

I. Radical expressions can be written in simplified form by making use of the properties

- If $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are defined, then $\sqrt[n]{a}\sqrt[n]{b} = \sqrt[n]{ab}$ and $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$
- For nonnegative a , $\sqrt[n]{a^n} = a$

1. Simplify

(a). $\sqrt{2} \cdot \sqrt{32}$	(b) $\sqrt[3]{3}\sqrt[3]{9}$	(c) $\sqrt{50}\sqrt{2}$
(d) $\frac{\sqrt{50}}{\sqrt{2}}$	(e) $\sqrt{\frac{16}{81}}$	(f) $\sqrt{\frac{5}{8}}\sqrt{\frac{5}{2}}$

2. Rewrite in simplified form. Assume all variables are nonnegative.

(a) $\sqrt{700}$	(b) $\sqrt{45}$	(c) $\sqrt{48}$
(d) $7\sqrt{18}$	(e) $\sqrt{x^8}$	(f) $\sqrt{x^{11}}$
(g) $\sqrt[3]{a^6}$	(h) $\sqrt{20x^5}$	(i) $\sqrt{x}\sqrt{x^7}$
(j) $\sqrt{5a^3}\sqrt{8a^7}$	(k) $\sqrt[3]{x^2}\sqrt[3]{x^4}$	(l) $\frac{\sqrt{9x^3y}}{\sqrt{xy}}$

II. To **rationalize the denominator** of a fraction means to rewrite the fraction in an equivalent form so that the denominator is rational, that is, so that it does not contain a radical. If the denominator contains one term, multiply the numerator and denominator of the fraction by the radical in the denominator and then simplify the fraction.

3. Rationalize the denominator and simplify:

(a) $\frac{10}{\sqrt{5}}$	(b) $\frac{6}{\sqrt{7}}$
(c) $\frac{\sqrt{5}}{\sqrt{3}}$	(d) $\frac{2}{3\sqrt{10}}$

III. Radical expressions can be simplified by addition or subtraction if and only if they are like radicals, that is, if they have the same index and the same radicand. To add or subtract like radicals, add or subtract the coefficients. If the radicals are not like radicals, then they cannot be combined by addition or subtraction.

4. Simplify each expression.

(a) $7\sqrt{3} - 2\sqrt{3}$	(b) $3\sqrt{20} + \sqrt{45}$
(c) $4\sqrt[3]{6} - \sqrt[3]{6}$	(d) $\sqrt{32} + 5\sqrt{18}$

Answers

1(a) 8	(b) 3	(c) 10	(d) 5	(e) 4/9	(f) 5/4	
2 (a) $10\sqrt{7}$	(b) $3\sqrt{5}$	(c) $4\sqrt{3}$	(d) $21\sqrt{2}$	(e) x^4	(f) $x^5\sqrt{x}$	(g) a^2
2 (h) $2x^2\sqrt{5x}$	(i) x^4	(j) $2a^5\sqrt{10}$	(k) x^2	(l) $3x$		
3 (a) $2\sqrt{5}$	(b) $\frac{6\sqrt{7}}{7}$	(c) $\frac{\sqrt{15}}{3}$	(d) $\frac{\sqrt{10}}{15}$			
4 (a) $5\sqrt{3}$	(b) $9\sqrt{5}$	(c) $3\sqrt[3]{6}$	(d) $19\sqrt{2}$			