

Mathematik Klasse 9

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Aufgabe 13:

$$\begin{aligned} \text{a)} \quad \sqrt{15} \cdot \sqrt{24} \cdot \sqrt{30} &= \sqrt{3} \sqrt{5} \cdot 2\sqrt{6} \cdot \sqrt{2} \sqrt{5} \sqrt{3} \\ &= 3 \cdot 5 \cdot 2 \cdot \sqrt{2} \sqrt{3} \cdot \sqrt{2} = 60\sqrt{3} \approx 103,92 \end{aligned}$$

$$\begin{aligned} \text{b)} \quad \frac{2}{3} \cdot \sqrt{98} \cdot \sqrt{54} \cdot \sqrt{6} &= \frac{2}{3} \cdot 7\sqrt{2} \cdot 3\sqrt{6} \cdot \sqrt{6} \\ &= \frac{2}{3} \cdot 7 \cdot 3 \cdot 6 \cdot \sqrt{2} = 84\sqrt{2} \approx 118,79 \end{aligned}$$

$$\begin{aligned} \text{c)} \quad \sqrt{128} \cdot \frac{2}{5} \cdot \sqrt{375} \cdot \sqrt{80} &= 8\sqrt{2} \cdot \frac{2}{5} \cdot 5\sqrt{15} \cdot 4\sqrt{5} \\ &= 8\sqrt{2} \cdot 2 \cdot \sqrt{3} \sqrt{5} \cdot 4\sqrt{5} = 16\sqrt{6} \cdot 5 \cdot 4 \\ &= 320 \cdot \sqrt{6} \approx 783,84 \end{aligned}$$

$$\begin{aligned} \text{d)} \quad \sqrt{243} \cdot 4 \cdot \sqrt{63} \cdot 3 \cdot \sqrt{56} &= 12 \cdot 9\sqrt{3} \cdot 3\sqrt{7} \cdot 2\sqrt{14} \\ &= 108\sqrt{3} \cdot 3\sqrt{7} \cdot 2\sqrt{2} \sqrt{7} = 108 \cdot 3 \cdot 2 \cdot 7\sqrt{6} \\ &= 4536 \cdot \sqrt{6} \approx 11110,89 \end{aligned}$$

$$\begin{aligned} \text{e)} \quad \sqrt{0,27} \cdot \sqrt{2,5} \cdot 3\sqrt{60} &= \sqrt{\frac{27}{100}} \cdot \sqrt{\frac{5}{2}} \cdot 3 \cdot 2\sqrt{15} \\ &= \frac{3\sqrt{3}}{10} \cdot \frac{\sqrt{5}}{\sqrt{2}} \cdot 6\sqrt{3} \sqrt{5} \\ &= \frac{18 \cdot 3 \cdot 5}{10\sqrt{2}} = \frac{27}{\sqrt{2}} = \frac{27}{2}\sqrt{2} \approx 19,09 \end{aligned}$$

$$\begin{aligned} \text{f)} \quad \sqrt{2,4} \cdot \sqrt{7,2} \cdot 3\sqrt{50} &= \sqrt{\frac{12}{5}} \cdot \sqrt{\frac{36}{5}} \cdot 3\sqrt{50} = \frac{2\sqrt{3}}{\sqrt{5}} \cdot \frac{6}{\sqrt{5}} \cdot 15\sqrt{2} \\ &= \frac{2 \cdot 6 \cdot 15\sqrt{6}}{5} = 36\sqrt{6} \approx 88,18 \end{aligned}$$

$$\begin{aligned} \text{g)} \quad \sqrt{1,25} \cdot \sqrt{7,5} \cdot \sqrt{0,9} &= \sqrt{\frac{5}{4}} \cdot \sqrt{\frac{15}{2}} \cdot \sqrt{\frac{9}{10}} = \frac{\sqrt{5}}{2} \cdot \frac{\sqrt{3} \sqrt{5}}{\sqrt{2}} \cdot \frac{3}{\sqrt{2} \sqrt{5}} \\ &= \frac{3 \cdot 5 \cdot \sqrt{3}}{2 \cdot 2 \cdot \sqrt{5}} = \frac{15\sqrt{15}}{4 \cdot 5} = \frac{3}{4}\sqrt{15} \approx 2,90 \end{aligned}$$

$$\begin{aligned} \text{h)} \quad \sqrt{0,72} \cdot \sqrt{2,4} \cdot \sqrt{62,5} &= \sqrt{\frac{72}{100}} \cdot \sqrt{\frac{12}{5}} \cdot \sqrt{\frac{625}{10}} = \frac{6\sqrt{2}}{10} \cdot \frac{2\sqrt{3}}{\sqrt{5}} \cdot \frac{25}{\sqrt{2} \sqrt{5}} \\ &= \frac{6 \cdot 2 \cdot 25\sqrt{3}}{10 \cdot 5} = 6\sqrt{3} \approx 10,39 \end{aligned}$$

$$\begin{aligned} \text{l)} \quad \sqrt{\frac{54}{35}} \cdot \sqrt{\frac{45}{56}} \cdot 6 \cdot \sqrt{\frac{64}{27}} &= \frac{3\sqrt{2} \sqrt{3}}{\sqrt{5} \sqrt{7}} \cdot \frac{3\sqrt{5}}{2\sqrt{2} \sqrt{7}} \cdot 6 \cdot \frac{8}{3\sqrt{3}} \\ &= \frac{3}{7} \cdot \frac{3}{7} \cdot \frac{8}{1} = \frac{72}{7} \approx 10,29 \end{aligned}$$

