Northeastern University
College *of* Computer and Information Science

CS1100: Computer Science and Its Applications

Course Introduction

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CS1100 Computer Science and its Applications

- The course focuses on data:
  - how data may be organized
  - how useful information may be extracted from data
  - how summary information may be calculated
  - methodical and analytical problem solving techniques
- You will learn how to do simple but very effective computations using Microsoft Excel and Access.
- While a single course cannot cover all aspects of these software tools, you will nevertheless learn important highlights.

Learning Objectives

- Upon completion of this course, students will know how to:
  - conceptualize and solve problems involving the analysis of data
  - calculate elementary statistics and present data analyses in Excel
  - build charts and graphs in Excel
  - design relational databases and formulate queries in Access
  - construct reports in Access

Course Topics

Excel (Spreadsheet)

- Cells contain either Values or Formulas
- Cell references, named ranges
- Assume Given Data for a problem may change
- Copying and Dragging with Fill Handle
- Absolute and Relative Addressing
- IF function
- Partitioning data into subsets
- Math functions, counting
- Lookup tables - VLOOKUP
- Solving inductively defined problems
- Text manipulation and processing
- Formatting vs. rounding
- Charts and Graphs

Access (Database)

- Relational databases
- Tables, rows, columns, values
- Table Predicates
- Queries
- Selecting Rows
- Projecting Columns
- Duplicates, Uniqueness and Counting entities
- Joining Tables
- Database Keys
- Unrelated Tables
- Subqueries
- Reports

Course Web Site

- http://www.ccs.neu.edu/course/cs1100su14
  - Also linked from Blackboard
- Course Materials
  - Excel Tutorials
  - Access Tutorials
  - PPT Slides
- Blackboard:
  - Submit Labs, Quizzes, Tests
  - Grades

Communication

- Communication through Blackboard's email feature
  - Be sure your Blackboard email address is correct and that you check it often
- Piazza Discussion Group
  - Anonymous posts are fine.

Grading & Assessment

Assessment	Grade %
Excel Quiz	10%
Excel Test	25%
Access Quiz	10%
Access Test	25%
Lecture Quizzes	5%
Excel Part of Final (optional)	Average with Excel Test
Access Part of Final (optional)	Average with Access Test
Excel Labs (5)	12.5%
Access Labs (5)	12.5%
Lab 0	Mandatory, but 0%

- A better test grade replaces a lower quiz grade.

Course Format

- There are four class sessions per week, all held in the computer lab, WVH 210.
- Class sessions alternate between lecture/discussion of the material, and time to work on lab assignments.
- Lectures will end with a very short quiz. Lecture quizzes are worth 5% of your final grade.
- Attendance in lab sections is optional if all lab assignments due to that point have been submitted.
  - I.E. You may leave (quietly, please) when you are done.
  - You may miss additional explanation/clarification of previously discussed material, but never new material.

Lab Assignments

- Labs are intended to reinforce and deepen your study of the covered material
- You are expected to not only study the provided resources, but investigate additional resources
- Labs are to be completed individually
- Late submissions are subject to penalties

Late Submissions

- 20 percentage points will be deducted per late day from assignments which are submitted after the due date.
- The only exception is **a valid medical excuse accompanied by a physician's note.**

Academic Honesty

Why is Academic Honesty Important?

- *Your* diploma represents the University's certification that *you* have attained a certain level of knowledge in your program.
- *Your* grade in this course represents my certification that *you* have attained a certain level of knowledge in this course.
- "*You*" means *you*, not "you with a little help from your friends."

Who cares?

- Employers care.
  - When they see an NU diploma, they expect *that individual* to have reached a certain level of achievement
- Faculty and Advisors care.
  - When they see a grade in this course, they expect *that individual* to have reached a certain level of knowledge.

Who else cares?

- Your classmates care.
  - An honest student gets angry when his or her classmate gets a reward without putting in the effort.
- The University cares.
  - Every time a student goes out into the world with an NU diploma and doesn't perform well, it makes the whole University look bad.

CCIS Cheating Policy

- All violations of the University academic integrity policy must be reported to OSCCR.
  - OSCCR = Office of Student Conduct and Conflict Resolution.
- Students who cheat often do so in multiple courses. By reporting all violations to OSCCR, we guarantee that such students are suitably punished.

University Academic Integrity Policy

The following is a broad overview, but not an all-encompassing definition, of what constitutes a violation of academic integrity. [from OSCCR website]

Cheating: The University defines cheating as using or attempting to use unauthorized materials, information, or study aids in any academic exercise. **When completing any academic assignment, a student shall rely on his or her own mastery of the subject.** [emphasis added]

Fabrication: The University defines fabrication as falsification, misrepresentation, or invention of any information, data, or citation in an academic exercise.

Plagiarism: The University defines plagiarism as using as one's own the words, ideas, data, code, or other original academic material of another without providing proper citation or attribution. Plagiarism can apply to any assignment, either final or drafted copies, and it can occur either accidentally or deliberately. Claiming that one has "forgotten" to document ideas or material taken from another source does not exempt one from plagiarizing.

Unauthorized Collaboration: The University defines unauthorized collaboration as instances when students submit individual academic works that are substantially similar to one another. While several students may have the same source material, any analysis, interpretation, or reporting of data required by an assignment **must be each individual's independent work unless the instructor has explicitly granted permission for group work.** [emphasis added]

Participation in Academically Dishonest Activities: The University defines participation in academically dishonest activities as any action taken by a student with the intention of gaining an unfair advantage over other students.

The Short Version:

DON'T SHARE BITS

If you share files or even portions of files with somebody else, we *will* detect it and you *will* get sent to OSCCR. Period. End of story.

Typical scenarios (1)

- Your friend comes and says that he or she is lost and the problem is due tomorrow, and can he just please look at your solution, or your data definitions, or even just your test cases.
- What should you do?
- Tell him that the University policy requires that you tell him "no." If you give him or her your files, you *will* be sent to OSCCR. (And of course he will be sent to OSCCR.)

Typical scenarios (2)

- The problem is due tomorrow and your roommate has solved the problem and has left his machine unlocked, but you are still struggling.
- You think: I'll just take a peek at his solution
- And then you think: I'll mail myself a copy so I can look at it more closely
- What should you do?
- **DON'T DO IT:** you **WILL** be sent to OSCCR (and your punishment may be harsher: theft is much worse than collaboration.)

Typical scenarios (3)

- You are sitting in the library with a group of people and you write some test cases on the whiteboard.
- And then you all submit the same test cases, maybe with the numbers changed.
- What happens next?
- You all will be sent to OSCCR.

Typical scenarios (4)

- You and a classmate share a USB drive. You submit your classmate's file as your own.
- You will both be submitted to OSCCR as each student is responsible for keeping his/her code hidden from all other students, which is violated when a USB drive is shared.

What happens if I get caught?

- You will get called to my office and I will show you what you did.
- You will receive a grade penalty in the course.
- You will be sent to OSCCR.
  - They will assign a non-academic penalty (typically some form of suspension, possibly deferred if there are no future violations)
  - A second OSCCR violation typically results in expulsion from the University.

What happens if I don't get caught?

- You go on to the next course, and do poorly because you are unprepared
- You go out on an interview, and do poorly because you are unprepared
- You manage to get a job, but do poorly because you are unprepared.
- Your co-op employer is so disappointed by your performance that he decides not to interview any more NU students.

