

1. a.) $\sqrt{x^6} = \underline{\underline{x^3}}$

b.) $\sqrt{y^8} = \underline{\underline{y^4}}$

c.) $\sqrt{t^{12}} = \underline{\underline{t^6}}$

d.) $\sqrt{m^{20}} = \underline{\underline{m^{10}}}$

2. a.) $\sqrt{a^4 x^2} = \underline{\underline{a^2 x}}$

b.) $\sqrt{16r^2} = \underline{\underline{4r}}$

c.) $\sqrt{25t^4 u^6} = \underline{\underline{5t^2 u^3}}$

d.) $\sqrt{81b^2 c^8} = \underline{\underline{9bc^4}}$

3. a.) $\sqrt{2} \cdot \sqrt{18} = \sqrt{36} = \underline{\underline{6}}$

b.) $\sqrt{27} \cdot \sqrt{3} = \sqrt{81} = \underline{\underline{9}}$ g.) 7

c.) $\sqrt{99} \cdot \sqrt{11} = \sqrt{1089} = \underline{\underline{33}}$

d.) $\sqrt{32} \cdot \sqrt{8} = \sqrt{256} = \underline{\underline{16}}$ h.) 12

e.) $\sqrt{2,5} \cdot \sqrt{10} = \sqrt{25} = \underline{\underline{5}}$

f.) $\sqrt{12\frac{1}{2}} \cdot \sqrt{50} = \sqrt{625} = \underline{\underline{25}}$

4. a.) $\sqrt{4 \cdot 9} = 2 \cdot 3 = \underline{\underline{6}}$

b.) $\sqrt{16 \cdot 64} = 4 \cdot 8 = \underline{\underline{32}}$

c.) $\sqrt{4 \cdot 36} = 2 \cdot 6 = \underline{\underline{12}}$

d.) $\sqrt{25 \cdot 49} = 5 \cdot 7 = \underline{\underline{35}}$

e.) $\sqrt{81 \cdot 121} = 9 \cdot 11 = \underline{\underline{99}}$

f.) $\sqrt{169 \cdot 49} = 13 \cdot 7 = \underline{\underline{91}}$

g.) $\sqrt{324 \cdot 16} = 18 \cdot 4 = \underline{\underline{72}}$

h.) $\sqrt{225 \cdot 25} = 15 \cdot 5 = \underline{\underline{75}}$

5. a.) $\sqrt{40'000} = \sqrt{4 \cdot 10'000} = \sqrt{4} \cdot \sqrt{10'000} = 2 \cdot 100 = \underline{\underline{200}}$

b.) $\sqrt{62'500} = \sqrt{625 \cdot 100} = \sqrt{625} \cdot \sqrt{100} = 25 \cdot 10 = \underline{\underline{250}}$

c.) $\sqrt{250'000} = \sqrt{25 \cdot 10'000} = \sqrt{25} \cdot \sqrt{10'000} = 5 \cdot 100 = \underline{\underline{500}}$

d.) $\sqrt{640'000} = \sqrt{64 \cdot 10'000} = \sqrt{64} \cdot \sqrt{10'000} = 8 \cdot 100 = \underline{\underline{800}}$

e.) $\sqrt{1'440'000} = \sqrt{144 \cdot 10'000} = \sqrt{144} \cdot \sqrt{10'000} = 12 \cdot 100 = \underline{\underline{1'200}}$

$$f.) \sqrt{758'000'000} = \sqrt{758 \cdot 1'000'000} = \sqrt{758} \cdot \sqrt{1'000'000} = \underline{\underline{\sqrt{758} \cdot 1'000}}$$

$$g.) \sqrt{5'238'000'000} = \sqrt{5'238 \cdot 1'000'000} = \sqrt{5'238} \cdot \sqrt{1'000'000} = \underline{\underline{\sqrt{5'238} \cdot 1'000}}$$

$$h.) \sqrt{50'000'000'000} = \sqrt{5 \cdot 10'000'000'000} = \sqrt{5} \cdot \sqrt{10'000'000'000} = \underline{\underline{\sqrt{5} \cdot 100'000}}$$

$$i.) \sqrt{35'000'000'000} = \sqrt{350 \cdot 100'000'000} = \sqrt{350} \cdot \sqrt{100'000'000} = \underline{\underline{\sqrt{350} \cdot 10'000}}$$

