

## Question 1

### Version 1

$i = 0 : j = 0$   
 $i = 2 : k = 2 : j = 2$   
 $i = 4 : k = 3 : k = 4 : j = 4$   
 $i = 6 : k = 5 : k = 6 : j = 6$   
 $i = 8 : k = 7 : k = 8 : j = 8$   
 $i = 10 :$   
No More!

### Version 2

$i = 0 : j = 1$   
 $i = 4 : k = 4 : j = 5$   
 $i = 8 : k = 7 : j = 9$   
 $i = 12 : k = 10 : k = 13 : j = 13$   
 $i = 16 : k = 16 : j = 17$   
 $i = 20 :$   
No More!

**Question 2****Version 1**

$i = 1 \quad j = 0 \quad k = 0$   
 $i = 3 \quad j = 0 \quad k = 0$   
 $i = 5 \quad j = 0 \quad k = 0$   
 $i = 7 \quad j = 0 \quad k = 0$   
 $i = 9 \quad j = 0 \quad k = 0$   
 $i = 9 \quad j = 0 \quad k = 8$   
 $i = 9 \quad j = 4 \quad k = 8$   
 $i = 9 \quad j = 8 \quad k = 8$   
 $i = 11 \quad j = 0 \quad k = 0$   
 $i = 11 \quad j = 0 \quad k = 8$   
 $i = 11 \quad j = 4 \quad k = 8$   
 $i = 11 \quad j = 8 \quad k = 8$

**Version 2**

$i = 1 \quad j = 0 \quad k = 0$   
 $i = 5 \quad j = 0 \quad k = 0$   
 $i = 9 \quad j = 0 \quad k = 0$   
 $i = 13 \quad j = 0 \quad k = 0$   
 $i = 17 \quad j = 0 \quad k = 0$   
 $i = 17 \quad j = 0 \quad k = 16$   
 $i = 17 \quad j = 8 \quad k = 16$   
 $i = 17 \quad j = 16 \quad k = 16$   
 $i = 21 \quad j = 0 \quad k = 0$   
 $i = 21 \quad j = 0 \quad k = 16$   
 $i = 21 \quad j = 8 \quad k = 16$   
 $i = 21 \quad j = 16 \quad k = 16$

### Question 3

#### Version 1

5:10

4:16

4:8

3:18

2:8

2:12

1:2

0:0

0:0

#### Version 2

10:40

8:48

8:32

6:60

4:56

4:40

2:36

0:0

0:0

**Question 4****Version 1**

```
public class Shopping {

    private String[] itemNames;
    private double[] itemPrices;
    private int numItems;
    private double taxRate;

    public Shopping() {
        this.itemPrices = new double[10];
        this.itemNames = new String[10];
        this.numItems = 0;
        this.taxRate = 0.08875;
    }

    public void addItem(String name, double price) {
        if (this.numItems < 10) {
            this.itemNames[numItems] = name;
            this.itemPrices[numItems] = price;
            numItems++;
        }
    }

    public String[] getItemNames() {
        return itemNames;
    }

    public double[] getItemPrices() {
        return itemPrices;
    }

    public int getNumItems() {
        return numItems;
    }

    public double getTaxRate() {
        return taxRate;
    }

    public double computeTax() {
        double total = 0;
        for ( int i = 0 ; i < this.numItems ; i++ ) {
            total += this.itemPrices[i];
        }

        double tax = total * this.taxRate;

        return tax;
    }
}
```

**Question 4**

```
public double computeTotal() {
    double total = 0;
    for ( int i = 0 ; i < this.numItems ; i++ ) {
        total += this.itemPrices[i];
    }
    return total + this.computeTax();
}

@Override
public boolean equals(Object obj) {
    boolean answer = false;

    if (obj instanceof Shopping) {
        Shopping s = (Shopping) obj;

        if (this.numItems != s.getNumItems()) {
            return false;
        }
        if (this.taxRate != s.getTaxRate()) {
            return false;
        }

        String[] sNames = s.getItemNames();
        double[] sPrices = s.getItemPrices();
        int index = 0;

        while (index < this.numItems) {
            if (!this.itemNames[index].equals(sNames[index])) {
                return false;
            }
            if (this.itemPrices[index] != sPrices[index]) {
                return false;
            }

            index++;
        }
        answer = true;
    }

    return answer;
}

@Override
public String toString() {
    String s = new String();

    for ( int i = 0 ; i < this.numItems ; i++ ) {
        s = s + this.itemNames[i] + " = " + this.itemPrices[i] + "\n";
    }
    s = s + "Tax = " + this.computeTax() + "\n";

    s = s + "Total = " + this.computeTotal() + "\n";

    return s;
}
}
```

**Question 4****Version 2**

```
public class Dinner {

    private String[] dishNames;
    private double[] dishPrices;
    private int numDishes;
    private double taxRate;

    public Dinner() {
        this.dishPrices = new double[10];
        this.dishNames = new String[10];
        this.numDishes = 0;
        this.taxRate = 0.08875;
    }

    public void addDish(String name, double price) {
        if (this.numDishes < 10) {
            this.dishNames[numDishes] = name;
            this.dishPrices[numDishes] = price;
            numDishes++;
        }
    }

    public String[] getDishNames() {
        return dishNames;
    }

    public double[] getDishPrices() {
        return dishPrices;
    }

    public int getNumDishes() {
        return numDishes;
    }

    public double getTaxRate() {
        return taxRate;
    }

    public double computeTax() {
        double total = 0;
        for ( int i = 0 ; i < this.numDishes ; i++ ) {
            total += this.dishPrices[i];
        }

        double tax = total * this.taxRate;

        return tax;
    }
}
```

**Question 4**

```
public double computeTotal() {
    double total = 0;
    for ( int i = 0 ; i < this.numDishes ; i++ ) {
        total += this.dishPrices[i];
    }

    return total + this.computeTax();
}

@Override
public boolean equals(Object obj) {
    boolean answer = false;

    if (obj instanceof Dinner) {
        Dinner s = (Dinner) obj;

        if (this.numDishes != s.getNumDishes()) {
            return false;
        }
        if (this.taxRate != s.getTaxRate()) {
            return false;
        }

        String[] sNames = s.getDishNames();
        double[] sPrices = s.getDishPrices();
        int index = 0;

        while (index < this.numDishes) {
            if (!this.dishNames[index].equals(sNames[index])) {
                return false;
            }
            if (this.dishPrices[index] != sPrices[index]) {
                return false;
            }
            index++;
        }
        answer = true;
    }

    return answer;
}

@Override
public String toString() {
    String s = new String();

    for ( int i = 0 ; i < this.numDishes ; i++ ) {
        s = s + this.dishNames[i] + " = " + this.dishPrices[i] + "\n";
    }
    s = s + "Tax = " + this.computeTax() + "\n";

    s = s + "Total = " + this.computeTotal() + "\n";

    return s;
}
}
```