

תוכנה 1

סמסטר א' תשע"א

תרגול מס' 6
מנשקים, דיאגרמות וביטים*
רובי בוים ומתי שמרת

General Tips on Programming

- Write your code modularly
 - top-down approach
- Compile + test functionality “on the fly”
 - Start with an “empty” program/classes
 - Add content gradually and keep testing
 - If something goes wrong, probably the bug is in the latest change...

General Tips on Programming

- Use the Debugger to follow your execution flow and find what went wrong
- Understanding is good but not enough – you must practice!

Even More Tips

- Based on a true story:
 - Do not send us code
 - Do not send us emails saying “the code you gave us does not work”, before you make sure the **original** given code is problematic
 - When you ask questions be as specific as you can, give as much information about the problem and your trials as possible

Even More Tips

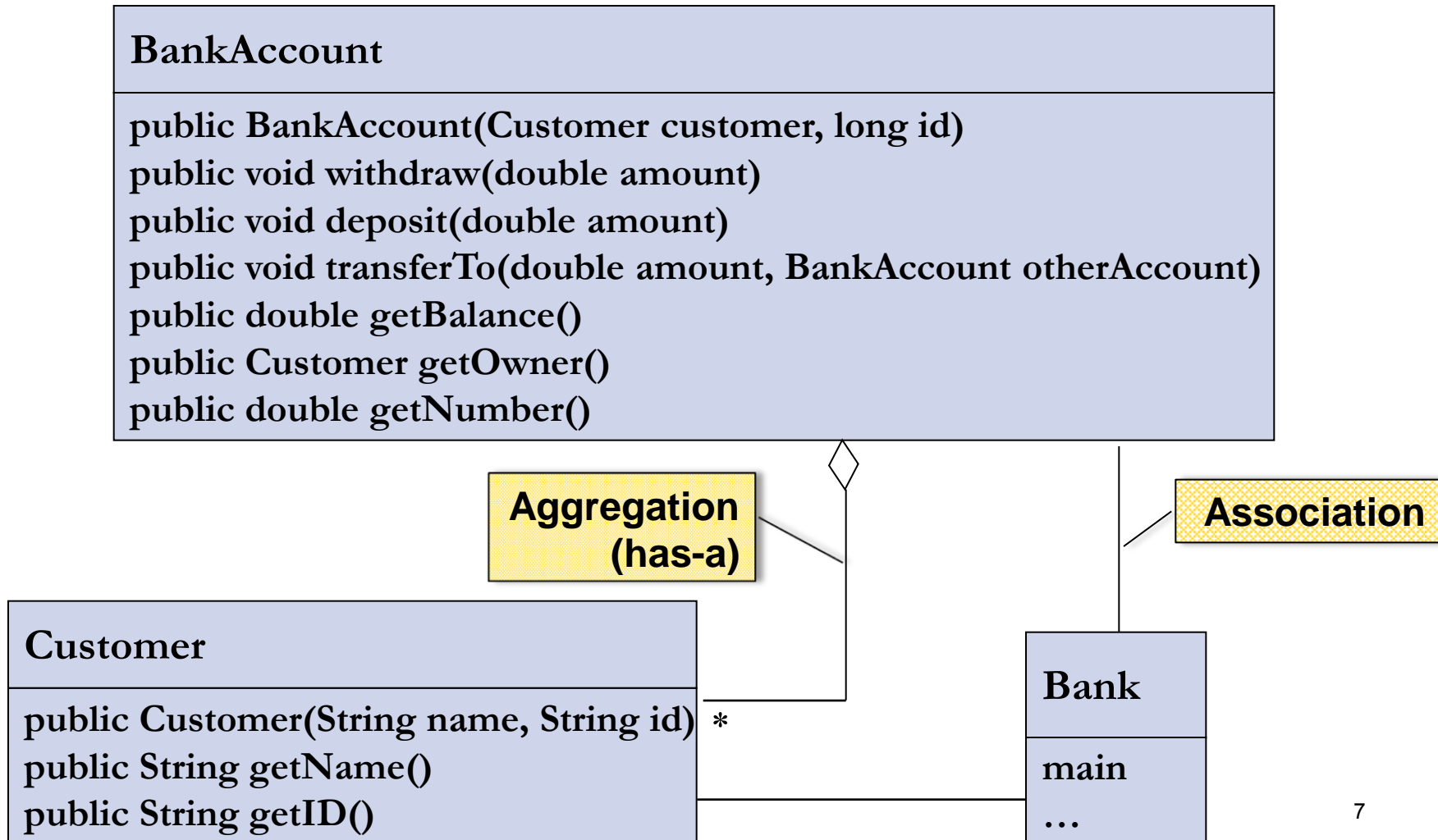
- Late submissions / appeals on homework grades?
- Please contact the graders
 - odedelba@post.tau.ac.il