6. a.) $\sqrt{0,04} = \sqrt{\frac{4}{100}} = \frac{\sqrt{4}}{\sqrt{100}} = \frac{2}{10} = \underline{\underline{0,2}}$

b.) $\sqrt{0,016} = \sqrt{\frac{16}{1100}} = \frac{\sqrt{16}}{\sqrt{1'000}} = \frac{4}{\sqrt{10 \cdot 100}} = \frac{4}{\sqrt{10} \cdot \sqrt{100}} = \frac{4}{\sqrt{10} \cdot 10} = \frac{4^2}{\sqrt{10} \cdot 10^2} = \frac{2}{\sqrt{10} \cdot 5} = \underline{\underline{\frac{2}{5\sqrt{10}}}}$

c.) $\sqrt{0,0016} = \sqrt{\frac{16}{10'000}} = \frac{\sqrt{16}}{\sqrt{10'000}} = \frac{4}{100} = \frac{1}{25} = \underline{\underline{0,04}}$

d.) $\sqrt{0,000324} = \sqrt{\frac{324}{1'000'000}} = \frac{\sqrt{324}}{\sqrt{1'000'000}} = \frac{18}{1'000} = \frac{9}{500} = \underline{\underline{0,018}}$

e.) $\sqrt{0,000625} = \sqrt{\frac{625}{1'000'000}} = \frac{\sqrt{625}}{\sqrt{1'000'000}} = \frac{25}{1'000} = \underline{\underline{0,025}}$

f.) $\sqrt{0,000009} = \sqrt{\frac{9}{1'000'000}} = \frac{\sqrt{9}}{\sqrt{1'000'000}} = \frac{3}{1'000} = \underline{\underline{0,003}}$

g.) $\sqrt{0,00009} = \sqrt{\frac{9}{100'000}} = \frac{\sqrt{9}}{\sqrt{100'000}} = \frac{3}{\sqrt{10} \cdot \sqrt{10'000}} = \frac{3}{\sqrt{10} \cdot 100} = \underline{\underline{\frac{3}{100\sqrt{10}}}}$

h.) $\sqrt{0,000027} = \sqrt{\frac{27}{1'000'000}} = \frac{\sqrt{27}}{\sqrt{1'000'000}} = \frac{\sqrt{3 \cdot 9}}{1'000} = \frac{\sqrt{3} \cdot 3}{1'000} = \underline{\underline{\frac{3\sqrt{3}}{1'000}}}$

i.) $\sqrt{0,00000038} = \sqrt{\frac{38}{100'000'000}} = \frac{\sqrt{38}}{\sqrt{100'000'000}} = \frac{\sqrt{38}}{10'000} = \underline{\underline{\frac{\sqrt{38}}{10'000}}}$

7. a.) $\sqrt{32} : \sqrt{8} = \sqrt{32 : 8} = \sqrt{4} = \underline{\underline{2}}$

b.) $\sqrt{98} : \sqrt{2} = \sqrt{98 : 2} = \sqrt{49} = \underline{\underline{7}}$

c.) $\sqrt{180} : \sqrt{5} = \sqrt{180 : 5} = \sqrt{36} = \underline{\underline{6}}$

d.) $\sqrt{52} : \sqrt{0,13} = \sqrt{52 : 0,13} = \sqrt{400} = \underline{\underline{20}}$

8. a.) $\sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$ b.) $\sqrt{\frac{144}{9}} = \frac{\sqrt{144}}{\sqrt{9}} = \frac{12}{3} = \underline{\underline{4}}$

c.) $\sqrt{3\frac{1}{16}} = \sqrt{\frac{49}{16}} = \frac{\sqrt{49}}{\sqrt{16}} = \frac{7}{4}$ d.) $\sqrt{5\frac{1}{16}} = \sqrt{\frac{81}{16}} = \frac{\sqrt{81}}{\sqrt{16}} = \frac{9}{4}$

