Unit 4
Lesson 1

Rational Exponents

Denominator
becomes
Index

Numerator
becomes
Exponent

Converting from rational exponent to radical form:

index

$$x^{a/b} = \sqrt[b]{x^a}$$

The **numerator** of the exponent becomes the **exponent** of the radicand.

The **denominator** of the exponent becomes the **index** of the radicand.

EXAMPLES:

1. $9^{1/2} =$ $\sqrt[2]{9^1} = 3$ $\sqrt[2]{9}$	2. $64^{1/3} =$ $\sqrt[3]{64^1} = 4$
3. $x^{2/3} =$ $\sqrt[3]{x^2}$	4. $16^{-1/2} =$ $\frac{1}{16^{1/2}}$ $\frac{1}{\sqrt{16}}$ $\frac{1}{4}$ *** **Negative** exponents become fractions
5. $4x^{1/7} =$ $4\cdot x^{1/7}$ $4\cdot\sqrt[7]{x^1}$ $4\sqrt[7]{x}$	6. $(3x)^{3/4} =$ $3^{3/4}\cdot x^{3/4}$

$\cancel{47\sqrt{x}}$

$\sqrt[4]{3^3}\cdot\sqrt[4]{x^3}$

$\boxed{\sqrt[4]{27x^3}}$

You Try: Write each expression in **simplest** radical form:

1. $2^{1/2}$ $\sqrt{2}$	2. $3^{1/2}$ $\sqrt{3}$	3. $9^{-1/2}$ $\frac{1}{\sqrt{9}} = \frac{1}{3}$	4. $25^{1/2}$ $\sqrt{25} = 5$	5. $7^{1/3}$ $\sqrt[3]{7}$
6. $x^{4/7}$ $\sqrt[7]{x^4}$	7. $15^{-1/4}$ $\frac{1}{\sqrt[4]{15}}$	8. $x^{1/2}$ $\sqrt{x}$	9. $y^{-1/2}$ $\frac{1}{\sqrt{y}}$	10. $4x^{2/3}$ $4\cdot x^{2/3}$ $4\cdot\sqrt[3]{x^2}$ $4\sqrt[3]{x^2}$
11. $3x^{-1/2}$ $3\cdot\frac{1}{x^{1/2}}$ $3\cdot\frac{1}{\sqrt{x}}$ $\frac{3}{\sqrt{x}}$	12. $(9a)^{1/2}$ $9^{1/2}a^{1/2}$ $\sqrt{9}\cdot\sqrt{a}$ $3\sqrt{a}$	13. $(16x^5)^{-1/2}$ $16^{-1/2}\cdot x^{-5/2}$ $\frac{1}{16^{1/2}}\cdot\frac{1}{x^{5/2}}$ $\frac{1}{\sqrt{16}}\cdot\frac{1}{\sqrt{x^5}} = \frac{1}{4\sqrt{x^5}}$	14. $27^{5/3}$ $\sqrt[3]{27^5}$ $\sqrt[3]{14348907}$ $=243$	15. $(5x)^{1/6}$ $5^{1/6}\cdot x^{1/6}$ $\sqrt[6]{5}\cdot\sqrt[6]{x}$ $\sqrt[6]{5x}$

Radicals can be rewritten in rational exponent form:

Converting from radical to rational exponent form:

$$\sqrt[b]{x^a} = x^{a/b}$$

The **exponent** of the radicand becomes the **numerator** of the fraction.

The **index** of the radicand becomes the **denominator** of the fraction.

EXAMPLES:

1. $\sqrt{5} = \sqrt[2]{5^1} = 5^{1/2}$	2. $\sqrt[3]{7^2} = 7^{2/3}$
3. $\sqrt[4]{x} = x^{1/4}$	4. $\frac{1}{\sqrt[3]{x^2}} = \frac{1}{x^{2/3}} = x^{-2/3}$
5. $5\sqrt[3]{x} = 5 \cdot \sqrt[3]{x}$ $5 \cdot x^{1/3}$ $5x^{1/3}$	6. $\sqrt[5]{3x^2} = \sqrt[5]{(3x^2)^1}$ $(3x)^{2/5}$ $(3x^2)^{1/5}$ $3^{1/5}x^{2/5}$

➢ You Try: Write each expression in **exponential** form:

16. $\sqrt[2]{7}$ $7^{1/2}$	17. $\sqrt[2]{6}$ $6^{1/2}$	18. $\sqrt[4]{8}$ $8^{1/4}$	19. $\sqrt[5]{18}$ $18^{1/5}$	20. $\sqrt[3]{x^2}$ $x^{2/3}$
21. $\sqrt[3]{(2x^2)}$ $(2x^2)^{1/3}$ $2^{1/3}x^{2/3}$	22. $\frac{1}{\sqrt[3]{5}}$ $5^{-1/3}$	23. $2\sqrt[4]{15}$ $2\cdot 15^{1/4}$ $2(15)^{1/4}$	24. $\sqrt[2]{(3x)^7}$ $(3x)^{7/2}$ $3^{7/2}x^{7/2}$	25. $(\sqrt[3]{3v})^2$ $((3v)^{1/3})^2$ $(3^{1/3}v^{1/3})^2$ $3^{2/3}v^{2/3}$

$\sqrt[3]{(3v)^2}$

$(3v)^{2/3}$ $3^{2/3}v^{2/3}$

HW: 3 Last 2 columns