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Aufgabe 14:

$$a) \quad \sqrt{180} \cdot (\sqrt{8} : 2\sqrt{5}) = 6\sqrt{5} \cdot \left(\frac{2\sqrt{2}}{2\sqrt{5}}\right) = 6\sqrt{2} \approx 8,49$$

$$b) \quad \frac{1}{2} \cdot \sqrt{98 : 54} \cdot \frac{4}{7} \cdot \sqrt{24} = \frac{1}{2} \cdot \frac{7\sqrt{2}}{3\sqrt{6}} \cdot \frac{4}{7} \cdot 2\sqrt{6} = \frac{\sqrt{2}}{3} \cdot \frac{4}{1} = \frac{4}{3}\sqrt{2}$$

$$c) \quad (\sqrt{64} : \sqrt{125}) : 2\sqrt{40} = \frac{8}{5\sqrt{5}} : (2 \cdot 2\sqrt{10}) = \frac{8}{5\sqrt{5} \cdot 4\sqrt{2} \sqrt{5}} \\ = \frac{8}{20 \cdot 5\sqrt{2}} = \frac{2\sqrt{2}}{25 \cdot 2} = \frac{1}{25}\sqrt{2} \approx 0,06$$

$$d) \quad \sqrt{243} : (\sqrt{84} \cdot 3 \cdot \sqrt{21}) = \frac{9\sqrt{3}}{2\sqrt{21} \cdot 3 \cdot \sqrt{21}} = \frac{1}{14}\sqrt{3} \approx 0,21$$

$$e) \quad \sqrt{0,5 \cdot 3,5} : \frac{2}{3}\sqrt{0,21} = \sqrt{\frac{1}{2} \cdot \frac{7}{2}} \cdot \frac{3}{2} \cdot \sqrt{\frac{100}{21}} = \frac{\sqrt{7}}{2} \cdot \frac{3}{2} \cdot \frac{10}{\sqrt{3} \sqrt{7}} \\ = \frac{30}{4\sqrt{3}} = \frac{15}{6}\sqrt{3} \approx 4,33$$

$$f) \quad 5 \cdot \sqrt{4,8} : (\sqrt{0,24} : \sqrt{5}) = 5 \cdot \sqrt{\frac{24}{5}} : \left(\frac{\sqrt{6}}{\sqrt{25} \sqrt{5}}\right) = 5 \cdot \frac{2\sqrt{6}}{\sqrt{5}} : \frac{\sqrt{6}}{5\sqrt{5}} \\ = 5 \cdot \frac{2\sqrt{6}}{\sqrt{5}} \cdot \frac{5\sqrt{5}}{\sqrt{6}} = 50$$

$$g) \quad \sqrt{(1,25 : 3) \cdot 7,2} = \sqrt{\frac{5}{4} : 3 \cdot \frac{36}{5}} = \sqrt{\frac{5}{4} \cdot \frac{1}{3} \cdot \frac{36}{5}} = \sqrt{3} \approx 1,73$$

$$h) \quad \sqrt{0,36} : \frac{4}{5}\sqrt{0,4 \cdot 31,25} = \frac{\sqrt{\frac{36}{100}}}{\frac{4}{5}\sqrt{\frac{2}{5} \cdot \frac{3125}{100}}} = \frac{\frac{6}{10}}{\frac{4}{5} \cdot \sqrt{\frac{625}{50}}} = \frac{6}{10} \cdot \frac{5}{4} \cdot \frac{5\sqrt{2}}{25} \\ = \frac{3}{20}\sqrt{2} \approx 0,21$$

$$i) \quad \left(\sqrt{\frac{5}{8}} : \sqrt{\frac{81}{8}}\right) \cdot \sqrt{\frac{32}{15}} = \left(\frac{\sqrt{5}}{2\sqrt{2}} \cdot \frac{2\sqrt{2}}{9}\right) \cdot \frac{4\sqrt{2}}{\sqrt{3} \sqrt{5}} = \frac{4\sqrt{2}}{9\sqrt{3}} = \frac{4}{27}\sqrt{6} \approx 0,36$$

$$l) \quad \sqrt{\frac{84}{69}} : \left(\sqrt{\frac{14}{75}} : \sqrt{\frac{42}{92}}\right) = \frac{2\sqrt{21}}{\sqrt{3} \sqrt{23}} : \left(\frac{\sqrt{2} \sqrt{7}}{5\sqrt{3}} : \frac{\sqrt{3} \sqrt{2} \sqrt{7}}{2\sqrt{23}}\right) \\ = \frac{2\sqrt{21}}{\sqrt{3} \sqrt{23}} : \left(\frac{\sqrt{2} \sqrt{7}}{5\sqrt{3}} \cdot \frac{2\sqrt{23}}{\sqrt{3} \sqrt{2} \sqrt{7}}\right) = \frac{2\sqrt{21}}{\sqrt{3} \sqrt{23}} \cdot \frac{5 \cdot 3}{2\sqrt{23}} \\ = \frac{15\sqrt{21}}{23\sqrt{3}} = \frac{15\sqrt{3} \sqrt{7}}{23\sqrt{3}} = \frac{15}{23}\sqrt{7} \approx 1,73$$

