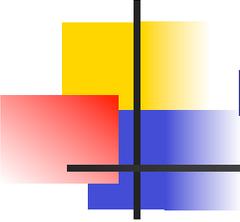
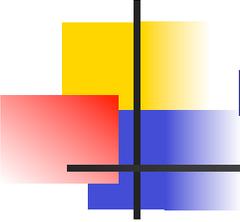


Purpose of Testing



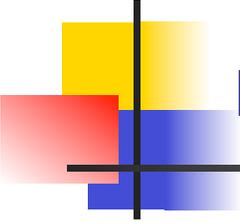
Beizer's testing levels on test process maturity

- There are four levels of maturity
 - **Fundamental differences**
 - **In viewpoint**
 - **Effect on the individual**
 - **Effect on the organization**
 - **Effect on developed systems**



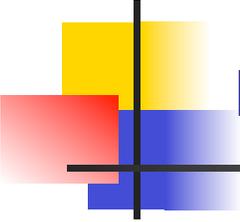
Beizer' s testing levels on test process maturity

- Level 0
 - No difference between testing and debugging



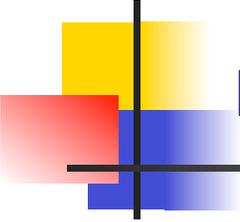
Level 0

- No difference between testing and debugging
 - **Adopted by undergraduate CS students**



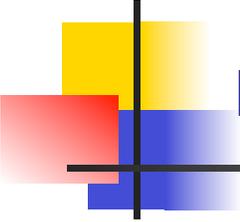
Level 0

- No difference between testing and debugging
 - **Adopted by undergraduate CS students**
 - **Get their programs to compile**



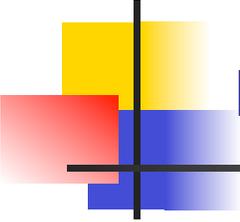
Level 0

- No difference between testing and debugging
 - **Adopted by undergraduate CS students**
 - Get their programs to compile
 - **Debug with few arbitrarily chosen inputs or those provided by the instructor**



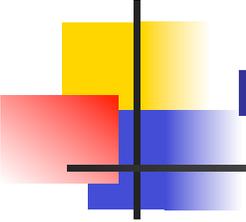
Level 0

- No difference between testing and debugging
 - Adopted by undergraduate CS students
 - Get their programs to compile
 - Debug with few arbitrarily chosen inputs or those provided by the instructor
 - **Does not distinguish between incorrect program behaviour and programming mistakes**



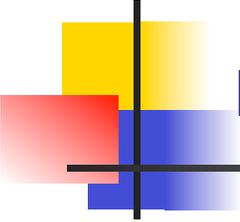
Level 0

- No difference between testing and debugging
 - Adopted by undergraduate CS students
 - Get their programs to compile
 - Debug with few arbitrarily chosen inputs or those provided by the instructor
 - Does not distinguish between incorrect program behaviour and programming mistakes
 - **Does little to help develop programs that are reliable or safe**



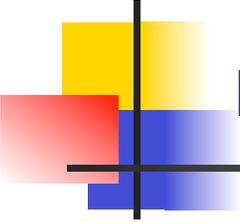
Beizer's testing levels on test process maturity

- Level 1
 - Purpose of testing is to show that software works
- Level 0
 - No difference between testing and debugging



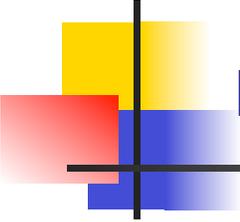
Level 1

- Purpose of testing is to show that software works
 - **Significant step up**



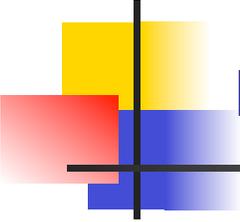
Level 1

- Purpose of testing is to show that software works
 - Significant step up
 - **But correctness is virtually impossible to either achieve or demonstrate**



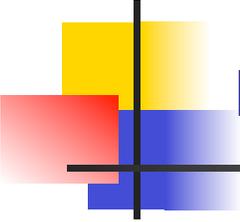
Level 1

- Purpose of testing is to show that software works
 - Significant step up
 - **But correctness is virtually impossible to either achieve or demonstrate**
 - **Problems?**



