

**EXERCISES 1.1****Mastering the Concepts**

1. Identify five items designed by engineers. What did these items do that was new and innovative at the time of their creation? What items did these new creations replace? How is the world a better place because of these designs?
2. Identify five items that you suspect were not designed by engineers. How do they differ from those designed by engineers?
3. Apply the engineering design algorithm to the following processes:
  - a. Making the family dinner
  - b. Creating new laws
  - c. Treating illness in a patientBe specific about each step in the design algorithm.
4. Determine the likely constraints applied by the engineer in designing these items:
  - a. Cash register
  - b. Bicycle
  - c. Office lamp
  - d. Sneakers
  - e. Calculator

**Back of the Envelope**

5. Select a device designed by an engineer. Discuss each step of the engineering design algorithm, and describe the likely path taken by engineers in creating the device.
6. Evaluate the effectiveness of the following engineering designs:
  - a. Conventional telephone
  - b. Medical CAT scan
  - c. Desktop computer
  - d. Cell phone
  - e. MP3 player
  - f. PDA

Make sure to describe the strengths and weaknesses of the designs. Try to guess what capabilities these technologies will have in the future as engineers continue to improve the current designs.

## 1.2 Birth of the Digital Age

### Before Digital There Was Analog

To understand where engineers will be taking our world in the future, it is important that we briefly look back. Up until the middle of the 20th century, the technology designed by engineers was primarily **analog**; more specifically, the devices and systems that engineers created relied primarily upon physical forces and matter for their basic operation rather than some abstract quantity, such as numbers.

For example, analog audio records introduced in the first part of the 20th century use the physical bumps and indentations in the grooves on vinyl discs (albums) to store audio data. The stylus at the end of the tone arm of a turntable rides in these grooves and vibrates

**Analog:** Phenomena that are characterized by fluctuating, evolving, or continually changing physical quantities, such as force or mass.