



1.2.4 Object-Oriented Languages

1. An object oriented system is implemented to organise information about worker's attendance at a warehouse.

a) State the meaning of each of the following terms:

i. Object

- An instance of a class

ii. Method

- An action an object performs / subroutine of an object

iii. Attribute

- A value held by an object

[3 marks]

Each worker has a name and an attendance figure which can be between 0 and 100.

b) Write a definition for a fully encapsulated customer class, providing both get and set methods for all attributes. You do **not** have to write code for the constructor method.

[5 marks]

```
class Customer
  private name
  private attendance

  public function getName()
    return name
  endfunction

  public function getAttendance()
    return attendance
  endfunction

  public procedure setName(newName)
    name = newName
  endprocedure

  public procedure setAttendance(newAttend)
    if newAttend >= 0 and newAttend <= 100 then
      attendance = newAttend
    endif
  endprocedure
endclass
```





2. A program is written using an object-oriented programming paradigm and uses a class called Video to organise the videos that are streamed to customer.

The class video has these attributes:

- Name
- Number of views
- Star rating

The constructor method will set the name attribute to the name that is passed in as a parameter. The constructor will also initially set the number of views to 0 and the star rating to 3.

- a) Write program code or pseudocode to declare the class video and initialise the required attributes as private.

You should include **both** the attribute definitions and the constructor method in your answer.

[7 marks]

```
class Video
    private name
    private views
    private starrating

    public procedure new(newName)
        name = newName
        views = 0
        starrating = 3
    endprocedure
endclass
```





3. A video game has treasure that players can pick up as they move around the map.

Below is part of the code from the game.

```
class Treasure

    private value
    private weight
    private name

    public procedure new(givenName)
        name = givenName
        weight = 20
        value = randomInteger(1, 20)
    endprocedure

    public procedure changeName(givenName)
        name = givenName
    endprocedure

endclass

class TreasureChest inherits Treasure

    private locked

    public procedure new(givenName)
        super.new(givenName)
        locked = false
        value = randomInteger(1, 100)
        weight = randomInteger(80, 120)
    endprocedure

    public procedure picklock()
        if getRandomNumber() > 0.5 then
            locked = false
        endif
    endprocedure

endclass
```





- a) Explain what is meant by the term 'encapsulation' with reference to the attribute called name.

[3 marks]

- When an object is made private so it cant be directly accessed from outside the class
- Public methods are used to read / amend the attribute's value
- The attribute name's value can only be amended through the methods `changeName`

- b) Describe what is meant by the term 'inheritance' referring to the code above.

[3 marks]

- When a subclass takes on the attributes and methods of a superclass
- It may also have additional attributes and methods of its own
- `TreasureChest` inherits from `Treasure`

- c) Identify **all** attributes and methods in the `TreasureChest` class. Clearly mark which are which.

[2 marks]

- **Attibutes:** `new`, `changeName`, `pickLock`
- **Methods:** `value`, `weight`, `name`, `locked`





4. Procedural programming and object-oriented programming are two paradigms commonly used by programmers when developing computer games.

Discuss the advantages of using object-oriented programming over procedural programming when developing computer games. You should refer to inheritance, encapsulation and polymorphism in your answer.

[12 marks]

Knowledge

- **Object oriented programming makes use of classes (templates) from which objects are made.**
- **Classes have attributes and methods**
- **Classes can be encapsulated by making attributes private and providing public access methods**
- **Object oriented programming supports inheritance which allows classes to use attributes and methods of parent classes.**
- **Object oriented programming supports polymorphism meaning that class attributes and methods can take on many different forms if required.**

Application

- **OO approach would call on classes per type of player or enemy object**
- **Objects made from these classes, so one enemy class may generate many enemy objects, each with different values for their attributes (e.g. speed, energy)**
- **Special types of Player or Enemy objects could be instantiated from classes that inherit from the original Player/Enemy classes, but have attributes/methods of their own.**
- **Polymorphism would allow for the attributes/methods of Player/Enemy objects to behave differently from normal if required.**

Evaluation

- **OO promotes a modular approach (procedural through use of subroutines, OO through classes).**
- **OO is an abstraction of a real world problem, with classes for each type of things to be modelled and objects for each instance of these.**
- **OO has advantages in data security in that encapsulation forces developers/users to use methods (with their built in validation) to access/amend data stored in attributes.**
- **OO has advantages in efficiency of design where classes can be reused and can inherit from one another. Procedural programming struggles to support this.**
- **OO also offers flexibility through polymorphism.**

