Section 1.1, Problem 25

The problem checks your understanding of the properties of fractions; see page 5 of the textbook.

Let us look at (a):

$$\frac{2}{\frac{2}{3}} - \frac{\frac{2}{3}}{2}.$$

By the definition of fraction, we have

$$2 \div \frac{2}{3} - \frac{2}{3} \div 2.$$

We apply property 2 to get

$$2 \cdot \frac{3}{2} - \frac{2}{3} \cdot \frac{1}{2},$$

which, by property 1, yields

$$\frac{6}{2} - \frac{2}{6}.$$

Now, property 4 yields

$$\frac{6 \cdot 6 - 2 \cdot 2}{2 \cdot 6} = \frac{32}{12}$$

Finally, by property 5, we have

$$\frac{4 \cdot 8}{4 \cdot 3} = \frac{8}{3},$$

which is the answer.

Now, let us look at (b):

$$\frac{\frac{1}{12}}{\frac{1}{8} - \frac{1}{9}}.$$

By the definition of fraction, we have

$$\frac{1}{12} \div \left(\frac{1}{8} - \frac{1}{9} \right).$$

We apply property 4 to get

$$\frac{1}{12} \div \frac{9 - 8}{8 \cdot 9} = \frac{1}{12} \div \frac{1}{72},$$

which, by property 2, yields

$$\frac{1}{12} \cdot \frac{72}{1}.$$

Now, property 1 yields

$$\frac{72}{12}.$$

Finally, by property 5, we have

$$\frac{12 \cdot 6}{12 \cdot 1} = 6,$$

which is the answer.

Section 1.1, Problem 34

This problem checks your basic *translation* skills. Such skills are very important, as you cannot solve a math problem without translating it to the language appropriate for the problem.

(a) y is negative, hence y must be smaller than zero. The answer is: $y < 0$.

(b) $z > 1$

(c) b is at most 8, hence b is smaller than or equal to 8. The answer is: $b \leq 8$.

(d) w is positive, hence $w > 0$. Furthermore, w is less than or equal to 17, hence $w \leq 17$. The answer is: $0 < w \leq 17$.

(e) y is at least 2 units from π, hence $y - \pi \geq 2$ or $\pi - y \leq 2$. Equivalently, $y - \pi \geq 2$ or $y - \pi \leq -2$. The answer is: $|y - \pi| \geq 2$.

Section 1.2, Problem 66

This problem checks your understanding of the laws of exponents (see pages 14-15) and the properties of nth roots (see page 18). The definition of rational exponents on page 19 must be memorized and understood as well.

$$\begin{aligned}
\left(\frac{-2x^{1/3}}{y^{1/2}z^{1/6}}\right)^4 &= \frac{(-2)^4(x^{1/3})^4}{(y^{1/2})^4(z^{1/6})^4} \\
&= \frac{16x^{4/3}}{y^2z^{2/3}} \\
&= \frac{16xx^{1/3}}{y^2z^{2/3}} \\
&= \frac{16x\sqrt[3]{x}}{y^2\sqrt[3]{z^2}} \\
&= \frac{16x\sqrt[3]{x}}{y^2\sqrt[3]{z^2}} \cdot \frac{\sqrt[3]{z}}{\sqrt[3]{z}} \\
&= \frac{16x\sqrt[3]{xz}}{y^2z}
\end{aligned}$$

Section 1.2, Problem 71

The facility with scientific notation is very important if you plan on working in any field requiring extensive numerical computations. The idea behind it, which is explained in pages 16-17, is simple, and the result efficient.

(a) $69,300,000 = 6.93 \times 10^7$

(b) $7,200,000,000,000 = 7.2 \times 10^{12}$

(c) $0.000028536 = 2.85436 \times 10^{-5}$

(d) $0.0001213 = 1.213 \times 10^{-4}$

Section 1.2, Problem 92

This problem requires you to interpret a given set of data, and analyze the relations between them. Let us examine the simplified version of the problem:

As of November 2004, the population of the Isle of Turtles was 10, and the national debt was 10 cats. How much was each person's share of the debt?

We expect a response along the lines of "Duh! 10 people owe 10 cats, so each person owes one cat!" Now, what sort of calculation did we carry out here? We see that:

$$\text{(total debt)} \div \text{(population)} = \text{(individual share of the debt)}$$

Now it is only a matter of plugging in the right numbers and carrying out the computation:

$$7.529 \times 10^{12} \div 2.949 \times 10^{8} \approx 2.553 \times 10^{4}$$

Make sure to keep the correct number of significant digits.