CS 102 | Ozyegin University
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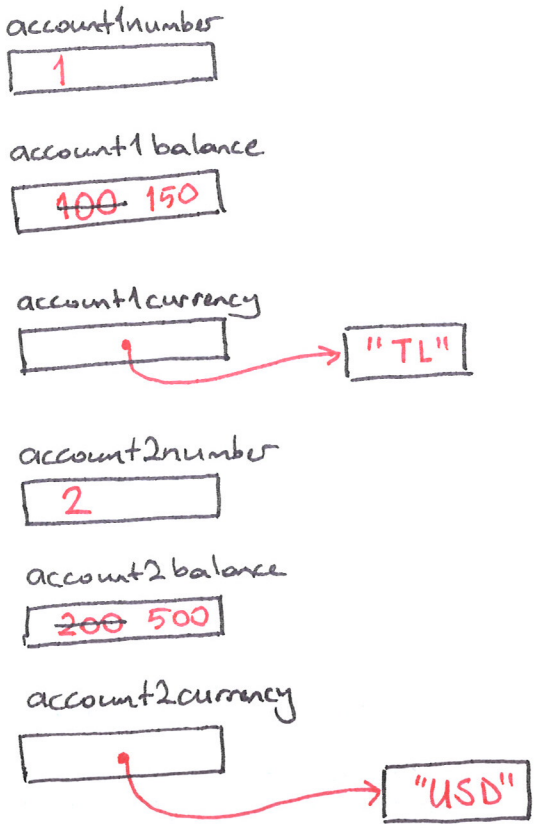
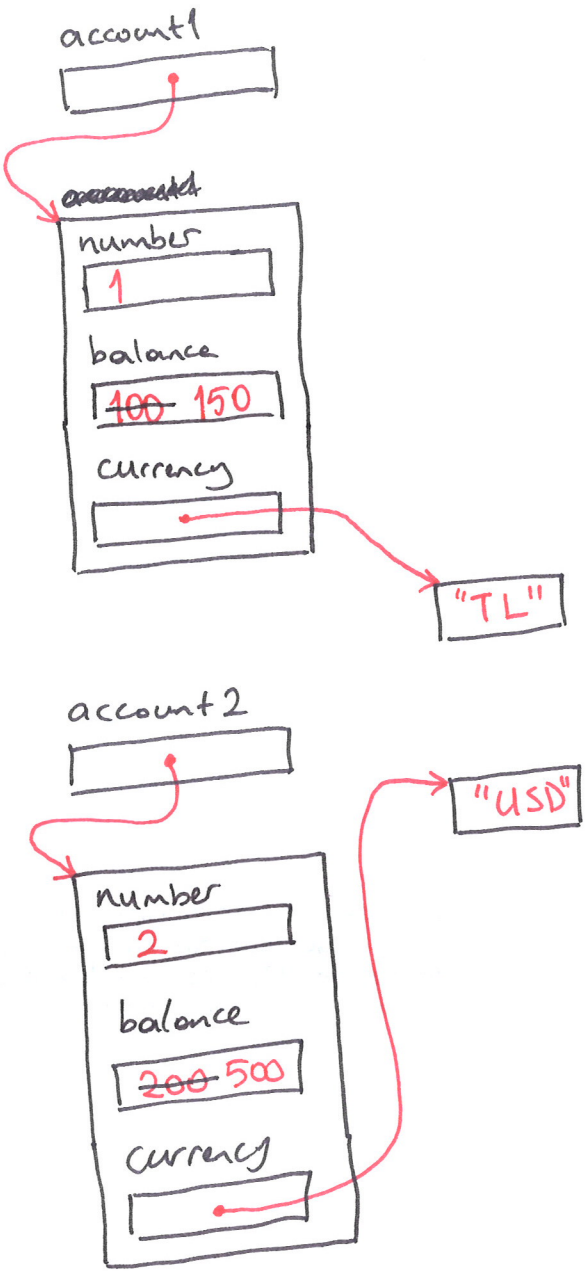
Version 0.

```
public class AccountTest {
  public static void main(String[] args) {
    int account1number = 1;
    double account1balance = 100;
    String account1currency = "TL";

    int account2number = 2;
    double account2balance = 200;
    String account2currency = "USD";

    System.out.println("Account " + account1number
        + " has " + account1balance
        + " " + account1currency + ".");
    System.out.println("Account " + account2number
        + " has " + account2balance
        + " " + account2currency + ".");

    // Deposit 50TL into account 1
    account1balance = account1balance + 50;

    // Deposit 300 USD into account 2
    account2balance = account2balance + 300;

    System.out.println("Account " + account1number
        + " has " + account1balance
        + " " + account1currency + ".");
    System.out.println("Account " + account2number
        + " has " + account2balance
        + " " + account2currency + ".");
  }
}
```



