♦ Computer Key-In

The sequence 1, 1, 2, 3, 5, 8, 13, 21, . . . is called a *Fibonacci sequence* after its discoverer, Leonardo Fibonacci, a thirteenth century mathematician. The first two terms are 1 and 1. You then add two consecutive terms to get the next term.

$$\begin{matrix}\text{1st}\\\text{term}\end{matrix} + \begin{matrix}\text{2nd}\\\text{term}\end{matrix} = \begin{matrix}\text{3rd}\\\text{term}\end{matrix} \qquad \begin{matrix}\text{2nd}\\\text{term}\end{matrix} + \begin{matrix}\text{3rd}\\\text{term}\end{matrix} = \begin{matrix}\text{4th}\\\text{term}\end{matrix} \qquad \begin{matrix}\text{3rd}\\\text{term}\end{matrix} + \begin{matrix}\text{4th}\\\text{term}\end{matrix} = \begin{matrix}\text{5th}\\\text{term}\end{matrix}$$

The following computer program computes the first twenty-five terms of the Fibonacci sequence shown above and finds the ratio of any term to its preceding term. For example, we want to look at the ratios

$$\frac{1}{1} = 1,\ \frac{2}{1} = 2,\ \frac{3}{2} = 1.5,\ \frac{5}{3} \approx 1.66667, \text{ and so on.}$$

```
10 PRINT "TERM NO.", "TERM", "RATIO"
20 LET A = 1
30 LET B = 1
40 PRINT "1",A,"-"
50 FOR N = 2 TO 25
60   LET D = B/A
70   LET E = 10000 * D
80   LET F = INT(E)
90   LET G = F/10000
100    PRINT N,B,G
110    LET C = B + A
120    LET A = B
130    LET B = C
140  NEXT N
150  END
```

Exercises

Type the program into your computer and use it in Exercises 1–4.

1. RUN the given computer program. As the terms become larger, what happens to the values of the ratios?

2. Suppose another sequence is formed by choosing starting numbers different from 1 and 1. For example, suppose the sequence is 3, 11, 14, 25, 39, . . . , where the pattern for creating the terms of the sequence is still the same. Change lines 20 and 30 to:

```
20 LET A = 3
30 LET B = 11
```

RUN the modified program. What happens to the values of the ratios as the terms become larger and larger?

3. Modify the program again so that another pair of starting numbers is used and the first thirty terms are computed. RUN the program. What can you conclude from the results?

4. Compare this ratio to the golden ratio calculated in Exercise 2 on page 253. Do you see a connection?