9. a.) $\sqrt{\frac{x^4}{y^6}} = \frac{\sqrt{x^4}}{\sqrt{y^6}} = \frac{x^2}{y^3}$ b.) $\sqrt{\frac{36a^2}{49b^8}} = \frac{\sqrt{36a^2}}{\sqrt{49b^8}} = \frac{6a}{7b^4}$

c.) $\sqrt{\frac{121x^4}{4u^2}} = \frac{\sqrt{121x^4}}{\sqrt{4u^2}} = \frac{11x^2}{2u}$ d.) $\sqrt{\frac{x^{10}}{169y^{12}}} = \frac{\sqrt{x^{10}}}{\sqrt{169y^{12}}} = \frac{x^5}{13y^6}$

10. a.) $\sqrt{50} = \sqrt{2 \cdot 25} = \sqrt{2} \cdot \sqrt{25} = \underline{\underline{\sqrt{2} \cdot 5}}$

b.) $\sqrt{600} = \sqrt{6 \cdot 100} = \sqrt{6} \cdot \sqrt{100} = \underline{\underline{\sqrt{6} \cdot 10}}$

c.) $\sqrt{48} = \sqrt{3 \cdot 16} = \sqrt{3} \cdot \sqrt{16} = \underline{\underline{\sqrt{3} \cdot 4}}$

d.) $\sqrt{45} = \sqrt{5 \cdot 9} = \sqrt{5} \cdot \sqrt{9} = \underline{\underline{\sqrt{5} \cdot 3}}$

e.) $\sqrt{2a^2} = \sqrt{2 \cdot a^2} = \sqrt{2} \cdot \sqrt{a^2} = \underline{\underline{\sqrt{2} \cdot a}}$

f.) $\sqrt{5y^2} = \sqrt{5 \cdot y^2} = \sqrt{5} \cdot \sqrt{y^2} = \underline{\underline{\sqrt{5} \cdot y}}$

g.) $\sqrt{18x^2} = \sqrt{2 \cdot 9x^2} = \sqrt{2} \cdot \sqrt{9x^2} = \underline{\underline{\sqrt{2} \cdot 3x}}$

h.) $\sqrt{12b^2} = \sqrt{3 \cdot 4b^2} = \sqrt{3} \cdot \sqrt{4b^2} = \underline{\underline{\sqrt{3} \cdot 2b}}$

i.) $\sqrt{a^3} = \sqrt{a \cdot a^2} = \sqrt{a} \cdot \sqrt{a^2} = \underline{\underline{\sqrt{a} \cdot a}}$

k.) $\sqrt{x^2y} = \sqrt{x^2 \cdot y} = \sqrt{x^2} \cdot \sqrt{y} = \underline{\underline{x \cdot \sqrt{y}}}$

l.) $\sqrt{9z^3} = \sqrt{9z^2 \cdot z} = \sqrt{9z^2} \cdot \sqrt{z} = \underline{\underline{3z \cdot \sqrt{z}}}$

$$11. \quad a.) \quad \sqrt{8} = \sqrt{2 \cdot 4} = \sqrt{2} \cdot \sqrt{4} = \underline{\underline{\sqrt{2} \cdot 2}}$$

$$b.) \quad \sqrt{12} = \sqrt{3 \cdot 4} = \sqrt{3} \cdot \sqrt{4} = \underline{\underline{\sqrt{3} \cdot 2}}$$

$$c.) \quad \sqrt{18} = \sqrt{2 \cdot 9} = \sqrt{2} \cdot \sqrt{9} = \underline{\underline{\sqrt{2} \cdot 3}}$$

$$d.) \quad \sqrt{20} = \sqrt{4 \cdot 5} = \sqrt{4} \cdot \sqrt{5} = \underline{\underline{2 \cdot \sqrt{5}}}$$

$$e.) \quad \sqrt{24} = \sqrt{4 \cdot 6} = \sqrt{4} \cdot \sqrt{6} = \underline{\underline{2 \cdot \sqrt{6}}}$$

$$f.) \quad \sqrt{125} = \sqrt{5 \cdot 25} = \sqrt{5} \cdot \sqrt{25} = \underline{\underline{\sqrt{5} \cdot 5}}$$