Version 1.

```
public class Account {
  int number;
  double balance;
  String currency;
}

public class AccountTest {
  public static void main(String[] args) {
    Account account1 = new Account();
    account1.number = 1;
    account1.balance = 100;
    account1.currency = "TL";

    Account account2 = new Account();
    account2.number = 2;
    account2.balance = 200;
    account2.currency = "USD";

    System.out.println("Account " + account1.number
        + " has " + account1.balance
        + " " + account1.currency + ".");
    System.out.println("Account " + account2.number
        + " has " + account2.balance
        + " " + account2.currency + ".");

    // Deposit 50TL into account 1
    account1.balance = account1.balance + 50;

    // Deposit 300 USD into account 2
    account2.balance = account2.balance + 300;

    System.out.println("Account " + account1.number
        + " has " + account1.balance
        + " " + account1.currency + ".");
    System.out.println("Account " + account2.number
        + " has " + account2.balance
        + " " + account2.currency + ".");
  }
}
```

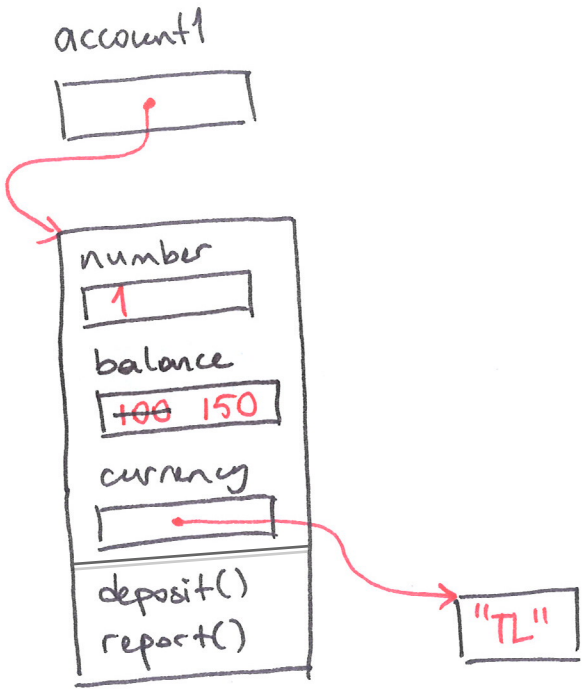


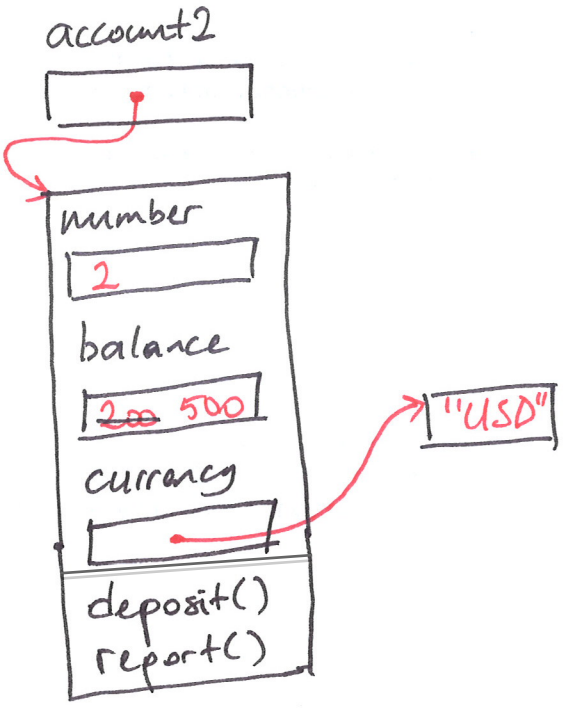
Version 2.

```
public class Account {
  int number;
  double balance;
  String currency;

  public void deposit(double d) {
    balance = balance + d;
  }
}

public class AccountTest {
  public static void main(String[] args) {
    Account account1 = new Account();
    account1.number = 1;
    account1.balance = 100;
    account1.currency = "TL";

    Account account2 = new Account();
    account2.number = 2;
    account2.balance = 200;
    account2.currency = "USD";

    System.out.println("Account " + account1.number
        + " has " + account1.balance
        + " " + account1.currency + ".");
    System.out.println("Account " + account2.number
        + " has " + account2.balance
        + " " + account2.currency + ".");

    // Deposit 50TL into account 1
    account1.deposit(50);

    // Deposit 300 USD into account 2
    account2.deposit(300);

    System.out.println("Account " + account1.number
        + " has " + account1.balance
        + " " + account1.currency + ".");
    System.out.println("Account " + account2.number
        + " has " + account2.balance
        + " " + account2.currency + ".");
  }
}
```

