



THE UNIVERSITY OF
MELBOURNE

SWEN90016
Software Processes & Project Management

Quality Management Case study

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Lecture 8



What do these movies have in common?

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Characters make huge amounts of money by taking advantage of the fact that numbers need to be shortened to two decimal places in order to function as currency, in dollars and cents.

- `round()`, which rounds to the nearest cent, or
- `floor()`, which just cuts off all the extra decimal places.

For example, an after-tax salary computation of \$145.459 would normally be rounded to \$145.46; *floored* to \$145.45

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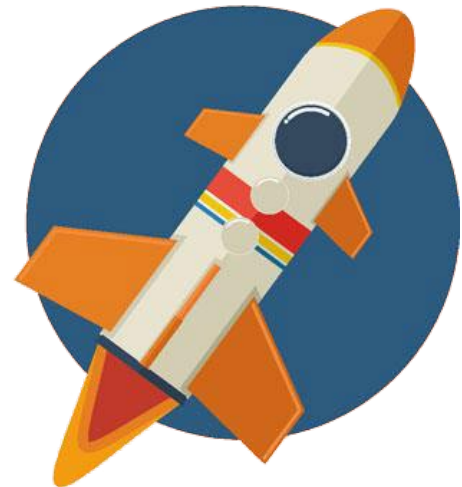
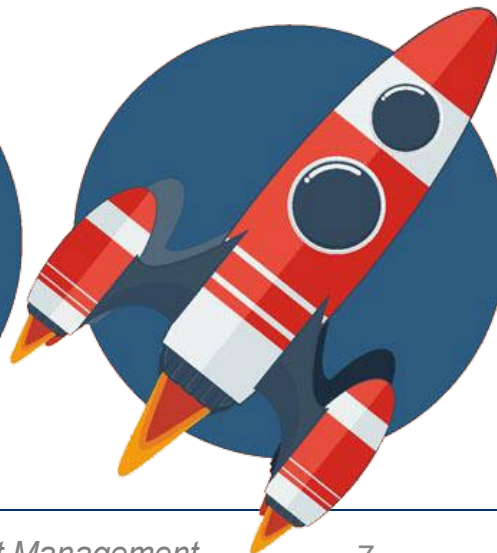
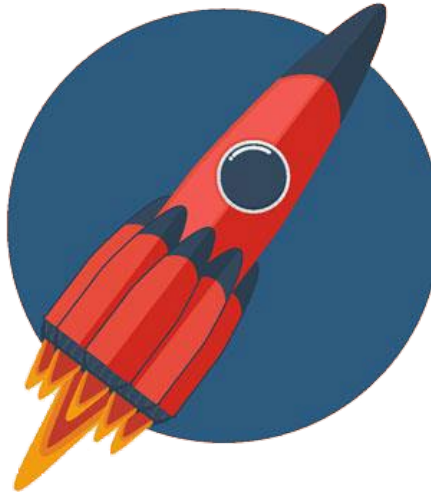
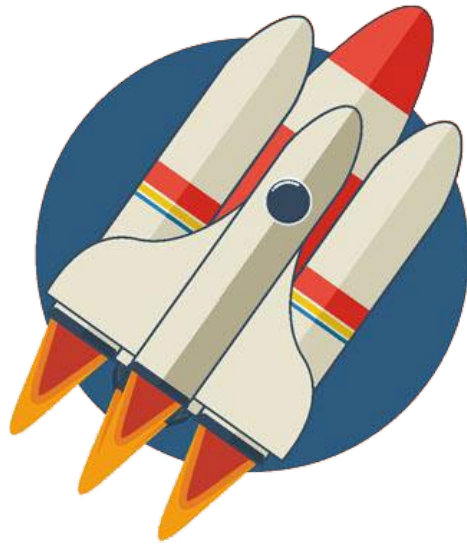
- Sometimes fractional cents aren't stolen—they *vanish*.
- Early 1980s, a new stock index at the Vancouver Stock Exchange tracked a steady and mysterious loss in value.
- An investigation revealed that floor() was being used instead of round()
- Lost fractions of cents accumulating to almost a 50 percent loss of value in 22 months.
- The programming mistake was finally fixed; the index closed around 500 on a Friday and reopened the following Monday at over 1,000, the lost value restored.

- Germany
- Parliamentary election rule that parties must surpass a minimum 5-percent threshold in order to receive a seat/s in the legislature.
- April 1992 elections in the state of Schleswig-Holstein, Green Party had received exactly 5 percent of the votes.
- After the election results were published, discovered that the Greens had received only 4.97 percent of the vote





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June 1996, when the European Space Agency's

- Ariane 5 rocket exploded just 39 seconds after lift-off.
- After a decade of development
- Cost \$7 billion,
- Destroyed payload of four uninsured scientific satellites across mangrove swamps, resulting in the loss of \$500 million worth of equipment.
- Rocket blew up because made an abrupt attempt to correct and compensate for wrong turn—a turn it had not, in fact, taken.