המערכת הבנקאית

- נתאר את מערכת התוכנה שלנו בעזרת דיאגרמות
- דיאגרמות סטטיות:
- תיאור היחסים בין המחלקות השונות במערכת
- דיאגרמות דינאמיות:
- תיאור ההתנהגות של המערכת בזמן ריצה
 - מצב האובייקטים
 - תיאור של תרחיש



Class Diagram



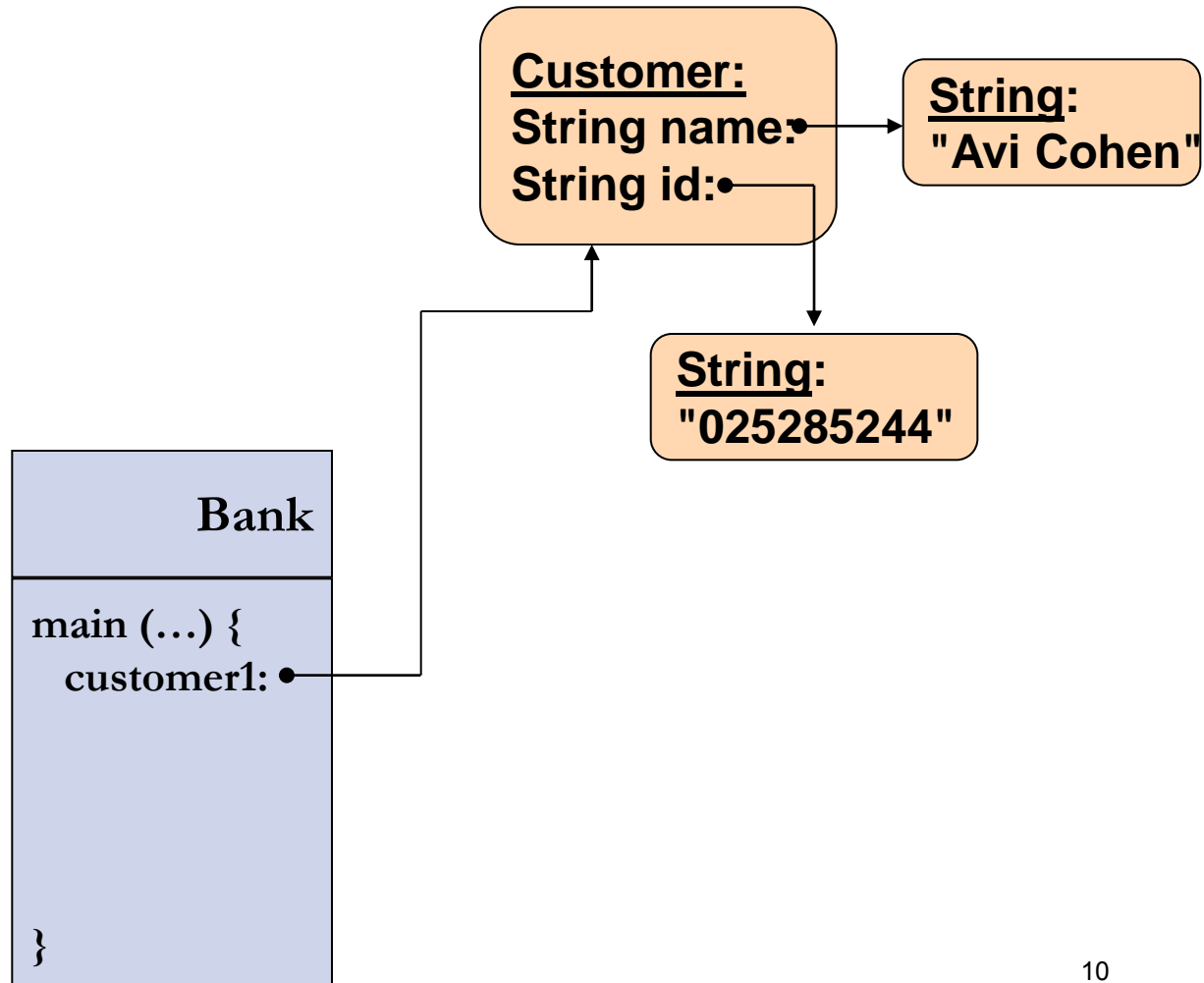
המחלקה Customer

```
public class Customer {  
    public Customer(String name, String id) {  
        this.name = name;  
        this.id = id;  
    }  
  
    public String getName() {  
        return name;  
    }  
  
    public String getID() {  
        return id;  
    }  
  
    private String name;  
    private String id;  
}
```


