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Approximating Square Roots

Exit Quiz

Answers:

Part A: Find the value of the following.

1) $\pm\sqrt{\mathbf{36}} = \mathbf{\pm 6}$

2) $\sqrt{\mathbf{-4}}$ **undefined**

3) $\sqrt{\mathbf{900}} = \mathbf{30}$

4) $\pm\sqrt{\mathbf{169}} = \mathbf{\pm 13}$

Part B: Find two consecutive integers between $\sqrt{46}$ lies.

Solution:

The radicand is 45.

The closest perfect square number less than 46 is 36.

The closest perfect square number greater than 46 is 49.

$$\sqrt{36} < \sqrt{46} < \sqrt{49}$$

$$6 < \sqrt{46} < 7$$

The square root of $\sqrt{46}$ is between 6 and 7.

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Part C: Determine two rational numbers with two decimal places between which $\sqrt{46}$ lies.

Solution:

Since 45 is between 36 and 49, $\sqrt{46}$ must be between $\sqrt{36}$ and $\sqrt{49}$.

$$\sqrt{36} < \sqrt{46} < \sqrt{49}$$

$$6 < \sqrt{46} < 7$$

By estimation, we have:

$6.1^2 = 37.21$
$6.2^2 = 38.44$
$6.3^2 = 39.69$
$6.4^2 = 40.96$
$6.5^2 = 42.25$
$6.6^2 = 43.56$
$6.7^2 = 44.89$
$6.8^2 = 46.24$

So, $\sqrt{46}$ lies between 6.7 and 6.8.

To find the two rational numbers with two decimal places between which $\sqrt{46}$ lies, let's estimate further:

$6.74^2 = 45.4276$
$6.75^2 = 45.5625$
$6.76^2 = 45.6976$
$6.77^2 = 45.8329$
$6.78^2 = 45.9684$
$6.79^2 = 46.1041$

So, $\sqrt{46}$ lies between 6.78 and 6.79.

The square root of $\sqrt{46}$ is between 6.78 and 6.79.

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Part D: Approximate $\sqrt{46}$ up to the third estimate by averaging.

Solution:

Since 46 is between 46 and 49, $\sqrt{46}$ must be between $\sqrt{36}$ and $\sqrt{49}$.

$$\sqrt{36} < \sqrt{46} < \sqrt{49}$$

$$6 < \sqrt{46} < 7$$

Step 1: The integer closest to $\sqrt{46}$ is 7.

The first estimate is 7.

Step 2: Divide the radicand by the first estimate.

$$46 \div 7 \approx 6.57$$

Step 3: To find the second estimate, find the average of the quotient in Step 2 and the first estimate.

$$\frac{6.57 + 7}{2} = \frac{13.57}{2} = 6.785$$

The second estimate is 6.785.

Step 4: Repeat Step 2. But this time, divide the radicand by the second estimate.

$$46 \div 6.785 \approx 6.78$$

Step 5: To find the third estimate, repeat Step 3. This time, find the average of the quotient in Step 4 and the second estimate.

$$\frac{6.78 + 6.785}{2} = \frac{13.565}{2} = 6.7825$$

The closest approximate of $\sqrt{46}$ is 6.7825.