**Introduction to Object-Oriented Programming and Software Development**

**1.1 Classes and Objects**

1. Draw an object diagram for a Person class and two Person objects Ms. Latte and Mr. Espresso.

   ![Object Diagram]

   Ms Latte : Person
   Mr Espresso : Person

2. What must be defined before you can create an object?

   *A class which the object belongs must be defined first.*
1.2 Messages and Methods

1. Draw an object diagram of an Account object with instance methods deposit and withdraw.

Here's one possible diagram of withdrawing and depositing 200.

\[
\text{withdraw(200)} \quad \text{acct1 : Account} \quad \text{deposit(200)}
\]

2. Is the getObstacleDistance method an instance or a class method?

It is an instance method because the value would be different for each instance.

1.3 Class and Instance Data Values

1. What is the difference between a constant and a variable?

During the program execution, you can change the value of a variable, but you cannot change the value of a constant once its value is assigned at the declaration.
2. Draw an object diagram of a `Person` object with three instance variables name, age, and gender.

```
<table>
<thead>
<tr>
<th>per1 : Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
</tr>
<tr>
<td>age</td>
</tr>
<tr>
<td>gender</td>
</tr>
</tbody>
</table>
```

1.4 Inheritance

1. If Class A inherits from Class B, which is a superclass? Which is a subclass?

   *B is the superclass, and A is the subclass.*

2. Draw an object diagram that shows Class A is inheriting from Class B.

```
B

↓

A
```

3. What are the other names for superclass and subclass?

   *A superclass is also an ancestor of its subclasses. A subclass is also a descendent of its superclass. They are also called base and derived classes, respectively.*
4. If we have Animal, Insect, and Mammal classes, which one will be a superclass?

_Since Insect and Mammal are subspecies of Animal, Animal should be the superclass of Insect and Mammal._

5. Model different types of vehicles, using inheritance. Include Vehicle, Automobile, Motorcycle, SportsCar, Sedan, and Bicycle?

_Here’s one possible hierarchy:_

```
Vehicle
  \-- Automobile
    \-- SportsCar
    \-- Sedan
  \-- Bicycle
  \-- Motorcycle
```

### 1.5 Software Engineering and Software Life Cycle

1. Name the stages of the software life cycle.

_The stages are Analysis, Design, Coding, Testing, and Operation._

2. How does the quality of design affect the software maintenance cost?

_A poorly designed software is more costly to maintain than a properly designed software._

3. What is debugging?

_An activity to locate and correct errors in software. By designing a software properly, we can minimize the amount of time we spend on debugging._