$$g.) \quad \sqrt{250} = \sqrt{10 \cdot 25} = \sqrt{10} \cdot \sqrt{25} = \underline{\underline{\sqrt{10} \cdot 5}}$$

$$h.) \quad \sqrt{98} = \sqrt{2 \cdot 49} = \sqrt{2} \cdot \sqrt{49} = \underline{\underline{\sqrt{2} \cdot 7}}$$

$$12. \quad a.) \quad \sqrt{7x^2} = \sqrt{7} \cdot \sqrt{x^2} = \underline{\underline{\sqrt{7} \cdot x}}$$

$$b.) \quad \sqrt{3y^3} = \sqrt{3y \cdot y^2} = \sqrt{3y} \cdot \sqrt{y^2} = \underline{\underline{\sqrt{3y} \cdot y}}$$

$$c.) \quad \sqrt{0,25b} = \sqrt{0,25} \cdot \sqrt{b} = \underline{\underline{0,5 \cdot \sqrt{b}}}$$

$$d.) \quad \sqrt{\frac{5}{4}} = \frac{\sqrt{5}}{\sqrt{4}} = \underline{\underline{\frac{\sqrt{5}}{2}}}$$

$$e.) \quad \sqrt{\frac{2a^2}{9}} = \frac{\sqrt{2a^2}}{\sqrt{9}} = \frac{\sqrt{2} \cdot \sqrt{a^2}}{3} = \underline{\underline{\frac{\sqrt{2} \cdot a}{3}}}$$

$$f.) \quad \sqrt{\frac{5y^2}{16}} = \frac{\sqrt{5y^2}}{\sqrt{16}} = \frac{\sqrt{5} \cdot \sqrt{y^2}}{4} = \underline{\underline{\frac{\sqrt{5} \cdot y}{4}}}$$

$$g.) \quad \sqrt{\frac{a^3}{4}} = \frac{\sqrt{a^3}}{\sqrt{4}} = \frac{\sqrt{a} \cdot \sqrt{a^2}}{2} = \underline{\underline{\frac{\sqrt{a} \cdot a}{2}}}$$

$$h.) \quad \sqrt{\frac{2b^3}{25}} = \frac{\sqrt{2b^3}}{\sqrt{25}} = \frac{\sqrt{2b} \cdot \sqrt{b^2}}{5} = \underline{\underline{\frac{\sqrt{2b} \cdot b}{5}}}$$

13.

a.) $\sqrt{a} \cdot \sqrt{a} = \sqrt{a^2} = \underline{\underline{a}}$ b.) $\sqrt{b^2} \cdot \sqrt{c^2} = \underline{\underline{bc}}$

c.) $\sqrt{p^2} \cdot \sqrt{q} = \underline{\underline{p \cdot \sqrt{q}}}$ d.) $\sqrt{p} \cdot \sqrt{p^2 q^2} = \sqrt{p^3 q^2} = \underline{\underline{p q}}$

e.) $\sqrt{r} \cdot \sqrt{r^3} = \sqrt{r^4} = \underline{\underline{r^2}}$ f.) $\sqrt{3s} \cdot \sqrt{3s^2} = \sqrt{9s^3} = \underline{\underline{3s^2}}$

g.) $\sqrt{0,4t^2} \cdot \sqrt{0,4t^4} = \sqrt{0,16t^6} = \underline{\underline{0,4t^3}}$

h.) $\sqrt{8t^2} \cdot \sqrt{2t} \cdot \sqrt{9t} = \sqrt{144t^4} = \underline{\underline{12t^2}}$

14.