Version 3.

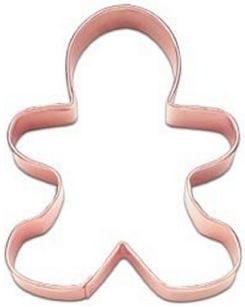
```
public class Account {
  int number;
  double balance;
  String currency;

  public void deposit(double d) {
    balance = balance + d;
  }

  public void report() {
    System.out.println("Account " + number
        + " has " + balance
        + " " + currency + ".");
  }
}

public class AccountTest {
  public static void main(String[] args) {
    Account account1 = new Account();
    account1.number = 1;
    account1.balance = 100;
    account1.currency = "TL";

    Account account2 = new Account();
    account2.number = 2;
    account2.balance = 200;
    account2.currency = "USD";

    account1.report();
    account2.report();

    // Deposit 50TL into account 1
    account1.deposit(50);

    // Deposit 300 USD into account 2
    account2.deposit(300);

    account1.report();
    account2.report();
  }

}
```





An object groups some data. Class is a specification of what types of data we can **encapsulate** in an object, plus the operations we can perform on the objects. From a class definition, we can **instantiate/create** many objects. These objects are called **instances** of their class. Each object has its own data. The operations defined in a class are called **methods**.

Instantiation is analogous to making cookies from a cookie cutter. In this case, the cookie cutter is the class, it specifies the shape of each cookie. Cookies are objects, the values of their fields (e.g. color of buttons) may be different. Each object has its own identity, but they are created from the same specification.