Avoiding Problems (1)

- We know that students who are under time pressure are far more likely to resort to theft.
- Time pressure or stress is not an acceptable excuse.
- **The measure of character is not what you do when things are easy; it is what you do when things get tough.**

Avoiding Problems (2)

- Guard your work!
- If you keep your work on your home machine, be sure your machine is secure, both from Internet hostiles and from your roommates, etc.
  - It only takes a minute for your roommate, or for the person sitting next to you in the hallway, to stick a USB drive in your machine and steal your work.
- **Don't discount this; we have encountered theft by roommates on a regular basis in the past.**
  - Remember that physical security is a prerequisite for information security.

Sorry about that...

- I know that most of you are honest, and none of this will apply to you
- BUT cheating happens often enough that we need to have policies about it, and you need to know them.
- If you have any questions about any actions that you have done or are thinking about, please come talk to me immediately.

General Principles

- Assume Your Data May Change!
  - It is best practice when creating spreadsheets or writing database queries to assume that the given data for a problem might change.

General Principles

- Don’t Duplicate Given Data!
  - Since the given data for a problem may change, this data should appear in one place only.
  - If data given for a problem is repeated in many places, then changing that data will require changes in many places.
    - This can be a source of errors as well as a source of unnecessary work.

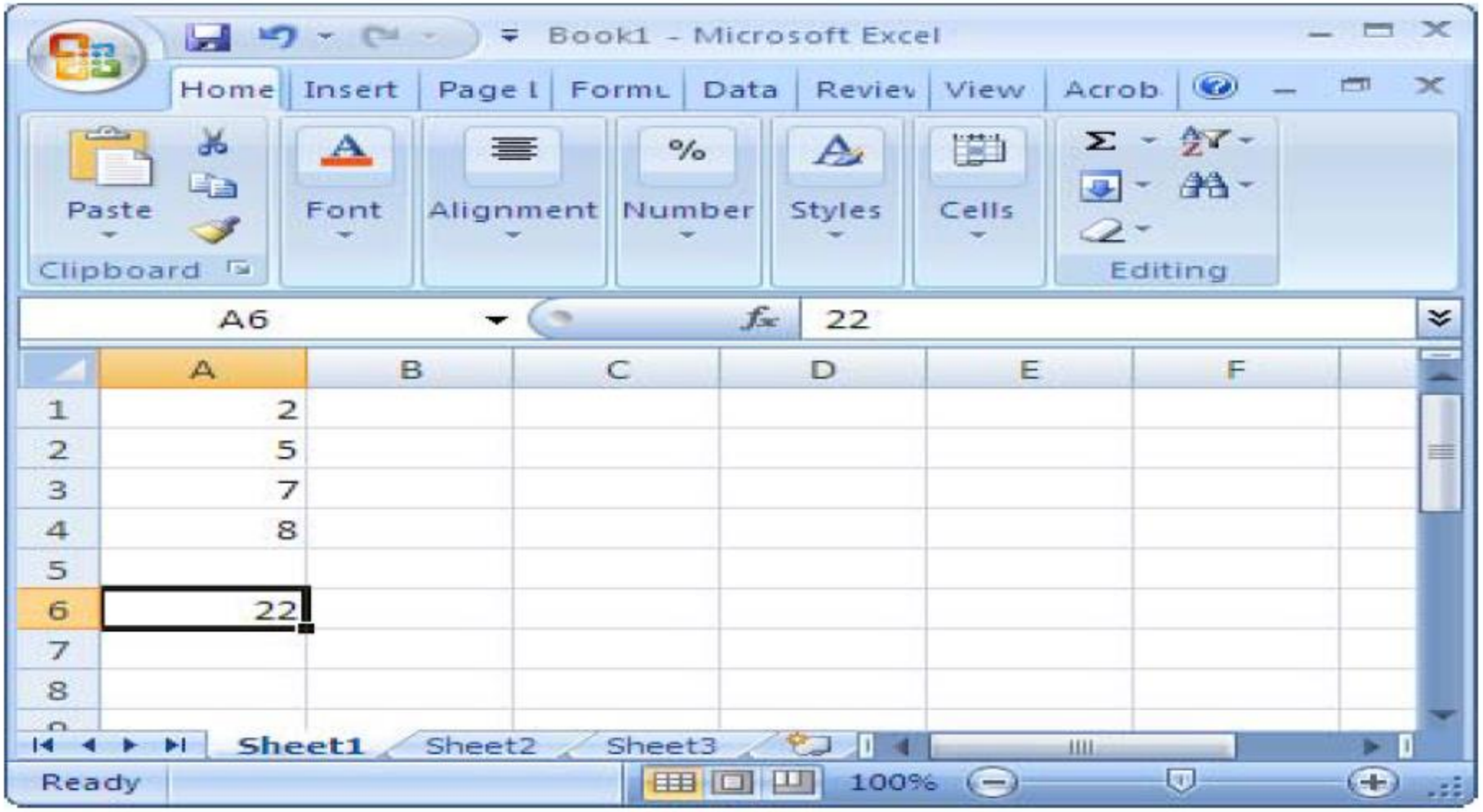
General Principles

- Ask the Right Question!
  - Make sure your formulas will not only work for this data set, but they will work for ANY data set.
  - If the data changes, the answer should be correct for the new data set.