a.) $\sqrt{a^2} : \sqrt{a} = \sqrt{a^2 : a} = \underline{\underline{a}}$

b.) $\sqrt{b^2} : \sqrt{b} = \sqrt{b^2 : b} = \underline{\underline{b}}$

c.) $\sqrt{c^2 d} : \sqrt{d} = \sqrt{c^2} = \underline{\underline{c}}$

d.) $\sqrt{d} : \sqrt{de^2} = \frac{\sqrt{d}}{\sqrt{de^2}} = \sqrt{\frac{d}{de^2}} = \sqrt{\frac{1}{e^2}} = \frac{\sqrt{1}}{\sqrt{e^2}} = \underline{\underline{\frac{1}{e}}}$

e.) $\sqrt{u^3} : \sqrt{u} = \sqrt{u^2} = \underline{\underline{u}}$

f.) $\sqrt{8v} : \sqrt{2v^3} = \sqrt{\frac{8v}{2v^3}} = \sqrt{\frac{4}{v^2}} = \frac{\sqrt{4}}{\sqrt{v^2}} = \underline{\underline{\frac{2}{v}}}$

g.) $\sqrt{0,09x^4} : 0,16x^2 = \frac{\sqrt{0,09x^4}}{\sqrt{0,16x^2}} = \frac{0,3x^2}{0,4x} = \frac{0,3x}{0,4} = \underline{\underline{\frac{3x}{4}}}$

h.) $\sqrt{1\frac{2}{3}y^4} \cdot \sqrt{0,6y^2z^2} = \sqrt{\frac{5}{3}y^4 \cdot \frac{2}{5}y^2z^2} = \sqrt{y^6z^2} = \underline{\underline{y^3z}}$

$$\underline{15.} \quad a.) \quad (\sqrt{a} \cdot \sqrt{b}) : \sqrt{abc} = \frac{\sqrt{ab}}{\sqrt{abc}} = \sqrt{\frac{ab}{abc}} = \sqrt{\frac{1}{c}} = \frac{\sqrt{1}}{\sqrt{c}} = \underline{\underline{\frac{1}{\sqrt{c}}}}$$

$$b.) \quad \sqrt{ab^2} : \sqrt{a^2b} = \sqrt{\frac{ab^2}{a^2b}} = \sqrt{\frac{b}{a}} = \underline{\underline{\frac{\sqrt{b}}{\sqrt{a}}}}$$

$$c.) \quad \sqrt{\frac{2c^2}{d}} \cdot \sqrt{\frac{d^3}{32}} = \sqrt{\frac{2c^2}{d} \cdot \frac{d^3}{32}} = \sqrt{\frac{c^2 d^2}{16}} = \frac{cd}{4}$$

$$d.) \quad \sqrt{\frac{2c^2}{d}} : \sqrt{\frac{d^3}{32}} = \sqrt{\frac{2c^2}{d} : \frac{d^3}{32}} = \sqrt{\frac{2c^2}{d} \cdot \frac{32}{d^3}} = \sqrt{\frac{64c^2}{d^4}} = \underline{\underline{\frac{8c}{d^2}}}$$

$$e.) \quad \sqrt{\frac{uv^2}{2}} : \sqrt{\frac{8u}{9}} = \sqrt{\frac{uv^2}{2} : \frac{8u}{9}} = \sqrt{\frac{uv^2}{2} \cdot \frac{9}{8u}} = \sqrt{\frac{9v^2}{16}} = \underline{\underline{\frac{3v}{4}}}$$

$$f.) \quad \sqrt{\frac{0,2x}{y}} \cdot \sqrt{\frac{5y}{2}} \cdot \sqrt{\frac{4z}{y}} = \sqrt{\frac{0,2x}{y} \cdot \frac{5y}{2} \cdot \frac{4z}{y}} = \sqrt{\frac{4xz}{y}} = \frac{\sqrt{4xz}}{\sqrt{y}} = \underline{\underline{\frac{2\sqrt{xz}}{\sqrt{y}}}}$$

$$g.) \quad \sqrt{\frac{xy^2z}{16}} \cdot \left(\sqrt{\frac{4x}{5z}} : \sqrt{\frac{5}{x}} \right) = \sqrt{\frac{xy^2z}{16}} \cdot \left(\sqrt{\frac{4x}{5z} : \frac{5}{x}} \right) =$$

$$\sqrt{\frac{xy^2z}{16}} \cdot \sqrt{\frac{4x}{5z} \cdot \frac{x}{5}} = \sqrt{\frac{xy^2z}{16}} \cdot \sqrt{\frac{4x^2}{25z}} = \sqrt{\frac{xy^2z}{16} \cdot \frac{4x^2}{25z}} =$$

