Pre-Algebra

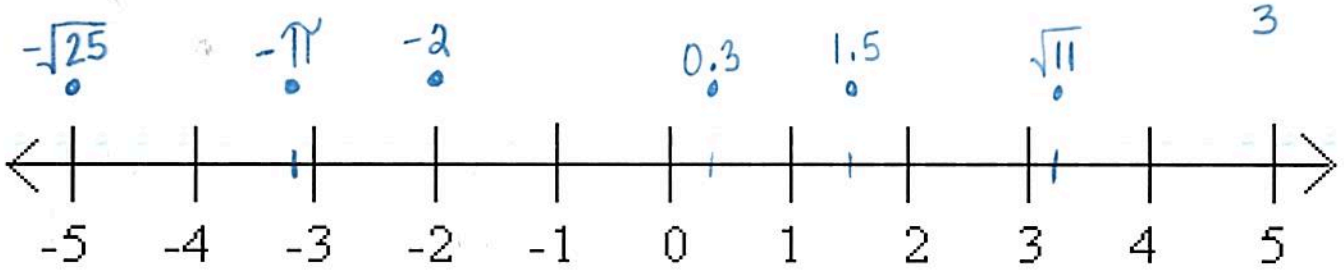
Essential Question: How do we evaluate square roots?

Do Now: Consider the real numbers listed below. Place each number on the number line. Be ready to justify how you made your decision.

-2 1.5 0.3 $-\sqrt{25}$ $-\pi$ $\sqrt{11}$

-5 -3.14159...

between $\sqrt{9}$ and $\sqrt{16}$ → 3 and 4



Squares and Square Roots

Perfect square numbers represent the **product of an integer multiplied by itself.**

Perfect Squares

Squares of numbers

$1^2 = 1$	$6^2 = 36$	$11^2 = 121$
$2^2 = 4$	$7^2 = 49$	$12^2 = 144$
$3^2 = 9$	$8^2 = 64$	$13^2 = 169$
$4^2 = 16$	$9^2 = 81$	$14^2 = 196$
$5^2 = 25$	$10^2 = 100$	$15^2 = 225$

Square roots of numbers

$\sqrt{1} = 1$	$\sqrt{36} = 6$	$\sqrt{121} = 11$
$\sqrt{4} = 2$	$\sqrt{49} = 7$	$\sqrt{144} = 12$
$\sqrt{9} = 3$	$\sqrt{64} = 8$	$\sqrt{169} = 13$
$\sqrt{16} = 4$	$\sqrt{81} = 9$	$\sqrt{196} = 14$
$\sqrt{25} = 5$	$\sqrt{100} = 10$	$\sqrt{225} = 15$

$\sqrt{11}$ →

Think about this....

1) Taking the square root of a perfect square is easy. $\sqrt{16}$ = 4 because 4^2 / (4 • 4) = 16

2) How do we take the square root of a "non-perfect" square number?

Estimating Square Roots

Let's consider $\sqrt{11}$ from the Do Now.

Between which two perfect squares is $\sqrt{11}$ located?

$\sqrt{9}$ and $\sqrt{16}$

Which one is the $\sqrt{11}$ closer to?

Closer to $\sqrt{9}$

Conclusion: $\sqrt{11}$ is between $\sqrt{9} = 3$ and $\sqrt{16} = 4$. It is closer to $\sqrt{9}$ therefore $\sqrt{11}$ is closer to 3.

Calculator Check: 3.31662...

Evaluate each of the following square root expressions (***estimate to the nearest integer when necessary***). **Treat square roots like parentheses in the order of operations – always evaluate them first!**

1) $\sqrt{9}$

3

2) $-\sqrt{9}$

$-(3)$

-3

the opposite of $\sqrt{9}$

3) $-\sqrt{49}$

-7

4) $\sqrt{5}$

$\sqrt{4}$ $\sqrt{9}$

2 3

about → ≈ 2

5) $\sqrt{21}$

$\sqrt{16}$ $\sqrt{25}$

4 5

≈ 5

6) $-\sqrt{92}$

$-\sqrt{81}$ $-\sqrt{100}$

-9 -10

≈ -10

7) $\sqrt{81} \times \sqrt{121}$

$9 \cdot 11$

99

8) $\sqrt{169} + \sqrt{36}$

$13 + 6$

19

Turn and Talk

9) Is $\sqrt{25} + \sqrt{4}$ equivalent to $\sqrt{25 + 4}$? Justify your response. No

$5 + 2$

$7 \neq \sqrt{29}$

10) Is $\sqrt{25} - \sqrt{4}$ equivalent to $\sqrt{25 - 4}$? Justify your response. No

$5 - 2$

$3 \neq \sqrt{21}$

11) Is $\sqrt{25} \cdot \sqrt{4}$ equivalent to $\sqrt{25 \cdot 4}$? Justify your response. Yes

$5 \cdot 2$ $\sqrt{100}$

$10 = 10$

12) Is $\sqrt{25} \div \sqrt{4}$ equivalent to $\sqrt{25 \div 4}$? Justify your response. Yes

$5 \div 2$ $\sqrt{6.25}$

$2.5 \neq 2.5$

TAKE AWAY!

When we take the square root of a ***perfect square*** number, the result is always rational but when we take the square root of a ***non-perfect square*** number, the result is always irrational.

In this case we can only estimate the root because it is a nonterminating, nonrepeating decimal.