

## $n^{\text{TH}}$ ROOTS AND REAL EXPONENTS

For any  $\sqrt[n]{a}$  :

$a$	$n$ is even	$n$ is odd
$a > 0$	<u><math>\pm</math></u> answer	One $+$ answer
$a < 0$	No <u>real</u> solutions	One $-$ answer
$a = 0$	0	0

Evaluate.

$$a) -\sqrt{49}$$

$$-(7)$$

$$\boxed{-7}$$

$a > 0$ ,  $n$  is even

$$b) \sqrt[3]{\frac{64}{27}}$$

$$= \frac{\sqrt[3]{64}}{\sqrt[3]{27}}$$

$a > 0$ ,  $n$  is odd

$a > 0$ ,  $n$  is odd

$$\boxed{= \frac{4}{3}}$$

$$c) \sqrt[4]{-121}$$

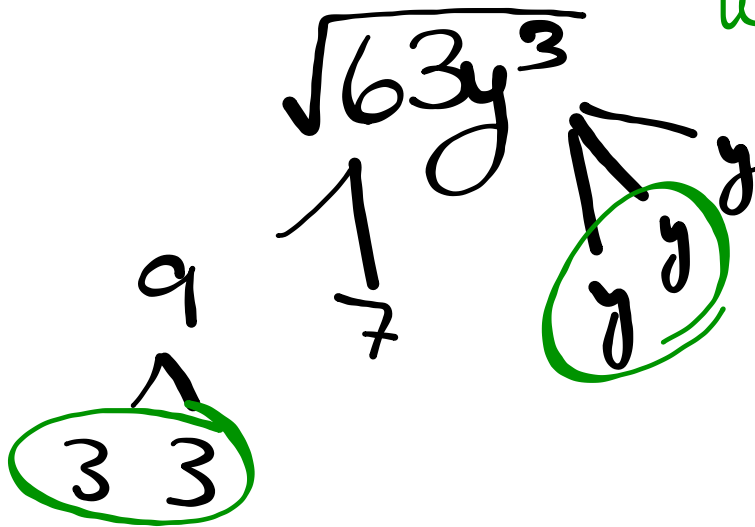
$a < 0$ ,  $n$  is even

No real solution

$\emptyset$

Factor trees

The root tells us how many to circle



$$3y\sqrt{7y}$$

$$\sqrt[6]{n^{18}}$$

Long way:

$$n \ n \ n \ n \ n \ n$$

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$$= n^3$$

Short way:

$$18 \div 6 = 3$$

$$(n^3)$$

$$4\sqrt{81(a+1)^{12}}$$

$12 \div 4 = 3$

$3(a+1)^3$

$a < 0, n \text{ is odd}$

$$\sqrt[3]{-27a^6b^3c^5}$$

$$\begin{array}{ccc} 6 \div 3 & 3 \div 3 & 5 \div 3 \\ = 2 & = 1 & 1 R 2 \end{array}$$

$$-3a^2b^1c^1\sqrt[3]{c^2}$$