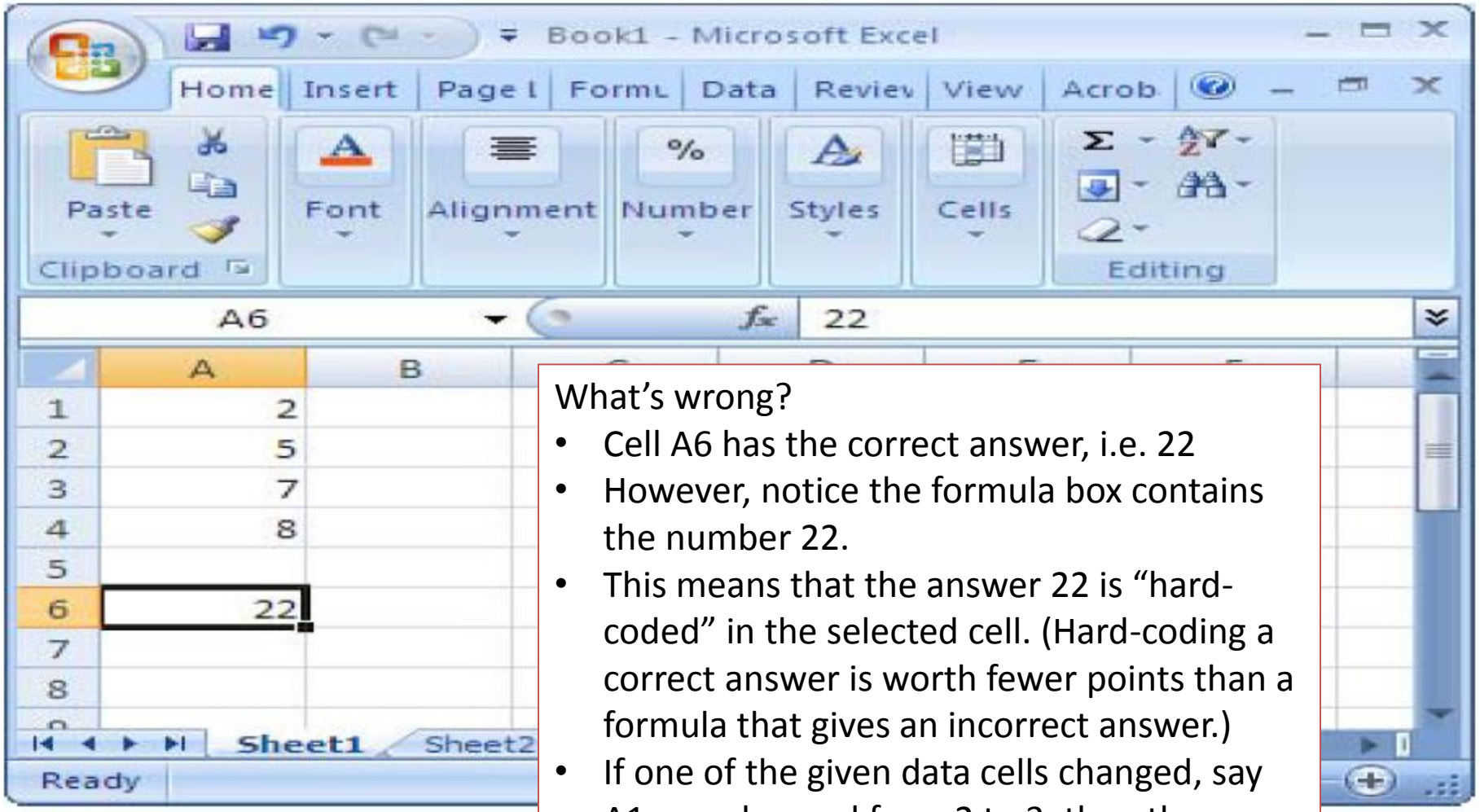
A Trivial Example

- Here is a simple problem to illustrate the concept of “Ask the Right Question”
  - You are asked to find the sum of the following numbers: 2, 5, 7, 8

