

QUIZ DATE: _____

Math 2

Unit 3 – Rational Exponents and Solving Quadratics

Lesson 1 → Rational Exponents

TEST DATE: _____

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❖ Rational or fractional exponents can be rewritten in radical form:

Converting from rational exponent to radical form:

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

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

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

➤ **EXAMPLES:**

1. $9^{1/2} = \sqrt[2]{9^1} = \sqrt{9} = 3$	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. $(3x)^{3/4} = 3^{3/4} \cdot x^{3/4} = \sqrt[4]{3^3} \cdot \sqrt[4]{x^3} = \sqrt[4]{27x^3}$

$x^{-2/3} = \frac{1}{\sqrt[3]{x^2}}$

➤ **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. $15^{-1/4}$	8. $x^{1/2}$ \sqrt{x}	9. $y^{-1/2}$ $\frac{1}{y^{1/2}} = \frac{1}{\sqrt{y}}$	10. $4x^{2/3}$ $4 \cdot x^{2/3} = 4\sqrt[3]{x^2}$
11. $3x^{-1/2}$ $3 \cdot x^{-1/2} = 3 \cdot \frac{1}{x^{1/2}} = \frac{3}{\sqrt{x}}$	12. $(9a)^{1/2}$ $9^{1/2} \cdot a^{1/2} = \sqrt{9} \cdot \sqrt{a} = 3\sqrt{a}$	13. $(16x^5)^{-1/2}$ $\frac{1}{\sqrt{16x^5}} = \frac{1}{\sqrt{16}} \cdot \frac{1}{\sqrt{x^5}} = \frac{1}{4} \cdot \frac{1}{\sqrt{x^5}} = \frac{1}{4\sqrt{x^5}}$	14. $27^{5/3}$	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 radical becomes the **denominator** of the fraction.

➤ **EXAMPLES:**

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

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

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

➤ Rewrite each expression in radical form and then simplify completely:

1. $100^{1/2}$	2. $125^{1/3}$	3. $(17x)^{1/2}$	4. $64^{1/3}$	5. $16^{1/4}$
6. $16^{3/4}$	7. $(8^{1/2})^2$ 8	8. $(8^{1/3})^3$ 8	9. $(16x^4)^{1/4}$ $16^{1/4} \cdot x^1$ $2x$	10. $125^{-1/3}$

➤ Rewrite each expression in exponential form and then simplify completely:

11. $\sqrt{81}$	12. $\sqrt[3]{125}$	13. $\sqrt[4]{20x^3}$	14. $\sqrt[3]{-64}$	15. $\sqrt[3]{8}$
16. $(\sqrt[3]{8x})^3$	17. $(\sqrt{98})^2$ 98	18. $(\sqrt[3]{98})^3$ 98	19. $(\sqrt[4]{98})^4$ 98	20. $(\frac{1}{\sqrt{x}})^{-4}$

$(x^2)^2 = x^4$

➤ Evaluate each of the following expressions. Give exact answers.

21. $27^{2/3}$	22. $1^{3.5}$	23. $(\frac{1}{32})^{1/5}$	24. $(-27)^{-2/3}$	25. $4^{2.5}$
26. $(\frac{1}{16})^{3/4}$	27. $216^{1/3}$	28. $16^{-1/4}$	29. $25^{3/2}$	30. $(x^6)^{1/2}$
31. $(9x^2)^{1/2}$	32. $(4x^{1/2})^{1/2}$	33. $((8x^3)^2)^{1/3}$	34. $(9x^{-5}y^2)^{-1/2}$	35. $((-4x^3y^{-2})^3)^{1/2}$ $(-4x^3y^{-2})^{3/2}$ $-4^{3/2}x^{9/2}y^{-3}$