

Quadratwurzeln

1. Vereinfache

$$\text{a) } \sqrt{20} - \sqrt{45} + \sqrt{125} = 2\sqrt{5} - 3\sqrt{5} + 5\sqrt{5} = 4\sqrt{5}$$

$$\text{b) } 2\sqrt{24} + 3\sqrt{54} - 5\sqrt{6} = 4\sqrt{6} + 9\sqrt{6} - 5\sqrt{6} = 8\sqrt{6}$$

$$\begin{aligned} \text{c) } 4\sqrt{25x-25} + 5\sqrt{4y+4} - 2\sqrt{9x-9} - 6\sqrt{y+1} &= \\ &= 4\sqrt{25(x-1)} + 5\sqrt{4(y+1)} - 2\sqrt{9(x-1)} - 6\sqrt{y+1} = \\ &= 20\sqrt{x-1} + 10\sqrt{y+1} - 6\sqrt{x-1} - 6\sqrt{y+1} = 14\sqrt{x-1} + 4\sqrt{y+1} \end{aligned}$$

$$\text{d) } \sqrt{12a^3} + \sqrt{75a^3} - \sqrt{3a^3} = 2a\sqrt{3a} + 5a\sqrt{3a} - a\sqrt{3a} = 6a\sqrt{a}$$

2. Vereinfache :

$$\text{a) } \sqrt{\frac{3,125b^5}{162a}} : \sqrt{\frac{a^3}{2b}} = \sqrt{\frac{\frac{25}{8}b^5 \cdot 2b}{162a \cdot a^3}} = \sqrt{\frac{\frac{25}{4}b^6}{162a^4}} = \frac{5b^3}{2a^2} \sqrt{\frac{1}{162}} = \frac{5b^3}{18a^2} \cdot \frac{1}{\sqrt{2}} = \frac{5\sqrt{2}b^3}{36a^2}$$

$$\text{b) } \left(\sqrt{\frac{625r}{st}} : \sqrt{25\frac{s}{t}} \right) \cdot \sqrt{0,01r^3} = \sqrt{\frac{625r}{st} \cdot \frac{t}{25s}} \cdot \sqrt{0,01r^3} = \sqrt{\frac{25r}{s^2} \cdot 0,01r^3} = 0,5 \frac{r^2}{s}$$

3. Radiziere teilweise :

$$\text{a) } \sqrt{45 \cdot 10^{2003}} = 15 \cdot 10^{1001} \sqrt{2} \quad \text{b) } \sqrt{27a^9b^3} = 3a^4b\sqrt{3ab} \quad \text{c) } \sqrt{4a^2b^2 - 8b^2} = 2b\sqrt{a^2 - 2}$$

$$\text{4. Ziehe unter die Wurzel und vereinfache : } \frac{0,4x^3}{y} \sqrt{\frac{y^3}{x}} = \sqrt{0,16 \frac{x^6 y^3}{y^2}} = \sqrt{0,16x^5y}$$

5. Multipliziere und vereinfache

$$\text{a) } \left(\sqrt{2} + \sqrt{5} - \sqrt{3} \right) \cdot \sqrt{2} = 2 - \sqrt{10} - \sqrt{6}$$

$$\text{b) } \left(\sqrt{8} + \sqrt{2} - \sqrt{18} \right) \cdot \sqrt{2} = \sqrt{16} + \sqrt{4} - \sqrt{36} = 4 + 2 - 6 = 0$$

$$\text{c) } \left(2\sqrt{3} + 3\sqrt{2} - 5\sqrt{6} \right) \cdot \sqrt{6} = 2\sqrt{18} + 3\sqrt{12} - 5 \cdot 6 = 6\sqrt{2} + 6\sqrt{3} - 30$$

$$\begin{aligned} \text{d) } & \left(3\sqrt{10x} + 4\sqrt{15x} - 5\sqrt{30x} \right) \cdot \sqrt{6} = 3\sqrt{60x} + 4\sqrt{90x} - 5\sqrt{180x} = \\ & = 6\sqrt{15x} + 12\sqrt{10x} - 30\sqrt{5x} \end{aligned}$$