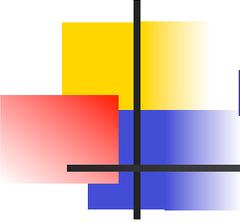
Level 1

- Purpose of testing is to show that software works
 - Significant step up
 - **But correctness is virtually impossible to either achieve or demonstrate**
 - **Run test suite with no failures**
 - **Is program correct?**
 - **Do we have bad tests?**



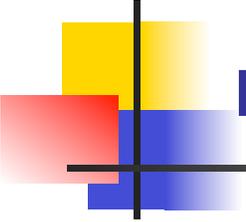
Level 1

- Purpose of testing is to show that software works
 - Significant step up
 - But correctness is virtually impossible to either achieve or demonstrate
 - Run test suite with no failures
 - Is program correct?
 - Do we have bad tests?
- **Test engineers have no strict goal, real stopping rule or formal test technique**



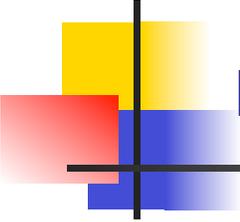
Level 1

- Purpose of testing is to show that software works
 - Significant step up
 - But correctness is virtually impossible to either achieve or demonstrate
 - Run test suite with no failures
 - Is program correct?
 - Do we have bad tests?
 - Test engineers have no strict goal, real stopping rule or formal test technique
 - **Test managers are powerless because they have no way to quantitatively express or evaluate their work**



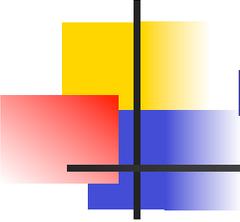
Beizer's testing levels on test process maturity

- Level 2
 - Purpose of testing is to show that software doesn't work
- Level 1
 - Purpose of testing is to show that software works
- Level 0
 - No difference between testing and debugging



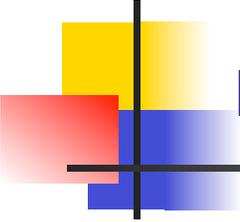
Level 2

- Purpose of testing is to show that software doesn't work
 - **Valid but negative goal**



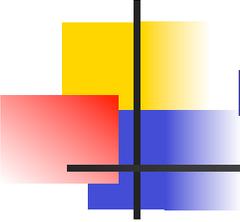
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - **Testers may like it but developers do not**



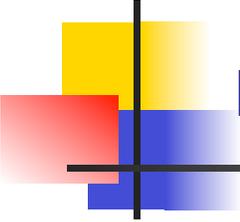
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - **Testers may like it but developers do not**
 - Why?



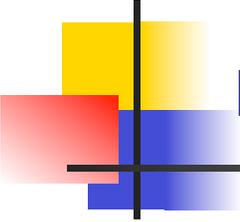
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - **Testers may like it but developers do not**
 - **Level 1 thinking is natural for developers**



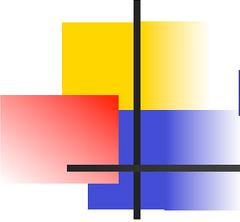
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - **Testers may like it but developers do not**
 - **Level 1 thinking is natural for developers**
 - What is the problem?



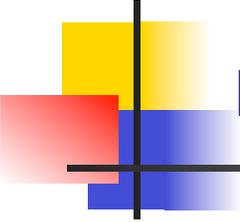
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - Testers may like it but developers do not
 - Level 1 thinking is natural for developers
 - **Have adversarial relationship**
 - **Bad for team morale**
 - **Conflict of interest if the same person**



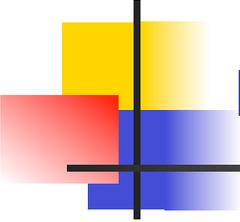
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - Testers may like it but developers do not
 - Level 1 thinking is natural for developers
 - Have adversarial relationship
 - Bad for team morale
 - Conflict of interest if the same person
- What else?



