Source: Leonardo Pisano (Fibonacci), *Liber Abaci* (*Book of Calculation*), Chapter 13, Part One. As translated by L. E. Sigler in *Fibonacci's Liber Abaci: A Translation into Modern English of Leonardo Pisano's Book of Calculation*, Sources and Studies in the History of Mathematics and Physical Sciences, Springer: New York, 2002, pp. 462–463.

On Two Birds

Two birds were above the height of two towers; one tower was 40 paces in height and the other 30, and they were 50 paces apart; at an instant the pair of birds descended flying to the center where there was a fountain, and they arrived at the same moment at the fountain which was between both towers. From the moment they left until the moment they arrived they flew in straight lines from the tops of the towers to the center of the fountain; the flights were of equal lengths; in geometry it is clearly demonstrated that the height of either tower multiplied by itself added to the distance from the tower to the center of the fountain multiplied by itself is the same as the straight line from the center of the fountain to the top of the tower multiplied by itself this therefore known, you put it that the distance from the center of the fountain to the higher tower is any number of paces, we say 10, and you multiply the 10 by itself; there will be 100 that you add to the height of the higher tower multiplied by itself, namely to 1600; there will be 1700 that you keep, and you multiply by itself the remaining distance, namely the 40 which is the distance from the center to the lower tower; there will be 1600 which you add to the height of the lower tower multiplied by itself, namely 900; this makes 2500 as was the sum of the other two products; therefore this position is long of the true value by 800, namely the difference between 1700 and 2500; therefore you lengthen the distance from the center of the fountain to the higher tower; indeed it is lengthened 5 paces from the first position, namely 15 paces from the center to the higher tower, and you multiply the 15 by itself; there will be 225 which you add to height of the higher tower multiplied by itself, namely 1600; there will be 1825. Similarly you multiply by itself the 35 which is the distance from the center of the fountain to the lower tower making 1225; this added to the 900, namely the height of the higher tower multiplied by itself, makes 2125 that should be 1825 by the abovewritten rule. Therefore the value of the second position is an amount long of the true value by 300 the first value was long indeed by 800; therefore you say: for the five paces which we lengthened the distance from the center of the fountain to the higher tower we approximated more closely to the true value by 500; how much indeed shall we lengthen the distance from the center of the fountain to the same higher tower in order to improve the approximation by 300? You multiply the 5 by the 300, and you divide by 500; the quotient will be 3 paces which added to the 15 paces yields 18 paces, and this will be the distance from the fountain to the higher tower. Truly the remaining distance, namely the 32, is the distance to the lower tower. For example, the product of the 18 by itself added to the product of the 40 by itself makes as much as the product of the 32 by itself added to the product of the 30 by itself, as had to be.

distance to higher tower
18
lower tower
32;