

## **Breuken Machten Variabelen oefenopgaven**

*Versie 7-9-2015*

Merk op dat

- $-3^2 = -9$ , terwijl  $(-3)^2 = 9$
- De breuken waarbij de uitkomst of het tussenantwoord erg grote getallen levert, zullen niet op het tentamen komen. Deze zijn prima om te oefenen maar op het tentamen hoef je niet te rekenen met grote getallen.

## Breuken

De opgaven met grote getallen in de breuk hoef je niet op het tentamen te verwachten, maar zijn wel goed om te oefenen.

Bereken:

2.9

a.  $\frac{1}{3} + \frac{1}{4}$

b.  $\frac{1}{5} - \frac{1}{6}$

c.  $\frac{1}{7} + \frac{1}{9}$

d.  $\frac{1}{9} - \frac{1}{11}$

e.  $\frac{1}{2} + \frac{1}{15}$

2.10

a.  $\frac{2}{3} + \frac{3}{4}$

b.  $\frac{3}{5} - \frac{4}{7}$

c.  $\frac{2}{7} + \frac{3}{4}$

d.  $\frac{4}{9} - \frac{3}{8}$

e.  $\frac{5}{11} + \frac{4}{15}$

2.11

a.  $\frac{1}{6} + \frac{1}{4}$

b.  $\frac{1}{9} - \frac{2}{15}$

c.  $\frac{3}{8} + \frac{1}{12}$

d.  $\frac{1}{3} + \frac{5}{6}$

e.  $\frac{4}{15} - \frac{3}{10}$

2.12

a.  $\frac{2}{45} + \frac{1}{21}$

b.  $\frac{5}{27} - \frac{1}{36}$

c.  $\frac{5}{72} + \frac{7}{60}$

d.  $\frac{3}{34} + \frac{1}{85}$

e.  $\frac{7}{30} + \frac{8}{105}$

2.13

a.  $\frac{1}{3} + \frac{1}{4} + \frac{1}{5}$

b.  $\frac{1}{2} - \frac{1}{3} + \frac{1}{7}$

c.  $\frac{1}{4} - \frac{1}{5} + \frac{1}{9}$

d.  $\frac{1}{2} - \frac{1}{7} - \frac{1}{3}$

e.  $\frac{1}{8} + \frac{1}{3} - \frac{1}{5}$

2.14

a.  $\frac{1}{2} + \frac{1}{4} + \frac{1}{8}$

b.  $\frac{1}{3} + \frac{1}{6} + \frac{1}{4}$

c.  $\frac{1}{12} + \frac{1}{8} - \frac{1}{2}$

d.  $\frac{1}{9} - \frac{1}{12} + \frac{1}{18}$

e.  $\frac{1}{10} - \frac{1}{15} + \frac{1}{6}$

2.15

a.  $\frac{1}{2} - \frac{1}{4} + \frac{1}{8}$

b.  $\frac{1}{3} + \frac{1}{6} - \frac{1}{4}$

c.  $\frac{1}{12} - \frac{1}{8} - \frac{1}{2}$

d.  $\frac{1}{9} - \frac{1}{12} - \frac{1}{18}$

e.  $\frac{1}{10} + \frac{1}{15} + \frac{1}{6}$

2.16

a.  $\frac{1}{3} - \frac{1}{9} + \frac{1}{27}$

b.  $\frac{1}{2} + \frac{1}{10} - \frac{2}{15}$

c.  $\frac{1}{18} - \frac{7}{30} - \frac{3}{20}$

d.  $\frac{3}{14} - \frac{1}{21} + \frac{5}{6}$

e.  $\frac{2}{5} - \frac{3}{10} + \frac{4}{15}$

2.17

a.  $\frac{2}{5} - \frac{1}{7} - \frac{1}{10}$

b.  $\frac{3}{2} + \frac{2}{3} - \frac{5}{6}$

c.  $\frac{8}{21} - \frac{2}{7} + \frac{3}{4}$

d.  $\frac{2}{11} - \frac{5}{13} + \frac{1}{2}$

e.  $\frac{4}{17} - \frac{3}{10} + \frac{2}{5}$

Bereken:

