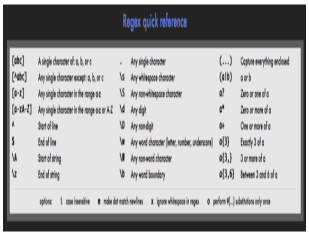
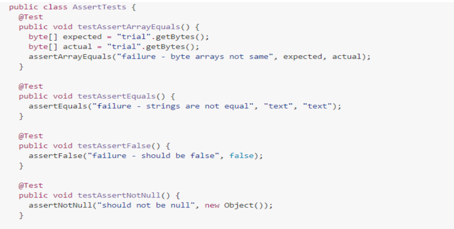
Back references: refers to the exact part of string that is matched to the group number not matched to the pattern



Regex quick reference

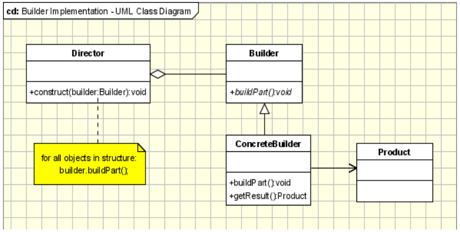
[abc]	A single character of: a, b, or c	.	Any single character	(...)	Capture everything enclosed
[^abc]	Any single character except: a, b, or c	\s	Any whitespace character	(a|b)	a or b
[a-z]	Any single character in the range a-z	\S	Any non-whitespace character	a?	Zero or one of a
[a-zA-Z]	Any single character in the range a-z or A-Z	\d	Any digit	a*	Zero or more of a
^	Start of line	\D	Any non-digit	a+	One or more of a
$	End of line	\w	Any word character (letter, number, underscore)	a{3}	Exactly 3 of a
\A	Start of string	\W	Any non-word character	a{3,}	3 or more of a
\z	End of string	\b	Any word boundary	a{3,6}	Between 3 and 6 of a

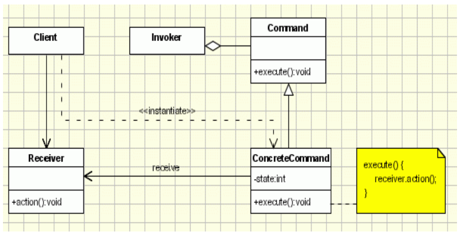
options: i case insensitive m make dot match newlines x ignore whitespace in regex o perform #{...} substitutions only once

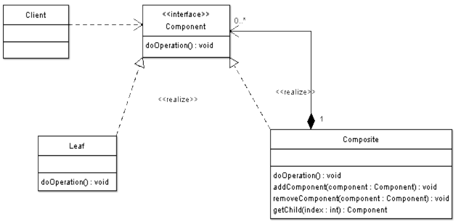


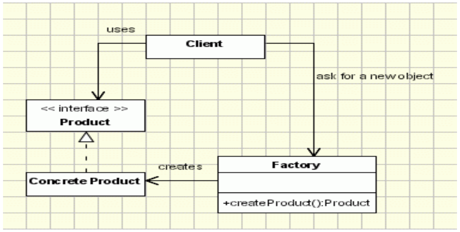
```
public class AssertTests {
  @Test
  public void testAssertArrayEquals() {
    byte[] expected = "trial".getBytes();
    byte[] actual = "trial".getBytes();
    assertArrayEquals("failure - byte arrays not same", expected, actual);
  }

  @Test
  public void testAssertEquals() {
    assertEquals("failure - strings are not equal", "text", "text");
  }

  @Test
  public void testAssertFalse() {
    assertFalse("failure - should be false", false);
  }

  @Test
  public void testAssertNotNull() {
    assertNotNull("should not be null", new Object());
  }
```