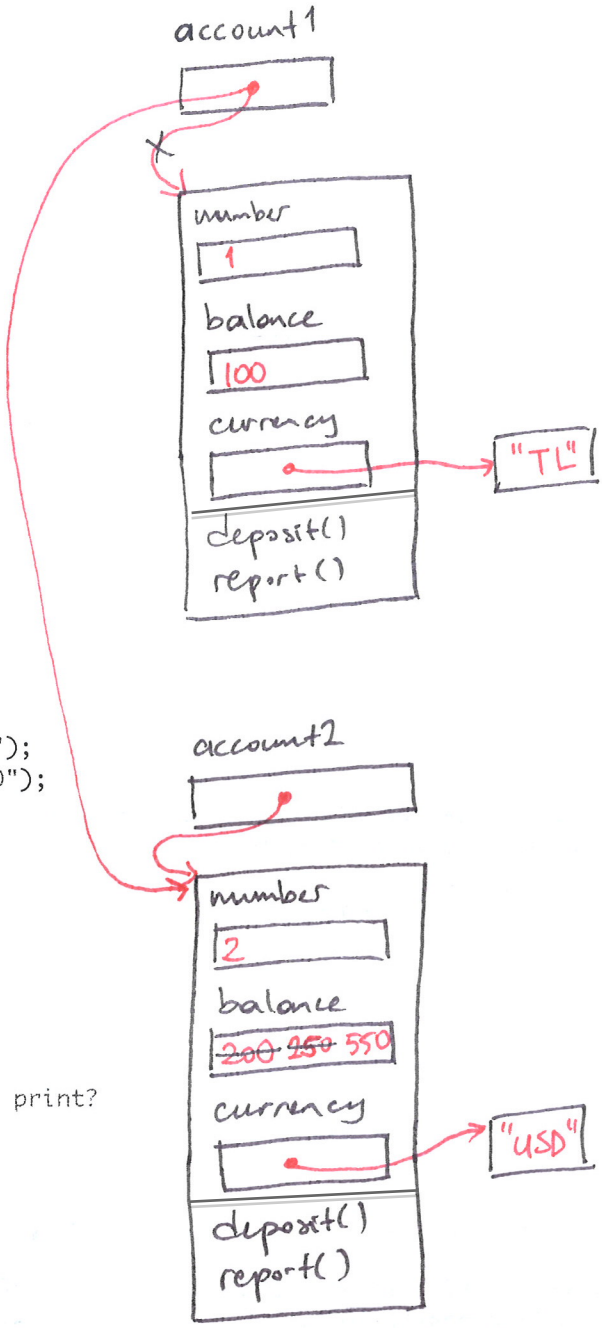


Version 4.

```
public class Account {
  int number;
  double balance;
  String currency;

  // Constructor
  public Account(int n, double b, String c) {
    number = n;
    balance = b;
    currency = c;
  }

  public void deposit(double d) {
    balance = balance + d;
  }

  public void report() {
    System.out.println("Account " + number
        + " has " + balance
        + " " + currency + ".");
  }
}

public class AccountTest {
  public static void main(String[] args) {
    Account account1 = new Account(1, 100, "TL");

    Account account2 = new Account(2, 200, "USD");

    account1.report();
    account2.report();

    // Deposit 50TL into account 1
    account1.deposit(50);

    // Deposit 300 USD into account 2
    account2.deposit(300);

    account1.report();
    account2.report();
  }
}
```

Version 5.

```
public class Account {
  int number;
  double balance;
  String currency;

  // Constructor
  public Account(int n, double b, String c) {
    number = n;
    balance = b;
    currency = c;
  }

  public void deposit(double d) {
    balance = balance + d;
  }

  public void report() {
    System.out.println("Account " + number
        + " has " + balance
        + " " + currency + ".");
  }
}

public class AccountTest {
  public static void main(String[] args) {
    Account account1 = new Account(1, 100, "TL");
    Account account2 = new Account(2, 200, "USD");

    account1.report();
    account2.report();

    System.out.println();

    account1 = account2;

    account1.report();
    account2.report(); // What does this report print?

    // Deposit 50TL into account 1
    account1.deposit(50);

    // Deposit 300 USD into account 2
    account2.deposit(300);

    System.out.println();

    account1.report(); // What does this report print?
    account2.report(); // What does this report print?
  }
}
```



