

LESSON
3.2**Practice A**

For use with the lesson "Apply Properties of Rational Exponents"

Simplify the expression using the properties of rational exponents.

1. $5^{1/2} \cdot 5^{3/2}$

2. $(3^{2/3})^{5/2}$

3. $(4 \cdot 3)^{2/3}$

4. $7^{-3/2}$

5. $\frac{9^{3/5}}{9^{2/5}}$

6. $\left(\frac{5}{4}\right)^{1/6}$

Simplify the expression using the properties of radicals.

7. $\sqrt{5} \cdot \sqrt{2}$

8. $\sqrt[3]{14} \cdot \sqrt[3]{196}$

9. $\frac{\sqrt{27}}{\sqrt{3}}$

10. $\sqrt{\frac{4}{9}}$

11. $\sqrt[4]{5} \cdot \sqrt[4]{2000}$

12. $\frac{\sqrt{10} \cdot \sqrt{21}}{\sqrt{15}}$

Simplify the expression. Assume all variables are positive.

13. $x^{1/3} \cdot x^{4/3}$

14. $(x^{2/5})^2$

15. $(x^{3/2})^{1/2}$

16. $(8x)^{1/3}$

17. $x^{-4/3}$

18. $(x^{5/6})^{-3}$

19. $\frac{x^{5/6}}{x^{1/6}}$

20. $\frac{x^{2/3}}{x^{5/3}}$

21. $\left(\frac{64}{x}\right)^{2/3}$

Perform the indicated operation. Assume all variables are positive.

22. $\sqrt{5} + 3\sqrt{5}$

23. $6\sqrt{7} - 3\sqrt{7}$

24. $2\sqrt[5]{13} + 5\sqrt[5]{13}$

25. $7\sqrt{5} - 2\sqrt{20}$

26. $2\sqrt{27} + 4\sqrt{75}$

27. $\sqrt[3]{16} + \sqrt[3]{54}$

28. $3\sqrt{x} - 8\sqrt{x}$

29. $5\sqrt[3]{x} + 2\sqrt[3]{x}$

30. $-4\sqrt[4]{x} - 6\sqrt[4]{x}$

Write the expression in simplest form. Assume all variables are positive.

31. $\sqrt{64x^3}$

32. $\sqrt{\frac{x^3}{x^4}}$

33. $\sqrt[3]{x^3y^4z^5}$

34. $\sqrt[3]{8x^3y^6z^4}$

35. $\sqrt{xy^2z^3} + \sqrt{9xy^2z^3}$

36. $\frac{\sqrt[3]{x^3y^2z^7}}{\sqrt[3]{xy^4}}$

37. **Geometry** The area of an equilateral triangle is given by $A = \frac{\sqrt{3}}{4}s^2$.

Find the length of the side s of an equilateral triangle with an area of $\sqrt{27}$ square units.

Lesson 3.1 Evaluate n th Roots and Use Rational Exponents, continued

c. cube roots of 1: 1, $\frac{-1 + i\sqrt{3}}{2}$, $\frac{-1 - i\sqrt{3}}{2}$;

cube roots of 8: 2, $\frac{-2 + 2i\sqrt{3}}{2} = -1 + i\sqrt{3}$,

$\frac{-2 - 2i\sqrt{3}}{2} = -1 - i\sqrt{3}$; cube roots of 64:

4, $\frac{-4 + 4i\sqrt{3}}{2} = -2 + 2i\sqrt{3}$, $\frac{-4 - 4i\sqrt{3}}{2} =$

$-2 - 2i\sqrt{3}$ 6. 78 vibrations/sec to 1047

vibrations/sec 7. 28 vibrations/sec to 4186

vibrations/sec 8. about 5 notes above A-440, or high D; about 7 notes below A-440, or middle D

9. The frequency of a note one octave above another note is twice that of the original note.

Lesson 3.2 Apply Properties of Rational Exponents

Teaching Guide

1. Add the exponents. m^9 ; product of powers property 2. $m^{3/4} \cdot m^{3/4} \cdot m^{3/4} \cdot m^{3/4}$; m^3

3. $p^{1/2} \cdot p^{1/2} \cdot p^{1/2}$; $p^{3/2}$ 4. Let m and n be rational numbers. $(a^m)^n = a^{mn}$

Investigating Algebra Activity

1. $\sqrt[n]{a \cdot b} = (a \cdot b)^{1/n} = a^{1/n} \cdot b^{1/n} = \sqrt[n]{a} \cdot \sqrt[n]{b}$

2. The root of a product is equal to the product of the roots.

3. $\sqrt[n]{\frac{a}{b}} = \left(\frac{a}{b}\right)^{1/n} = \frac{a^{1/n}}{b^{1/n}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$, $b \neq 0$

4. The root of a quotient is equal to the quotient of the roots. It is important to state that $b \neq 0$, because division by 0 is undefined.

