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Information Technology

Grade 12

OOP Test 2020

MEMO

Examiner: Ms E van Aarde

Total: 45 marks

Moderators: Ms L Krause, Mr S Barber

Time: 45 minutes

Instructions:

1. This question paper consists of 9 pages (including the cover page).
2. Answer ALL questions. There are no options in this paper.
3. This is a fill-in paper. Please answer question in the space provided. If you need additional space, please use the last page.

Scenario

A database that stored data about hiking trails in South Africa exists. A system will be created to display this data and allow for changes to the data.

Section A – OOP Concepts

[27]

- Investigate the class diagram in figure 1 and fill in the values that correspond with the number and question mark. Write your answers in the table below.

Notes concerning the method, "convertDifficulty":

- The method is not accessible from another class.
- The method uses the "difficulty" property and returns a string representation, 1 = Easy, 2 = Moderate, 3 = Difficult. This string value forms part of the toString method's return value.

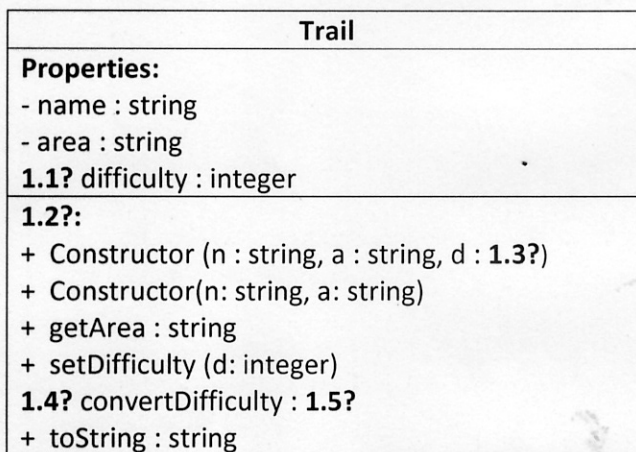


Figure 1

(5)

1.1	- ✓
1.2	Methods ✓
1.3	integer ✓
1.4	- ✓
1.5	string ✓

- What is the reason for making the properties in the "Trail" class private?

(1)

To protect them, cannot be accessed from another class / It hides the implementation details from the class user. ✓

3. How can the properties be accessed from another class? (1)

Via the public methods, namely getters and setter ✓

4. Explain what encapsulation is by referring to the diagram in figure 1. (1)

The properties and methods of the Trail class is combined in one class. ✓

5. Why does the "Trail" class have two constructors? (2)

Enables us to create an object with the first constructor, the name, area and difficulty need to be available. ✓ When the difficulty is not known, the second constructor can be used. ✓

6. What term is used for the fact the we can have two constructor methods with the same name, yet different parameters? (1)

Overloading. ✓

7. Would it be allowed to create yet another constructor as seen below? The "a" represents area and "n" represents name. Explain your answer.

+ Constructor (a: string, n:String) (2)

No ✓, there is already a constructor with two String parameters. Java / Delphi will not be able to distinguish between the two, it will appear like a duplicate method and a compile error will be displayed. ✓

8. I want to create an object for a trail. I want the trail to be named "Mount Komati" and the area of the trail to be "Machadodorp". If the code below was to be used to create the object with one of the constructors in the class diagram in figure 1, would it be instantiated accurately? Explain your answer.

Java: `Trail mk = new Trail("Machdodorp", "Mount Komati", 3);`

Delphi: `Result := Trail.Create("Machdodorp", "Mount Komati", 3);` (2)

The trail name will be Machadodorp and the area Mount Komati. ✓ No, the name and area will be swopped. ✓

9. If a trail object already exists and the trail rating needs to be upgraded from 'moderate' to 'difficult', could this change be made using the given information in the class diagram?

Motivate your answer. (2)

Yes ✓ there is a set methods that will enable this. ✓

10. In the current scenario, the method "convertDifficulty" cannot be called from another class.

- 10.1 What is the OOP term for this kind of method? (1)

Helper method. ✓

- 10.2 The method, "convertDifficulty" is used in the toString method. If there is a need to retrieve the converted difficulty level from another class apart from the toString method, how can this be accomplished? (2)

Create a public method in the "Trail" class ✓ that calls the Helper method and return the value. ✓
OR

Change the access modifier of this method and make it public.

