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Rewrite the expression using rational exponent notation.

1) $(\sqrt[5]{63})^3$

$63^{3/5}$

2) $(\sqrt[3]{-25})^4$

$(-25)^{4/3}$

3) $(\sqrt[6]{124})^7$

$124^{7/6}$

Rewrite the expression using radical notation.

4) $(-57)^{4/3}$

$\sqrt[3]{-57}^{\,4}$

5) $13^{3/2}$

$\sqrt{13}^{\,3}$

6) $204^{5/8}$

$\sqrt[8]{204}^{\,5}$

Evaluate the expression without using a calculator.

7) $(\sqrt[3]{27})^2$

3^2

9

8) $(\sqrt[4]{256})^3$

4^3

64

9) $(\sqrt[3]{-64})^2$

$(-4)^2$

16

10) $36^{3/2}$

6^3

216

11) $(25)^{-3/2}$

$\frac{1}{125}$

12) $(16)^{1/4}$

2

13) $(-32)^{-3/5}$

$\frac{1}{-8}$

14) $(81)^{-5/2}$

$\frac{1}{9^5}$

15) $(-125)^{-5/3}$

$\frac{1}{(-5)^5}$

Simplify the expression using the properties of radicals and rational exponents.

16) $(4^{2/3} \bullet 5^{3/4})^3$

$4^2 \cdot 5^{9/4}$

$16 \cdot 5^{9/4}$

17) $(3^{3/2} \bullet 3^3)^{1/3}$

$\frac{\cancel{3}}{2} \cdot \frac{1}{\cancel{3}}$ $\quad \cancel{3} \cdot \frac{1}{\cancel{3}}$

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

$3^{3/2}$

18) $((7^{2/3})^{3/5})^3$

$\frac{2}{\cancel{3}} \cdot \frac{\cancel{3}}{5} \cdot \frac{3}{1}$

$7^{6/5}$

19) $\left(\frac{5^2}{5^{7/2}}\right)^{-1/3}$

$\left(\frac{5^{7/2}}{5^2}\right)^{\frac{1}{3}} = 5^{\frac{1}{2}}$

$\frac{7}{6} - \frac{2}{3}\ \frac{4}{6}$

20) $\left(\frac{1^{1/3}}{2^{1/3}}\right)^2$

$\frac{1}{2^{2/3}}$

21) $\sqrt[4]{\sqrt[3]{\sqrt{6}}}$ $\left(\left(6^{1/2}\right)^{1/3}\right)^{\frac{1}{4}}$

$6^{\frac{1}{24}}$

22) $\sqrt{\frac{\sqrt{3}}{\sqrt{7}}}$ $\left(\frac{3^{\frac{1}{2}}}{7^{\frac{1}{2}}}\right)^{\frac{1}{2}}$

$\frac{3^{1/4}}{7^{1/4}}$ $\left(\frac{3}{7}\right)^{1/4}$

23) $\sqrt[5]{\left(3^3\right)^2 \cdot \left(3^4\right)^2}$ 6 8

$\sqrt[5]{3^{14}}$

$3^{14/5}$

24) $\frac{\sqrt{\frac{5}{7}} \cdot \frac{\cancel{4}}{\sqrt{5}}}{\cancel{\sqrt{4}}}$ 2

$2\sqrt{\frac{5}{35}}$ $\frac{1}{7}$

$\frac{2}{\sqrt{7}} = \frac{2\sqrt{7}}{7}$

Simplify the expression. Assume all variables are positive.

25) $x^{\sqrt{3}} \cdot x^{\cancel{x}\ 1}$

$x^{1+\sqrt{3}}$

26) $\sqrt[4]{\frac{x^1}{y^8}}$

$\frac{x^{1/4}}{y^2}$

27) $\left(\frac{x^{1/4}}{x^{1/2}}\right)^{-1}$

$\frac{x^{\frac{1}{2}}}{x^{1/4}}$ $\frac{2}{4}\frac{1}{2} - \frac{1}{4}$

$x^{1/4}$

28) $\frac{x^{4/3}y^{7/6}}{xy}$

$\frac{4}{3} - \frac{3}{3} =$

$\frac{7}{6} - \frac{6}{6}$

$x^{\frac{1}{3}} y^{\frac{1}{6}}$

29) $\left(\frac{2x^3y^{2/3}}{x^{5/3}y^{3/5}z}\right)^3 =$

$\frac{2^3 x^9 y^{2\ \frac{10}{5}}}{x^5 y^{9/5} z^3}$

$\frac{8x^4y^{\frac{1}{5}}}{z^3}$

30) $\left(\frac{xy^2}{3y^{4/3}z^{1/2}}\right)^{-1/2}$

$\frac{3^{1/2} y^{2/3} z^{1/4}}{x^{1/2} y}$

$\frac{3^{1/2} z^{1/4}}{x^{1/2} y^{1/3}}$

31) $\left(\frac{\left(12xy^2\right)^{1/2}}{\left(3y^3z\right)^{1/2}}\right)^{-3}$

