Oral Exercises

Simplify.

1. a. $9^{1/2}$ 3 b. $9^{-1/2}$ 1/3
2. a. $8^{1/3}$ 2 b. $8^{-1/3}$ 1/2
3. a. $8^{2/3}$ 4 b. $8^{-2/3}$ 1/4
4. a. $16^{1/4}$ 2 b. $16^{-1/4}$ 1/2
5. $27^{-1/3}$ 1/3
6. $27^{2/3}$ 9
7. $4^{3/2}$ 8
8. $25^{-1/2}$ 1/5

Give the letter of the correct answer. Assume x and y are positive numbers.

9. $x^{1/2}$ equals: a. $\frac{x}{2}$ b. $\frac{2}{x}$ (c.) $\sqrt{x}$
10. $x^{2/3}$ equals: (a.) $(\sqrt[3]{x})^2$ b. $\sqrt{x^3}$ c. $\frac{2\sqrt{x}}{3}$
11. $2x^{-1/2}$ equals: a. $\frac{1}{\sqrt{2x}}$ b. $\frac{1}{2\sqrt{x}}$ (c.) $\frac{2}{\sqrt{x}}$
12. $(2x)^{-1/2}$ equals: (a.) $\frac{1}{\sqrt{2x}}$ b. $\frac{1}{2\sqrt{x}}$ c. $\frac{\sqrt{2}}{x}$
13. $-8x^{-1/3}$ equals: a. $\frac{-2}{\sqrt[3]{x}}$ (b.) $\frac{-8}{\sqrt[3]{x}}$ c. $\frac{-1}{2\sqrt[3]{x}}$
14. $\sqrt[4]{x^3y^{-4}}$ equals: (a.) $\frac{x^{3/4}}{y}$ b. $\frac{x^{3/4}}{y^{-1}}$ c. $\frac{3x}{4y}$
15. $\sqrt[3]{\frac{x^2}{8y^{-1}}}$ equals: a. $\frac{x^{2/3}y}{8}$ (b.) $\frac{x^{2/3}y^{1/3}}{2}$ c. $\frac{x^{2/3}}{2y}$
16. $8 \cdot 2^{1/2}$ equals: (a.) $2^{7/2}$ b. $16^{1/2}$ c. $16\sqrt{2}$

Tell whether each equation is true or false.

17. a. $9^{1/2} + 4^{1/2} = (9 + 4)^{1/2}$ F
b. $9^{1/2} \cdot 4^{1/2} = (9 \cdot 4)^{1/2}$ T
18. a. $2^{1/3} + 4^{1/3} = (2 + 4)^{1/3}$ F
b. $2^{1/3} \cdot 4^{1/3} = (2 \cdot 4)^{1/3}$ T
19. a. $\left(\frac{1}{a} + \frac{1}{b}\right)^{-1} = a + b$ F
b. $\left(\frac{1}{a} \cdot \frac{1}{b}\right)^{-1} = ab$ T
20. a. $(\sqrt{a} + \sqrt{b})^2 = a + b$ F
b. $(\sqrt{a} \cdot \sqrt{b})^2 = ab$ T
21. a. $(a^{-1} + b^{-1})^{-2} = a^2 + b^2$ F
b. $(a^{-1} \cdot b^{-1})^{-2} = a^2b^2$ T
22. a. $(x^{1/3} + y^{1/3})^6 = x^2 + y^2$ F
b. $(x^{1/3} \cdot y^{1/3})^6 = x^2y^2$ T

Give the power to which you would raise both sides of each equation in order to solve the equation.

23. $x^{1/2} = 9$ 2
24. $x^{2/3} = 4$ 3/2
25. $x^{-1/3} = 2$ -3
26. $x^{-3/4} = 8^{-1}$ -4/3

Tell what steps you would use to solve each equation.

27. $3x^{1/4} = 6$
28. $5x^{-3/2} = 40$
29. $(x - 3)^{-2} = \frac{1}{4}$
30. $(5x)^{-1/2} = 3$

Check for Understanding

Here is a suggested use of the Oral Exercises to check students' understanding as you teach the lesson.

Oral Exs. 1–8: use after Example 2.
Oral Exs. 9–16: use after Example 3.
Oral Exs. 17–22: use after Example 4.
Oral Exs. 23–30: use after Example 5.

Guided Practice

Evaluate.

1. $49^{-1/2}$ $\frac{1}{7}$
2. $8^{5/3}$ 32

Write in exponential form.

3. $\sqrt{ab^3}$ $a^{1/2}b^{3/2}$
4. $\frac{1}{\sqrt[3]{xy^5}}$ $x^{-1/3}y^{-5/3}$

Express in simplest form.

5. $\sqrt[6]{5^5} \div \sqrt[3]{25}$ $\sqrt[6]{5}$
6. $\sqrt[3]{16} \cdot \sqrt{8}$ $4\sqrt[6]{32}$

Summarizing the Lesson

In this lesson students learned the meaning of rational exponents and how to simplify expressions and solve equations where rational exponents appear. Ask students to explain why $b^{p/q}$ can be defined as either $(\sqrt[q]{b})^p$ or $\sqrt[q]{b^p}$.

Additional Answers
Oral Exercises

27. Divide by 3; raise to the fourth power.
28. Divide by 5; raise to the $-\frac{2}{3}$ power.
29. Raise to the $-\frac{1}{2}$ power; add 3.
30. Raise to the -2 power; divide by 5.