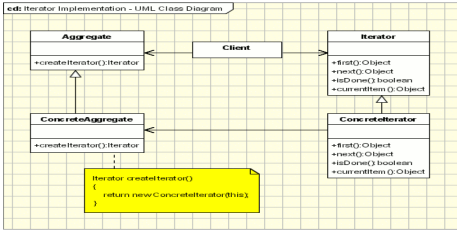
UML Design Patterns











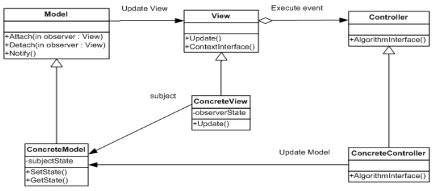
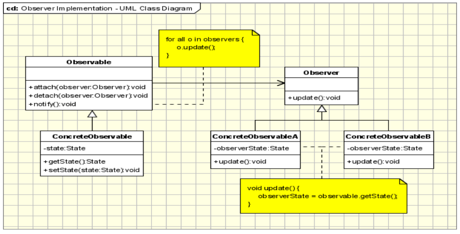
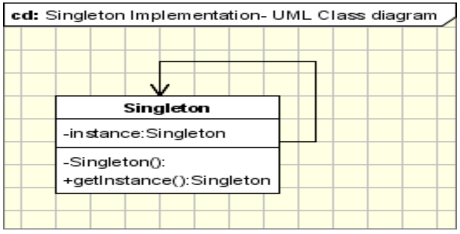
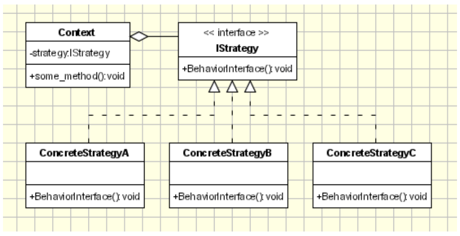


Figure 3: MVC







Git Basics git pull [location name]
git add [file name] or . (adds all)
git commit -m (message)
git push [file name]
git checkout [branch name] – switches branches
git branch [branch name] – creates new branch or checks which branches exist.
git log – shows log of past push history
git clone [location]
git merge [file name]
git branch -D [branch] Force delete the specified branch
git branch -d [branch] Delete the specified branch. prevents you from deleting the branch if it has unmerged changes.
git branch -m [branchName] rename branch to branchName
Dealing with merge conflict, run the git status command shows you which files need to be resolved, Fix these files, then git add, then commit and push as usual

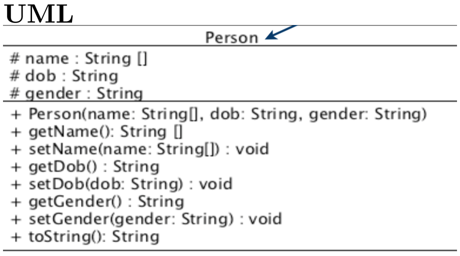
```
public class fileParser(){
    private Pattern pname = Pattern.compile("regex");
    public boolean parse(BufferReader input){
    try{int state 0; Matcher m; String L;
        while((L = input.readLine()) != null) {
            switch(state){
                case 0:
                    m = pname.matcher(L);
                    if(m.matches()){int p1 = Integer.parseInt(m.group(1));state = 1; break;}
                    error("message";
                    return false;
                }#state
            }#while
        }#try
        catch(Exception e){}
        return true;
    }#method
}#class
```

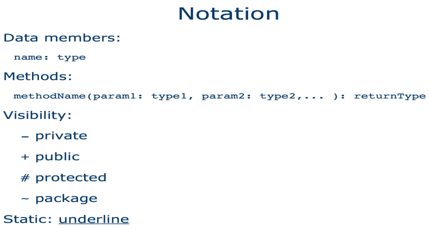
Inheritance

In a subclass:
-use super.attribute to refer to a variable or method in parent class
-use super(attribute) to call a constructor defined in parent class

```
public class LandAnimal extends Animal{
    public LandAnimal(String name){super(name);}}
```