6. Multipliziere und vereinfache

$$\text{a) } \left(\sqrt{5} + \sqrt{3} \right) \cdot \left(\sqrt{10} - \sqrt{6} \right) = \sqrt{50} - \sqrt{30} + \sqrt{30} - \sqrt{18} = 5\sqrt{2} - 3\sqrt{2} = 2\sqrt{2}$$

$$\begin{aligned} \text{b) } & \left(\sqrt{14} - \sqrt{3} \right) \cdot \left(\sqrt{21} + \sqrt{2} \right) = \sqrt{14 \cdot 21} + \sqrt{28} - \sqrt{63} + \sqrt{6} = \\ & = 7\sqrt{6} + 2\sqrt{7} - 3\sqrt{7} - \sqrt{6} = 6\sqrt{6} - \sqrt{7} \end{aligned}$$

$$\begin{aligned} \text{c) } & \left(2\sqrt{7} - 3\sqrt{6} \right) \cdot \left(\sqrt{14} + 2\sqrt{3} \right) = 2\sqrt{98} + 4\sqrt{21} - 3\sqrt{84} - 6\sqrt{18} = \\ & = 14\sqrt{2} + 4\sqrt{21} - 6\sqrt{21} - 18\sqrt{2} = -4\sqrt{2} - 2\sqrt{21} \end{aligned}$$

$$\begin{aligned} \text{d) } & \left(3\sqrt{10} - 2\sqrt{6} \right) \cdot \left(6\sqrt{5} + 4\sqrt{3} \right) = 18\sqrt{50} + 12\sqrt{30} - 12\sqrt{30} - 8\sqrt{18} = \\ & = 90\sqrt{2} - 24\sqrt{2} = 66\sqrt{2} \end{aligned}$$

7. Vereinfache

$$\text{a) } \left(\sqrt{48} - \sqrt{12} \right) : \sqrt{3} = \sqrt{16} - \sqrt{4} = 4 - 2 = 2$$

$$\text{b) } \left(\sqrt{14} - \sqrt{7} \right) : \sqrt{7} = \sqrt{2} - 1$$

8. Vereinfache

$$\text{a) } \left(\sqrt{3} + \sqrt{2} \right) \cdot \left(\sqrt{3} - \sqrt{2} \right) = 3 - 2 = 1$$

$$\text{b) } \left(2\sqrt{5} - 3\sqrt{2} \right) \cdot \left(2\sqrt{5} + 3\sqrt{2} \right) = \left(2\sqrt{5} \right)^2 - \left(3\sqrt{2} \right)^2 = 20 - 18 = 2$$

$$c) \left(x - \sqrt{x} \right) \cdot \left(x + \sqrt{x} \right) = x^2 - x$$

$$d) \left(\sqrt{2x+1} - \sqrt{x} \right) \cdot \left(\sqrt{2x+1} + \sqrt{x} \right) = 2x+1 - x = x+1$$

$$e) \left(\sqrt{3} + \sqrt{2} \right)^2 = 3 + 2 \cdot \sqrt{3} \cdot \sqrt{2} + 2 = 5 + 2\sqrt{6}$$

$$f) \left(2\sqrt{5} - 5\sqrt{2} \right)^2 = \left(2\sqrt{5} \right)^2 - 2 \cdot 2\sqrt{5} \cdot 5\sqrt{2} + \left(5\sqrt{2} \right)^2 = 20 - 20\sqrt{10} + 50 = 70 - 20\sqrt{10}$$

$$g) \left(\sqrt{2x+1} - 1 \right)^2 = 2x+1 - 2\sqrt{2x+1} + 1 = 2x + 2 - 2\sqrt{2x+1}$$

$$h) \left(\sqrt{2x+1} + \sqrt{2x+1} \right)^2 = \left(2\sqrt{2x+1} \right)^2 = 4 \cdot (2x+1) = 8x+4$$

