of the operators comes into play. An operator is said to be *left associative* if it groups from left to right. The binary arithmetic operators (*, /, %, +, and -) are all left associative, so

```
i - j - k     is equivalent to   (i - j) - k
i * j / k     is equivalent to   (i * j) / k
```

An operator is *right associative* if it groups from right to left. The unary arithmetic operators (+ and -) are both right associative, so

```
- + i             is equivalent to   - (+i)
```

Precedence and associativity rules are important in many languages, but especially so in C. However, C has so many operators (almost fifty!) that few programmers bother to memorize the precedence and associativity rules. Instead, they consult a table of operators when in doubt or just use plenty of parentheses.

table of operators ➤ *Appendix A*

PROGRAM   Computing a UPC Check Digit

For a number of years, manufacturers of goods sold in U.S. and Canadian stores have put a bar code on each product. This code, known as a Universal Product Code (UPC), identifies both the manufacturer and the product. Each bar code represents a twelve-digit number, which is usually printed underneath the bars. For example, the following bar code comes from a package of Stouffer's French Bread Pepperoni Pizza:
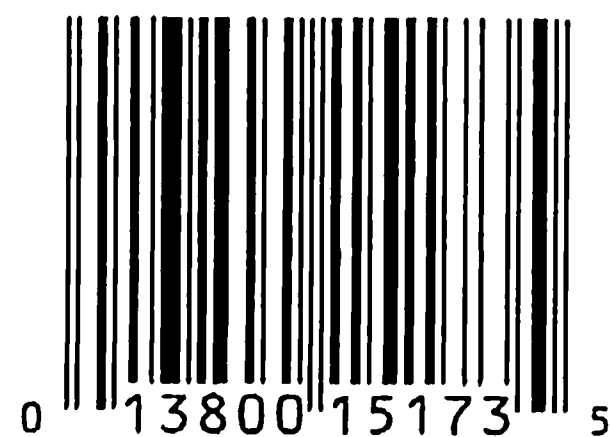
The digits

```
0   13800  15173   5
```

appear underneath the bar code. The first digit identifies the type of item (0 or 7 for most items, 2 for items that must be weighed, 3 for drugs and health-related merchandise, and 5 for coupons). The first group of five digits identifies the manufacturer (13800 is the code for Nestlé USA's Frozen Food Division). The second group of five digits identifies the product (including package size). The final digit is a "check digit," whose only purpose is to help identify an error in the preceding digits. If the UPC is scanned incorrectly, the first 11 digits probably won't be consistent with the last digit, and the store's scanner will reject the entire code.

Here's one method of computing the check digit:

Add the first, third, fifth, seventh, ninth, and eleventh digits.
Add the second, fourth, sixth, eighth, and tenth digits.