

Squares and square roots are basic arithmetic. They are fundamental for understanding science (gravity, energy, sound, drag, viruses), finance (compound interest), and higher math (geometry).

1^2	2^2	3^2	4^2	5^2	6^2	7^2	8^2	9^2
1	4	9	16	25	36	49	64	81

If you can do long division you can do square roots.

- From the decimal point, separate the numbers into pairs: 55 . 65 16
- Start at the left pair (55) choose the greatest square (49) that can be subtracted from 55 Put the square root (7) above the first pair

$$\begin{array}{r} 7. \\ \hline 55.6516 \\ -49 \\ \hline \end{array}$$

- Subtract the square
- Bring down the next pair
- Double the top number ($7 \times 2 = 14$) Put this number on the left

$$\begin{array}{r} 7. \\ \hline 55.6516 \\ -49 \\ \hline 14 \quad 6 \quad 65 \end{array}$$

- Divide this "doubled" number into the new "bottom" number (665), but leave off the right digit (66)

$$14 \overline{) 66 _}$$

- Put this quotient (4) above the second pair
- Annex the quotient (4) to the number on the left (14) and multiply it times the quotient (4)

$$\begin{array}{r} 14 \textcircled{4} \\ \times \quad \textcircled{4} \\ \hline 576 \end{array}$$

$$\begin{array}{r} 7. \textcircled{4} \\ \hline 55.6516 \\ -49 \\ \hline 14 \quad 6 \quad 65 \end{array}$$

- Subtract this number from the bottom number
- Bring down the next pair
- Double the top number ($74 \times 2 = 148$) and put it on the left

$$\begin{array}{r} 7. \textcircled{4} \\ \hline 55.6516 \\ -49 \\ \hline 148 \quad 6 \quad 65 \\ -5 \quad 76 \\ \hline 89 \quad 16 \end{array}$$

- Divide this "doubled" number into the new "bottom" number (8916) but leave off the right digit (891_)

$$148 \overline{) 891 _}$$

- Put this quotient (6) above the third pair
- Annex the quotient (6) to the number on the left (148) and multiply it times the quotient (6)

$$\begin{array}{r} 148 \textcircled{6} \\ \times \quad \textcircled{6} \\ \hline 8916 \end{array}$$

$$\begin{array}{r} 7.4 \textcircled{6} \\ \hline 55.6516 \\ -49 \\ \hline 148 \quad 6 \quad 65 \\ -5 \quad 76 \\ \hline 89 \quad 16 \\ -89 \quad 16 \\ \hline 0 \end{array}$$

- Subtract this number from the bottom number

- The remainder is zero because 556516 is a perfect square (746^2). If there is a remainder, either add zeros and repeat steps 11 – 16 or add a plus sign after the answer to indicate the answer is not exact. (The square root of 200 \approx 14.142135)

$$\begin{array}{r} 14.14 + \\ \hline 0200.0000 \end{array}$$