

### 14.3 Breuken en wortels

#### Opgave 38:

- a.  $\frac{A}{B} = C$  dus  $A = B \cdot C$
- b.  $\frac{A}{B} = 0$  dus  $A = 0$

#### Opgave 39:

- a.  $\frac{20}{x-3} = 2$   
 $2(x-3) = 20$   
 $x-3 = 10$   
 $x = 13$
- b.  $\frac{800}{x-3} - 300 = 100$   
 $\frac{800}{x-3} = 400$   
 $400(x-3) = 800$   
 $x-3 = 2$   
 $x = 5$
- c.  $\frac{5}{x^2} - \frac{20}{x^3} = 0$   
 $\frac{5}{x^2} = \frac{20}{x^3}$   
 $5x^3 = 20x^2$   
 $5x^3 - 20x^2 = 0$   
 $5x^2(x-4) = 0$   
 $x = 0 \quad \vee \quad x = 4$   
 $x = 0$  vervalt, dus  $x = 4$
- d.  $\frac{-0,03x^2 + 18x}{x+7} = 0$   
 $-0,03x^2 + 18x = 0$   
 $-0,03x(x-600) = 0$   
 $x = 0 \quad \vee \quad x = 600$
- e.  $\frac{3(2x-5) - (x+3)(x-5)}{2x-1} = 0$   
 $3(2x-5) - (x+3)(x-5) = 0$   
 $6x-15 - (x^2-2x-15) = 0$   
 $6x-15-x^2+2x+15 = 0$   
 $-x^2+8x = 0$   
 $-x(x-8) = 0$   
 $x = 0 \quad \vee \quad x = 8$
- f.  $\frac{x}{x-10} = \frac{5}{x}$

$$x^2 = 5(x-10)$$

$$x^2 = 5x - 50$$

$$x^2 - 5x + 50 = 0$$

$D = 25 - 200 = -175$  dus geen oplossingen

**Opgave 40:**

a.  $\frac{500}{a} - 70 = \frac{500}{a} - \frac{70a}{a} = \frac{500 - 70a}{a}$

b.  $\frac{100}{a} + \frac{200}{b} = \frac{100b}{ab} + \frac{200a}{ab} = \frac{100b + 200a}{ab}$

c.  $5 + \frac{3}{x-2} = \frac{5(x-2)}{x-2} + \frac{3}{x-2} = \frac{5x-10}{x-2} + \frac{3}{x-2} = \frac{5x-7}{x-2}$

d.  $\frac{0,5}{x+3} - 0,2x = \frac{0,5}{x+3} - \frac{0,2x(x+3)}{x+3} = \frac{0,5}{x+3} - \frac{0,2x^2 + 0,6x}{x+3} = \frac{-0,2x^2 - 0,6x + 0,5}{x+3}$

e.  $80 + \frac{50}{3x-10} = \frac{80(3x-10)}{3x-10} + \frac{50}{3x-10} = \frac{240x-800}{3x-10} + \frac{50}{3x-10} = \frac{240x-750}{3x-10}$

f.  $\frac{380}{x^2} - \frac{40}{x} = \frac{380}{x^2} - \frac{40x}{x^2} = \frac{380-40x}{x^2}$

**Opgave 41:**

a.  $\frac{3}{x} \cdot \frac{5}{y} = \frac{15}{xy}$

b.  $\frac{3}{2x} \cdot \frac{x^3}{5y} = \frac{3x^3}{10xy} = \frac{3x^2}{10y}$

c.  $\frac{6000}{\left(\frac{2}{x-4}\right)} = 6000 \cdot \frac{x-4}{2} = 3000(x-4) = 3000x = 12000$

d.  $\frac{350}{x} \left(1 - \frac{2}{x}\right) = \frac{350}{x} - \frac{700}{x^2} = \frac{350x}{x^2} - \frac{700}{x^2} = \frac{350x-700}{x^2}$

e.  $\frac{150}{x} : \frac{x-4}{x} = \frac{150}{x} \cdot \frac{x}{x-4} = \frac{150}{x-4}$

f.  $8x \left(3 + \frac{5}{x^2}\right) = 24x + \frac{40x}{x^2} = \frac{24x^2}{x} + \frac{40}{x} = \frac{24x^2 + 40}{x}$

