What Is In the MsgBox?

```
Private Sub Form_Click()
    a = 2
    b = 3
    c = 4
    Call DoIt(a, b)
    MsgBox (a & " " & b & " " & c)
    Call DoIt(c, a)
    MsgBox (a & " " & b & " " & c)
    Call DoIt(c, b)
    MsgBox (a & " " & b & " " & c)
End Sub

Private Sub DoIt (g As Integer, f As Integer)
    Dim t As Integer
    t = f
    f = g
    g = t
End Sub
```

Reliability, Correctness and Accountability

Can we build completely reliable and correct computer systems? If not, who or what is responsible for the failure? Are there decisions computers should never make?

FIT 100 When Machines Fail…

- Failures occur when machines no longer perform as desired or expected
- *Mechanical* failures tend to be localized and effect a single aspect of the system (e.g., when the brakes on a car fail, the engine still works fine)
- CONCEPT: *Computational* failures can be closely coupled – a small failure in one part of the system may have a significant effect elsewhere in the system (e.g. Zero and the USS *Yorktown*)

FIT 100 Exactly What Do We Mean by Failure?

- We can understand failure in terms of system:

1. Specification
2. Correctness
3. Reliability

FIT 100 Specification

- CONCEPT: Specification is a *precise description* of the desired behavior of a computer system
- That is, the specification may say what outputs are to be produced by a system for each input
- For example, in the Binary Search Project, the project description specified how the program was to work, including what was to happen when a radio button was selected, the “OK” button was clicked, and so on

FIT 100 Correctness

- CONCEPT: Correctness is the property of *being consistent* with a specification.
- That is, the specification may say that proper outputs are produced by a system for each input.
- For example, in the Binary Search project, the program you wrote produced the proper outputs (e.g., asked the next question correctly) for each input (e.g., depending on whether you clicked on the “yes” or “no” button)

FIT 100 Reliability

- CONCEPT: Reliability is the capability of a computer to *perform consistently* and *precisely* according to its specifications and design requirements, and to do so with high confidence.
- That is, the program may regularly produce the proper outputs for each input.
- For example, in the Binary Search project, your program consistently and precisely produced the correct output (e.g., questions) for each input (e.g., clicking on the “yes” and “no” buttons)

FIT 100 But in the Real World…

- Given the complexity of computer systems, it is virtually impossible to write programs that are completely:
  - Correct
  - Reliable
- Moreover:
  - We often specify solutions to the wrong problem

FIT 100 How Good Is Good Enough?

- Standard of Practice
  - Accepted practices of the field (e.g., testing, debugging)
  - Reflect the “best” practices known
  - Change over time as our knowledge changes and (hopefully!) improves
- If standard practices NOT used and the system fails, then we cry negligence! (e.g., when a building that wasn’t built to standard specs crumbles during a small earthquake)
- However, if standard practices are used and the system fails, then we don’t hold the engineers accountable (e.g., when a building that was built to standard specs crumbles during a 9.8 earthquake)

FIT 100 Accountability

- When computer systems fail, who or what is responsible?
  - Software designers who designed the system and wrote the specifications?
  - Software engineers who wrote the code?
  - System administrations who oversee the computer system’s use?
  - Users who use the system on a daily basis?
  - Organization’s administration who decided to the computer system would be used?
  - The computer system itself?

FIT 100 A Thought Question…

Are there some decisions that computers should never make?

FIT 100 Statement 1

Computers should never make any decisions which humans want to make.

- Take out a piece of paper. Write your name(s) on it.
- Discuss this statement with the person to your right or left. Do you agree or disagree? Why? Write down two or three ideas that arise in your discussion.
- (I'll collect these at the end of class today. These won't be graded.)

FIT 100 Statement 2

Computers should never make any decisions which humans can make more competently.

- ❖ Discuss this statement with the person to your right or left. Do you agree or disagree? Why?
- ❖ Write down two or three ideas that arise in your discussion.

FIT 100 Statement 3

Computers should never make any decisions which humans cannot override.

- ❖ Discuss this statement with the person to your right or left. Do you agree or disagree? Why?
- ❖ Write down two or three ideas that arise in your discussion.

FIT 100 James Moor

These “dubious” maxims come from an article by the philosopher James Moor:

“Are there decisions computers should never make”
Nature and Systems, 1, pp. 217 – 219 (1979).

FIT 100 The Bottom Line

- Computers systems are only as good as people make them
- We don’t know how to create computer systems that function correctly and reliably all the time
- Our computer use needs to take into account the limits of our abilities to create correct and reliable systems
- Bottom Line: People decide when and how computer systems will be used