

### Operations on Radicals

1. Write each of the following as a mixed radical

a)  $\sqrt{162}$       b)  $-2\sqrt{54}$       c)  $\frac{3}{5}\sqrt{50}$       d)  $8\sqrt[3]{-54}$

2. Write each of the following as an entire radical

a)  $4\sqrt{3}$       b)  $\frac{1}{2}\sqrt{60}$       c)  $5\sqrt[3]{2}$       d)  $\frac{1}{4}\sqrt[3]{128}$

3. Completely simplify each of the following:

a)  $\sqrt{5} - 7\sqrt{3} + 2\sqrt{5} + 12\sqrt{3}$       b)  $3\sqrt{32} + 5\sqrt{18} - \sqrt{72}$       c)  $\frac{1}{2}\sqrt{48} + \frac{2}{3}\sqrt{27} - \frac{1}{3}\sqrt{108}$

d)  $4\sqrt[3]{54} - 2\sqrt[3]{128} + 8\sqrt[3]{250}$       e)  $\sqrt{15} \times \sqrt{27}$       f)  $-4\sqrt{28} \times -2\sqrt{63}$

4. Simplify.

a)  $\sqrt{3}(\sqrt{6} - 3\sqrt{8})$       b)  $(\sqrt{10} - \sqrt{5})^2$       c)  $(\sqrt{12} + 2\sqrt{5})(2\sqrt{12} - \sqrt{5})$

5. Simplify. Rationalize the denominator if necessary.

a)  $\frac{\sqrt{32}}{\sqrt{4}}$       b)  $\frac{12\sqrt{72}}{2\sqrt{6}}$       c)  $\frac{16}{\sqrt{8}}$       d)  $\frac{3\sqrt{12}}{7\sqrt{54}}$

e)  $\frac{5\sqrt{2}}{\sqrt{5} + 2\sqrt{2}}$       f)  $\frac{2 + 4\sqrt{5}}{5\sqrt{5} + 3}$       g)  $\frac{8\sqrt{24} - 6\sqrt{54} + 12\sqrt{150}}{2\sqrt{3}}$

### Answers

1) a)  $9\sqrt{2}$     b)  $-6\sqrt{6}$     c)  $3\sqrt{2}$     d)  $-24\sqrt[3]{2}$     2) a)  $\sqrt{48}$     b)  $\sqrt{15}$     c)  $\sqrt[3]{250}$     d)  $\sqrt[3]{2}$

3) a)  $3\sqrt{5} + 5\sqrt{3}$     b)  $21\sqrt{2}$     c)  $2\sqrt{3}$     d)  $44\sqrt[3]{2}$     e)  $9\sqrt{5}$     f) 336

4) a)  $3\sqrt{2} - 6\sqrt{6}$     b)  $15 - 10\sqrt{2}$     c)  $14 + 6\sqrt{15}$     5) a)  $2\sqrt{2}$     b)  $12\sqrt{3}$     c)  $4\sqrt{2}$     d)  $\sqrt{2}/7$

e)  $(20 - 5\sqrt{10})/3$     f)  $(47 - \sqrt{5})/58$     g)  $29\sqrt{2}$