Toy Bank Program

```
public class Bank {  
    public static void main(String[] args) {  
        → Customer customer1 = new Customer("Avi Cohen", "025285244");  
        Customer customer2 = new Customer("Rita Stein", "024847638");  
  
        BankAccount account1 = new BankAccount(customer1, 1234);  
        BankAccount account2 = new BankAccount(customer2, 5678);  
        BankAccount account3 = new BankAccount(customer1, 2984);  
  
        account1.deposit(1000);  
        account2.deposit(500);  
        account1.transferTo(100, account3);  
        account2.withdraw(300);  
  
        System.out.println("account1 has " + account1.getBalance());  
        System.out.println("account2 has " + account2.getBalance());  
    }  
}
```

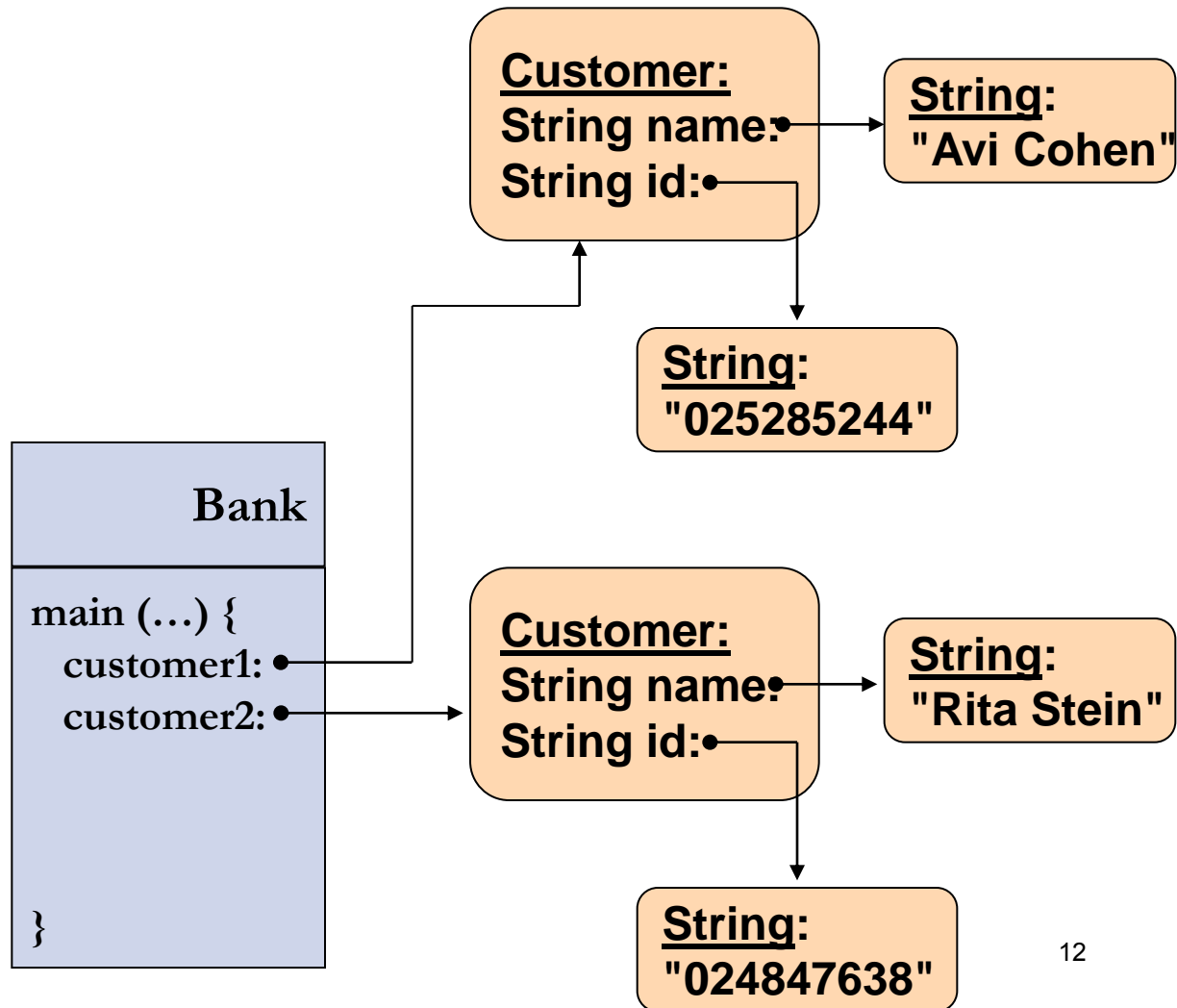
Object Diagram



Toy Bank Program

```
public class Bank {  
    public static void main(String[] args) {  
        Customer customer1 = new Customer("Avi Cohen", "025285244");  
        → Customer customer2 = new Customer("Rita Stein", "024847638");  
  
        BankAccount account1 = new BankAccount(customer1, 1234);  
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        account1.deposit(1000);  
        account2.deposit(500);  
        account1.transferTo(100, account3);  
        account2.withdraw(300);  
  
        System.out.println("account1 has " + account1.getBalance());  
        System.out.println("account2 has " + account2.getBalance());  
    }  
}
```

