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Level: 1st year “Computer science”	Module: Algorithmic and Data Structures 2	Date : 15/05/2024 Duration: 1h30m
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Exam n°2
Typical correction

Exercise n°1

Algorithm car ;

Type Car=Record **(1 pt)**

registration_number: integer;
brand: string(20);
model: string(20);
price: real;

EndRecord

Variables **(0.5 pt)**

C : array [1..20] of Car;
i, pr, ind: integer;

Begin

Write (“Enter the information about the cars”);

For 1←i to 20 do **(1.5 pt)**

Read (C[i]. registration_number);
Read (C[i]. brand);
Read (C[i]. model);
Read (C[i]. price);

Endfor

pr← C[1].price ; ind← 1 ; **(0.5 pt)**

For 2←i to 20 do (2 pts)

 If (C[i].price>pr) then

 pr ← C[i].price ;

 ind← i;

 endif

Endfor

Write (“The most expensive car is the”, ind, “car”); (0.5 pt) // The student displays only the index of the most expensive car or the details of the most expensive car (both solutions are correct)

END.

Exercise n°2

1. **Function Product (V1, V2: [1..20] array of integer): integer (1.5 pt)**

 Variable P : integer ;

Begin

 P ← 0 ;

For i←1 to N do

 P ← P +(V1[i] * V2[i]);

Endfor

Product ← P ;

 End ;

2. **Procedure Sum (V1, V2: [1..20] array of integer) (1.5 pt)**

 Variables S1, S2: integer;

Begin

 S1=0; S2=0;

For i←1 to N do

 S1 ← S1 +V1 [i];

 S2 ← S2 +V2 [i];

Endfor

 Write (“the sum of the elements of the vector V1 is”,S1);

 Write (“the sum of the elements of the vector V2 is”,S2);

End;

3. **Algorithm exercise_2;**

Function Product (V1, V2: [1..20] array of integer): integer

 Variable P : integer ;

Begin

$P \leftarrow 0$;

For $i \leftarrow 1$ to N do

$P \leftarrow P + V1[i] * V2[i]$;

Endfor

Product $\leftarrow P$;

End;

Procedure Sum (V1, V2: [1..20] array of integer);

Variables S1, S2: integer;

Begin

S1=0; S2=0;

For $i \leftarrow 1$ to N do

$S1 \leftarrow S1 + V1[i]$;

$S2 \leftarrow S2 + V2[i]$;

Endfor

Write (“the sum of the elements of the vector V1 is”,S1);

Write (“the sum of the elements of the vector V2 is”,S2);

End;

Variables V1: array [1..20] of integer; V2: array [1..20] of integer; prod, N, i integer; (0.5 pt)

Begin

Repeat **(0.5 pt)**

Write (“Enter the real dimension of the vectors”);

Read(N);

Until ($N \geq 1$ & $N \leq 20$)

Write (“Enter the elements of the first vector V1”);

For $1 \leftarrow i$ to N do **(0.5 pt)**

Read (V1[i]);

Endfor

Write (“Enter the elements of the second vector V”);

For $1 \leftarrow i$ to N do **(0.5 pt)**

Read (V2[i]);

Endfor

prod ← **Product (V1, V2); (0.5 pt)**

Write ("Scalar product of the two vectors V1 and V2 is", prod);

Sum (V1, V2); (0.5 pt)

END.

4. No, we can't; (0.5 pt)

Justification: The variables "S1 & S2", declared to calculate the sum of the elements of the array, **are local variables** . Indeed, they cannot be used in the main algorithm to compare between S1 and S2 because the space of these local variables is freed when the execution of the procedure is finished.

Solution: there are three possible solutions **(1.5 pt)**

1. Use S1 and S2 as parameters and pass them by variable (**var** S1, S2).
2. Declare S1 and S2 as global variables.
3. Use two different function the first one to calculate S1 and the second to calculate S2.

Exercise n°3

Algorithm Find_indexes_odd ;

Variables T : array [1..100] integer ; P, P1:*integer ; **(0.5 pt)**

Begin

For P=T to (T+100) do **(1.5 pt)**

Read (*P);

Endfor

Allocate (P1); (1.5 pt)

***P1←0;**

For P=T to (T+50) do

If ((*P) mod 2 != 0) then

Write("index of the odd number is",P-T);

*P1←*P1+*P;

Endif

End

(2.5 pts)