UML


Person
# name : String []
# dob : String
# gender : String
+ Person(name: String[], dob: String, gender: String)
+ getName(): String []
+ setName(name: String[]) : void
+ getDob() : String
+ setDob(dob: String) : void
+ getGender() : String
+ setGender(gender: String) : void
+ toString(): String



Notation

Data members:

name: type

Methods:

methodName(param1: type1, param2: type2,...): returnType

Visibility:

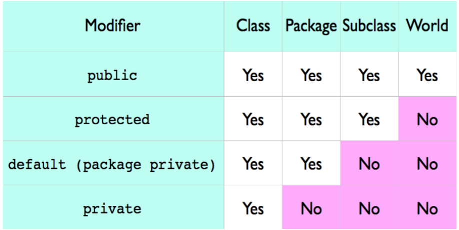
– private

+ public

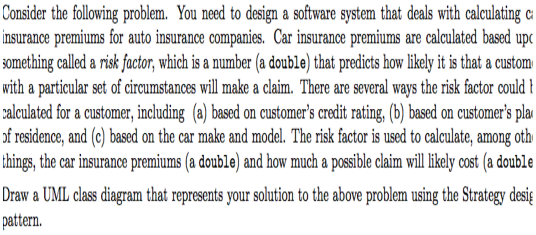
protected

~ package

Static: underline

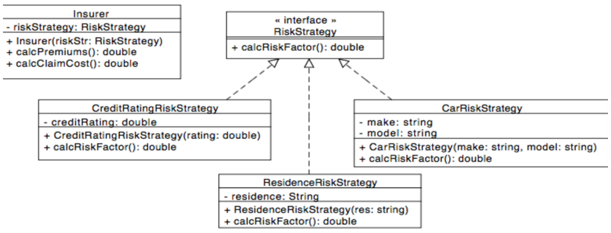


Modifier	Class	Package	Subclass	World
public	Yes	Yes	Yes	Yes
protected	Yes	Yes	Yes	No
default (package private)	Yes	Yes	No	No
private	Yes	No	No	No



Consider the following problem. You need to design a software system that deals with calculating c insurance premiums for auto insurance companies. Car insurance premiums are calculated based upo something called a *risk factor*, which is a number (a double) that predicts how likely it is that a custom with a particular set of circumstances will make a claim. There are several ways the risk factor could l calculated for a customer, including (a) based on customer's credit rating, (b) based on customer's pla of residence, and (c) based on the car make and model. The risk factor is used to calculate, among oth things, the car insurance premiums (a double) and how much a possible claim will likely cost (a double

Draw a UML class diagram that represents your solution to the above problem using the Strategy desig pattern.


Insurer
- riskStrategy: RiskStrategy
+ Insurer(riskStr: RiskStrategy)
+ calcPremiums(): double
+ calcClaimCost(): double
« interface »
RiskStrategy
+ calcRiskFactor(): double
CreditRatingRiskStrategy
- creditRating: double
+ CreditRatingRiskStrategy(rating: double)
+ calcRiskFactor(): double
CarRiskStrategy
- make: string
- model: string
+ CarRiskStrategy(make: string, model: string)
+ calcRiskFactor(): double
ResidenceRiskStrategy
- residence: String
+ ResidenceRiskStrategy(res: string)
+ calcRiskFactor(): double

Iterator

```
public class SongsMain {
    public static void main(String[] args) {
        YourSongs songs1 = new YourSongs(); #iterable
        Iterator<Song> it = songs1.iterator(); #iterator
while (it.hasNext()) {it.next();}}}
public class YourSongs implements Iterable<Song> {
    Song[] songs;
    public YourSongs() {songs = new Song[1];songs[0] = new Song("Hello", "Adele");}
    public Iterator<Song> iterator() {return new YourSongsIterator(songs);}}
public class YourSongsIterator implements Iterator<Song> {
    private Song[] songs; // HashMap<Integer, Song> songs;
    private int indexKey;
    public YourSongsIterator(Song[] s) {this.songs = s; indexKey = 0;}
public boolean hasNext() {return this.indexKey < this.songs.length;}
    public Song next() {return this.songs[indexKey++];}}
```