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Aufgabe 15: (Es gilt stets $a, b, c \geq 0$)

- a) $\sqrt{9a} = 3 \cdot \sqrt{a}$
- b) $\sqrt{9b^2} = 3 \cdot b$
- c) $\sqrt{8a \cdot 2a} = \sqrt{16a^2} = 4 \cdot a$
- d) $\sqrt{9a \cdot 4b} = \sqrt{36ab} = 6 \cdot \sqrt{a} \cdot \sqrt{b}$
- e) $\sqrt{25c^4} = 5c^2$
- f) $\sqrt{18a^3} = \sqrt{9 \cdot 2 \cdot a^2 \cdot a} = 3 \cdot \sqrt{2} \cdot a \cdot \sqrt{a}$
- l) $\sqrt{98ab^2c^3} = \sqrt{49 \cdot 2 \cdot a \cdot b^2 \cdot c^2 \cdot c} = 7 \cdot \sqrt{2} \cdot \sqrt{a} \cdot b \cdot c \cdot \sqrt{c}$

Aufgabe 16:

- a) $\sqrt{ab^2} = \sqrt{a} \cdot |b|$
- b) $\sqrt{8a^2b^2} = \sqrt{4 \cdot 2 \cdot a^2 \cdot b^2} = 2 \cdot \sqrt{2} \cdot |a| \cdot |b|$
- c) $\sqrt{12a^3b^2} = \sqrt{4 \cdot 3 \cdot a^2 \cdot a \cdot b^2} = 2 \cdot \sqrt{3} \cdot |a| \cdot \sqrt{a} \cdot |b|$
- d) $\sqrt{8a} \cdot \sqrt{2a^3} = \sqrt{16a^4} = 4a^2$
- e) $\sqrt{15ab^2} \cdot \sqrt{3a^3} = \sqrt{45a^4b^2} = \sqrt{9 \cdot 5 \cdot a^4 \cdot b^2} = 3 \cdot \sqrt{5} \cdot a^2 \cdot |b|$
- j) $\sqrt{12a^3b^4} : \sqrt{6a^2b^3} = \sqrt{\frac{12a^3b^4}{6a^2b^3}} = \sqrt{2ab} = \sqrt{2} \cdot \sqrt{a} \cdot \sqrt{b}$

Aufgabe 17:

- a) $\frac{9}{\sqrt{3a}} = \frac{9 \cdot \sqrt{3a}}{\sqrt{3a} \cdot \sqrt{3a}} = \frac{9 \cdot \sqrt{3a}}{3a} = \frac{3 \cdot \sqrt{3a}}{a}$
- b) $\frac{8}{\sqrt{12x}} = \frac{8 \cdot \sqrt{12x}}{\sqrt{12x} \cdot \sqrt{12x}} = \frac{8 \cdot \sqrt{12x}}{12x} = \frac{2 \cdot \sqrt{12x}}{3x}$
- c) $\frac{x^2}{\sqrt{5x}} = \frac{x^2 \cdot \sqrt{5x}}{\sqrt{5x} \cdot \sqrt{5x}} = \frac{x^2 \cdot \sqrt{5x}}{5x} = \frac{x \cdot \sqrt{5x}}{5}$
- d) $\frac{\sqrt{12x}}{\sqrt{4xy}} = \frac{\sqrt{12x} \cdot \sqrt{4xy}}{\sqrt{4xy} \cdot \sqrt{4xy}} = \frac{\sqrt{48x^2y}}{4xy} = \frac{\sqrt{16 \cdot 3 \cdot x^2 \cdot y}}{4xy} = \frac{4 \cdot \sqrt{3} \cdot x \cdot \sqrt{y}}{4xy} = \frac{\sqrt{3y}}{y}$
- h) $\frac{\sqrt{120v}}{5u \cdot \sqrt{uv}} = \frac{\sqrt{120v} \cdot \sqrt{uv}}{5u \cdot \sqrt{uv} \cdot \sqrt{uv}} = \frac{\sqrt{120} \cdot \sqrt{u} \cdot v}{5u \cdot uv} = \frac{\sqrt{4 \cdot 30} \cdot \sqrt{u} \cdot v}{5u^2v} = \frac{2 \cdot \sqrt{30} \cdot \sqrt{u}}{5u^2} = \frac{2 \cdot \sqrt{30u}}{5u^2}$