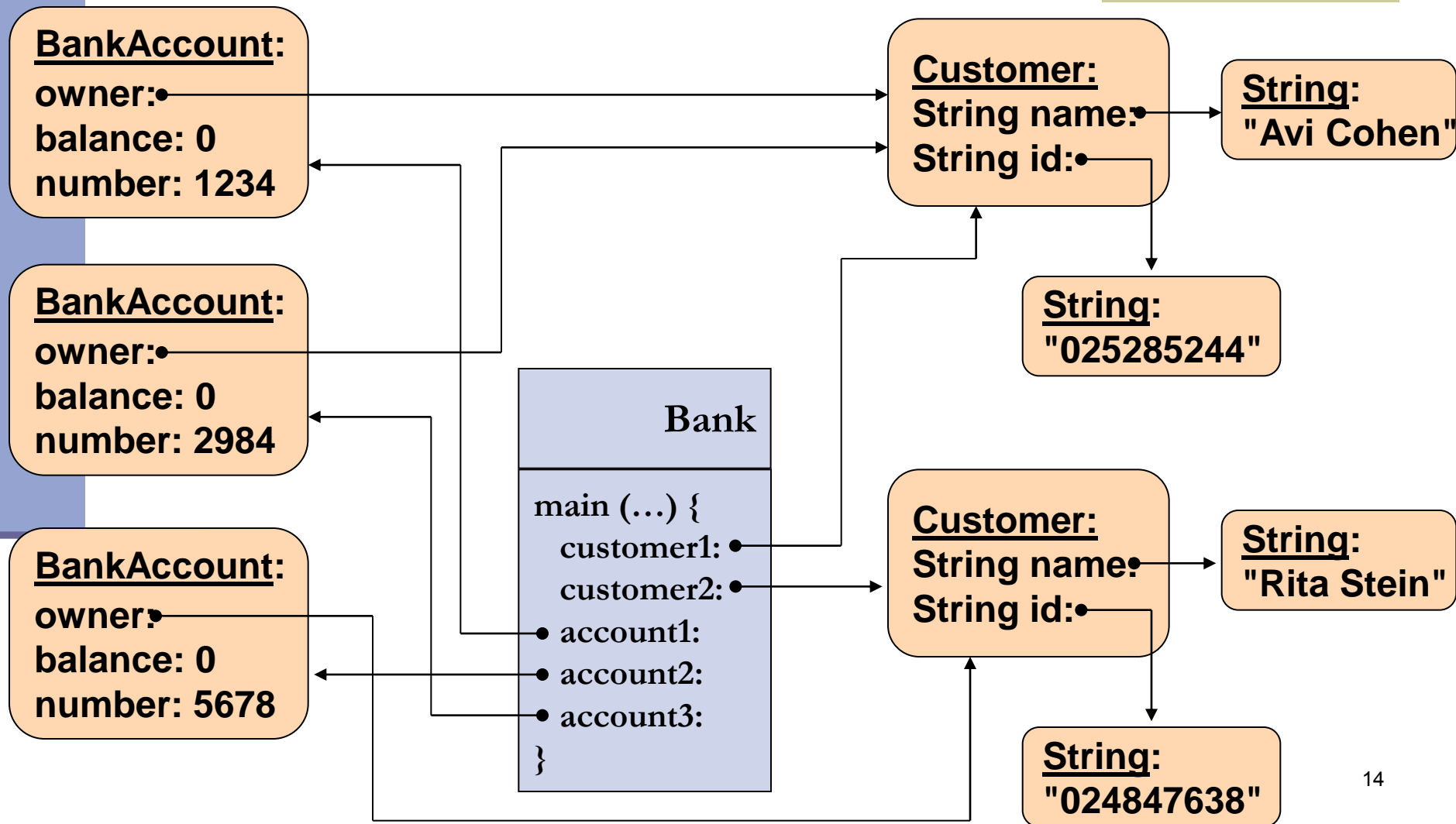
Object Diagram



Toy Bank Program

```
public class Bank {  
    public static void main(String[] args) {  
        Customer customer1 = new Customer("Avi Cohen", "025285244");  
        Customer customer2 = new Customer("Rita Stein", "024847638");  
        → BankAccount account1 = new BankAccount(customer1, 1234);  
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        account1.deposit(1000);  
        account2.deposit(500);  
        account1.transferTo(100, account3);  
        account2.withdraw(300);  
  
        System.out.println("account1 has " + account1.getBalance());  
        System.out.println("account2 has " + account2.getBalance());  
    }  
}
```