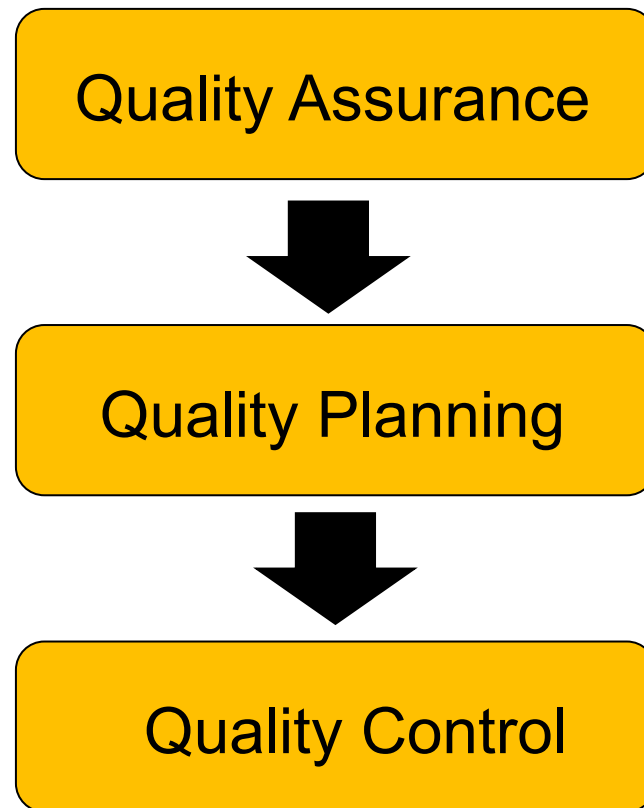
Rockets

- This confusion was caused by a rounding error in the inertial reference code that was being reused from the Ariane 4 rocket.
- A 64-bit floating point number representing the horizontal velocity was converted to a 16-bit signed integer,
- 48 fewer number places.
- Mistake because Ariane 5 was much faster than Ariane 4.
- The conversion yielded a number that was larger than the largest possible number in that quantized representation from the slower Ariane 4.
- Caused an error message to be transmitted
- Interpreted as a nonsensical number by the on-board computer—and disaster

What should they have done?



Quality Management Process



1. *Quality assurance:*

The establishment of a framework of organizational procedures and standards that lead to high-quality software

2. *Quality planning:*

The selection of appropriate procedures and standards from the framework, adopted for the specific project

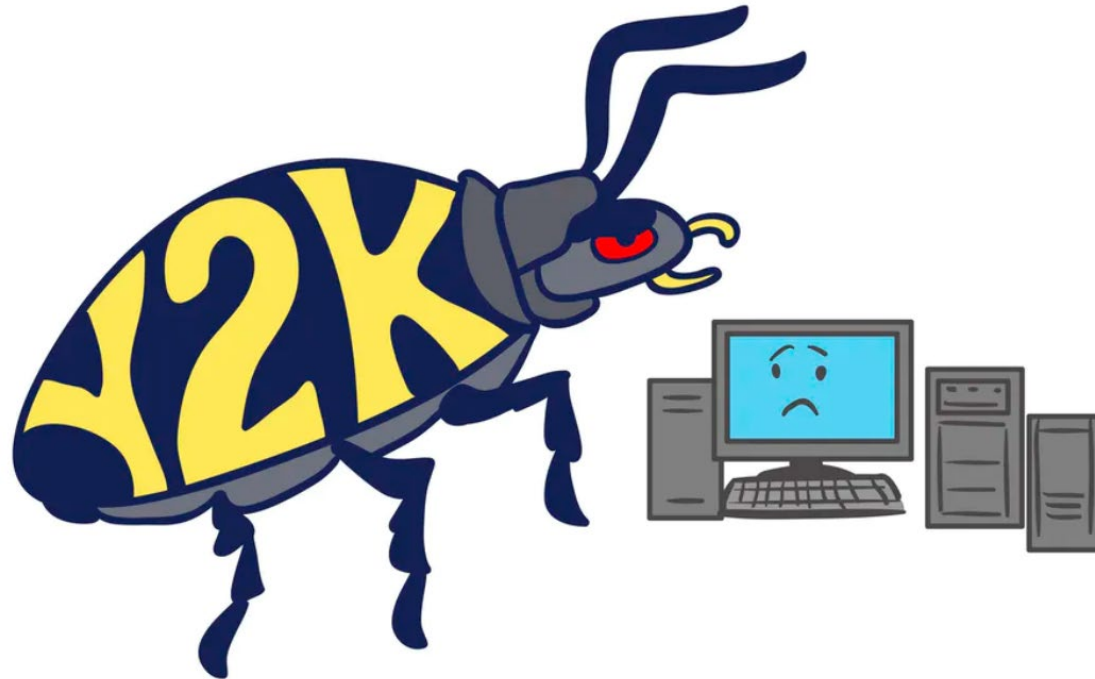
3. *Quality control:*

Ensuring that the software development team has followed the project quality procedures and standards

