# Appendix F:
## Exponents and Scientific Notation

## TERMINOLOGY — Appendix F

For each of the following terms, provide 1) a definition in your own words, 2) the formal definition (as provided by your text or instructor), and 3) an example of the term using a drawing or problem. A sample filled-out form is available in the Introduction.

Scientific Notation

| | |
|---|---|
| **Your definition** | |
| **Formal definition** | |
| **Example** | |

## CRITICAL THINKING QUESTIONS — Appendix F

1. Why is scientific notation useful in working with very large or very small numbers?
   **Scientific notation gives shorter numbers, especially when there are many place values in a given number, such as is the case in the sciences.**

2. Name two real-life situations where the use of scientific notation is preferable to standard decimal notation.
   **Answers will vary. Typical answers might include atomic distances and measurements, quantities of very small things or amounts in relationship to large spaces or amounts (such as cells in the human body), geological ages or time periods, interstellar distances.**

## DEMONSTRATE YOUR UNDERSTANDING — Appendix F

1. Write the following decimal numbers in scientific notation.

   a) 24,309 **$2.1309 \times 10^4$**

   b) 1480 **$1.480 \times 10^3$**

   c) .00035 **$3.5 \times 10^{-4}$**

   d) .9003 **$9.003 \times 10^1$**

2. Write the following numbers in decimal notation.

   a) $3.42 \times 10^5$ **342,000**

   b) $4.5007 \times 10^3$ **4500.7**

   c) $6.2211 \times 10^{-2}$ **0.062211**

   d) $8.24769 \times 10^{-5}$ **0.0000824769**

# IDENTIFY AND CORRECT THE ERRORS — APPENDIX F

In the second column, identify the error(s) you find in each of the following worked solutions. Describe the error made in the second column. Solve the problem correctly in the third column.

| Problem | Describe Error | Correct Process |
|---|---|---|
| 1. Write in scientific notation: 24809<br>**Worked Solution** *(What is wrong here?)*<br>**$2.489 \times 10^4$** | **While the student did count the correct number of decimal places, he/she has left out the zero in the number.** | **$2.4809 \times 10^4$** |
| **Problem** | **Describe Error** | **Correct Process** |
| 2. Write in scientific notation: 36500<br>**Worked Solution** *(What is wrong here?)*<br>**$3.65 \times 10^2$** | **The student has ignored the zeros which must also be counted to determine the power to which 10 must be raised.** | **$3.65 \times 10^4$** |
| **Problem** | **Describe Error** | **Correct Process** |
| 3. Write in decimal notation: $4.57 \times 10^3$<br>**Worked Solution** *(What is wrong here?)*<br>**457** | **The student has failed to add a zero to the coefficient to account for moving the decimal an additional place to the right of the 7.** | **4570** |

| Problem | Describe Error | Correct Process |
|---|---|---|
| 4. Write in decimal notation: $1.70895 \times 10^{-2}$<br>**Worked Solution**<br>*(What is wrong here?)*<br>**270.895** | **At the very least, the student has moved the decimal in the wrong direction. It should have been moved to the left, not the right (because the exponent of 10 is a negative number). Additionally, the student seems to have multiplied the 1 in the coefficient by 2.** | **.0170895** |

| Problem | Describe Error | Correct Process |
|---|---|---|
| 5. Write in decimal notation: $7.625 \times 10^{-3}$<br>**Worked Solution**<br>*(What is wrong here?)*<br>**.07625** | **The student has only moved the decimal by two places instead of three.** | **.007625** |