Questions

1. Simplify $\sqrt{54}$.

2. Simplify $\sqrt{44}$.

3. Simplify $\sqrt{90}$.

4. Simplify $5\sqrt{75} + \sqrt{48}$.

5. Simplify $\sqrt{45} + \sqrt{80} - 3\sqrt{20}$.

6. Simplify $-\sqrt{12} + 2\sqrt{48} - \sqrt{75}$.

7. Simplify $5\sqrt{27x} - 4\sqrt{75x}$.

8. Simplify $\sqrt{75a^3} + a\sqrt{12a}$.

9. Simplify $\sqrt[3]{128} - 4\sqrt[3]{16}$.

Solutions

1. $\sqrt{54} = \sqrt{9 \cdot 6} = \sqrt{9}\sqrt{6} = 3\sqrt{6}$.

2. $\sqrt{44} = \sqrt{4 \cdot 11} = \sqrt{4}\sqrt{11} = 2\sqrt{11}$.

3. $\sqrt{90} = \sqrt{9 \cdot 10} = \sqrt{9}\sqrt{10} = 3\sqrt{10}$.

4.

$$
\begin{aligned}
5\sqrt{75} + \sqrt{48} &= 5\sqrt{25 \cdot 3} + \sqrt{16 \cdot 3} \\
&= 5\sqrt{25}\sqrt{3} + \sqrt{16}\sqrt{3} \\
&= 5 \cdot 5\sqrt{3} + 4\sqrt{3} \\
&= 25\sqrt{3} + 4\sqrt{3} \\
&= 29\sqrt{3}
\end{aligned}
$$

5.

$$
\begin{aligned}
\sqrt{45} + \sqrt{80} - 3\sqrt{20} &= \sqrt{9 \cdot 5} + \sqrt{16 \cdot 5} - 3\sqrt{4 \cdot 5} \\
&= \sqrt{9}\sqrt{5} + \sqrt{16}\sqrt{5} - 3\sqrt{4}\sqrt{5} \\
&= 3\sqrt{5} + 4\sqrt{5} - 6\sqrt{5} \\
&= \sqrt{5}
\end{aligned}
$$

6.

$$
\begin{aligned}
-\sqrt{12} + 2\sqrt{48} - \sqrt{75} &= -\sqrt{4 \cdot 3} + 2\sqrt{16 \cdot 3} - \sqrt{25 \cdot 3} \\
&= -\sqrt{4}\sqrt{3} + 2\sqrt{16}\sqrt{3} - \sqrt{25}\sqrt{3} \\
&= -2\sqrt{3} + 8\sqrt{3} - 5\sqrt{3} \\
&= \sqrt{3}
\end{aligned}
$$

7.

$$
\begin{aligned}
5\sqrt{27x} - 4\sqrt{75x} &= 5\sqrt{9 \cdot 3x} - 4\sqrt{25 \cdot 3x} \\
&= 5\sqrt{9}\sqrt{3x} - 4\sqrt{25}\sqrt{3x} \\
&= 15\sqrt{3x} - 20\sqrt{3x} \\
&= -5\sqrt{3x}
\end{aligned}
$$

8.

$$
\begin{aligned}
\sqrt{75a^3} + a\sqrt{12a} &= \sqrt{25a^2 \cdot 3a} + a\sqrt{4 \cdot 3a} \\
&= \sqrt{25a^2}\sqrt{3a} + a\sqrt{4}\sqrt{3a} \\
&= 5a\sqrt{3a} + 2a\sqrt{3a} \\
&= 7a\sqrt{3a}
\end{aligned}
$$

9. Since this involves a cube root, look for numbers that are cubed, like $8 = 2^3$ and $64 = 4^3$.

$$
\begin{aligned}
\sqrt[3]{128} - 4\sqrt[3]{16} &= \sqrt[3]{64 \cdot 2} - 4\sqrt[3]{8 \cdot 2} \\
&= \sqrt[3]{64}\sqrt[3]{2} - 4\sqrt[3]{8}\sqrt[3]{2} \\
&= \sqrt[3]{4^3}\sqrt[3]{2} - 4\sqrt[3]{2^3}\sqrt[3]{2} \\
&= 4\sqrt[3]{2} - 4(2)\sqrt[3]{2} \\
&= 4\sqrt[3]{2} - 8\sqrt[3]{2} \\
&= -4\sqrt[3]{2}
\end{aligned}
$$