11. Investigate the diagram in figure 2 and answer the questions that follow.

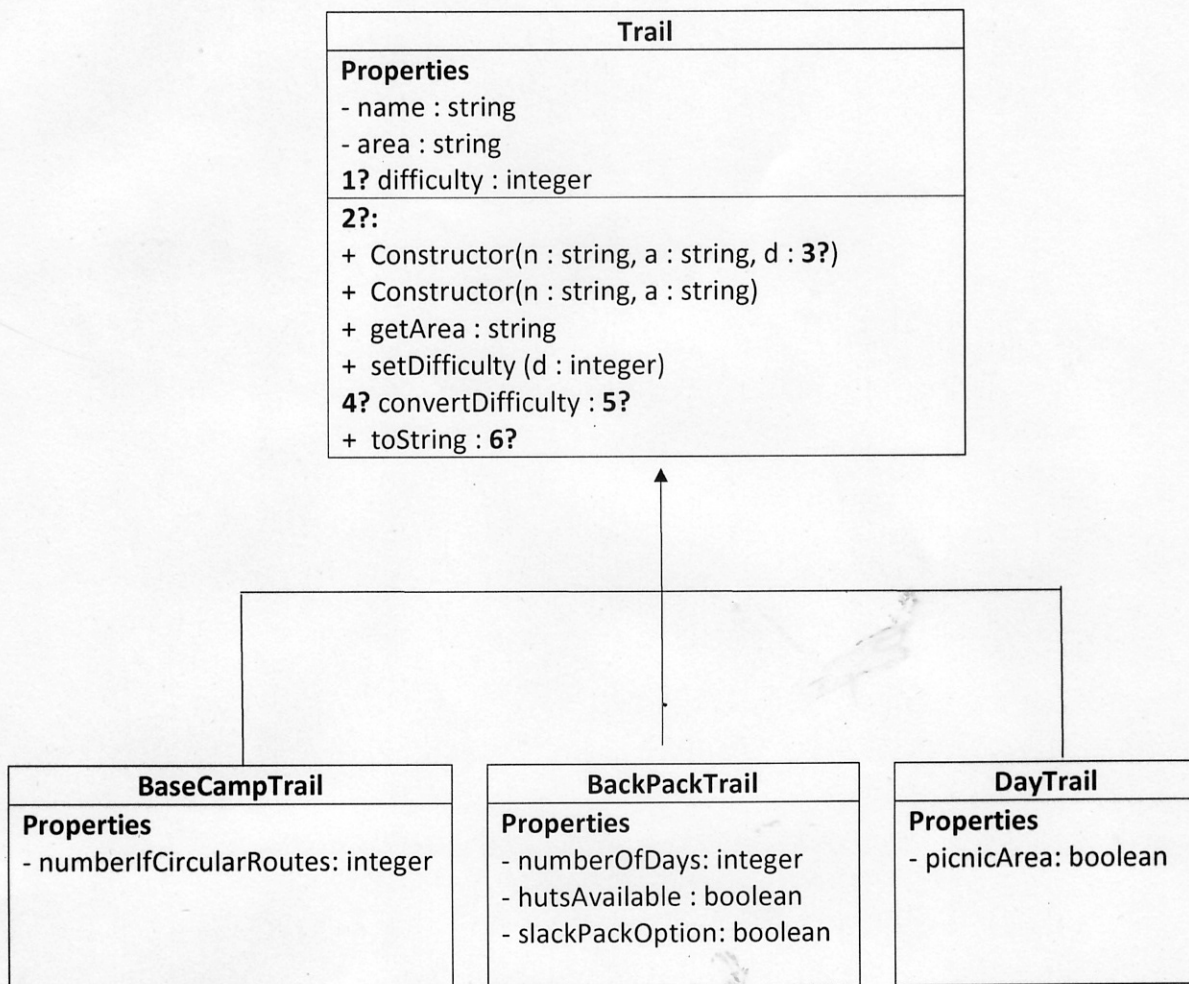


Figure 2

11.1 What is this programming technique that is represented by figure 2, called? (1)

Inheritance ✓

11.2 What is the term we use for the "Trail" class in this figure 2? (1)

Super class / Parent class ✓

11.3 What is the term we use for the "BaseCampTrail" class in this figure 2? (1)

Sub class / Child class ✓

- 11.4 If we create a toString method for the "BackPackTrail" that uses the toString method of the "Trail" class, and add additional properties to this class, what would the term be for what we are doing to this method? (1)

Overriding ✓

- 11.5 Name three advantages of the programming technique used in figure 2. (3)

Any 3: ✓✓✓

- Code reusability
- Faster development time
- Easier to maintain code
- More reliable code
- Information hiding through encapsulation

Section B – Algorithms and Trace tables

[18]

12. An array named "TrailArray", is populated with "Trail" objects. If a trail in this array of objects closes, it would need to be removed from the array. Write pseudo code for a method that will allow for the deletion of a trail. (9)

Possible solution:

Public Method deleteTrail (inName: string) ✓ *(Only award mark for appropriate method name and correct input parameter)*

Begin

 DECLARE int position <- 0 ✓

 for index i from 0 to array length – 1, increase with 1: ✓

 Begin

 If name property in trailArray position i = inName ✓

 Begin

 position <- i ✓

 break from for loop ✓

 End

 End

 for index i from 0 to array length – 1, increase with 1: ✓

 Begin

 Object in trailArray position i <- Object in trailArray position i + 1 ✓

 End

 size of array <- size of array – 1 ✓

End

13. A stand-alone program is developed to calculate a conservation fee for hiking trails. If a hiking trail is part of a nature reserve, every hiker needs to pay a conservation fee. The conservation fee is based on the distance of the trail. If the trail stretches over more than one day, the total distance applies. A fee of R2.50 per kilometre is payable. No fee is payable if the trail is on private property or other land that is not part of a nature reserve. The pseudo code in figure 3 represents a method calculating and displaying the conservation fee.

```
1 Method calculateConservationFee
2 Begin
3     DECLARE boolean natureReserveArea <- false
4     DECLARE double totalDistance <- 0
5     DECLARE double fee <- 0

6     natureReserveArea <- Get user input: Is the trail in a nature reserve?
7     If natureReserveArea is true
8         fee <- totalDistance x 2.50
9     Display "The conservation fee is: R" & value of variable, fee
10 End
```

Figure 3

13.1 Draw a trace table based on the above pseudo code. Assume the user indicates that the trail is in a nature reserve. (6)

Line no.	natureReserveArea	totalDistance	fee	natureReserveArea = true?	Output
3	False				
4		0			
5			0		
6				True	
7			0		
8					The conservation fee is: R0

Mark allocation:

Heading line ✓✓

Initialising values in line 3, 4 and 5 ✓

Indicating the condition is true in line 6 ✓

Setting fee to 0 in line 7 ✓

Correct output in line 8 ✓

13.2 Will the pseudo code in figure 3 result in the correct output? Motivate your answer. (3)

No ✓, the totalDistance is initialised to 0 and never asked from the user. ✓ This will result in the conservation fee always being 0. ✓

Total: [45]

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