Bad Solution



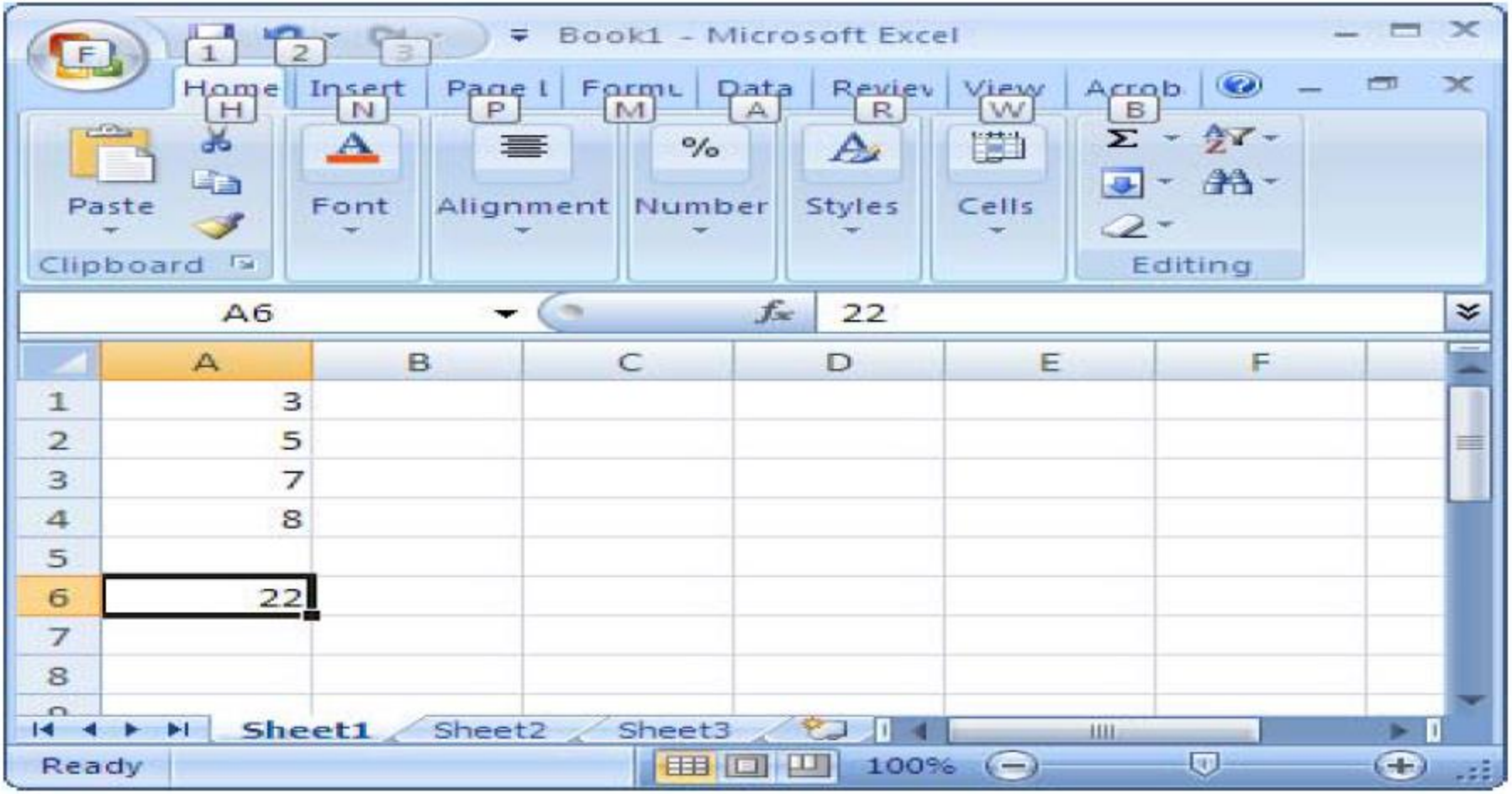
Bad Solution



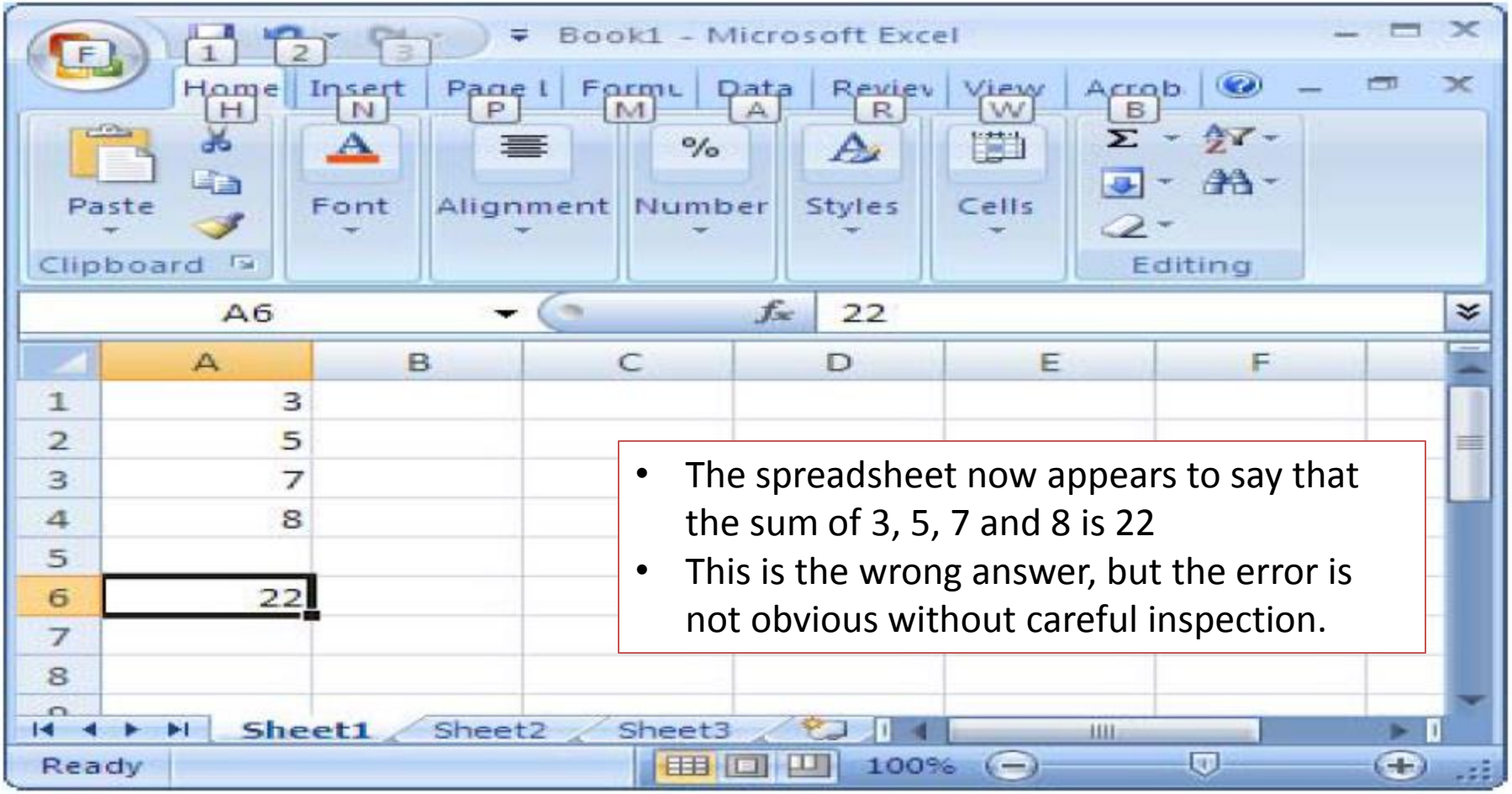
What's wrong?

- Cell A6 has the correct answer, i.e. 22
- However, notice the formula box contains the number 22.
- This means that the answer 22 is "hard-coded" in the selected cell. (Hard-coding a correct answer is worth fewer points than a formula that gives an incorrect answer.)
- If one of the given data cells changed, say A1 was changed from 2 to 3, then the spreadsheet would look like this:

Changed Data / Incorrect Answer



Changed Data / Incorrect Answer



- The spreadsheet now appears to say that the sum of 3, 5, 7 and 8 is 22
- This is the wrong answer, but the error is not obvious without careful inspection.

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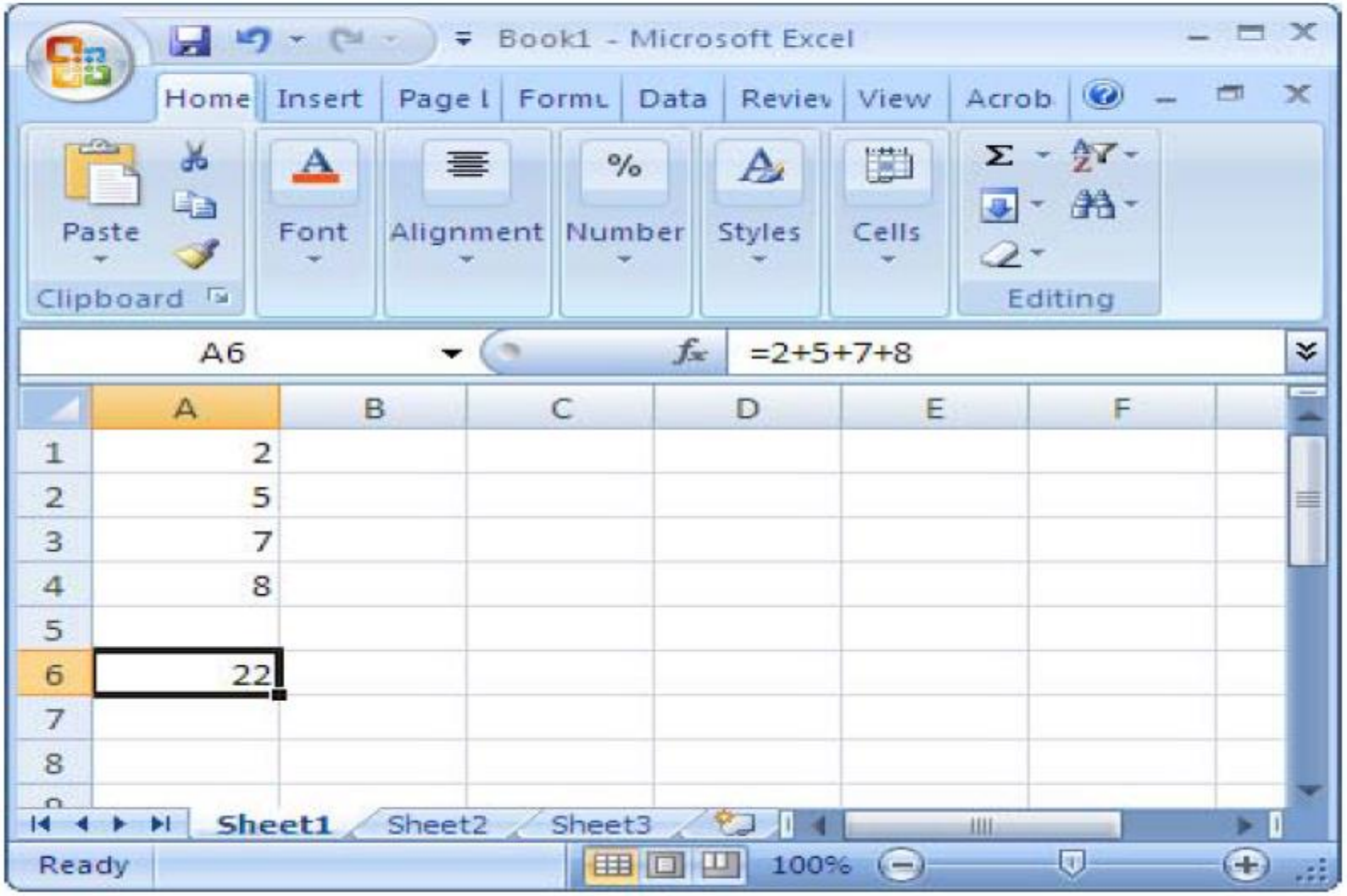
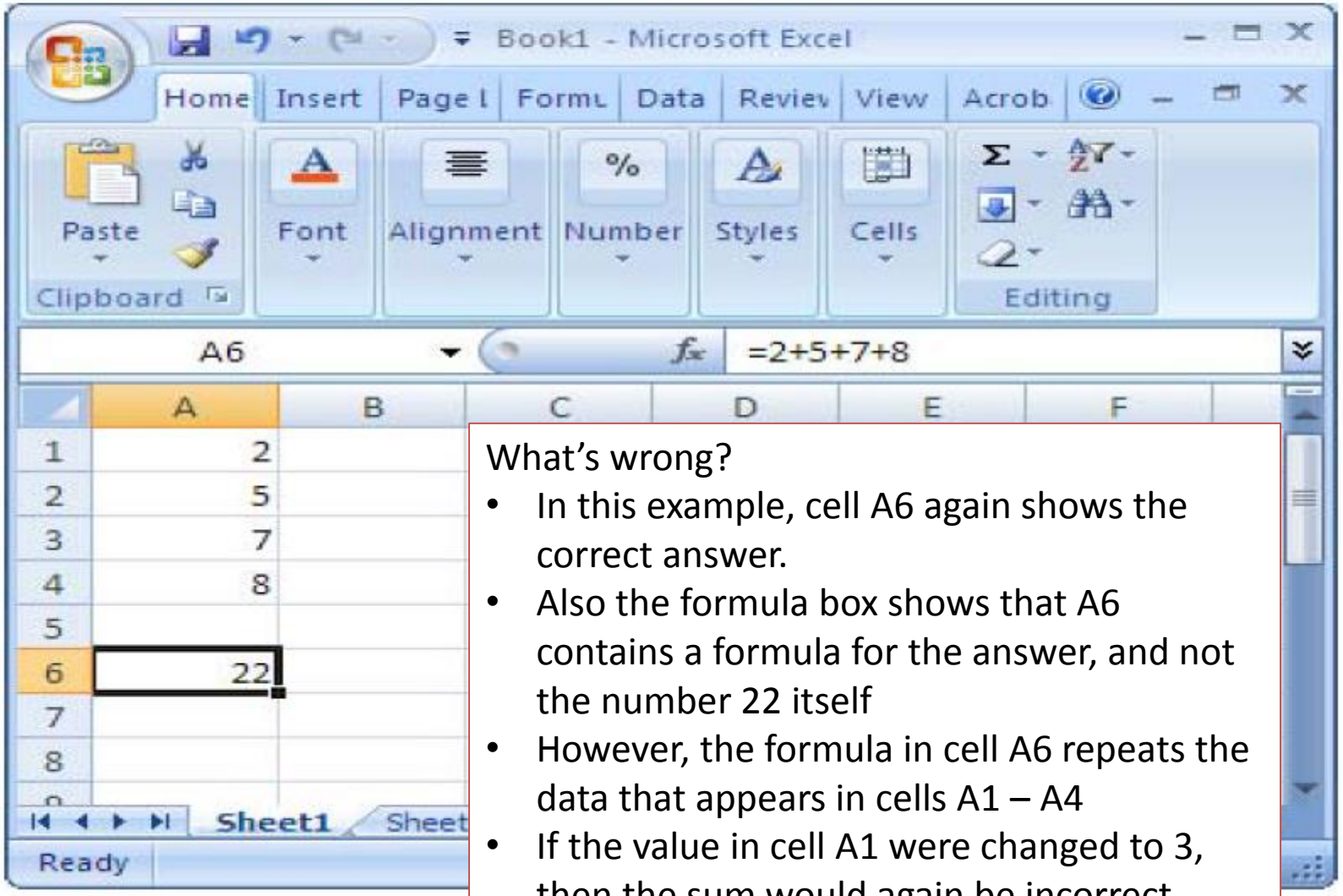
Another Bad Solution



