COMP2026 Problem Solving Using Object Oriented Programming

# Laboratory 9

**Part A Discovery Exercises**

**Task 1: Memory Model**

1. Draw the memory model of the following code fragment and then write down the resulted values of all the variables.

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| int num1 = 21;  int num2 = 22;  int num3 = 23;  int[] a = {10, 11, 12, 13};  int[] b = {30, 31, 32, 33};  num3 = num1;  num1 = num2;  num2 = num3;  a[2] = 42;  b = a;  b[0] = 40; |

Answer:

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| --- |
| Memory model  22  num1  21  num2  21  num3  @12  {40,11,42,13}  {40,11,42,13}  @12  a  @12  b |

Results:

num1 = 22 . num2 = 21 . num3 = 21 .

a = {40,11,42,13} . b = {40,11,42,13} .

1. Draw the memory model of the following code fragment.

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| Person a = new Person("Alan");  Person b = new Person("Bob");  Person c = new Person("Carlie");  a.setFriend(b);  b.setFrined(c);  c.setFriend(a); |

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| --- |
| public class Person {  String name;  Person friend;  public Person(String name) {  this.name = name;  }  public String getName() {  return name;  }  public void setName(String name) {  this.name = name;  }  public Person getFriend() {  return friend;  }  public void setFriend(Person p){  this.friend = p;  }  } |

Answer:

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| --- |
| Memory model  name “Alan” friend “Bob”  a  Name “Bob” friend “Carlie”  b  name “Carlie” friend “Alan”  c |

**Task 2: Public vs Private**

1. Add the following statements to the **main** of the given **Person.java** to modify the name of object p.

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1. Run the program and paste the screenshot of the output below.

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1. Add the given **Group.java** to the same project. Now, **Person.java** and **Group.java** are inside the **src** folder. Run the **Group.java** program and paste the screenshot of the output below.

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1. Add the following statements to the given **Group.java** to modify the name of object p.

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1. Run the **Group.java** program and paste the screenshot of the output below.

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1. Modify the **Person.java** to change the **name** field to public as follow.

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1. Run the **Group.java** program again and paste the screenshot of the output below.

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1. Modify the **Person.java** to change the **name** field back to private. Run the **Group.java** program again should result in error message.

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1. Add the following statements to the **main** of the given **Group.java** to modify the name of object p.

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1. Run the **Group.java** program and paste the screenshot of the output below.

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1. Remove the **setName** method in **Person.java**. Run the **Group.java** program again and paste the screenshot of the output below.

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1. With private **name** field and no public **setName** method in **Personjava**. Can you modify the name of the Person object in **Group.java**?

Cant .

**Task 3: Writing our own Comparing Methods**

Refer to the given **Bee.java**, answer the following questions.

1. Write a method called **compareSpeed** that compares the speed of this Bee with a specified Bee object. The method

* returns a negative integer if this Bee’s speed is less than the speed of the specified Bee object
* returns a positive integer if this Bee’s speed is greater than the speed of the specified Bee object
* returns 0 if the speeds are the same

Add the method into **Bee.java**.

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| public int compareSpeed(Bee obj){  if(obj.speed > getSpeed()){  return -1; }else if(obj.speed == getSpeed()){  return 0; }else{  return 1; }  } |

1. Test your **compareSpeed** method with the following **main()** method in **Bee.java**.

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1. Run the program and paste the screenshot of the output below.

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**References**

1. Bravaco, R., & Simonson, C. (2009). *Java programming: From the ground up*. Dubuque, IA: McGraw-Hill.
2. Dean, J., & Dean, R. (2008). *Introduction to programming with Java: A problem solving approach*. Boston: McGraw-Hill.
3. Farrell, J. (2012). *Java programming. Boston, MA: Course Technology Cengage Learning*
4. Forouzan, B. A., & Gilberg, R. F. (2007). *Computer science: A structured programming approach using C (3rd ed.)*. Boston, MA: Thomson Course Technology.
5. Gaddis, T. (2016). *Starting out with Java (6th ed.)*. Pearson.
6. Liang, Y. D. (2013). *Introduction to Java programming: Comprehensive version*. (8th ed.). Pearson.
7. Schildt, H. ( 2006). *Java a beginner's guide*. New York: McGraw Hill.
8. Schildt, H., & Skrien, D. J. (2013). Java programming: A comprehensive introduction. New York: McGraw-Hill.
9. Wu, C. T. (2010). *An introduction to object-oriented programming with Java*. Boston: McGraw Hill Higher Education
10. Xavier, C. (2011). *Java programming: A practical approach*. New Delhi: Tata McGraw Hill.
11. yet another insignificant Programming Notes. (n.d.). Retrieved from https://www3.ntu.edu.sg/home/ehchua/programming
12. Zakhour, S., Kannan, S., & Gallardo, R. (2013). *The Java tutorial: A short course on the basics (5th ed.)*.