Estimating Square Roots

Estimating Square Roots

From yesterday, we recall that not all numbers have a perfect whole number square root:

$\sqrt{1} = 1$

$\sqrt{4} = 2$

$\sqrt{9} = 3$

$\sqrt{16} = 4$

$\sqrt{25} = 5$

Etc

But how can we find the square roots that don’t have a perfect whole number answer?

Estimating Square Roots

When we have numbers such as $\sqrt{5}$ or $\sqrt{10}$ or $\sqrt{14}$ - they do have an answer, but that answer is a decimal number with no pattern that repeats (an irrational number).

There is no way of getting the exact value of an irrational number, therefore we need to estimate.

Estimating Square Roots

Again, let's recall:

1 x 1 = 1	7 x 7 = 49
2 x 2 = 4	8 x 8 = 64
3 x 3 = 9	9 x 9 = 81
4 x 4 = 16	10 x 10 = 100
5 x 5 = 25	11 x 11 = 121
6 x 6 = 36	12 x 12 = 144

Estimating Square Roots

Let’s put them on a number line:

Example #1

Let’s estimate $\sqrt{52}$

Where does it fall on the number line?

Example #1 (continued)

We saw that $\sqrt{52}$ was located between $\sqrt{49}$ and $\sqrt{64}$

$\sqrt{49} = 7$ and $\sqrt{64} = 8$

So, that means $\sqrt{52}$ is between 7 and 8

Is this precise or exact? No

Is $\sqrt{52}$ closer to 49 or 64? Definitely 49, so we can estimate that it is 7.2

Example #2

What is the square root of 6500?

This is a big number, but we know a few things

$10 \times 10 = 100$
So, $\sqrt{100} = 10$

$6500 \div 100 = 65$
So, $100 \times 65 = 6500$

Therefore, $\sqrt{6500} = \sqrt{100} \times \sqrt{65}$

Example #2 (Continued)

Can we estimate $\sqrt{65}$?

Example #2 (Continued)

$\sqrt{65}$ is inbetween $\sqrt{64}$ and $\sqrt{81}$, therefore it is between 8 and 9.

Is it closer to 64 or 81?

So therefore, we estimate $\sqrt{65}$ to be 8.1

Example #2 (Continued)

Let's put it all together

$\sqrt{100} = 10$ and $\sqrt{65} = 8.1$

$$\begin{aligned}\sqrt{6500} &= \sqrt{100} \times \sqrt{65} \\ &= 10 \times 8.1 \\ &= 81\end{aligned}$$

Classwork

Estimate the following square roots:

1. $\sqrt{24}$
2. $\sqrt{38}$
3. $\sqrt{72}$
4. $\sqrt{8200}$

Homework: Assignment on MHS