$\left(\frac{3^{1/2} y^{3/2} z^{1/2}}{12^{1/2} x^{1/2} y}\right)^3 = \frac{3^{3/2} y^{\frac{9}{2}} z^{3/2}}{12^{3/2} x^{3/2} y^3} = \frac{3^{3/2} y^{3/2} z^{3/2}}{12^{3/2} x^{3/2}} = \left(\frac{3yz}{12x}\right)^{3/2} = \left(\frac{yz}{4x}\right)^{3/2}$

32) $\sqrt[4]{\left(3x^3\right)^3 \left(3x^2\right)^5} = \sqrt[4]{3^8 x^{19}}$ 9 10 16 -3

$= 9x^4\sqrt[4]{x^3}$

Perform the indicated operation. Assume all variables are positive.

33) $\sqrt{\left(10\sqrt{3} - 6\sqrt{3}\right)}$

$\sqrt{4\sqrt{3}}$

$2(3)^{1/4}$

34) $2x\sqrt[3]{x^4yz^5} + \sqrt[3]{x^7yz^5}$ 6

$2x^2z\sqrt[3]{xyz^2} + x^2z\sqrt[3]{xyz^2}$

$3x^2z\sqrt[3]{xyz^2}$

Solve the equation. Check for extraneous solutions.

35) $3(x-5)^{3/2} - 6 = 18$

$$\left((x-5)^{3/2}\right)^{2/3} = 8^{2/3}$$

$$x - 5 = 4$$

$$x = 9$$

36) $(5x+14)^{2/3} + 10 = 6$

$$\left((5x+14)^{2/3}\right)^{3/2} = (-4)^{3/2}$$

$$\emptyset$$

37) $\frac{1}{2}(x-3)^{3/4} + 6 = 9$

$$\left((x-3)^{3/4}\right)^{4/3} = (6)^{4/3}$$

$$x - 3 = 3 + 6^{4/3}$$

38) $2(5x^2+10)^{2/3} - 5 = 45$

$$\left((5x^2+10)^{2/3}\right)^{3/2} = 25^{3/2}$$

$$5x^2 + 10 = 125$$

$$5x^2 = 115$$

$$x^2 = 23$$

$$\boxed{x = \pm\sqrt{23}}$$

39) $\left(\sqrt{x+9}\right)^2 = \left(3 - \sqrt{x}\right)^2$

$$\cancel{x} + \cancel{9} = \cancel{9} - 6\sqrt{x} + \cancel{x}$$

$$x = 0$$

40) $\left(\sqrt{x+3}\right)^2 = \left(1 + \sqrt{x+1}\right)^2$

$$\cancel{x} + 3 = 1 + 2\sqrt{x+1} + \cancel{x} + 1$$

$$(1)^2 = \left(2\sqrt{x+1}\right)^2$$

$$1 = 4(x+1)$$

$$1 = 4x + 4$$

$$x = -3/4$$

41) $\left(\sqrt{x-7}\right)^2 = \left(\sqrt{x+1} + 2\right)^2$

$$x - 7 = x + 1 + 4\sqrt{x+1} + 4$$

$$-12 = 4\sqrt{x+1}$$

$$-3 = \sqrt{x+1}$$

$$9 = x + 1$$

$$\cancel{x = 8}$$

$$\sqrt{1} = \sqrt{9} + 2$$

$$1 \neq 5$$

No sol.

42) $\left(\sqrt{x+8}\right)^2 = \left(\sqrt{x} + \sqrt{3}\right)^2$

$$\cancel{x} + 8 = \cancel{x} + 2\sqrt{3x} + 3$$

$$5 = 2\sqrt{3x}$$

$$25 = 4(3x)$$

$$25 = 12x$$

$$\frac{25}{12} = x$$