The number of REAL nth roots of a number

$\sqrt[n]{\text{Radicand}}$

Radicand is	Index is even	Index is odd
Positive	2	1
Zero	1	1
Negative	0	1

There are 2 even roots of every positive number.

$-\sqrt{\ }$ asks for the Negative Root

$\pm\sqrt{\ }$ asks for the Pos & Neg Roots

$\sqrt{\ }$ asks for the Positive Root

$\sqrt{25} = 5$

in this situation $\sqrt{\ }$ indicates the Principal Root

When there are two roots the Principal Root is the positive root.

Simplify each.

1. $-\sqrt{49} = -7$

2. $\pm\sqrt{36} = \pm 6$

3. $\sqrt{81} = 9$

No symbol in front of the even radical indicates the Principal (Pos) Root.

A real number raised to an even power is ALWAYS POSITIVE.

A real number raised to an odd power can either be negative or positive.

The answer will have the same sign as the base.

The answer from an even radical must be POSITIVE.
"Principal Root"

The answer from an odd radical can be anything.

Answer will have the same sign as the radicand.

Simplify.

1. $\sqrt{a^2} \rightarrow$ An even root without any sign in front means the Principal Root (Pos Root).

$\sqrt{a^2} = \cancel{a} = |a|$ Since we don't know if the variable a is positive or not we put Absolute Value symbols around the answer to ensure the result is positive.

2. $\sqrt[3]{x^3} = x$ Answer will have the same sign as the radicand which means answer can be either positive OR negative.
DON'T use Absolute Value symbols!

Simplify each. Use absolute value symbols when needed.

1. a. $\sqrt{r^{10}} = |r^5|$

r^5 could be negative.But since it is coming out of an even root we need to make sure it comes out positive so we ensure a positive result by using Absolute Value Symbols

b. $\sqrt[4]{m^{12}} = |m^3|$

m^3 could be negative.But since it is coming out of an even root we need to make sure it comes out positive so we ensure a positive result by using Absolute Value Symbols

c. $\sqrt[5]{w^{40}} = w^8$

There are two reasons we don't need Absolute Value symbols in this answer:
1. We are taking an odd root which can lead to a positive or negative answer. Therefore, we don't want to force it to be positive.
2. Since answer is raised to an even power w^8 will automatically be positive.

Get a small white board, rag, and marker

You can now finish Hwk #15 Sec 7-1

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Problems 1, 3, 5, 6, 22, 23, 25-27

Simplify each. Use absolute value symbols when needed.

2.a. $\sqrt{x^4} = x^2$ b. $\sqrt[3]{m^{12}} = m^4$

3.a. $\sqrt{x^6} = |x^3|$ b. $\sqrt[3]{m^{21}} = m^7$

4.a. $\sqrt{9x^8} = 3x^4$ b. $\sqrt[3]{-125Q^{36}} = -5Q^{12}$

Simplify each. Use absolute value symbols when needed.

5. $\sqrt{36x^{22}} = 6|x^{11}|$

6. $\sqrt{x^9} = \sqrt{x^8 \cdot x^1} = x^4\sqrt{x}$

7. $\sqrt{x^{15}} = \sqrt{x^{14} \cdot x} = |x^7|\sqrt{x}$

Simplify each. Use absolute value symbols when needed.

8. $\sqrt{16x^{27}}$ = $4|x^{13}|\sqrt{x}$

9. $\sqrt{25a^{18}b^{7}c^{13}}$ = $5|a^9||b^3|c^6\sqrt{bc}$
OR $5|a^9b^3|c^6\sqrt{bc}$

10. $\sqrt[3]{x^6}$ = x^2

Simplify each. Use absolute value symbols when needed.

11. $\sqrt[3]{x^{15}}$ = x^5

12. $\sqrt[3]{8x^{33}}$ = $2x^{11}$

13. $\sqrt[3]{x^{14}}$ = $\sqrt[3]{x^{12}\cdot x^2}$ = $x^4\sqrt[3]{x^2}$