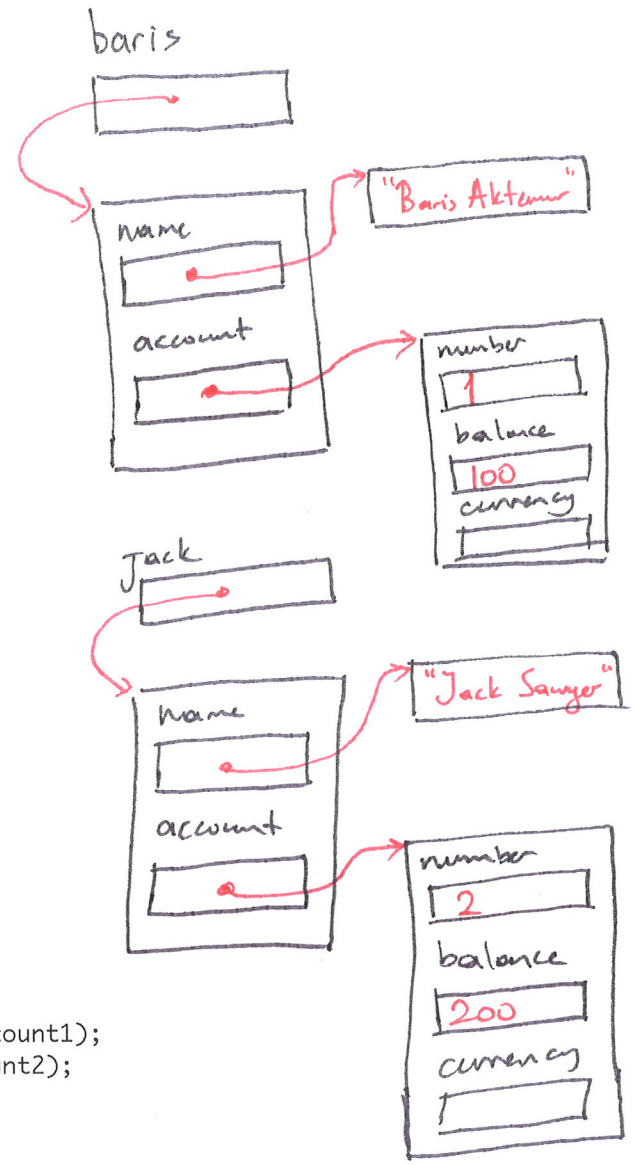
Version 6.

```
public class Account {
  private int number;
  private double balance;
  private String currency;

  // Constructor
  public Account(int n, double b, String c) {
    number = n;
    balance = b;
    currency = c;
  }

  public void deposit(double d) {
    if(d > 0)
      balance = balance + d;
  }

  public void report() {
    System.out.println("Account " + number
        + " has " + balance
        + " " + currency + ".");
  }

  void setCurrency(String newCurrency) {
    if(currency.equals("TL") && newCurrency.equals("USD")) {
      balance = balance / 1.50;
    }
    if(currency.equals("USD") && newCurrency.equals("TL")) {
      balance = balance * 1.50;
    }
    currency = newCurrency;
  }
}

public class AccountTest {
  public static void main(String[] args) {
    Account account1 = new Account(1, 100, "TL");
    Account account2 = new Account(2, 200, "USD");

    account1.report();
    account2.report();

    account1.setCurrency("USD");
    account2.deposit(-100);

    System.out.println();

    account1.report(); // What does this report print?
    account2.report(); // What does this report print?
  }
}
```

May create Accounts with negative initial balance. Check it in the constructor.

Version 7.

```
public class Account {
  // ... Same as v6
}

public class Customer {
  private String name;
  private Account account;

  Customer(String n, Account a) {
    name = n;
    account = a;
  }

  void deposit(double d) {
    account.deposit(d);
  }

  void report() {
    System.out.println("Customer: "+name);
    account.report();
  }

  Account getAccount() {
    return account;
  }
}

public class AccountTest {
  public static void main(String[] args) {
    Account account1 = new Account(1, 100, "TL");
    Account account2 = new Account(2, 200, "USD");

    Customer baris = new Customer("Baris Aktemur", account1);
    Customer jack  = new Customer("Jack Sawyer", account2);

    baris.report();
    jack.report();

    baris.getAccount().setCurrency("USD");
    jack.deposit(100);

    System.out.println();

    baris.report();
    jack.report();
  }
}
```



