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# **Toegepaste Wiskunde voor het hoger beroepsonderwijs**

## **Deel 1**

Vijfde, herziene druk

## **Uitwerking herhalingsopgaven hoofdstuk 1**

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## Uitwerking herhalingsopgaven hoofdstuk 1, paragraaf 1.8

$$1a) \frac{a}{b} + \frac{c}{d} = \frac{ad}{bd} + \frac{bc}{bd} = \frac{ad+bc}{bd}$$

$$1b) \frac{\left(\frac{2}{a}\right)}{3a} = \frac{2}{a} \cdot \frac{1}{3a} = \frac{2}{3a^2}$$

$$1c) \frac{a-b}{c} - \frac{2ac-3b}{c^2} = \frac{(a-b)c}{c^2} - \frac{2ac-3b}{c^2} = \frac{ac-bc-2ac+3b}{c^2} = \frac{-ac-bc+3b}{c^2}$$

$$1d) \frac{\frac{3b}{a^2}}{\frac{b}{a}} = \frac{3b}{a^2} \cdot \frac{a}{b} = \frac{3b^2}{a^3}$$

$$2a) x(x-y) - y(y-x) = x^2 - xy - y^2 + yx = x^2 - y^2$$

$$2b) \frac{1}{2}(a+b-c) - \frac{3}{2}(c-b) = \frac{1}{2}a + \frac{1}{2}b - \frac{1}{2}c - \frac{3}{2}c + \frac{3}{2}b = \frac{1}{2}a + 2b - 2c$$

$$2c) (a-c)^3 = (a-c)^2(a-c) \\ = (a^2 - 2ac + c^2)(a-c) \\ = a^3 - 2a^2c + c^2a - a^2c + 2ac^2 - c^3 \\ = a^3 - 3a^2c + 3ac^2 - c^3$$

$$2d) (a+2b)^2 - (a-b)^2 = a^2 + 4ab + 4b^2 - (a^2 - 2ab + b^2) = 6ab + 3b^2$$

$$3a) (2a^3)^2 + (3a^2)^3 = 4a^6 + 27a^6 = 31a^6$$

$$3b) a^2(a+b)^2(a-b)^{-2} = \frac{a^2(a^2+2ab+b^2)}{(a-b)^2} = \frac{a^4+2a^3b+a^2b^2}{a^2-2ab+b^2}$$

$$3c) (x^3y^2z)^{-1} \cdot (x^2y^0z^{-1}) = x^{-3}y^{-2}z^{-1}x^2z^{-1} = x^{-1}y^{-2}z^{-2} = \frac{1}{xy^2z^2}$$

$$3d) (x+3)(x-2)(x-1) = (x^2+3x-2x-6)(x-1) \\ = (x^2+x-6)(x-1) \\ = x^3+x^2-6x-x^2-x+6 \\ = x^3-7x+6$$

$$4a) \sqrt{a} \cdot \sqrt[3]{a^4} = a^{\frac{1}{2}} \cdot a^{\frac{4}{3}} = a^{\frac{11}{6}}$$

$$4b) \frac{\sqrt{abc}}{\sqrt[3]{a} \cdot \sqrt{b^3} \cdot c} = a^{\frac{1}{2}} \cdot b^{\frac{1}{2}} \cdot c^{\frac{1}{2}} \cdot a^{-\frac{1}{3}} \cdot b^{-\frac{3}{2}} \cdot c^{-1} = a^{\frac{1}{2}-\frac{1}{3}} \cdot b^{\frac{1}{2}-\frac{3}{2}} \cdot c^{\frac{1}{2}-1} = a^{\frac{1}{6}} \cdot b^{-1} \cdot c^{-\frac{1}{2}}$$

$$4c) x\sqrt{x} + x\sqrt{x^3} + x^2\sqrt{x} = x \cdot x^{\frac{1}{2}} + x \cdot x^{\frac{3}{2}} + x^2 \cdot x^{\frac{1}{2}} = x^{\frac{3}{2}} + x^{\frac{5}{2}} + x^{\frac{5}{2}} = x^{\frac{3}{2}} + 2x^{\frac{5}{2}}$$

$$4d) \sqrt{2^5} + (\sqrt{2})^5 + 2^{\frac{5}{2}} = 2^{\frac{5}{2}} + \left(2^{\frac{1}{2}}\right)^5 + 2^{\frac{5}{2}} = 3 \cdot 2^{\frac{5}{2}}$$

