

### Programmer or engineer

engineer = analytic mindset, oversee the whole software development cycle

programmer = implement and debug

### Water fall model

program specification project description/requirements

program design plan to solve the problems listed, no code at all, language independent

implementation coding in java

testing and debug testing case(end point, in range, out of range, special value/invalid)

compiler(java checked Exception)/runtime(java unchecked,error)/business logic errors(in corrected results)

robustness:deal bad input ( input correct ->correct answer, invalid input ->no crash/error/exception

maintenance upgrade, new features,document for new comers

infinite loop is a run time error because it will eventually eat up all memory.

divided by zero for int(runtime exception) and float (infinite, when output is known)

platform dependency and efficiency not belong to robustness.

### object oriented program design

identify classes -- noun

identify behavior --verb

find relation between classes

write API for each class ( pubic method header)

implement methods

### identify classes

lower level component Connect4 board, game rule

collection of lower level components players

control class controller ( setup player and board)

GUI Display

### identify behavior

all verbs

match behavior with class carefully and logically This could be in test

encapsulation, only expose what necessary

find suitable data structure( fields, properties)

### implementing methods

procedural abstraction/stepwise refinement helper methods (repeated code, smaller method body,easy read)

information hiding instance variable and helper method to be private

stub method for test, input and return correctly

algorithm step by step procedure to solve problem. understand the algorithm before coding

logically correctness,CPU time, memory needed,easier to maintain/understand

### determine relationships between classes

inheritance is-a

composition has-a

### UML Model

rectangular <<abstract>><<interface>>

up arrow is a

up arrow + dotted line interface is a

down arrow has a

use is-a and has-a to test if class design is ok or not.

### implementing classes

bottom independent class -->lower lever first -->major up components

top down main class ->step wise refinement and add detail classes

design is usually top down, implementation usu bottom up is easier.

### program analysis

assertion precondition( what's is true before a method,loop, block run - input), post condition (the status after the run - output)

efficiency cpu time, memory

best case; worst case;average case

### Vocabulary summary

software development	writing a program
object-oriented program	uses interacting object
program specification	description of a task
program implementation	the code
test data	input to test a program
program maintenance	keep program working and up to date
top down development	implement main class first, subsidiary classes later
bottom up development	implement lowest level classes, independent class first
driver class	used to test other class, contains main()
inheritance relationship	is a relationship between classes
composition relationship	has a relationship between classes
inheritance hierarchy	inheritance relationship shown in a tree like structure
UML diagram	tree like representation of relations between classes
data structure	java construt for storing data
encapsulation	combining data field and method in a class
information hiding	use private to restrict access
step wise refinement	breaking methods into smaller methods
procedural abstraction	use helper method
algorithm	step by step process to solve a problem
stub method	dummy method called by another method being tested
debugging	fixing errors
robust program	screens out bad input
compile time error	usu a xyntax error; prevent from compiling
syntax error	bad language usage
runtime error	occurs during eecution

### Vocabulary summary (cont)

exception	run time error thrown by java method
logic error	program runs but does the wrong things
independent class	donot use other classes of the program in its code