```
START
   Step 1 → Take an array A and define its values
   Step 2 → Declare largest as integer
   Step 3 → Set 'largest' to 0
   Step 4 → Loop for each value of A
   Step 5 → If A[n] > largest, Assign A[n] to largest
   Step 6 → After loop finishes, Display largest as largest element of array
STOP
```

```
procedure largest_array(A)

   Declare largest as integer
   Set largest to 0
   FOR EACH value in A DO
      IF A[n] is greater than largest THEN
         largest ← A[n]
      ENDIF
   END FOR
   Display largest

end procedure
```

۸- یافتن دومین عنصر ماکزیمم آرایه

```
START
   Step 1 → Take an array A and define its values
   Step 2 → Declare largest and second as integer
   Step 3 → Assign first two values of array A to largest and second
   Step 4 → Assign the large value to largest and second largest to second
   Step 5 → Iterate for Array A
   Step 6 → If A[n] > largest, Assign largest.value to second and Assign A[n] to largest
   Step 7 → Else If A[n] > second, Assign A[n] to second
   Step 8 → Loop Terminates
   Step 9 → Display largest and second
STOP
```

```
procedure largest_array(A)

   Declare largest and second as integer

   IF A[0] is greater than A[1] THEN
      largest ← A[0]
      second ← A[1]
   ELSE
      largest ← A[1]
      second ← A[0]
   ENDIF

   FOR EACH value in A DO
      IF A[n] is greater than largest THEN
         second ← largest
         largest ← A[n]
      ELSE IF second is less than A[n] THEN
         second ← A[n]
      END IF

   END FOR
   Display largest and second

end procedure
```

۹- پیدا کردن عنصر میانه یک آرایه

Mean index in a sorted list = (len + 1)/2 - 1


```
START
   Step 1 → Take an integer list A of n values
   Step 2 → Arrange the values in the list in some order, say ascending
   Step 3 → Calculate the middle of list → (n + 1) / 2
   Step 4 → Display the middle value as median
STOP
```

```
procedure median()

   Array A
   Size  N
   SORT(A)
   middle = (N + 1) / 2
   DISPLAY A[middle] as median

end procedure
```

۱۰- الگوریتم کپی معکوس آرایه

```
START
   Step 1 → Take two arrays A, B
   Step 2 → Store values in A
   Step 3 → Set count to sizeof(A)
   Step 4 → Loop for each value of A
   Step 5 → Copy A[loop] to B[count]
   Step 6 → Decrement count
   Step 7 → Display B
STOP
```

```
original -> copied
    1         0
    2         9
    3         8
    4         7
    5         6
    6         5
    7         4
    8         3
    9         2
    0         1
```

```
procedure reversecopy_array(A, B)

   SET index to 1
   Set count to sizeof(A)
   FOR EACH value in A DO
      B[count] = A[index]
      INCREMENT index
      DECREMENT count
   END FOR
   DISPLAY B

end procedure
```

تمرینات String

۱۱- یافتن تعداد حروف صدادار در string

حرفو صدادار: a , e , o , I , u

```
'TajMahal' contains 3 vowels and 5 consonants.
```

۱۲- Swap کردن دو string

```
Value of s1 - TajMahal
Value of s2 - Dazzling
```

```
Value of s1 - Dazzling
Value of s2 - TajMahal
```

۱۳- تشخیص آناگرام بودن دو string (دو رشته متفاوت با طول و کاراکترهای یکسان)

```
char s1[] = "recitals";
char s2[] = "articles";
```

```
printf("Strings are anagrams! \n");
```

۱۴- معکوس کردن ترتیب کلمات یک string

```
Taj Mahal is one of the seven wonders of the world
```

```
world the of wonders seven the of one is Mahal Taj
```

۱۵- معکوس کردن کاراکترهای هر کلمه در یک string

```
Taj Mahal is one of the seven wonders of the world
```

```
jaT lahaM si eno fo eht neves srednow fo eht dlrow
```

اصول و مبانی برنامه‌نویسی

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