Builder Design Pattern Example

```
public static void main(String[] args){
    Director director = new Director();
    Builder builder = Null;
    Scanner s = new Scanner(System.in);
    String ans = s.nextline();
    if(ans.equals("kid"){builder = new Kidsmealbuilder();}
    else{builder = new Studentmealbuilder();}
    Meal meal = director.createMeal(builder)}
public abstract class MealBuilder {
    protected Meal meal = new Meal();
    public abstract void buildDrink();
    public abstract void buildMain();
    public abstract Meal getMeal();}
public class director{
    #no constructor
    public Meal createMeal(Mealbuilder builder){ builder.buildDrink(); builder.buildFood();
    return builder.getMeal();}
public class KidsMealBuilder extends MealBuilder{
    public void buildDrink(){meal.setDrink("Kid drink: Kool-aid");}
    public void buildMain(){meal.setMain("Chicken nuggets");}
    public Meal getMeal(){return meal;}
```

Singleton

```
public class Client(){
        Singleton S1 = Singleton.getInstance();
        Singleton S2 = Singleton.getInstance(); #S1 and S2 are the same instance of the singleton object}
public class Singleton(){
    private static Singleton instance = new Singleton();
    public static Singleton getInstance() {
        return instance;}}
```

Command

```
public class Client(){
    Receiver R = new Receiver();
    Invoker = I = new Invoker();
    Command C = new concreteCommand(Receiver R);
    invoker.setCommand(C);
    invoker.execute();
public class concreteCommand implements Command {
    Light light;
    public TurnOffCommand(Light light) {this.light = light;}
    public void execute() {this.light.switchOff();}}
```

Composite

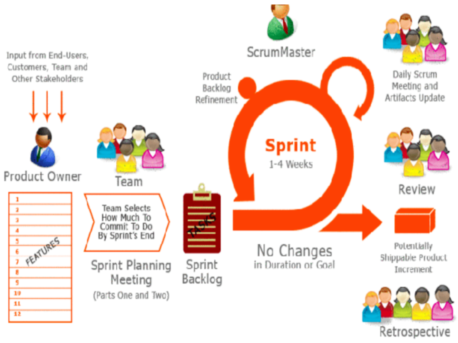
```
public interface GraphicComponent{public void paint();}
public class SimpleGraphic implements GraphicComponent {
    public void paint() {System.out.println("I am a simple graphic.");}}
public class CompositeGraphic implements GraphicComponent {
    ArrayList<GraphicComponent> graphics = new ArrayList<>();
    public void paint() {
        for (GraphicComponent g: graphics){g.paint();}}
        public void add(GraphicComponent g) {graphics.add(g);}
        public void remove(GraphicComponent g) {graphics.remove(g);}}
public class Client{
    public static void main(String[] args) {
        SimpleGraphic graphic1 = new SimpleGraphic();
        CompositeGraphic graphicGroup1 = new CompositeGraphic();
        graphicGroup1.add(graphic1);
        CompositeGraphic mainGroup = new CompositeGraphic();
        mainGroup.add(graphicGroup1);
        mainGroup.paint();}}
```

Strategy

```
public interface TravelStrategy {
    public void travel(Person p, String location);}
public class CarStrategy implements TravelStrategy {
    public void travel(Person p, String location) {
        p.setLocation(location);
        System.out.println(p.getName() + " has traveled to " + p.getLocation() + " by car.");}}
public class TravelContext {
    private TravelStrategy strategy;
    public void setTravelStrategy(TravelStrategy s){strategy =s;}
    public void takeTrip(Person p, String location) {strategy.travel(p, location);}}
public class Client {
    public static void main(String[] args) {
        TravelContext ctx = new TravelContext();
        ctx.setTravelStrategy(new BusStrategy());
        ctx.takeTrip(new Person("Sadia", "Canada"), "Australia");}}
```