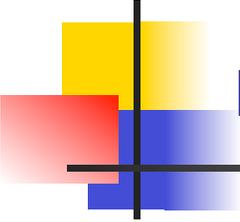
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - Testers may like it but developers do not
 - Level 1 thinking is natural for developers
 - Have adversarial relationship
 - Bad for team morale
 - Conflict of interest if the same person
 - **What to do if no failures are found?**
 - **Is software good?**
 - **Is testing bad?**



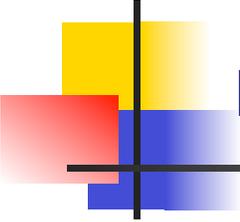
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - Testers may like it but developers do not
 - Level 1 thinking is natural for developers
 - Have adversarial relationship
 - Bad for team morale
 - Conflict of interest if the same person
 - What to do if no failures are found?
 - Is software good?
 - Is testing bad?
- Conclusion?



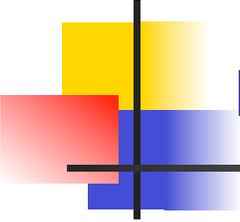
Level 2

- Purpose of testing is to show that software doesn't work
 - Valid but negative goal
 - Testers may like it but developers do not
 - Level 1 thinking is natural for developers
 - Have adversarial relationship
 - Bad for team morale
 - Conflict of interest if the same person
 - What to do if no failures are found?
 - Is software good?
 - Is testing bad?
 - **Having confidence when testing is complete is an important goal**



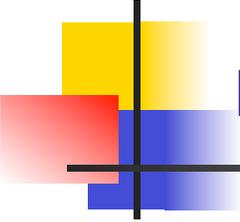
Beizer's testing levels on test process maturity

- Level 3
 - Purpose of testing is not to prove anything specific but to reduce the risk of using the software
- Level 2
 - Purpose of testing is to show that software doesn't work
- Level 1
 - Purpose of testing is to show that software works
- Level 0
 - No difference between testing and debugging



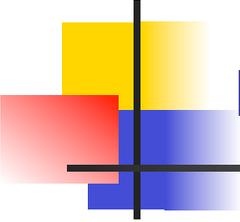
Level 3

- Purpose of testing is not to prove anything specific but to reduce the risk of using the software
 - **Realize that testing can show the presence of failures but not their absence.**



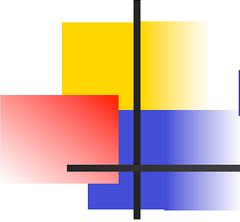
Level 3

- Purpose of testing is not to prove anything specific but to reduce the risk of using the software
 - Realize that testing can show the presence of failures but not their absence.
 - **Accept fact that using software incurs some risk**



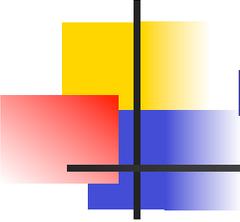
Level 3

- Purpose of testing is not to prove anything specific but to reduce the risk of using the software
 - Realize that testing can show the presence of failures but not their absence.
 - **Accept fact that using software incurs some risk**
 - **May be small with unimportant consequences**
 - **May be big with important consequences, or even catastrophic**



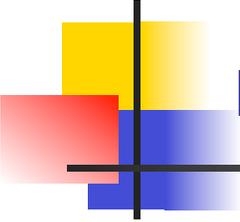
Level 3

- Purpose of testing is not to prove anything specific but to reduce the risk of using the software
 - Realize that testing can show the presence of failures but not their absence.
 - Accept fact that using software incurs some risk
 - May be small with unimportant consequences
 - May be big with important consequences, or even catastrophic
 - **Entire team wants the same thing**



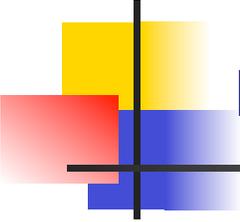
Level 3

- Purpose of testing is not to prove anything specific but to reduce the risk of using the software
 - Realize that testing can show the presence of failures but not their absence.
 - Accept fact that using software incurs some risk
 - May be small with unimportant consequences
 - May be big with important consequences, or even catastrophic
 - **Entire team wants the same thing**
 - Which is?



