NAME

Solving Quadratic and Other Equations | 3.3

Set

Topic: Finding equivalent expressions and functions.

Determine whether the expressions or functions in each problem below are equivalent. Justify why or why they are not equivalent.

7. $5(3^{x-1})$ $\quad 15(3^{x-2})$ $\quad \frac{3}{5}(3^{x})$

8. $64\ (2^{-x})$ $\quad \frac{64}{2^{x}}$ $\quad 64\left(\frac{1}{2}\right)^{x}$

9. 3(x-1)+4 $\quad$ 3x - 1 $\quad$ 3(x-2) +7

10. $50(2^{x+2})$ $\quad 25(2^{2x+1})$ $\quad 50(4^{x})$

11. $30(1.05^{x})$ $\quad 30\left(1.05^{\frac{1}{7}}\right)^{7x}$ $\quad 30\left(1.05^{\frac{x}{2}}\right)^{2}$

12. $20\ (1.1^{x})$ $\quad 20\ (1.1^{-1})^{-1x}$ $\quad 20\left(1.1^{\frac{1}{5}}\right)^{5x}$

Go

Topic: Using rules of exponents

Simplify each expression.

13. $7^3 \cdot 7^5 \cdot 7^2$

14. $(3^4)^5$

15. $(5^3)^4 \cdot 5^7$

16. $x^3 \cdot x^5$

17. x^{-b}

18. $x^a \cdot x^b$

19. $(x^a)^b$

20. $\dfrac{y^a}{y^b}$

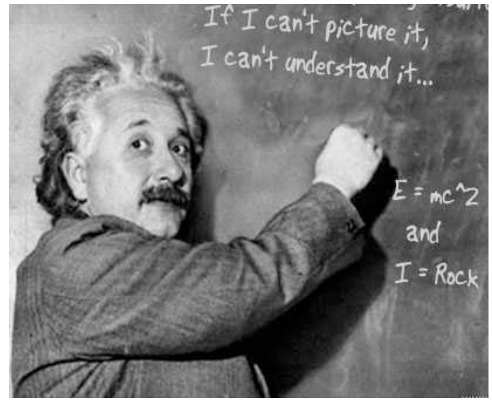
21. $\dfrac{(y^a)^c}{y^b}$

22. $\dfrac{(3^4)^6}{3^7} =$

23. $\dfrac{r^5 s^3}{r s^2} =$

24. $\dfrac{x^5 y^{12} z^0}{x^8 y^9} =$

3.4 Radical Ideas
A Practice Understanding Task



Now that Tia and Tehani know that $a^{m/n} = \left(\sqrt[n]{a}\right)^m$ they are wondering which form, radical form or exponential form, is best to use when working with numerical and algebraic expressions.

Tia says she prefers radicals since she understands the following properties for radicals (and there are not too many properties to remember):

If *n* is a positive integer greater than 1 and both *a* and *b* are positive real numbers then,

1. $\sqrt[n]{a^n} = a$
2. $\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$
3. $\sqrt[n]{\dfrac{a}{b}} = \dfrac{\sqrt[n]{a}}{\sqrt[n]{b}}$

Tehania says she prefers exponents since she understands the following properties for exponents (and there are more properities to work with):

1. $a^m \cdot a^n = a^{m+n}$
2. $\left(a^m\right)^n = a^{mn}$
3. $(ab)^n = a^n \cdot b^n$
4. $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$
5. $\dfrac{a^m}{a^n} = a^{m-n}, \quad a \neq 0$
6. $a^{-n} = \dfrac{1}{a^n}$

DO THIS: Illustrate with examples and explain, using the properties of radicals and exponents, why $a^{1/n} = \sqrt[n]{a}$ and $a^{m/n} = \left(\sqrt[n]{a}\right)^m$ are true identities.

Using their preferred notation, Tia might simplify $\sqrt[3]{x^8}$ as follows:

$$\sqrt[3]{x^8} = \sqrt[3]{x^3 \cdot x^3 \cdot x^2} = \sqrt[3]{x^3} \cdot \sqrt[3]{x^3} \cdot \sqrt[3]{x^2} = x \cdot x \cdot \sqrt[3]{x^2} = x^2 \cdot \sqrt[3]{x^2}$$

(Tehani points out that Tia also used some exponent rules in her work.)

On the other hand, Tehani might simplify $\sqrt[3]{x^8}$ as follows:

$$\sqrt[3]{x^8} = x^{8/3} = x^{2+2/3} = x^2 \cdot x^{2/3} \text{ or } x^2 \cdot \sqrt[3]{x^2}$$

For each of the following problems, simplify the expression in the ways you think Tia and Tehani might do it.

Original expression	**What Tia and Tehani might do to simplify the expression:**
$\sqrt{27}$	Tia's method
	Tehani's method
$\sqrt[3]{32}$	Tia's method
	Tehani's method
$\sqrt{20x^7}$	Tia's method
	Tehani's method
$\sqrt[3]{\dfrac{16xy^5}{x^7y^2}}$	Tia's method
	Tehani's method