



Academic year: 2023-2024

Level: 1st year “Computer Science & Mathematics”

Module: Algorithmic and Data Structures 2

TD n°1
Solution

Pedagogic objectives

- Understand the usefulness of custom types and manipulate them to solve different problems.

Exercise n°1:

Type TIME= *Record*

Hour, Minute, Sec: integer;

EndRecord

Algorithm Sum_Time ;

Variables X: integer;

T, T1, T2: TIME;

Begin

Write (“ Enter the T1 and T2 durations in hours, minutes and seconds ”)

Read (T1.Hour);

Read (T1.Minute);

Read (T1.Sec);

Read (T2.Hour);

Read (T2.Minute);

Read (T2.Sec);

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X←T1.Sec+ T2.Sec;
T.Sec←X mod 60;
T.Minute ← X div 60;
X←T.Minute+T1.Minute+ T2.Minute;
T.Minute ← X mod 60;
T.Hour ← X div 60+ T1.Hour+ T2.Hour;
Write ( " The result of the sum of two durations T1 and T2 is ", T.Hour , " Hour ", T.Minute , "
Minute ", T.Sec , " Second " );
END

```

Algorithm Transformation;

Variables T: TIME;

R: integer;

Begin

Write (" Enter the duration T in hours, minutes and seconds ")

Read (T.Hour);

Read (T.Minute);

Read (T.Sec);

R←T.Sec +(60* T.Minute)+(3600* T.Hour);

Write (" The duration in seconds is ", R);

END

Exercise n°2:

Type Complex = **Record**

Preel : real;

Pimag : real;

EndRecord

Algorithm Complex_Calculation ;

Variables S, P, C1, C2: Complex;

Begin

Write ("Give the real part of the 1st complex number C1: ");

Read (C1.Preel);

Write ("Give the imaginary part of the 1st complex number C1: ");

Read (C1.Pimag);

```

Write ("Give the real part of the 2nd complex number C2: ");
Read (C2.Preel);
Write ("Give the imaginary part of the 2nd complex number C2: ");
Read (C2.Pimag );
S.Preel ← C1.Preel + C2.Preel;
S.Pimag ← C1.Pimag + C2.Pimag;
Write ("Sum = ", S.Preel , "+", S.Pimag , " i ");
P.Preel ← (C1.Preel * C2.Preel)- (C1.Pimag * C2.Pimag);
P.Pimag ← (C1.Preel * C2.Pimag )+ (C1.Pimag * C2.Preel);
Write ("Product = ", P.Preel , "+", P.Pimag , "i");
END

```

Exercise n°3:

Type Ens = **Record**

T_Pos :array [1..50] integer;

N: integer;

EndRecord

Algorithm Pos_ab ;

Variables i, j, k, T :integer ;

Ch: string;

Pos: Ens;

Begin

Write ("Enter a string");

Read (Ch);

T← Length (Ch);

i← 1 ;

j←1 ;

Pos.N←0 ;

While (i<T) **do**

If (Ch [i]='a' and Ch [i+1]='b') **then**

Pos. T_Pos [j] ←i ;

Pos.N←Pos.N+1 ;

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    j←j+1 ;  
    i←i+2 ;  
Else  
    i←i+1  
End if  
Endwhile  
Write ("The positions of the string 'ab' in ", Ch , "are");  
For k ← 1 to j do  
    Write (Pos. T_Pos [k]);  
Endfor  
Write ("The number of elements is", Pos.N );  
END
```