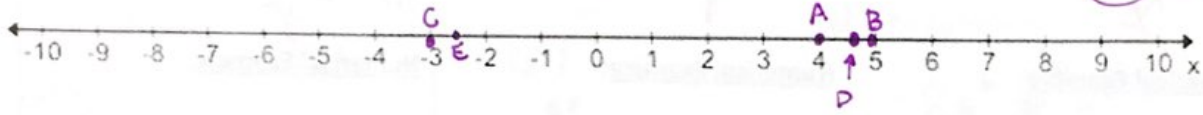
Let's practice simplifying radicals:

$\sqrt{18}$ $= 3\sqrt{2}$	$\sqrt{40}$ $= 2\sqrt{10}$	$\sqrt{-3}$ SKIP FOR NOW
$\sqrt[3]{8} = 2$	$\sqrt[3]{40}$ $2\sqrt[3]{5}$	$\sqrt[4]{40}$ cannot be simplified

Plot the value of each radical expression on the number line.

a. $\sqrt{16} = 4$ b. $\sqrt{25} = 5$ c. $-\sqrt{9} = -3$ d. $\sqrt{23} \approx 4.8$ e. $-\sqrt{8} \approx -2.8$ f. $\sqrt{-4}$ Skip



What is the same about all six of the expressions and what is different about the six expressions?

SAME: all radicals

DIFFERENT: some rational, some irrational.

Example 1: Simplify the radical expression:

$\sqrt{25x^3y^4}$ $5xy^2\sqrt{x}$	$\sqrt[3]{-27m^9n^6}$ $-3m^3n^2$

Practice: Simplify the radical expression.

$\sqrt[3]{125}$ $= 5$	$\sqrt[3]{-27}$ $= -3$	$\sqrt[3]{27a^3b^3}$ $= 3ab$	$\sqrt[3]{24a^5b^2c^7}$ $= 2ac^2\sqrt[3]{3a^2b^2c}$	$\sqrt[3]{27ab^3c^4}$ $= 3bc\sqrt[3]{ac}$

Question: Why can you only simplify a negative under the radical when the root is an odd number? Why can't you simplify a negative under the radical when the root is an even number?

SKIP

Example 2:

$\sqrt{45x^2y^5z^9}$ $= 3xy^2z^4\sqrt{5yz}$	$\sqrt[4]{x^{16}y^4}$ $= x^4y$

Practice:

$\sqrt{4x^4y^2z^8}$	$\sqrt[3]{27m^3n^6}$	$\sqrt{63x^2m^4}$	$\sqrt[3]{-81x^4y^2}$
$2x^2yz^4$	$3mn^2$	$3xm^2\sqrt{7}$	$-3x\sqrt[3]{3xy^2}$

Another way to deal with radicals:

Do you know how to solve these? $\sqrt{16}$ Vs. $16^{\frac{1}{2}}$

4 4

Memorize the following formula:

$$\left(\sqrt[m]{x}\right)^n = x^{\frac{n}{m}}$$

Practice: Convert each to the other form (radical → exponent OR exponent → radical)

$5^{\frac{4}{3}}$	$(\sqrt[5]{4})^9$	$8^{\frac{12}{5}}$	$(\sqrt{16})^3$	$(3x)^{\frac{1}{2}}$	$\sqrt[7]{4}$	$(4y^2)^{\frac{2}{5}}$	$(\sqrt[8]{5b})^3$
$\left(\sqrt[3]{5}\right)^4$	$4^{9/5}$	$\left(\sqrt[5]{8}\right)^{12}$	$16^{\frac{3}{2}}$	$\sqrt{3x}$	$4^{\frac{1}{7}}$	$\left(\sqrt[5]{4y^2}\right)^2$	$(5b)^{\frac{3}{8}}$

Simplify: Now that you know how to convert between radical and rational exponent form, try and evaluate these.

$81^{\frac{1}{2}}$	$9^{\frac{3}{2}}$	$256^{\frac{1}{4}}$	$32^{\frac{3}{5}}$
$=\sqrt{81}$ $=9$	$=\sqrt{9^3}$ $=27$	$\sqrt[4]{256}$ $=4$	$=\sqrt[5]{32^3}$ $=8$

Question: What operation would you apply to get x?

$\sqrt{x^2}$	$\sqrt{x}\cdot\sqrt{x}$	$\sqrt[3]{x^3}$	$\left(\sqrt[3]{x}\right)^3$

Practice:

$\sqrt[3]{x^3+8}$	$\sqrt[3]{5x-2}+1=3$	$2\sqrt{5x-10}=10$	$2x^3+10=64$
$x=2$	$-1 \quad -1$ $\left(\sqrt[3]{5x-2}\right)^3=(2)^3$ $5x-2=8$ $x=2$	$\frac{2}{2} \quad \frac{2}{2}$ $\left(\sqrt{5x-10}\right)^2=(5)^2$ $5x-10=25$ $5x=35$ $x=7$	$-10 \quad -10$ $\frac{2x^3}{2}=\frac{54}{2}$ $\sqrt[3]{x^3}=\sqrt[3]{27}$ $x=3$