Factory

```
public class Main {
    public static void main(String[] args) {
        Fruit fruit;
        FruitFactory fruitFactory = new FruitFactory();
        fruit = fruitFactory.makeFruit("Apple");
        fruit = fruitFactory.makeFruit("Orange");}}
public class FruitFactory {
    public Fruit makeFruit(String type) {
        Fruit fruit = null;
        if (type == "Apple") {fruit = new Apple();}
        else if (type == "Orange") {fruit = new Orange();}
        return fruit;}}
public abstract class Fruit {
    final String type;
    public Fruit(String type){this.type = type;}
    public String getType() {return type;}}
public class Apple extends Fruit {
    public Apple() {super("Apple");}}
```


Input from End-Users, Customers, Team and Other Stakeholders
Product Owner
FEATURES
1
2
3
4
5
6
7
8
9
10
11
12
Team
Team Selects How Much To Commit To Do By Sprint's End
Sprint Planning Meeting
(Parts One and Two)
TASKS
Sprint Backlog
ScrumMaster
Product Backlog Refinement
Sprint
1-4 Weeks
No Changes
in Duration or Goal
Daily Scrum Meeting and Artifacts Update
Review
Potentially Shippable Product Increment
Retrospective

Product Owner: Responsible for product backlog, represents users, expresses backlog items and orders them by value
Development Team: Responsible for delivering potentially shippable increment of working software
Scrum Master: Removes obstacles, facilitates scrum events and communication
Product Backlog: Source of requirements for any changes to be made to the product. Ordered by value, risk, priority and necessity, estimated by team Sprint planning meeting: Team selects items from backlog and defines a sprint goal, and the items are converted into tasks and estimated
Daily Scrum Meeting: Short meeting for the team to discuss what has been accomplished since last meeting, what will be done before the next meeting, and what obstacles are in the way
Sprint Review: Product Owner identifies what has been done, team discusses development process and demos current increment of software, product owner discusses current state of backlog, team decides what to do next

IEEE Conversion

$$\underbrace{0}_{+/-}\quad\underbrace{01111110}_{8bitrepsexponent+127}\quad\underbrace{01000000000000000000000}_{23bitmantissa}$$

Rounding GRS

0xx - round down/do nothing
100 - round up if mantissa's bit just before G is 1, else round down/do nothing.
101/110/111 - round up
Rounding up is done by adding 1 to the mantissa in the mantissa's least significant bit position just before G. G is the 1st element after the 23 mantissa.

Example for float -6.8

6: $2^2 + 2^1 + 2^0 <=> 110$

$$0.8 : 1100... \quad \{ \quad \begin{array}{ll} 0.8 * 2 & = \mathbf{1}.6 \\ 0.6 * 2 & = \mathbf{1}.2 \\ 0.2 * 2 & = \mathbf{0}.4 \\ 0.4 * 2 & = \mathbf{0}.8 \end{array}$$

mantissa = 110.1100 1100 1100 1100 1100 1 (24 since you don't count the first one)
Normalize mantissa to find exponent: 1.10(.)110011001100110011001 * 2^2 (Shifted 2 decimal places so exponent is 2)

8 bit exponent: Binary of (127 + exponent value) = 127 + 2 = 129 = $2^7 + 2^0$ <=> 10000001

The IEEE is:

$$\underbrace{1}_{SinceNegative}\quad\underbrace{10000001}_{129binrep}\underbrace{10110011001100110011001}_{23bitmantissa}$$

Round up since GRS is 100 and the element before G is a 1. Since 001 represents 1 in binary, and 1+1 = 2, the resulting binary rep is 010.
Final IEEE: $\underbrace{1}\ \underbrace{10000001}_{8bit}\underbrace{10110011001100110011010}_{23bitmantissa}$
Note: Interfaces can extend other interfaces, classes can implement multiple interfaces, classes can only extend a single class Note: Abstract classes cannot be instantiated Note: If A extends B, then the code A a = new B(); is valid but the code B b = new A(); is invalid because of a type mismatch