9. Mache den Nenner rational und vereinfache

$$a) \frac{\sqrt{5} - \sqrt{3}}{\sqrt{2}} = \frac{(\sqrt{5} - \sqrt{3}) \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} = \frac{\sqrt{10} - \sqrt{6}}{2}$$

$$b) \frac{\sqrt{7} + \sqrt{5}}{\sqrt{5}} = \frac{(\sqrt{7} + \sqrt{5}) \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}} = \frac{\sqrt{35} + 5}{5} = \frac{1}{5} \sqrt{35} + 1$$

$$c) \frac{2\sqrt{6} + 5\sqrt{3}}{\sqrt{15}} = \frac{(2\sqrt{6} + 5\sqrt{3}) \cdot \sqrt{15}}{\sqrt{15} \cdot \sqrt{15}} = \frac{2\sqrt{90} + 5\sqrt{45}}{15} = \frac{6\sqrt{10} + 15\sqrt{5}}{15} = \\ = \frac{2\sqrt{10} + 5\sqrt{5}}{5}$$

$$d) \frac{6}{3 - \sqrt{3}} = \frac{6 \cdot (3 + \sqrt{3})}{9 - 3} = 3 + \sqrt{3}$$

$$e) \frac{\sqrt{5}}{4 + \sqrt{15}} = \frac{\sqrt{5} \cdot (4 - \sqrt{15})}{(4 + \sqrt{15}) \cdot (4 - \sqrt{15})} = \frac{4\sqrt{5} - \sqrt{75}}{16 - 15} = 4\sqrt{5} - 5\sqrt{3}$$

$$f) \frac{10\sqrt{2}}{\sqrt{7} + \sqrt{2}} = \frac{10\sqrt{2} \cdot (\sqrt{7} - \sqrt{2})}{(\sqrt{7} + \sqrt{2}) \cdot (\sqrt{7} - \sqrt{2})} = \frac{10\sqrt{14} - 20}{7 - 2} = \frac{5 \cdot (2\sqrt{14} - 4)}{5} = 2\sqrt{14} - 4$$

10. Vereinfache

$$\begin{aligned} \text{a) } (\sqrt{6} - \sqrt{3})^2 - (\sqrt{6} - \sqrt{2})(\sqrt{3} + 1) &= 6 - 2\sqrt{18} + 3 - (\sqrt{18} + \sqrt{6} - \sqrt{6} - \sqrt{2}) = \\ &= 6 - 2\sqrt{18} + 3 - \sqrt{18} + \sqrt{2} = 9 - 6\sqrt{2} - 3\sqrt{2} + \sqrt{2} = 9 - 8\sqrt{2} \end{aligned}$$

$$\begin{aligned} \text{b) } (\sqrt{14} \cdot \sqrt{21} + \sqrt{13})\sqrt{26} &= (\sqrt{14 \cdot 21} + \sqrt{13}) \cdot \sqrt{26} = (7\sqrt{6} + \sqrt{13}) \cdot \sqrt{26} = \\ &= (7\sqrt{156} + \sqrt{13}) \cdot \sqrt{26} = 14\sqrt{39} + \sqrt{13 \cdot 26} = 14\sqrt{39} + 13\sqrt{2} \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{\sqrt{2} + \sqrt{3}}{\sqrt{2}} - \frac{\sqrt{3}}{\sqrt{3} - \sqrt{2}} &= \frac{(\sqrt{2} + \sqrt{3}) \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} - \frac{\sqrt{3} \cdot (\sqrt{3} + \sqrt{2})}{(\sqrt{3} - \sqrt{2}) \cdot (\sqrt{3} - \sqrt{2})} = \\ &= \frac{2 + \sqrt{6}}{2} - \frac{3 + \sqrt{6}}{1} = \frac{2 + \sqrt{6}}{2} - \frac{6 + 2\sqrt{6}}{2} = \frac{-4 - \sqrt{6}}{2} = -2 - \frac{1}{2}\sqrt{6} \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{\sqrt{2}}{\sqrt{3} - 2} - \frac{1 - \sqrt{3}}{\sqrt{2}} &= \frac{\sqrt{2} \cdot (\sqrt{3} + 2)}{(\sqrt{3} - 2) \cdot (\sqrt{3} + 2)} - \frac{(1 - \sqrt{3}) \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} = \\ &= \frac{\sqrt{6} + 2\sqrt{2}}{-1} - \frac{\sqrt{2} - \sqrt{6}}{2} = -\sqrt{6} - 2\sqrt{2} - \frac{1}{2}\sqrt{2} + \frac{1}{2}\sqrt{6} = -\frac{1}{2}\sqrt{6} - \frac{5}{2}\sqrt{2} \end{aligned}$$
