

8. Quality Assurance

- Purpose of quality assurance (QA)
 - to check if a solution works
 - to find bugs
- Quality management
 - the process of installing quality assessment
 - and making sure it's done
- Kinds of quality assurance
 - Dynamic versus Static
 - Tool-supported versus Manual
 - Formal versus Informal
- Tools
 - test drivers and other test execution tools
 - test case generators
 - coverage analyzers

Need for Quality Assurance

- Therac 25, 1985-1987
 - medical linear accelerator
 - X-ray treatment for cancer
 - patients died of overdose
 - error handling/ user interface
- Ariane 5, 1996
 - rocket carrying satellite
 - divide-by-zero exception
- Mars Polar Lander, 2000
 - robot sent to Mars to look for water; lost
 - metric/English conversion problem

Why is QA Hard?

- Difference between testing hardware and software?
 - cars, chairs, toasters

Two Potential Bugs

```
/** Return whether s starts with a capital A. */  
public boolean startsWithCapitalA( String s ) {  
    return s.charAt( 0 ) == 'A';  
}
```

Another Bug

```
/** Check if "foo" is mapped to "bar". */  
void checkFooBar( Map map ) {  
    if( map. get( "foo" ). equals( "bar" ) ) {  
        System. print. out( "yes! it is!" );  
    }  
}
```

Your trickiest bug so far??

- How did you notice it?
- How did you find the cause?