**Opgave 42:**

$$\frac{15}{\left(\frac{5}{3}\right)} = 15 \cdot \frac{3}{5} = 9$$

$$\frac{\left(\frac{15}{5}\right)}{3} = \frac{3}{3} = 1$$

**Opgave 43:**

a.  $\frac{15 + \frac{3}{x}}{x} = \frac{\frac{15x}{x} + \frac{3}{x}}{x} = \frac{\frac{15x+3}{x}}{x} = \frac{15x+3}{x^2}$

$$b. \frac{20a}{b + \frac{a^2}{2b}} = \frac{20a}{\frac{2b^2}{2b} + \frac{a^2}{2b}} = \frac{20a}{\frac{2b^2 + a^2}{2b}} = 20a \cdot \frac{2b}{2b^2 + a^2} = \frac{40ab}{2b^2 + a^2}$$

$$c. \frac{\frac{50}{x}}{10} = \frac{50}{10x} = \frac{5}{x}$$

$$d. \frac{50}{\frac{10}{x}} = 50 \cdot \frac{x}{10} = 5x$$

$$e. x + 25 \cdot \frac{100}{5} = x + 5 \cdot \frac{100}{x} = x + \frac{500}{x}$$

$$f. \frac{3 + \frac{2}{x}}{7 - \frac{1}{x}} = \frac{\frac{3x}{x} + \frac{2}{x}}{\frac{7x}{x} - \frac{1}{x}} = \frac{\frac{3x+2}{x}}{\frac{7x-1}{x}} = \frac{3x+2}{x} \cdot \frac{x}{7x-1} = \frac{3x+2}{7x-1}$$

#### **Opgave 44:**

$$a. A = 18 \cdot \frac{500}{10} + 25x = 1,8 \cdot \frac{500}{x} + 25x = \frac{900}{x} + 25x$$

$$b. T = \frac{50a}{\frac{a^2}{5b} + 2b} = \frac{50a}{\frac{a^2}{5b} + \frac{10b^2}{5b}} = \frac{50a}{\frac{a^2 + 10b^2}{5b}} = 50a \cdot \frac{5b}{a^2 + 10b^2} = \frac{250ab}{a^2 + 10b^2}$$

$$c. L = \left( 21 + \frac{180}{\frac{a}{b} \cdot 20} \right) \cdot a = 21a + \frac{180a}{\frac{20a}{b}} = 21a + 180a \cdot \frac{b}{20a} = 21a + 9b$$

#### **Opgave 45:**

$$a. A = \frac{5x^2 + 4x + 3}{x} = \frac{5x^2}{x} + \frac{4x}{x} + \frac{3}{x} = 5x + 4 + \frac{3}{x}$$

$$b. T = \frac{3x^2 + 6x + 180}{3x} = \frac{3x^2}{3x} + \frac{6x}{3x} + \frac{180}{3x} = x + 2 + \frac{60}{x}$$

$$c. y = \frac{5a^2 + 10a}{2a^2} = \frac{5a^2}{2a^2} + \frac{10a}{2a^2} = 2\frac{1}{2} + \frac{5}{a}$$

$$d. K = \frac{q^2 + 3q + 18}{q} = \frac{q^2}{q} + \frac{3q}{q} + \frac{18}{q} = q + 3 + \frac{18}{q}$$

