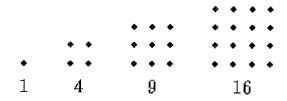
3. The 1st four square numbers are shown below.



Suppose we denote the  $n^{th}$  square number by  $S_n$ . Write a rule for determining  $S_n$  for any n.

To the ancient Greeks, the square root of a number in this sequence was the number of dots along one side of the square that represents the number. For non-square natural numbers, they used a clever technique to estimate the square roots. This technique is illustrated below.

$$\sqrt{11} \approx 3\frac{2}{7}$$

$$\frac{\cancel{3}}{\cancel{5}}$$

$$\sqrt{8} \approx 2\frac{4}{5}$$

Use this technique to arrive at the approximation  $[\sqrt{22}] \approx 4^6/9$ .