Another Bad Solution



What's wrong?

- In this example, cell A6 again shows the correct answer.
- Also the formula box shows that A6 contains a formula for the answer, and not the number 22 itself
- However, the formula in cell A6 repeats the data that appears in cells A1 – A4
- If the value in cell A1 were changed to 3, then the sum would again be incorrect

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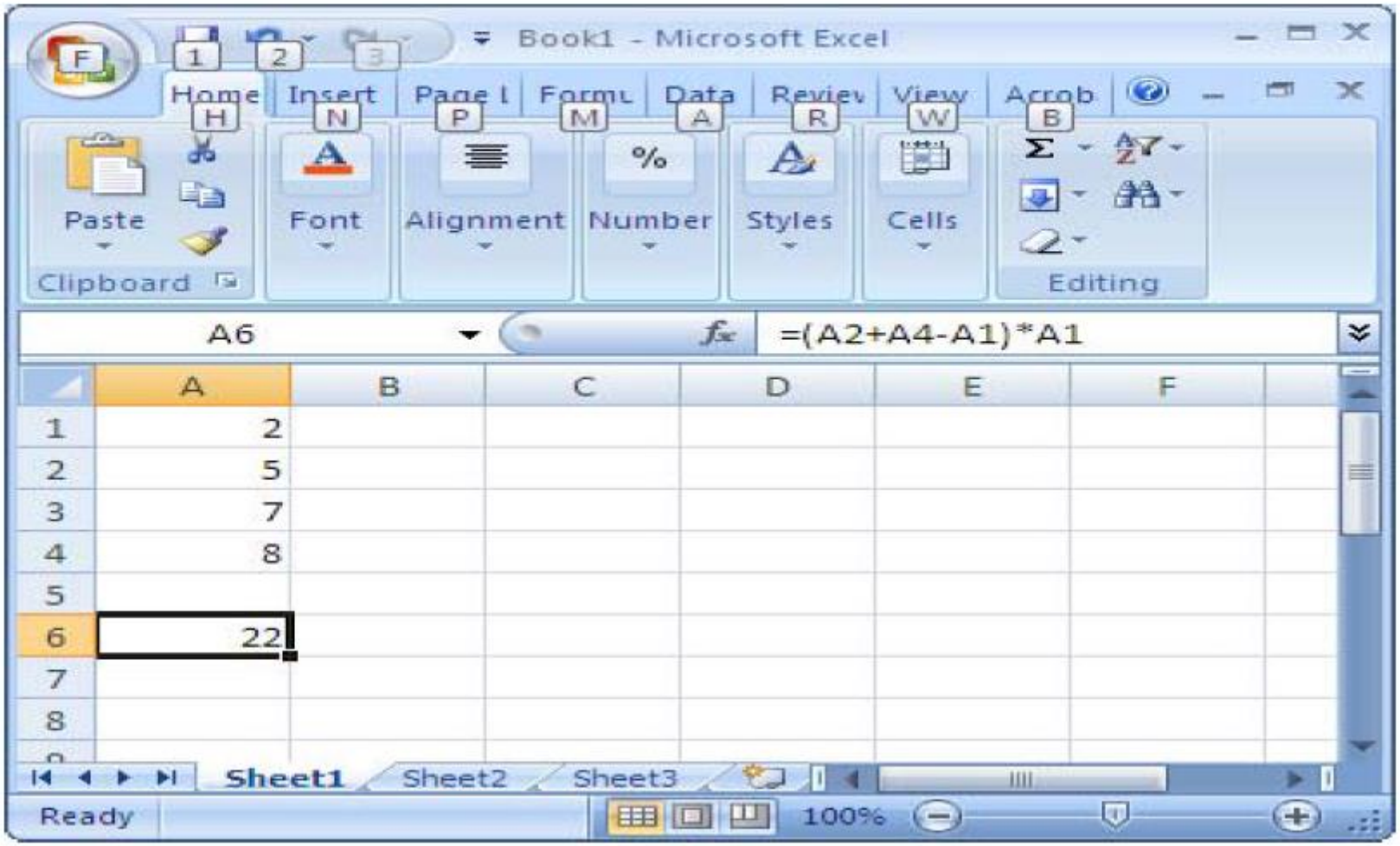
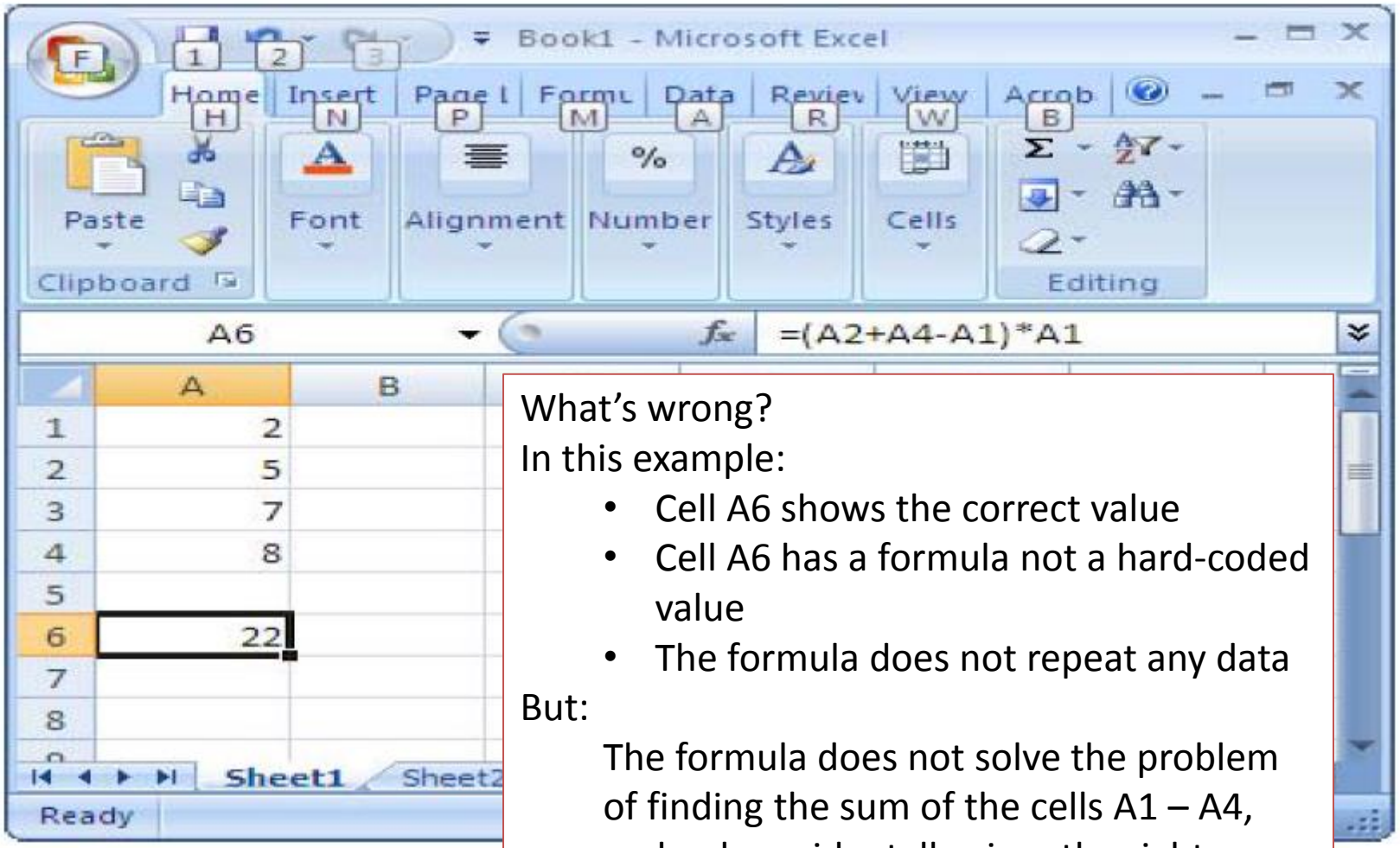
A Third Bad Solution