#### **Opgave 46:**

$$a. C = \frac{A}{B+3}$$

$$B+3 = \frac{A}{C}$$

$$B = \frac{A}{C} - 3$$

$$b. C = 5 + \frac{A}{B}$$

$$C - 5 = \frac{A}{B}$$

$$B = \frac{A}{C-5}$$

**Opgave 47:**

a.  $K = 5 + \frac{8}{q}$

$$K - 5 = \frac{8}{q}$$

$$q = \frac{8}{K - 5}$$

b.  $K = \frac{8}{q-1}$

$$q - 1 = \frac{8}{K}$$

$$q = 1 + \frac{8}{K}$$

c.  $K = \frac{q+3}{2q-1}$

$$K(2q-1) = q+3$$

$$2Kq - K = q+3$$

$$2Kq - q = K+3$$

$$q(2K-1) = K+3$$

$$q = \frac{K+3}{2K-1}$$

d.  $P = 18 - \frac{5}{q-2}$

$$P - 18 = \frac{-5}{q-2}$$

$$q - 2 = \frac{-5}{P-18}$$

$$q = 2 - \frac{5}{P-18}$$

e.  $P = \frac{7}{3q-2}$

$$3q - 2 = \frac{7}{P}$$

$$3q = 2 + \frac{7}{P}$$

$$q = \frac{2}{3} + \frac{7}{3P}$$

f.  $A = \frac{q}{q+4}$

$$A(q+4) = q$$

$$Aq + 4A = q$$

$$Aq - q = -4A$$

$$q(A-1) = -4A$$

$$q = \frac{-4A}{A-1}$$

**Opgave 48:**

a.  $T = \frac{a}{a-6}$

$$T(a-6) = a$$

$$aT - 6T = a$$

$$aT - a = 6T$$

$$a(T-6) = 6T$$

$$a = \frac{6T}{T-6}$$

b.  $L = 320 - \frac{18}{q-1}$

$$L - 320 = -\frac{18}{q-1}$$

$$q-1 = -\frac{18}{L-320}$$

$$q = 1 - \frac{18}{L-320}$$

c.  $\frac{3x}{x+y} = 5-x$

$$\frac{3x}{5-x} = x+y$$

$$y = \frac{3x}{5-x} - x$$

**Opgave 49:**

a.  $\frac{1}{T} = 5 + \frac{3}{A}$

$$\frac{1}{T} - 5 = \frac{3}{A}$$

$$\frac{1}{T} - \frac{5T}{T} = \frac{3}{A}$$

$$\frac{1-5T}{T} = \frac{3}{A}$$

$$A(1-5T) = 3T$$

$$A = \frac{3T}{1-5T}$$

b.  $\frac{1}{T} = 5 + \frac{3}{A} = \frac{5A}{A} + \frac{3}{A} = \frac{5A+3}{A}$  de breuken omdraaien geeft:

$$T = \frac{A}{5A+3}$$

**Opgave 50:**

$$a. \quad K = \frac{x \cdot 15}{120} \cdot \left(4 - \frac{\frac{1}{2}x + 4}{4}\right) = \frac{1}{8}x \cdot \left(4 - \left(\frac{1}{8}x + 1\right)\right) = \frac{1}{8}x \cdot \left(4 - \frac{1}{8}x - 1\right) = \frac{3}{8}x - \frac{1}{64}x^2$$

$$a = -\frac{1}{64} \quad b = \frac{3}{8}$$

$$b. \quad xy = 120 \text{ dus } y = \frac{120}{x}$$

$$K = \frac{50}{x} + 8x + \frac{6}{\frac{120}{x}} + \frac{1}{15} \cdot \frac{120}{x} = \frac{50}{x} + 8x + \frac{1}{20}x + \frac{8}{x} = \frac{58}{x} + 8\frac{1}{20}x$$

$$a = 58 \quad b = 8\frac{1}{20}$$

**Opgave 51:**

$$5\sqrt{x} = y$$

$$25x = y^2$$

$$x = \frac{1}{25}y^2$$

$$\sqrt{x-5} = y$$

$$x-5 = y^2$$

$$x = y^2 + 5$$

$$5\sqrt{x-5} = y$$

$$25(x-5) = y^2$$

$$x-5 = \frac{1}{25}y^2$$

$$x = \frac{1}{25}y^2 + 5$$

**Opgave 52:**

$$a. \quad y = \sqrt{16x} = \sqrt{16} \cdot \sqrt{x} = 4\sqrt{x}$$

$$b. \quad y = \sqrt{20x} = \sqrt{20} \cdot \sqrt{x} = 4,47\sqrt{x}$$

$$c. \quad y = 3\sqrt{7x} = 3 \cdot \sqrt{7} \cdot \sqrt{x} = 7,94\sqrt{x}$$

**Opgave 53:**

$$a. \quad A = \sqrt{t-3}$$

$$t-3 = A^2$$

$$t = A^2 + 3$$

$$b. \quad S = 2\sqrt{\frac{1}{2}t + 4}$$

$$S^2 = 4\left(\frac{1}{2}t + 4\right)$$

$$S^2 = 2t + 16$$

$$-2t = -S^2 + 16$$

$$t = \frac{1}{2}S^2 - 8$$

$$c. \quad y = 3 - \frac{2}{\sqrt{t}}$$

$$y-3 = -\frac{2}{\sqrt{t}}$$

$$(y-3)^2 = \frac{4}{t}$$

$$t = \frac{4}{(y-3)^2}$$

**Opgave 54:**

$$a. \quad z = 6\sqrt{8 - \frac{1}{2}y}$$

$$z^2 = 36(8 - \frac{1}{2}y)$$

$$z^2 = 288 - 18y$$

$$18y = 288 - z^2$$

$$y = 16 - \frac{1}{18}z^2$$

$$a = -\frac{1}{16} \quad b = 16$$

b.  $A = 8 - \frac{20}{\sqrt{s}}$

$$A - 8 = -\frac{20}{\sqrt{s}}$$

$$(A - 8)^2 = \frac{400}{s}$$

$$s = \frac{400}{(A - 8)^2}$$

c.  $\sqrt{At} = A + 2$

$$At = (A + 2)^2$$

$$At = A^2 + 4A + 4$$

$$t = A + 4 + \frac{4}{A}$$