2.18

a.  $\frac{2}{3} \times \frac{5}{7}$

b.  $\frac{4}{9} \times \frac{2}{5}$

c.  $\frac{2}{13} \times \frac{5}{7}$

d.  $\frac{9}{13} \times \frac{7}{2}$

e.  $\frac{1}{30} \times \frac{13}{10}$

2.19

a.  $\frac{2}{3} \times \frac{9}{2}$

b.  $\frac{8}{9} \times \frac{3}{4}$

c.  $\frac{14}{15} \times \frac{10}{7}$

d.  $\frac{25}{12} \times \frac{18}{35}$

e.  $\frac{36}{21} \times \frac{28}{27}$

2.20

a.  $\frac{63}{40} \times \frac{16}{27}$

b.  $\frac{49}{25} \times \frac{30}{21}$

c.  $\frac{99}{26} \times \frac{39}{44}$

d.  $\frac{51}{36} \times \frac{45}{34}$

e.  $\frac{46}{57} \times \frac{38}{69}$

2.21

a.  $\frac{2}{3} \times \frac{6}{5} \times \frac{15}{4}$

b.  $\frac{6}{35} \times \frac{15}{4} \times \frac{14}{9}$

c.  $\frac{26}{33} \times \frac{22}{9} \times \frac{15}{39}$

d.  $\frac{18}{49} \times \frac{35}{12} \times \frac{4}{21}$

e.  $\frac{24}{15} \times \frac{4}{27} \times \frac{45}{16}$

2.22

a.  $\frac{2}{3} : \frac{5}{7}$

b.  $\frac{1}{3} : \frac{1}{2}$

c.  $6 : \frac{1}{5}$

d.  $\frac{6}{5} : \frac{10}{9}$

e.  $\frac{4}{5} : \frac{5}{7}$

2.23

a.  $\frac{2}{3} : \frac{4}{9}$

b.  $\frac{7}{10} : \frac{21}{15}$

c.  $10 : \frac{5}{3}$

d.  $\frac{12}{25} : \frac{18}{35}$

e.  $\frac{24}{49} : \frac{36}{49}$

2.24

a.  $\frac{\frac{2}{3}}{\frac{4}{4}}$

b.  $\frac{\frac{6}{5}}{\frac{9}{10}}$

c.  $\frac{\frac{12}{7}}{\frac{9}{14}}$

2.25

a.  $\frac{\frac{1}{2} + \frac{1}{3}}{\frac{1}{4} + \frac{1}{6}}$

b.  $\frac{\frac{5}{9} + \frac{3}{10}}{\frac{3}{4} - \frac{8}{9}}$

c.  $\frac{\frac{4}{3} - \frac{3}{4}}{\frac{2}{3} + \frac{3}{2}}$

2.26

a.  $\frac{\frac{2}{7} + \frac{5}{6}}{\frac{1}{5} + \frac{3}{4}}$

b.  $\frac{\frac{1}{6} - \frac{5}{3}}{\frac{2}{7} - \frac{3}{5}}$

## Machten

De opgaven met grote getallen hoef je niet op het tentamen te verwachten, maar zijn wel goed om te oefenen.

Schrijf alle volgende uitdrukkingen als een geheel getal of als een onvereenvoudigbare breuk:

3.1

- a.  $2^3$
- b.  $3^2$
- c.  $4^5$
- d.  $5^4$
- e.  $2^8$

3.2

- a.  $(-2)^3$
- b.  $(-3)^2$
- c.  $(-4)^5$
- d.  $(-5)^4$
- e.  $(-2)^6$

3.3

- a.  $2^{-3}$
- b.  $4^{-2}$
- c.  $3^{-4}$
- d.  $7^{-1}$
- e.  $2^{-7}$

3.4

- a.  $2^0$
- b.  $9^{-1}$
- c.  $11^{-2}$
- d.  $9^{-3}$
- e.  $10^{-4}$

3.5

- a.  $(-4)^3$
- b.  $3^{-5}$
- c.  $(-3)^{-3}$
- d.  $2^4$
- e.  $(-2)^{-4}$

3.6

- a.  $(-2)^0$
- b.  $0^2$
- c.  $12^{-1}$
- d.  $(-7)^2$
- e.  $(-2)^{-7}$

3.7

- a.  $(\frac{2}{3})^2$
- b.  $(\frac{1}{2})^4$
- c.  $(\frac{4}{5})^3$
- d.  $(\frac{2}{7})^2$

3.8

- a.  $(\frac{2}{3})^{-2}$
- b.  $(\frac{1}{2})^{-3}$
- c.  $(\frac{7}{9})^{-1}$
- d.  $(\frac{3}{2})^{-4}$

3.9

- a.  $(\frac{4}{3})^{-2}$
- b.  $(\frac{1}{2})^{-4}$
- c.  $(\frac{4}{5})^{-1}$
- d.  $(\frac{2}{3})^{-5}$

3.10

- a.  $(\frac{1}{4})^{-1}$
- b.  $(\frac{6}{5})^0$
- c.  $(\frac{4}{3})^3$
- d.  $(\frac{5}{2})^{-4}$

3.11

- a.  $(\frac{6}{7})^2$
- b.  $(\frac{8}{7})^0$
- c.  $(\frac{6}{7})^{-2}$
- d.  $(\frac{2}{7})^3$

3.12

- a.  $(\frac{4}{9})^3$
- b.  $(\frac{5}{3})^{-3}$
- c.  $(\frac{5}{11})^2$

## Variabelen

Substitueer  $a=3$  in .... Betekent hetzelfde als: vul 3 in voor  $a$  in ....

