

1. Write as a simplified mixed radical.

a) $\sqrt{24}$

b) $\sqrt{45}$

c) $\sqrt{112}$

d) $-\frac{3}{4}\sqrt{64}$

e) $\sqrt{28x^3}$

f) $5x^2\sqrt{32x^7y^6}$

g) $\sqrt[3]{-8}$

h) $\sqrt[3]{125x^7}$

i) $5a\sqrt[3]{16ab^9}$

2. Write as an entire radical.

a) $3\sqrt{7}$

b) $5\sqrt{2}$

c) $4x\sqrt{xy}$

d) $2a\sqrt[3]{3a^2}$

3. Order the following numbers from least to greatest. $3\sqrt{7}$, $\sqrt{65}$, $2\sqrt{17}$, 8

4. Simplify. All answers should be in simplified radical form.

a) $\sqrt{7}(3\sqrt{2})$

b) $(5\sqrt{24})(2\sqrt{18})$

c) $(-4\sqrt{3x})(-3\sqrt{2x})(2\sqrt{10x})$

d) $(-2m\sqrt{3})(4m^2\sqrt{5})$

e) $3\sqrt{2}(2\sqrt{2}-\sqrt{6})$

f) $x\sqrt{2}(2x-\sqrt{2})$

g) $7\sqrt{3}(\sqrt{24}-3\sqrt{50})$

h) $(2\sqrt{x}-5)(\sqrt{x}+3)$

i) $(6\sqrt{3}-2\sqrt{6})^2$

j) $(5-\sqrt{3})(5+\sqrt{3})$

k) $(2\sqrt{5}-\sqrt{7y})(2\sqrt{5}+\sqrt{7y})$

5. Simplify.

a) $-\sqrt{7}+3\sqrt{5}+9\sqrt{7}-\sqrt{5}$

b) $8\sqrt{24}+3\sqrt{6}-4\sqrt{54}$

c) $3a\sqrt{7a^3}+2a^2\sqrt{28a}-a\sqrt{9a}$

d) $3\sqrt[3]{16}-5\sqrt[3]{54}$

6. Rationalize each denominator.

a) $\frac{4\sqrt{2}}{\sqrt{3}}$

b) $\frac{8\sqrt{6}+\sqrt{5}}{\sqrt{5}}$

c) $\frac{-1}{\sqrt[3]{4}}$

d) $\frac{\sqrt{11}}{8-\sqrt{5}}$

7. Simplify. Rationalize the denominator if necessary.

a) $\frac{12\sqrt{12}}{4\sqrt{2}}$ b) $\frac{-16\sqrt{50}}{2\sqrt{10}}$ c) $\frac{3\sqrt{12}}{6\sqrt{2}}$ d) $\frac{14\sqrt{2}}{18\sqrt{5}}$

e) $\frac{4\sqrt{3}}{\sqrt{8}}$ f) $\frac{20\sqrt{24}}{3\sqrt{20}}$ g) $\frac{5\sqrt{7}-3}{\sqrt{7}}$ h) $\frac{2\sqrt{3}}{\sqrt{6}-1}$

i) $\frac{a+\sqrt{b}}{a-\sqrt{b}}$ j) $\frac{3\sqrt{2}-5}{2\sqrt{5}-\sqrt{2}}$

8. Identify the restriction.

a) $\frac{3\sqrt{7x}}{\sqrt{x}}$ b) $3\sqrt{2x-5}$ c) $\sqrt{1-4x}$ d) $\sqrt[3]{5x}$ e) $\sqrt{a^2}$

9. Solve each equation.

a) $-\sqrt{x} = -5$ b) $\sqrt{6-x} = -3$ c) $3+2\sqrt{x-1} = 11$ d) $11-\sqrt{2x} = 7$

e) $\sqrt{4x-1} = \sqrt{2x-10}$ f) $\sqrt{x-3} = x-3$ g) $\sqrt{x^2+3} - x = 1$ h) $\sqrt{x-5} + 1 = \sqrt{x}$

10. A square has an area of $12\pi \text{ cm}^2$. Determine the side length and the length of the diagonal.

11. A rectangle has length, $4\sqrt{6} \text{ cm}$, and a width of $\sqrt{12} \text{ cm}$. Determine the rectangle's area and perimeter.

12. The kinetic energy of an object is given by the formula $E = \frac{1}{2}mv^2$, where m is the mass in kg, v is the velocity in metres per second, and E is the kinetic energy in joules.

- If the kinetic energy is 18150 joules and the mass is 75 kg, what velocity is the object travelling?
- Solve the equation for v.

Answers:

1.a) $2\sqrt{6}$ b) $3\sqrt{5}$ c) $4\sqrt{7}$ d) -6 e) $2x\sqrt{7x}$ f) $20x^5y^3\sqrt{2x}$ g) -2 h) $5x^2\sqrt[3]{x}$ i) $10ab^3\sqrt[3]{2a}$ 2.a) $\sqrt{63}$ b) $\sqrt{50}$ c) $\sqrt{16x^3y}$ d) $\sqrt[3]{24a^5}$

3. $3\sqrt{7}$, 8, $\sqrt{65}$, $2\sqrt{17}$ 4.a) $3\sqrt{14}$ b) $120\sqrt{3}$ c) $48x\sqrt{15x}$ d) $-8m^3\sqrt{15}$ e) $12-6\sqrt{3}$ f) $2x^2\sqrt{2}-2x$ g) $21\sqrt{2}-105\sqrt{6}$ h) $2x+\sqrt{x}-15$

i) $132-72\sqrt{2}$ j) 22 k) 20-7y 5.a) $8\sqrt{7}+2\sqrt{5}$ b) $7a^2\sqrt{7a}-3a\sqrt{a}$ c) $7\sqrt{6}$ d) $-9\sqrt[3]{2}$ 6.a) $\frac{4\sqrt{6}}{3}$ b) $\frac{8\sqrt{30}+5}{5}$ c) $\frac{-\sqrt[3]{2}}{2}$ d) $\frac{8\sqrt{11}+\sqrt{55}}{59}$

7.a) $3\sqrt{6}$ b) $-8\sqrt{5}$ c) $\frac{\sqrt{6}}{2}$ d) $\frac{7\sqrt{10}}{45}$ e) $\sqrt{6}$ f) $\frac{4\sqrt{30}}{3}$ g) $\frac{35-3\sqrt{7}}{7}$ h) $\frac{6\sqrt{2}+2\sqrt{3}}{5}$ i) $\frac{a^2+2a\sqrt{b}+b}{a^2-b}$ j) $\frac{5\sqrt{10}-4}{18}$ 8.a) $x > 0$ b) $x \geq \frac{5}{2}$ c) $x \leq \frac{1}{4}$

d) no restriction e) no restriction 9.a) $x = 25$ b) no solution c) $x = 17$ d) $x = 8$ e) $x = -4.5$ f) $x = 3, 4$ g) $x = 1$ h) $x = 9$

10. Side length = $2\sqrt{3\pi} \text{ cm}$, diagonal = $2\sqrt{6\pi} \text{ cm}$ 11. $A = 24\sqrt{2} \text{ cm}^2$, $P = 8\sqrt{6} + 4\sqrt{3} \text{ cm}$ 12.a) $v = 22 \text{ m/s}$ b) $v = \sqrt{\frac{2E}{m}}$