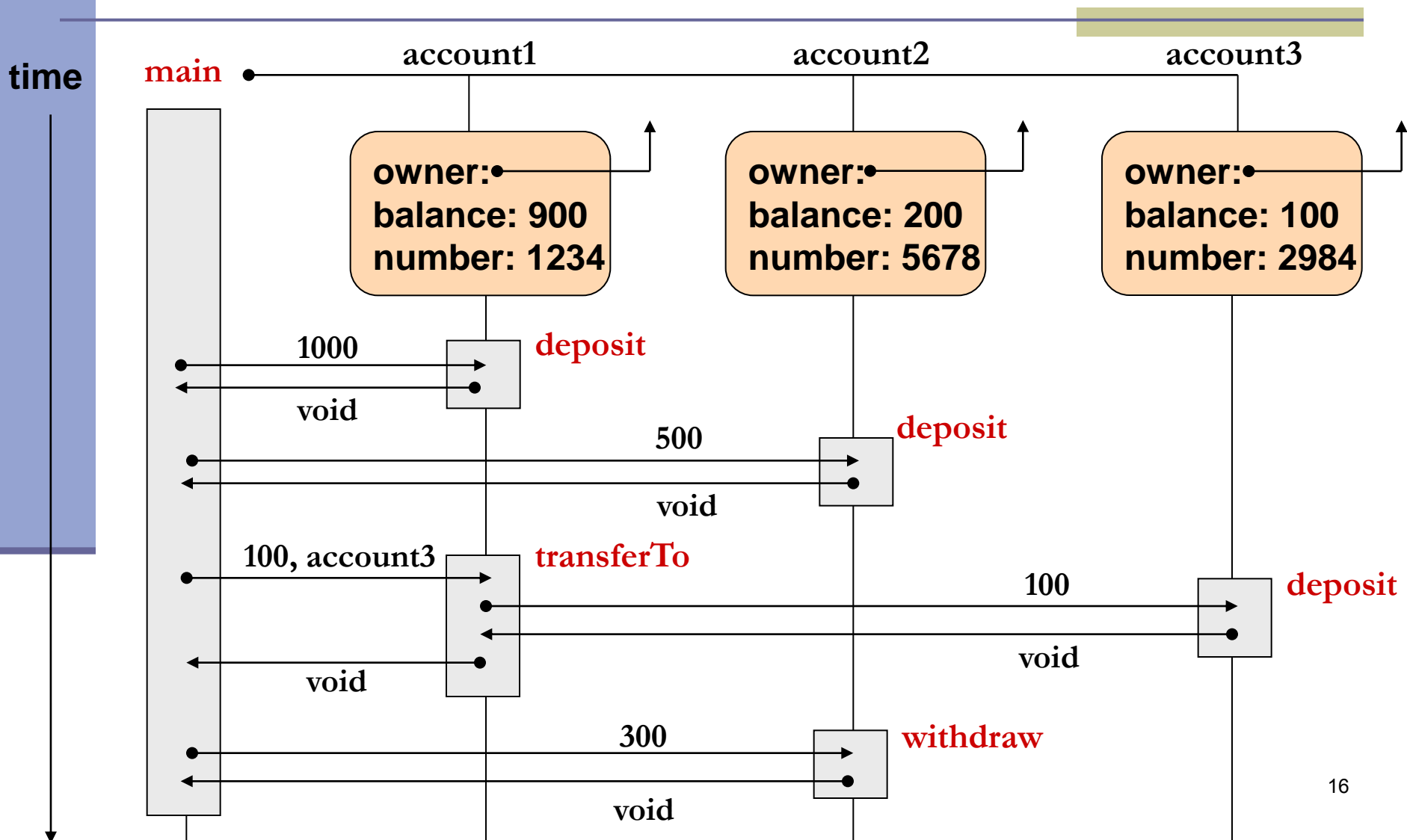
Object Diagram



Message Sequence Chart

```
public class Bank {  
    public static void main(String[] args) {  
        Customer customer1 = new Customer("Avi Cohen", "025285244");  
        Customer customer2 = new Customer("Rita Stein", "024847638");  
  
        BankAccount account1 = new BankAccount(customer1, 1234);  
        BankAccount account2 = new BankAccount(customer2, 5678);  
        BankAccount account3 = new BankAccount(customer1, 2984);  
  
        → account1.deposit(1000);  
           account2.deposit(500);  
           account1.transferTo(100, account3);  
           account2.withdraw(300);  
  
        System.out.println("account1 has " + account1.getBalance());  
        System.out.println("account2 has " + account2.getBalance());  
    }  
}
```

Message Sequence Chart



Output

```
public class Bank {  
    public static void main(String[] args) {  
        Customer customer1 = new Customer("Avi Cohen", "025285244");  
        Customer customer2 = new Customer("Rita Stein", "024847638");  
  
        BankAccount account1 = new BankAccount(customer1, 1234);  
        BankAccount account2 = new BankAccount(customer2, 5678);  
        BankAccount account3 = new BankAccount(customer1, 2984);  
  
        account1.deposit(1000);  
        account2.deposit(500);  
        account1.transferTo(100, account3);  
        account2.withdraw(300);  
  
        System.out.println("account1 has " + account1.getBalance());  
        System.out.println("account2 has " + account2.getBalance());  
    }  
}
```

output: account1 has 900.0
account2 has 200.0

מנשקים

- מנשק (interface) הוא מבנה תחבירי ב Java המאפשר לחסוך בקוד לקוח
- קוד אשר משתמש במנשק יוכל בזמן ריצה לעבוד עם מגוון מחלקות המממשות את המנשק הזה (ללא צורך בשכפול הקוד עבור כל מחלקה)
- דוגמא: נגן מוזיקה אשר מותאם לעבוד עם קובצי מוזיקה (mp3) ועם קובצי וידאו (mp4)