A Third Bad Solution



What's wrong?

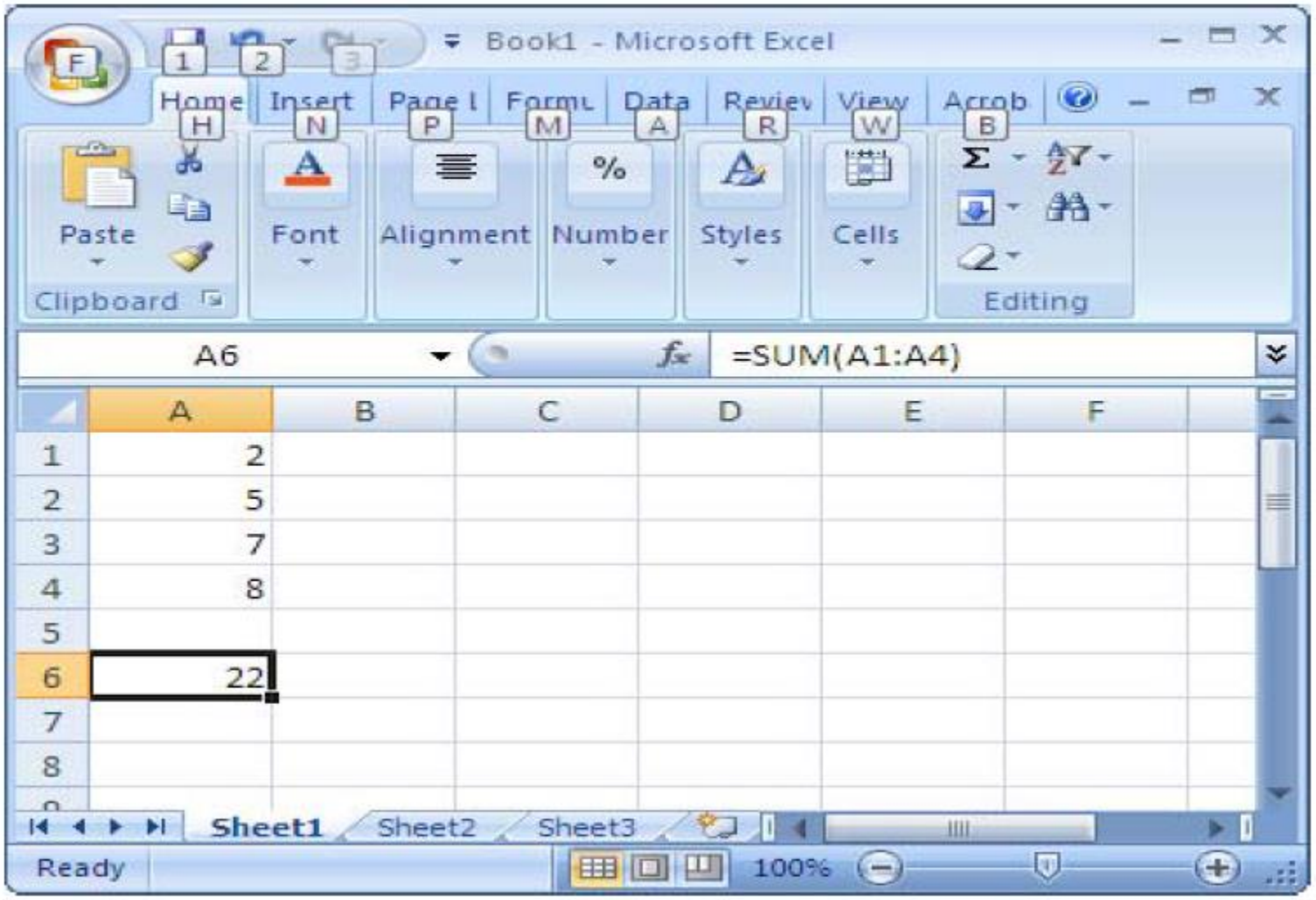
In this example:

