

## Approximating Square Roots:

- A. Square roots are a common approximation problem and can be somewhat challenging since some educated guessing is involved.
- B. The good thing about square roots is we can often get the answer in a somewhat close range. This method is very similar to [finding the exact value of a square root](#).
1. Mentally take off 2-digits at a time, starting from the right, until you are left with a manageable square root (i.e. one that you can find a range of 5 with). Usually you want 3 or 4 numbers to work with. (\*If you are using just 3 numbers you want a range of 1.\*)
  2. Judging from the value under the square root make an educated guess as to where in the range of 5 it might fall. Write this down. (For details on how to get a range of 5, see [finding the exact value of a square root](#).)
  3. Add 1 zero to the end for every 2 digits you took off from step 1.

Ex [1]  $\sqrt{139456} = \underline{\hspace{2cm}}$ .

- a. Taking off 2-digits at a time, we are left 1394.
- b. We know  $35^2 = 1225$  and  $40^2 = 1600$ . 1394 is closer to 1225 than it is to 1600, so we might want 37. Write 37.
- c. Add one 0 since we took off two numbers.
- d. We get 370.
- e. The answer can be between 355 and 392.

Ex [2]  $\sqrt{2439761} = \underline{\hspace{2cm}}$ .

- a. Taking off 2-digits at a time, we are left with 243. (\*Note, there were 4 digits taken off\*).
- b. We know that  $15^2 = 225$  and  $16^2 = 256$ . Now we must make an educated guess. 243 is between 225 and 256 so we could use 15.5 for the middle.
- c. If we do we would get 1550 for the answer. (\*Notice instead of just adding 2 0's we moved the decimal over 1 and added 1 zero.\*)
- d. The answer can be between 1483 and 1640.

- C. On problems like Ex [2], the numbers are large so we have a lot of leniency. You don't have to take a lot of time on guessing as you should already be close. In Ex[1] we have smaller numbers but you can see by the range that it is not necessary to spend a lot of time in making a decision. The guessing is just to get you closer, just in case.