Playing Mp3

```
public class MP3Song {  
  
    public void play(){  
        // audio codec calculations,  
        // play the song...  
    }  
  
    // does complicated stuff  
    // related to MP3 format...  
}
```

```
public class Player {  
  
    private boolean repeat;  
    private boolean shuffle;  
  
    public void playSongs(MP3Song[] songs) {  
        do {  
            if (shuffle)  
                Collections.shuffle(Arrays.asList(songs));  
  
            for (MP3Song song : songs)  
                song.play();  
  
        } while (repeat);  
    }  
}
```

Playing VideoClips

```
public class VideoClip {  
  
    public void play(){  
        // video codec calculations,  
        // play the clip ...  
    }  
  
    // does complicated stuff  
    // related to MP4 format ...  
}
```

```
public class Player {  
  
    // same as before...  
  
    public void playVideos(VideoClip[] clips) {  
        do {  
            if (shuffle)  
                Collections.shuffle(Arrays.asList(clips));  
  
            for (VideoClip videoClip : clips)  
                videoClip.play();  
  
        } while (repeat);  
    }  
}
```

שכפול קוד

```
public void playSongs(MP3Song[] songs) {  
    do {  
        if (shuffle)  
            Collections.shuffle(Arrays.asList(songs));  
  
        for (MP3Song song : songs)  
            song.play();  
  
    } while (repeat);  
}
```

למרות ששני השרותים נקראים
אלו פונקציות שונות!

```
public void playVideos(VideoClip[] clips) {  
    do {  
        if (shuffle)  
            Collections.shuffle(Arrays.asList(clips));  
  
        for (VideoClip videoClip : clips)  
            videoClip.play();  
  
    } while (repeat);  
}
```

נרצה למזג את שני קטעי הקוד

שימוש במנשק

```
public void play (Playable[] items) {  
    do {  
        if (shuffle)  
            Collections.shuffle(Arrays.asList(items));  
  
        for (Playable item : items)  
            item.play();  
  
    } while (repeat);  
}
```

```
public interface Playable {  
    public void play();  
}
```

מימוש המנשק ע"י הספקים

```
public class VideoClip implements Playable {  
  
    @Override  
    public void play() {  
        // render video, play the clip on screen...  
    }  
  
    // does complicated stuff related to video formats...  
}
```

```
public class MP3Song implements Playable {  
  
    @Override  
    public void play(){  
        // audio codec calculations, play the song...  
    }  
  
    // does complicated stuff related to MP3 format...  
}
```

מערכים פולימורפים

```
Playable[] playables = new Playable[3];
```

```
playables[0] = new MP3Song();
```

```
playables[1] = new VideoClip();
```

```
playables[2] = new MP4Song(); // new Playable class
```

```
Player player = new Player();
```

```
// init player...
```

```
player.play(playables);
```

```
public void play (Playable [] items) {  
    do {  
        if (shuffle)  
            Collections.shuffle(Arrays.asList(items));  
  
        for (Playable item : items)  
            item.play();  
  
    } while (repeat);  
}
```

עבור כל איבר במערך
יקרא ה `play()` המתאים

פעולות על סיביות

■ אופרטורים לביצוע פעולות על ביטים

■ רק על טיפוסים איטנגרליים (int, short, byte, char)

~	Unary bitwise complement
<<	Signed left shift
>>	Signed right shift
>>>	Unsigned right shift
&	Bitwise AND
^	Bitwise XOR
	Bitwise OR

פעולות על סיביות - דוגמאות

int 32 ביטים ■

ייצוג בינארי

3	00000000000000000000000000000011
~3	11111111111111111111111111111100
-3	11111111111111111111111111111101
3 << 2	00000000000000000000000000000100
-3 >> 1	11111111111111111111111111111110
-3 >>> 1	01111111111111111111111111111110

מה נקבל מ $i \& 3$? ■

שני הביטים הימניים של i ■

ומה נקבל מ $i \& 0xF0$? ■