- Cell A6 shows the correct value
- Cell A6 has a formula not a hard-coded value
- The formula does not repeat any data

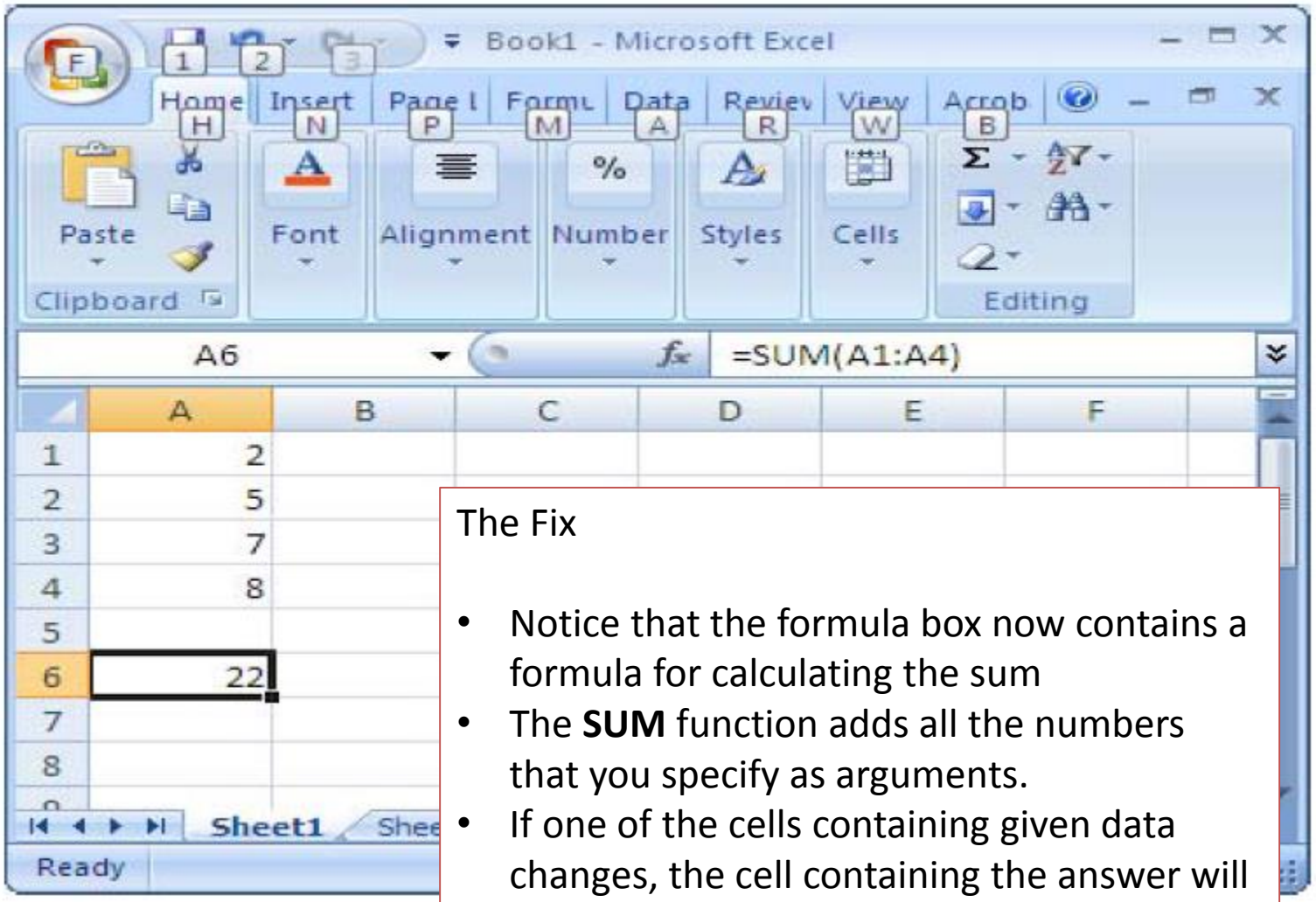
But:

The formula does not solve the problem of finding the sum of the cells A1 – A4, and only accidentally gives the right answer

The Problem Solved “Right”



The Problem Solved "Right"



The Fix

- Notice that the formula box now contains a formula for calculating the sum
- The **SUM** function adds all the numbers that you specify as arguments.
- If one of the cells containing given data changes, the cell containing the answer will change appropriately.

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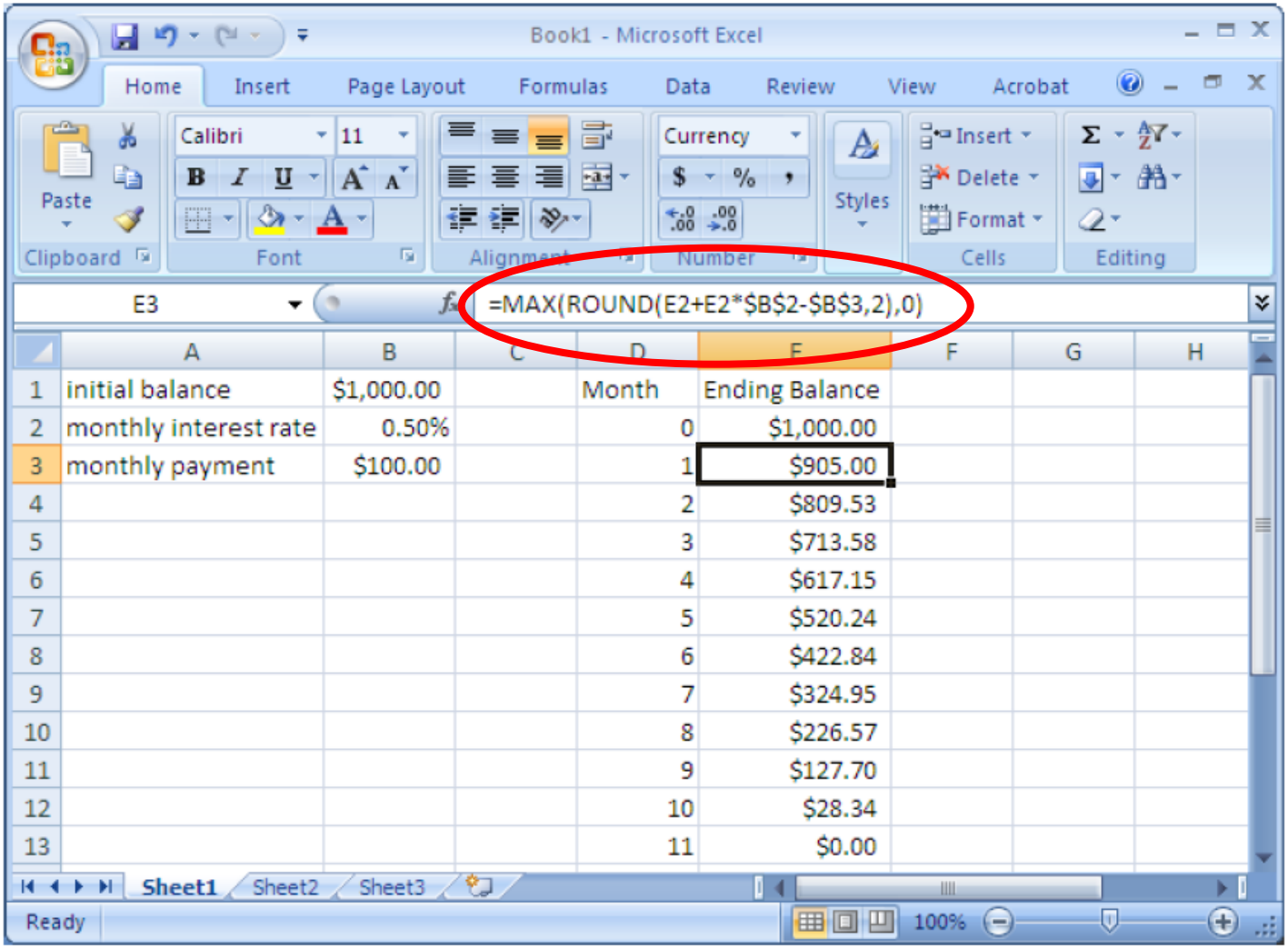
General Principle