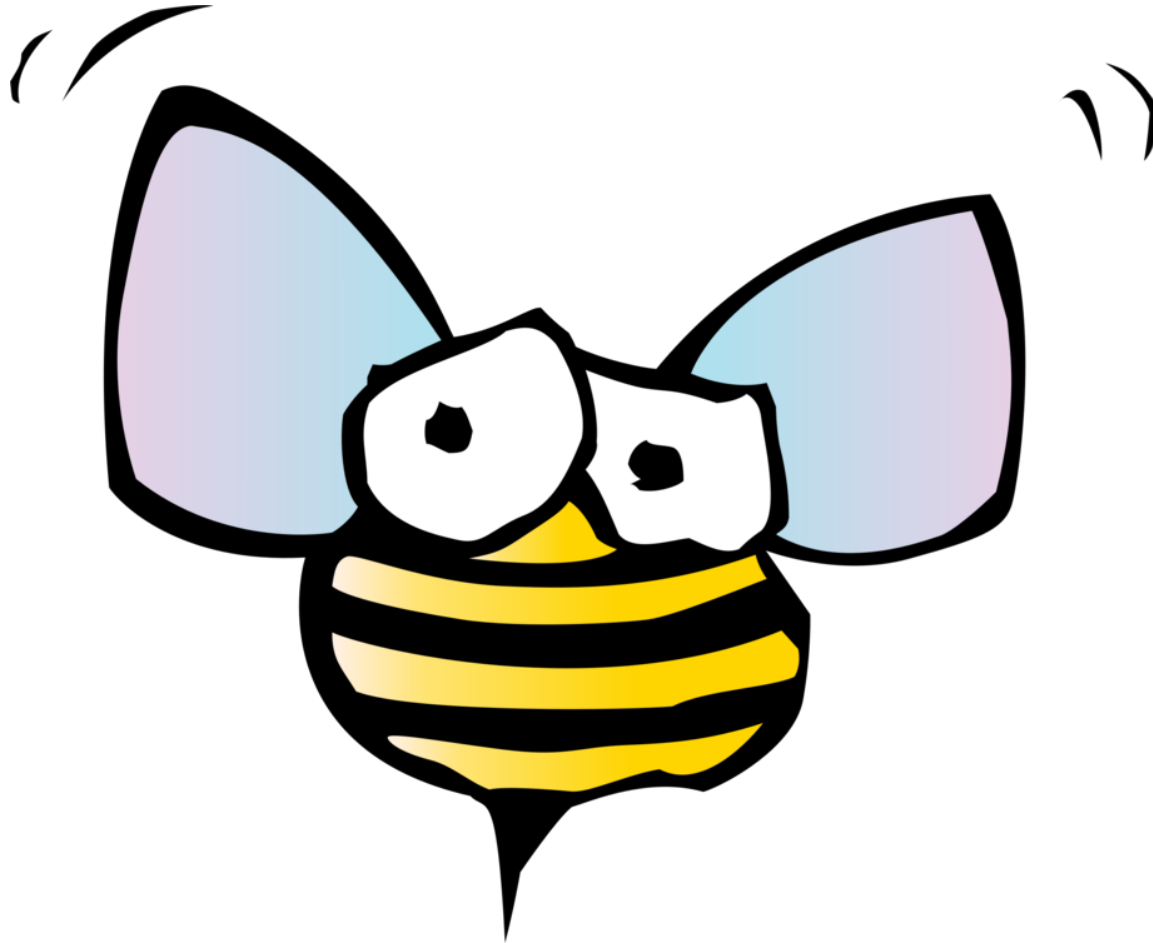
Informal Reviews
Formal Reviews
Walk throughs
Code inspections
Audits

Y2K bug

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What is a bug/debugging - Poll



- 1946
- Account by computer pioneer Grace Hopper, who publicized the cause of a malfunction in an early electromechanical computer.
- Grace Hopper worked at Harvard Faculty at the Computation Laboratory where she continued her work on the Mark II and Mark III
- Operators traced an error in the Mark II to a moth trapped in a relay, coining the term bug.
- This bug was carefully removed & taped to the log book. This was the first bug, today we call errors or glitches in a program a bug.

[3]



1. Movie pictures retrieved from imdb.com
2. Rounding errors <https://slate.com/technology/2019/10/round-floor-software-errors-stock-market-battlefield.html>
3. SoftwareBughttps://en.wikipedia.org/wiki/Software_bug#:~:text=The%20term%20%22bug%22was%20used,in%20an%20early%20electromechanical%20computer.&text=Operators%20traced%20an%20error%20in,taped%20to%20the%20log%20book.