$$5a) x^2 - 4 = (x+2)(x-2)$$

$$5b) x^2 - 5x - 6 = (x-6)(x+1)$$

$$5c) a^2 + 6a + 5 = (a+5)(a+1)$$

$$5d) a^2 + b^2 + 2ab = (a+b)^2$$

$$6a) 3x + 5 = 0 \Rightarrow 3x = -5 \Rightarrow x = -\frac{5}{3}$$

$$6b) 3x + 5a = 7a \Rightarrow 3x = 2a \Rightarrow x = \frac{2}{3}a$$

$$6c) 3x^2 - x - 10 = 0 \Rightarrow x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4 \cdot 3 \cdot (-10)}}{2 \cdot 3} = \frac{1 \pm \sqrt{121}}{6} \Rightarrow x = 2 \vee x = -\frac{10}{6} = -\frac{5}{3}$$

$$6d) x^2 + 2x - 5 = 0 \Rightarrow x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot (-5)}}{2} = \frac{-2 \pm \sqrt{24}}{2} = -1 \pm \sqrt{6}$$

$$7a) ax - 4b = 3x - 2a \Rightarrow ax - 3x = 4b - 2a \Rightarrow (a - 3)x = 4b - 2a \Rightarrow x = \frac{4b - 2a}{a - 3}$$

$$7b) 2x - \frac{a}{x} = b \Rightarrow 2x^2 - a = bx \Rightarrow 2x^2 - bx - a = 0 \Rightarrow x = \frac{b \pm \sqrt{(-b)^2 - 4 \cdot 1 \cdot (-a)}}{2 \cdot 2} = \frac{b \pm \sqrt{b^2 + 4a}}{4}$$

$$7c) x^2 - ax + b = cx \Rightarrow x^2 - ax - cx + b = 0 \Rightarrow x^2 - (a + c)x + b = 0 \Rightarrow x = \frac{a + c \pm \sqrt{(a + c)^2 - 4b}}{2}$$

$$7d) (x - a)(x - b) = c \Rightarrow x^2 - (a + b)x + ab - c = 0 \Rightarrow x = \frac{a + b \pm \sqrt{(a + b)^2 - 4(ab - c)}}{2}$$

$$8a) 2^x = 3 \Rightarrow x = {}^2 \log 3 = \frac{\log 3}{\log 2} \approx 1,5850$$

$$8b) \frac{1}{2^x} = 3 \Rightarrow 2^x = \frac{1}{3} \Rightarrow x = {}^2 \log \left( \frac{1}{3} \right) = \frac{\log \frac{1}{3}}{\log 2} \approx -1,5850$$

$$8c) 2^{-2x} = 4^{x+1} \Rightarrow 2^{-2x} = (2^2)^{x+1} = 2^{2x+2} \Rightarrow -2x = 2x + 2 \Rightarrow -4x = 2 \Rightarrow x = -\frac{1}{2}$$

8d)

$$2^x + 2^{-x} = 3 \Rightarrow a + \frac{1}{a} = 3$$

$$\Rightarrow a^2 + 1 = 3a$$

$$\Rightarrow a^2 - 3a + 1 = 0$$

$$\Rightarrow a = \frac{3 \pm \sqrt{9 - 4}}{2}$$

$$\Rightarrow 2^x = \frac{3}{2} \pm \frac{1}{2} \sqrt{5}$$

$$\Rightarrow 2^x = 2,6180 \vee 2^x = 0,3820$$

$$\Rightarrow x = {}^2 \log 2,6180 \vee x = {}^2 \log 0,3820$$

$$\Rightarrow x = \frac{\log 2,6180}{\log 2} \approx 1,3885 \vee x = \frac{\log 0,3820}{\log 2} \approx -1,3885$$

$$9a) \log x = -2 = x = 10^{-2} = 0,01$$

$$9b) 3 \cdot {}^2 \log x = 1 \Rightarrow {}^2 \log x = \frac{1}{3} \Rightarrow x = 2^{\frac{1}{3}} = \sqrt[3]{2}$$

$$9c) |x| = 2 \Rightarrow x = 2 \vee x = -2$$

$$9d) \log(|x|) = -\sqrt{2} \Rightarrow |x| = 10^{-\sqrt{2}} = 0,0385 \Rightarrow x = \pm 0,0385$$

$$10a) \begin{cases} ax - 2y = 3 \\ 3x + 5y = b \end{cases} \text{ heeft één oplossing wanneer } \frac{a}{3} \neq \frac{-2}{5} \Rightarrow a \neq -\frac{6}{5}$$

$$10b) \begin{cases} ax - 2y = 3 \\ 3x + 5y = b \end{cases} \text{ heeft geen oplossing wanneer } \frac{a}{3} = \frac{-2}{5} \Rightarrow a = -\frac{6}{5} \text{ èn } \frac{3}{b} \neq \frac{-2}{5} \Rightarrow b \neq -\frac{15}{2}$$