- Decompose Complex Problems!

Example:

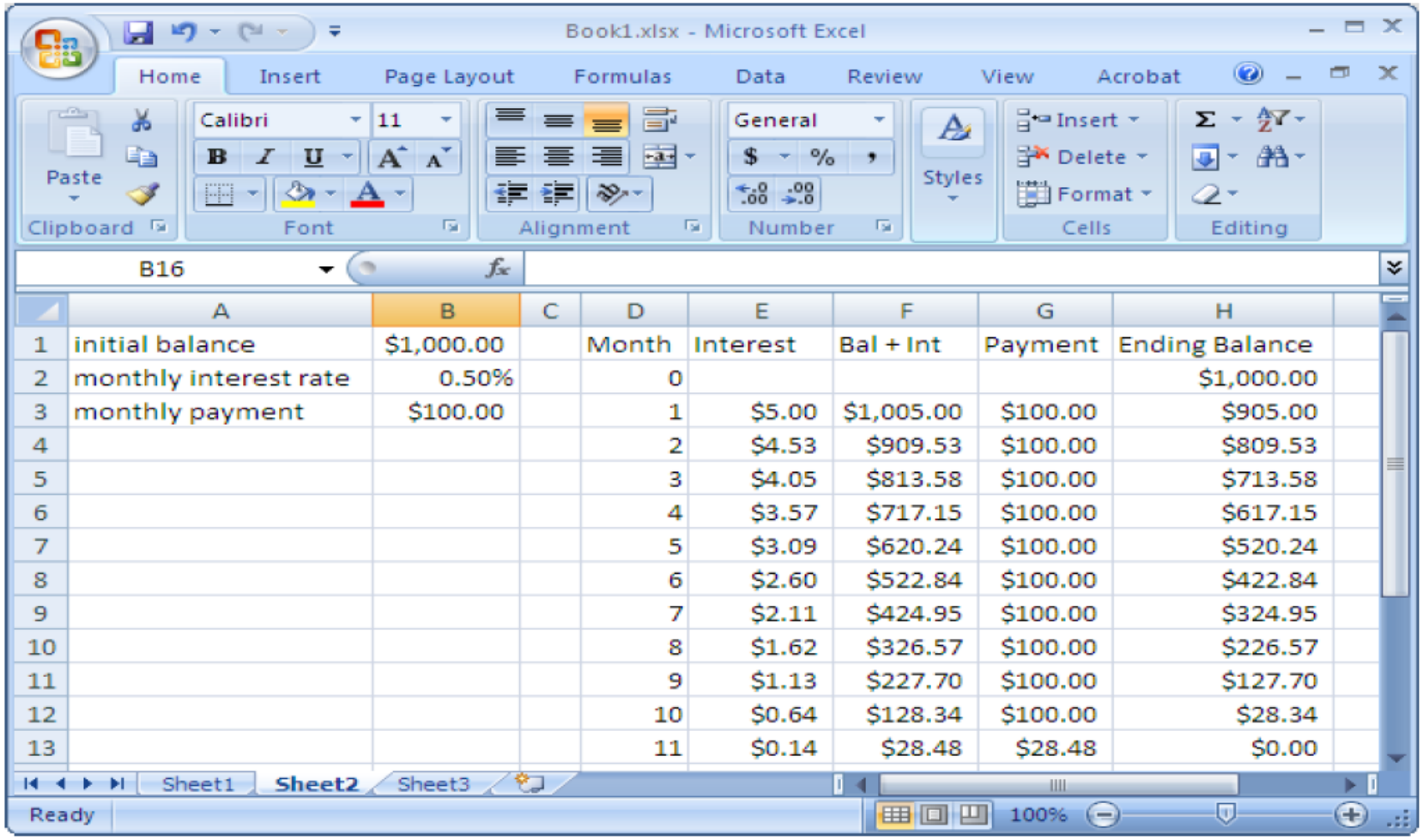
- You given the initial balance of a loan, a monthly interest rate for that loan, and a standard monthly payment amount.
- On the last month, only the remaining balance is paid
- You are asked to calculate the balance owed at the end of each month.

A Monolithic Solution



	A	B	C	D	E	F	G	H
1	initial balance	$1,000.00		Month	Ending Balance			
2	monthly interest rate	0.50%		0	$1,000.00			
3	monthly payment	$100.00		1	$905.00			
4				2	$809.53			
5				3	$713.58			
6				4	$617.15			
7				5	$520.24			
8				6	$422.84			
9				7	$324.95			
10				8	$226.57			
11				9	$127.70			
12				10	$28.34			
13				11	$0.00			

Breaking the Problem into Smaller Parts



	A	B	C	D	E	F	G	H
1	initial balance	$1,000.00		Month	Interest	Bal + Int	Payment	Ending Balance
2	monthly interest rate	0.50%		0				$1,000.00
3	monthly payment	$100.00		1	$5.00	$1,005.00	$100.00	$905.00
4				2	$4.53	$909.53	$100.00	$809.53
5				3	$4.05	$813.58	$100.00	$713.58
6				4	$3.57	$717.15	$100.00	$617.15
7				5	$3.09	$620.24	$100.00	$520.24
8				6	$2.60	$522.84	$100.00	$422.84
9				7	$2.11	$424.95	$100.00	$324.95
10				8	$1.62	$326.57	$100.00	$226.57
11				9	$1.13	$227.70	$100.00	$127.70
12				10	$0.64	$128.34	$100.00	$28.34
13				11	$0.14	$28.48	$28.48	$0.00

Comparison

- The Monolithic solution calculates the monthly balance with one complex formula
- The Solution with intermediate results, performs the same calculation by breaking up the complex formula into three simpler formulas.

Dividing the solution into smaller parts has advantages

1. It is easier to catch mistakes
   - There are more results that can be checked
2. It is easier to verify correctness
   - Verification can be done step by step
3. It is easier to reuse the parts
   - Say you are asked to find the total amount paid for the loan, it would be easier to make the necessary changes

Syllabus Quiz

- All students must take the syllabus quiz and earn a score of 100% in order to pass the course. The syllabus quiz does not count towards a student's grade. The quiz can be taken as often as needed to pass with a score of 100%. The quiz is administered through Blackboard.
- You must have 100% on the syllabus quiz by Monday.

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