

# 1.00/1.001

## Introduction to Computers and Engineering Problem Solving Spring 2011 - Quiz 1

<b>Name:</b>	
<b>MIT Email:</b>	
<b>TA:</b>	
<b>Section:</b>	

You have 80 minutes to complete this exam. For coding questions, you do not need to include comments, and you should assume that all necessary packages have already been imported. Do not write outside of the boxes provided for your answers throughout this exam packet or modify provided examination code. Any modifications to provided code will result in zero credit for that problem. Good luck!

<b>Question 1</b>	<b>/ 35</b>
<b>Question 2</b>	<b>/ 30</b>
<b>Question 3</b>	<b>/ 35</b>
<b>Total</b>	<b>/ 100</b>

## Question 1 - Control Structures, Operators, Objects (35 points)

You have been hired by a company that makes spacecraft that will travel to Mars. They want you to design a program to perform calculations to assist the spacecraft's pilots.

- 1.a Some of the quantities of interest include the distance between Earth and Mars, which can vary from  $56 \times 10^6$  kilometers to  $401 \times 10^6$  kilometers, and the angles that describe each planet's inclination: 0 to 7 degrees. The inclination quantities require 10 significant digits. Your program will need to handle both quantities with a single data type. You will use two variables, one for each quantity.

Which of the following data types can handle *both* the distance and angular quantities and requires the *lowest* number of bits to store the variable? Circle the correct answer:

- a. `int`
- b. `double`
- c. `float`
- d. `short`

- 1.b To conserve rocket fuel, the company directs its pilots to stay in Earth's orbit until Mars is in the best possible position. The program must evaluate the distance between the Earth and Mars over a 100 day period and tell the pilot which day will give the shortest distance between Earth and Mars.

Which type of control statement, alone, is best for computing each distance over all 100 days? Circle the correct answer:

- a. `if-else`
- b. `for`
- c. `continue`
- d. `return`

- 1.c Complete the class `SpaceNav` so that it finds the earliest day among the next 100 days that has the *shortest* distance between Earth and Mars. Your program should start at day 1. The static method `getDist(int dayNumber)` is written for you. `SpaceNav` should print the earliest day that has the shortest distance between Earth and Mars. Distances within a tolerance of  $1E-14$  km are considered equal.

```
public class SpaceNav {
```

```
public static void main(String[] args) {
```



```
}
```

```
public static double getDist(int dayNumber){  
    //Method that determines the distance between Earth and  
    //Mars for a given day.  
}  
  
}
```

## Question 2 - Access (30 points)

Two classes are given below. Class Student is in the package studentPKG, while class StudentTest is in the default package. Lines are labeled 1 through 28 in class Student and A through K in class StudentTest.

---

```
1  package studentPKG;
2
3  public class Student {
4
5      int year;
6      private String name;
7      private int studentID;
8      public static int count = 0;
9
10     public Student(String name, int studentID){
11         this.name=name;
12         this.year = 0;
13         setID(studentID);
14         ++count;
15     }
16
17     void setID(int sID){ studentID=sID; }
18
19     void setID(Student student){
20         studentID=student.studentID;
21     }
22
23     int getID(){ return studentID;}
24
25     public static void setCount(int c){
26         count = c;
27     }
28 }
```

---

```
A  import studentPKG.Student;
B
C  public class StudentTest {
D      public static void main(String[] args){
E          Student newStudent=new Student("", 12);
F          int snumber=newStudent.getID();
G          newStudent.name="Jason Brine";
H          int year = newStudent.year;
I          int count = Student.count;
J          Student.setCount(10000);
K      }}
```

Indicate whether the following lines compile. You may assume the logic is correct in any line that compiles. If a line does not compile, explain how you would fix the problem by modifying and/or adding code. Do not make changes to the code on page 4; write down your changes in the table below. Indicate the number(s) and/or letter(s) of the line(s) you modify. Use empty line number(s) and/letter(s) to indicate where you add code. If you add code where there is no blank line, give the line number after which to insert the code. You may not make any instance data member public.