Practice Level A

1. 25 2. $3^{5/3}$ 3. $4^{2/3} \cdot 3^{2/3}$ 4. $\frac{1}{7^{3/2}}$ 5. $9^{1/5}$

6. $\frac{5^{1/6}}{4^{1/6}}$ 7. $\sqrt{10}$ 8. 14 9. 3 10. $\frac{2}{3}$

11. 10 12. $\sqrt{14}$ 13. $x^{5/3}$ 14. $x^{4/5}$ 15. $x^{3/4}$

16. $2x^{1/3}$ 17. $\frac{1}{x^{4/3}}$ 18. $\frac{1}{x^{5/2}}$ 19. $x^{2/3}$ 20. $\frac{1}{x}$

21. $\frac{16}{x^{2/3}}$ 22. $4\sqrt{5}$ 23. $3\sqrt{7}$ 24. $7\sqrt[5]{13}$

25. $3\sqrt{5}$ 26. $26\sqrt{3}$ 27. $5\sqrt[3]{2}$ 28. $-5\sqrt{x}$

29. $7\sqrt[3]{x}$ 30. $-10\sqrt[4]{x}$ 31. $8x\sqrt{x}$ 32. $\frac{\sqrt{x}}{x}$

33. $xyz\sqrt[3]{yz^2}$ 34. $2xy^2z\sqrt[3]{z}$ 35. $4yz\sqrt{xz}$

36. $\frac{z^2\sqrt[3]{x^2yz}}{y}$ 37. $2\sqrt{3}$

Practice Level B

1. $7^{5/3}$ 2. $4^{1/3}$ 3. $6^{1/2}$ 4. $15^{1/4}$ 5. 2 6. $2\sqrt[4]{2}$

7. $11^{3/4}$ 8. 7 9. 27 10. $\frac{3\sqrt[3]{2}}{4}$ 11. 2

12. $\frac{\sqrt[5]{45}}{3}$ 13. x^3 14. $x^{1/5}$ 15. $x^{1/7}$ 16. $\frac{x^{2/3}}{3}$

17. $2x\sqrt[3]{2x}$ 18. $\frac{1}{x^{6/5}}$ 19. $x^{3/5}$ 20. $\frac{x^4\sqrt[3]{y}}{y}$

21. $x^5 + \sqrt[3]{x}$ 22. x^6 23. $\frac{x^{2\sqrt{3}}}{2}$ 24. $\frac{1}{x^{23/3}}$

25. $8\sqrt[3]{5}$ 26. $2\sqrt{5}$ 27. $-6\sqrt{3}$ 28. $9\sqrt{x}$

29. $2xy^6$ 30. $5x^{\sqrt{3}}$ 31. $xy^2\sqrt[4]{3x^3yz^3}$

32. $x^2y^2z^2\sqrt{yz}$ 33. $\frac{3\sqrt[3]{3xy^2z^2}}{2yz}$

34. 1.58×10^9 in. 35. 10 ft

Practice Level C

1. $16 \cdot 5^{9/4}$ 2. $3^{3/2}$ 3. $7^{6/5}$ 4. $5^{1/2}$ 5. 4

6. $\sqrt[4]{6}$ 7. $\frac{\sqrt{6}}{3}$ 8. $9\sqrt[5]{81}$ 9. $\frac{\sqrt{70}}{35}$ 10. $x^3\sqrt[3]{3}$

11. $\frac{x^4\sqrt[4]{x}}{y^2}$ 12. $x^{1/4}$ 13. $x^{1/3}y^{1/6}$ 14. $\frac{8x^4y^{1/5}}{z^3}$

15. $\frac{\sqrt{3}z^{1/4}}{x^{1/2}y^{1/3}}$ 16. $\frac{y^{9/2}}{8x^{3/2}z^{3/2}}$ 17. $9x^4\sqrt[4]{x^3}$

18. $x^{23/120}$ 19. $2\sqrt[4]{3}$ 20. $3x^2z\sqrt[3]{xyz^2}$ 21. $\sqrt[8]{x}$

22. $\frac{\sqrt[3]{50x + 25\sqrt{x}}}{5}$ 23. $2\sqrt[3]{x}$ 24. $4x^2z\sqrt{xyz}$

25. 4.29×10^8 in. 26. 4.3 in.

Study Guide

1. 24 2. $10^{2/3}$ 3. $\frac{1}{5}$ 4. 121 5. $9\sqrt{6}$ 6. $4\sqrt[3]{6}$

7. 5 8. 2 9. $6\sqrt[3]{2}$ 10. $\frac{\sqrt[4]{54}}{3}$ 11. $8(6)^{1/4}$

12. $24(6)^{1/2}$ 13. $\frac{3m}{2n^2}$ 14. $4p^4q^2$ 15. $\frac{\sqrt[3]{6xy}}{3y}$

16. $-2\sqrt{h}$ 17. $7a^{1/2}b$ 18. $y^2\sqrt{5}$

Problem Solving Workshop:

Worked Out Example

1. about 2.83 in. 2. about 2.42 mm 3. 9 ft

4. about 1.59; The surface area of the Canadian lynx is about 1.59 times as greater as the surface area of an average house cat.