The Different Kinds of Data

CS 5010 Program Design Paradigms
“Bootcamp”
Lesson 1.2
Learning Objectives for This Lesson

• By the time you finish this lesson, you should be able to:
  – explain the relationship between information and data.
  – list the steps of the data design recipe.
  – define scalar, compound, itemization, and mixed data and give examples of each.
Information and Data

Information → representation → Data

Data ← interpretation ← Information
Information Analysis and Data Design

• Information is what lives in the real world
• Need to decide *what part* of that information needs to be represented as data.
• Need to decide *how* that information will be represented as data
• Need to document how to *interpret* the data as information
Choosing a data representation

- Let's assume you know what pieces of information need to be represented.
- We need to know what kind of information each piece is.
# Kinds of Data

<table>
<thead>
<tr>
<th>No.</th>
<th>Type of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Scalar Data</td>
</tr>
<tr>
<td>2.</td>
<td>Compound Data</td>
</tr>
<tr>
<td>3.</td>
<td>Itemization Data</td>
</tr>
<tr>
<td>4.</td>
<td>Mixed Data</td>
</tr>
<tr>
<td>5.</td>
<td>Recursive Data</td>
</tr>
<tr>
<td>6.</td>
<td>Mutually Recursive Recursive Data</td>
</tr>
<tr>
<td>7.</td>
<td>Functional Data</td>
</tr>
</tbody>
</table>
1. Scalar Data

• Simple data, e.g. numbers, strings, etc.
• These are already values in Racket.
• Racket has lots more kinds of values, but these will be enough for now.
• If a variable or constant contains scalar data, the interpretation tells the meaning of that data.
2. Compound Data

- **Compound data** is data that consists of two or more quantities, or has two or more attributes.

- Examples:
  - a book in a bookstore inventory
    - it has author, title, ISBN, cost, price
  - a circle on the screen
    - it has x and y positions, color, and radius.

- The interpretation gives the meaning of each field.
A Compound can contain a compound

• An author might have a first name, a last name, a birthdate, etc.
• A faucet might contain two washers
  – an upper washer and a lower washer
• Each washer might have several attributes
  – inner dimension, outer dimension, thickness
  – manufacturer, model number, cost, etc.
3. Itemization Data

• *Itemization data* is data that takes on one of a few values.
• Sometimes this is called “enumeration data.”
• The data definition lists the possible values and their interpretation.
4. Mixed Data

• Our last kind of data (for today) is mixed data.
• Often your data is in the form of alternatives, like itemization data, but one or more of the alternatives is actually compound data.
• We call this mixed data.
• Compound data and itemization data are just special cases of mixed data.
Example of mixed data

In a wine bar, an order may be one of three things: a cup of coffee, a glass of wine, or a cup of tea.

– For the coffee, we need to specify the size (small, medium, or large) and type (this is a fancy bar, so it carries many types of coffee). Also whether or not it should be served with milk.

– For the wine, we need to specify which vineyard and which year.

– For tea, we need the size of the cup and the type of tea (this is a fancy bar, so it carries many types of tea).
Here's a summary of the different kinds of data

<table>
<thead>
<tr>
<th>Kind of Information</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scalar</td>
<td>Temperature</td>
</tr>
<tr>
<td>Itemization</td>
<td>Traffic Light state (red, yellow, OR green)</td>
</tr>
<tr>
<td>Compound</td>
<td>Book (author, title, AND copies)</td>
</tr>
<tr>
<td>Mixed</td>
<td>BarOrder (coffee (compound), OR wine (compound), OR tea (compound))</td>
</tr>
</tbody>
</table>
Next Steps

• Do Guided Practice 1.1
• If you have questions about this lesson, ask them on the Discussion Board
• Go on to the next lesson