Line	Does the line compile?	If the line does not compile, how would you fix the problem?
13	YES NO	
14	YES NO	
20	YES NO	
26	YES NO	
E	YES NO	
F	YES NO	
G	YES NO	
H	YES NO	
I	YES NO	
J	YES NO	

### Question 3 – Classes, Objects, Methods (35 points)

You are writing a Java application for an electronic book reader. A class to represent book pages has already been written. The `Page` class has a `String` data member holding the text of the page and a `show()` method to display the page to the user of the electronic book. The `show()` method prints the text of the page to the Java console.

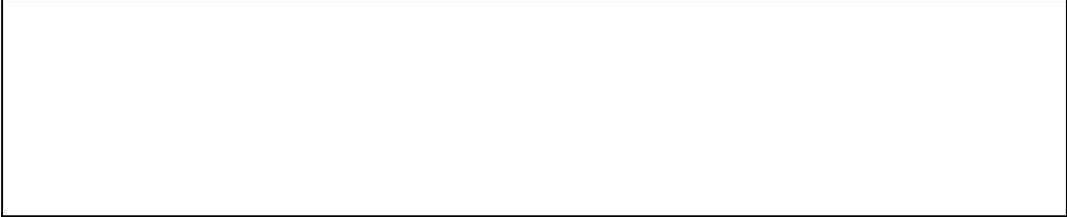
```
public class Page {  
  
    /* String with line breaks holding the entire page */  
    private String text;  
  
    public Page(String t) {text = t;}  
  
    public void show() {System.out.println(text);}  
}
```

You decide to create a `Chapter` class to organize your pages into chapters. A `Chapter` object holds an array of pages in natural order: the first page of the chapter is the first element of the array. The `Chapter` class also has an integer to keep track of the page that the user is currently reading in that chapter. Complete the `Chapter` class, as outlined below.

```
public class Chapter {  
  
    private Page[] pages;  
    private int currentPage;  
  
    public Chapter(Page[] p) {pages = p;}  
  
    /* 3.a Complete the startReading() method, which should display the first page of  
    the chapter to the user and set the value of currentPage accordingly. Assume that a  
    chapter has at least one page. */  
  
    public void startReading()  
    {  
  
    }  
}
```

```
    {  
  
    }  
}
```

**/\* 3.b Complete the `nextPage()` method, which should display the next page to the user and `return true` if the end of the chapter has not been reached, and should display nothing and `return false` otherwise.\*/**

```
public boolean nextPage()
{
    
}
} //End of Chapter class.
```

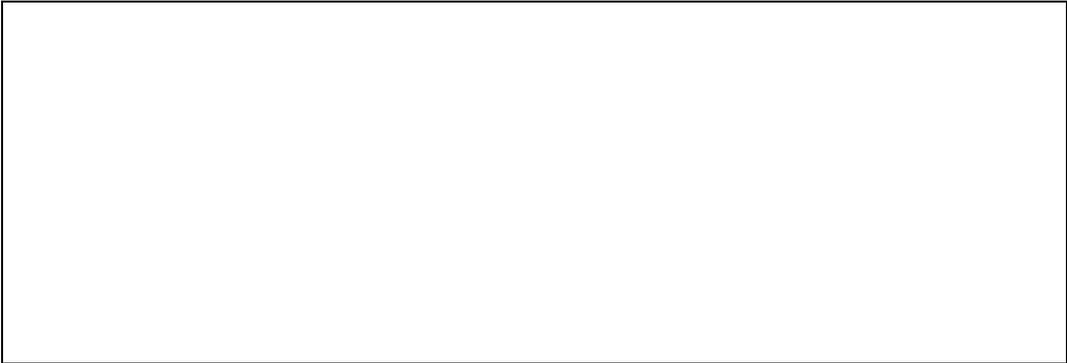
You now need a class to represent an entire book. The `EBook` class has an array of `Chapter` objects and an integer to keep track of the chapter that the user is currently reading. Complete the `EBook` class below.

```
public class EBook {

    private Chapter[] chapters;
    private int currentChap;

    public EBook(Chapter[] c){chapters = c;}
}
```

**/\* 3.c Complete the `turnPage()` method, which should display the next page of the book to the user. When the end of a chapter is reached, the first page of the next chapter should be displayed. When the end of the last chapter is reached, the method should print "End of book" to the console.\*/**

```
public void turnPage()
{
    
}
}
```

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