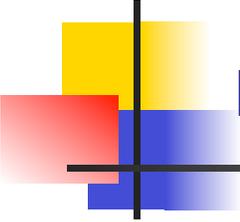
Level 3

- Purpose of testing is not to prove anything specific but to reduce the risk of using the software
 - Realize that testing can show the presence of failures but not their absence.
 - Accept fact that using software incurs some risk
 - May be small with unimportant consequences
 - May be big with important consequences, or even catastrophic
 - **Entire team wants the same thing**
 - **Reduce the risk**
 - **Developer and tester work together**



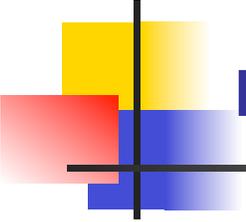
Beizer's testing levels on test process maturity

- Level 4
 - **Testing is a mental discipline that helps all IT professionals develop higher quality software**
- Level 3
 - Purpose of testing is not to prove anything specific but to reduce the risk of using the software
- Level 2
 - Purpose of testing is to show that software doesn't work
- Level 1
 - Purpose of testing is to show that software works
- Level 0
 - No difference between testing and debugging



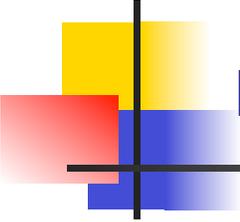
Level 4

- Testing is a mental discipline that helps all IT professionals develop higher quality software
 - **Testing is a mental discipline that increases quality**



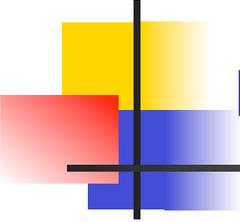
Level 4

- Testing is a mental discipline that helps all IT professionals develop higher quality software
 - Testing is a mental discipline that increases quality
 - **Testers become technical leaders of projects**



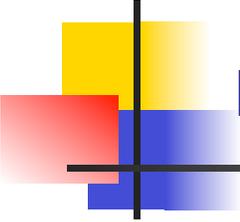
Level 4

- Testing is a mental discipline that helps all IT professionals develop higher quality software
 - Testing is a mental discipline that increases quality
 - Testers become technical leaders of projects
 - **Primary responsibility is measuring and improving software quality**



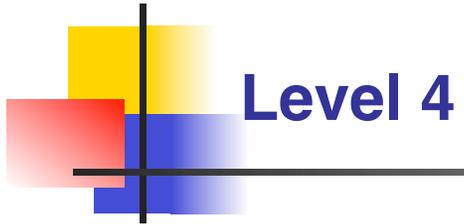
Level 4

- Testing is a mental discipline that helps all IT professionals develop higher quality software
 - Testing is a mental discipline that increases quality
 - Testers become technical leaders of projects
 - Primary responsibility is measuring and improving software quality
 - **Improve the ability of developers to produce quality software**



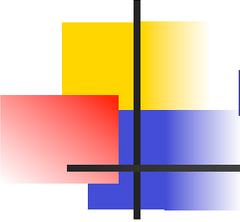
Level 4

- Testing is a mental discipline that helps all IT professionals develop higher quality software
 - Testing is a mental discipline that increases quality
 - Testers become technical leaders of projects
 - Primary responsibility is measuring and improving software quality
 - **Improve the ability of developers to produce quality software**
 - **Testers train developers**



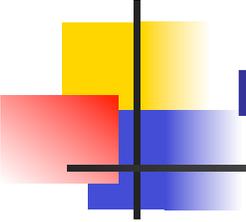
Level 4

- Example – spell checker



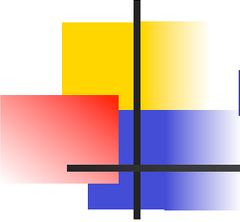
Level 4

- Example – spell checker
 - **Best purpose is to improve our ability to spell**



Level 4

- Example – spell checker
 - **Best purpose is to improve our ability to spell**
 - **Change of mindset**



Level 4

- Example – spell checker
 - **Best purpose is to improve our ability to spell**
 - **Change of mindset**
 - From – purpose is to find misspelled words