$$\sqrt{\frac{x^3y^2}{100}} = \frac{\sqrt{x} \cdot \sqrt{x^2y^2}}{\sqrt{100}} = \underline{\underline{\frac{\sqrt{x} \cdot xy}{10}}}$$

$$h.) \quad \sqrt{\frac{x^3yz}{64}} : \sqrt{\frac{0,27x}{0,48y}} = \sqrt{\frac{x^3yz}{64} : \frac{27x}{48y}} = \sqrt{\frac{x^3yz}{64} \cdot \frac{48y}{27x}} =$$

$$\sqrt{\frac{x^2y^2z}{36}} = \frac{\sqrt{x^2y^2} \cdot \sqrt{z}}{\sqrt{36}} = \underline{\underline{\frac{xy \cdot \sqrt{z}}{6}}}$$

$$\underline{16.} \quad a.) \quad 3 \cdot \sqrt{2} = \sqrt{9} \cdot \sqrt{2} = \underline{\underline{\sqrt{18}}}$$

$$b.) \quad 2 \cdot \sqrt{3} = \sqrt{4} \cdot \sqrt{3} = \underline{\underline{\sqrt{12}}}$$

$$c.) \quad 5 \cdot \sqrt{5} = \sqrt{25} \cdot \sqrt{5} = \underline{\underline{\sqrt{125}}}$$

$$d.) \quad 5 \cdot \sqrt{7} = \sqrt{25} \cdot \sqrt{7} = \underline{\underline{\sqrt{175}}}$$

$$e.) \quad 10 \cdot \sqrt{10} = \sqrt{100} \cdot \sqrt{10} = \underline{\underline{\sqrt{1000}}}$$

$$f.) \quad 4 \cdot \sqrt{15} = \sqrt{16} \cdot \sqrt{15} = \underline{\underline{\sqrt{240}}}$$

$$g.) \quad \frac{1}{2} \cdot \sqrt{3} = \sqrt{\frac{1}{4}} \cdot \sqrt{3} = \underline{\underline{\sqrt{\frac{3}{4}}}}$$

$$h.) \quad \frac{2}{5} \cdot \sqrt{12} = \sqrt{\frac{4}{25}} \cdot \sqrt{12} = \underline{\underline{\sqrt{\frac{48}{25}}}}$$

$$\underline{17.} \quad a.) \quad a \cdot \sqrt{a} = \sqrt{a^2} \cdot \sqrt{a} = \underline{\underline{\sqrt{a^3}}}$$

$$b.) \quad 3b \cdot \sqrt{b} = \sqrt{9b^2} \cdot \sqrt{b} = \underline{\underline{\sqrt{9b^3}}}$$

$$c.) \quad b \cdot \sqrt{2b} = \sqrt{b^2} \cdot \sqrt{2b} = \underline{\underline{\sqrt{2b^3}}}$$

$$d.) \quad 3u \cdot \sqrt{5u} = \sqrt{9u^2} \cdot \sqrt{5u} = \underline{\underline{\sqrt{45u^3}}}$$

$$e.) \quad u^2 \cdot \sqrt{u} = \sqrt{u^4} \cdot \sqrt{u} = \underline{\underline{\sqrt{u^5}}}$$

$$f.) \quad 5s^2 \cdot \sqrt{s} = \sqrt{25s^4} \cdot \sqrt{s} = \underline{\underline{\sqrt{25s^5}}}$$

$$g.) \quad \frac{1}{2} s \cdot \sqrt{5s} = \frac{s}{2} \cdot \sqrt{5s} = \sqrt{\frac{s^2}{4}} \cdot \sqrt{5s} = \underline{\underline{\sqrt{\frac{5s^3}{4}}}}$$

$$h.) \quad \frac{3}{4} v \cdot \sqrt{uv} = \frac{3v}{4} \cdot \sqrt{uv} = \sqrt{\frac{9v^2}{16}} \cdot \sqrt{uv} = \underline{\underline{\sqrt{\frac{9uv^3}{16}}}}$$