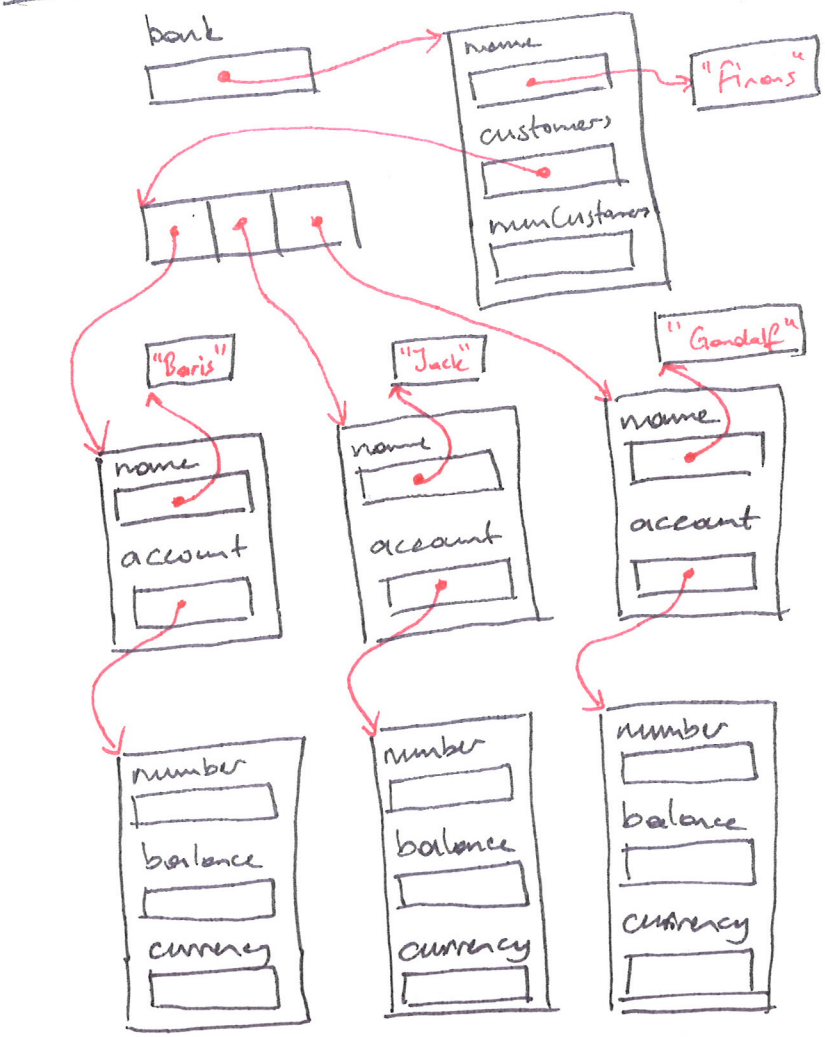
Version 8.

```
public class AccountTest {
  public static void main(String[] args) {
    Account account1 = new Account(1, 100, "TL");
    Account account2 = new Account(2, 200, "USD");

    Customer baris = new Customer("Baris Aktemur", account2);
    Customer jack  = new Customer("Jack Sawyer", account2);

    baris.report();
    jack.report();

    jack.deposit(100);
    baris.deposit(300);

    System.out.println();

    baris.report();
    jack.report();
  }
}
```

Version 9.

```
public class Bank {
  private String name;
  private Customer[] customers;
  private int numCustomers;

  Bank(String n) {
    name = n;
    customers = new Customer[3];
    numCustomers = 0;
  }
  String getName() {
    return name;
  }
  void setName(String n) {
    name = n;
  }
  void addCustomer(Customer c) {
    customers[numCustomers] = c;
    numCustomers++;
  }
  void display() {
    System.out.println("---- "+name+" ----");
    for(int i=0; i < numCustomers; i++) {
      customers[i].report();
    }
    System.out.println("------------------");
  }
}
```

One possible instance:




```
public class AccountTest {
  public static void main(String[] args) {
    Scanner input = new Scanner(System.in);

    Bank bank = new Bank("FinansBank");
    int accountNo = 1;

    System.out.println("Welcome to " + bank.getName());
    while(true) {
      System.out.print("Enter customer name (empty to quit): ");
      String customerName = input.nextLine();
      if(customerName.equals(""))
        break;

      System.out.print("Enter currency: ");
      String curr = input.nextLine();

      System.out.print("Enter initial balance: ");
      double balance = Double.parseDouble(input.nextLine());

      bank.addCustomer(new Customer(customerName, new Account(accountNo, balance, curr)));
      accountNo++;

      bank.display();
    }
    System.out.println("Bye!");
  }
}
```

Version 10.

```
import java.util.ArrayList;

public class Bank {
  private String name;
  private ArrayList<Customer> customers;

  Bank(String n) {
    name = n;
    customers = new ArrayList<Customer>();
  }

  String getName() {
    return name;
  }

  void setName(String n) {
    name = n;
  }

  void addCustomer(Customer c) {
    customers.add(c);
  }

  void display() {
    System.out.println("---- "+name+" ----");
    for(Customer customer: customers) {
      customer.report();
    }
    System.out.println("------------------");
  }
}
```

* numCustomers is not needed anymore.