4.1 Substitueer  $a = 3$  in

- a.  $2a^2$
- b.  $-a^2 + a$
- c.  $4a^3 - 2a$
- d.  $-3a^3 - 3a^2$
- e.  $a(2a - 3)$

4.2 Substitueer  $a = -2$  in

- a.  $3a^2$
- b.  $-a^3 + a$
- c.  $3(a^2 - 2a)$
- d.  $-2a^2 + a$
- e.  $2a(-a + 3)$

4.3 Substitueer  $a = 4$  in

- a.  $3a^2 - 2a$
- b.  $-a^3 + 2a^2$
- c.  $-2(a^2 - 2a)$
- d.  $(2a - 4)(-a + 2)$
- e.  $(3a - 4)^2$

4.4 Substitueer  $a = -3$  in

- a.  $-a^2 + 2a$
- b.  $a^3 - 2a^2$
- c.  $-3(a^2 - 2a)$
- d.  $(2a - 1)(-3a + 2)$
- e.  $(2a + 1)^2$

4.5 Substitueer  $a = 3$  en  $b = 2$  in

- a.  $2a^2b$
- b.  $3a^2b^2 - 2ab$
- c.  $-3a^2b^3 + 2ab^2$
- d.  $2a^3b - 3ab^3$
- e.  $-5ab^2 - 2a^2 + 3b^3$

4.6 Substitueer  $a = -2$  en  $b = -3$  in

- a.  $3ab - a$
- b.  $2a^2b - 2ab$
- c.  $-3ab^2 + 3ab$
- d.  $a^2b^2 - 2a^2b + ab^2$
- e.  $-a^2 + b^2 + 4ab$

4.7 Substitueer  $a = 5$  en  $b = -2$  in

- a.  $3(ab)^2 - 2ab$
- b.  $a(a + b)^2 - (2a)^2$
- c.  $-3ab(a + 2b)^2$
- d.  $3a(a - 2b)(a^2 - 2ab)$
- e.  $(a^2b - 2ab^2)^2$

4.8 Substitueer  $a = -2$  en  $b = -1$  in

- a.  $-(a^2b)^3 - 2(ab^2)^2$
- b.  $-b(3a^2 - 2b)^2$
- c.  $(3a^2b - 2ab^2)(2a^2 - b^2)$
- d.  $(a^2 + b^2)(a^2 - b^2)$
- e.  $((-a^2b + 2b)(ab^2 - 2a))^2$

Schrijf zo eenvoudig mogelijk en zonder haakjes:

4.9

- a.  $a^3 \cdot a^5$
- b.  $b^3 \cdot b^2$
- c.  $a^4 \cdot a^7$
- d.  $b \cdot b^3$
- e.  $a^7 \cdot a^7$

4.10

- a.  $(a^2)^3$
- b.  $(b^3)^4$
- c.  $(a^5)^5$
- d.  $(b^4)^2$
- e.  $(a^6)^9$

4.11

- a.  $(ab)^4$
- b.  $(a^2b^3)^2$
- c.  $(a^4b)^3$
- d.  $(a^2b^3)^4$
- e.  $(a^3b^4)^5$

4.12

- a.  $a^4 \cdot a^3 \cdot a$
- b.  $2a^5 \cdot 3a^5$
- c.  $4a^2 \cdot 3a^2 \cdot 5a^2$
- d.  $5a^3 \cdot 6a^4 \cdot 7a$
- e.  $a \cdot 2a^2 \cdot 3a^3$

4.13

- a.  $(2a^2)^3$
- b.  $(3a^3b^4)^4$
- c.  $(4a^2b^2)^2$
- d.  $(5a^5b^3)^3$
- e.  $(2ab^5)^4$

4.14

- a.  $3a^2b \cdot 5ab^4$
- b.  $6a^3b^4 \cdot 4a^6b^2$
- c.  $3a^2b^2 \cdot 2a^3b^3$
- d.  $7a^5b^3 \cdot 5a^7b^5$
- e.  $8a^2b^4 \cdot 3ab^2 \cdot 6a^5b^4$

4.15

- a.  $3a^2 \cdot -2a^3 \cdot -4a^5$
- b.  $-5a^3 \cdot 2a^2 \cdot -4a^3 \cdot 3a^2$
- c.  $4a^2 \cdot -2a^4 \cdot -5a^5$
- d.  $2a^4 \cdot -3a^5 \cdot -3a^6$
- e.  $-3a^2 \cdot -2a^4 \cdot -4a$

4.16

- a.  $(-2a^2)^3$
- b.  $(-3a^3)^2$
- c.  $(-5a^4)^4$
- d.  $(-a^2b^4)^5$
- e.  $(-2a^3b^5)^7$

4.17

- a.  $3a^2 \cdot (2a^3)^2$
- b.  $(-3a^3)^2 \cdot (2a^2)^3$
- c.  $(3a^4)^3 \cdot -5a^6$
- d.  $2a^2 \cdot (5a^3)^3 \cdot 3a^5$
- e.  $-2a^5 \cdot (-2a)^5 \cdot 5a^2$

4.18

- a.  $2a^3b^4(-3a^2b^3)^2$
- b.  $(-2a^2b^4)^3(-3a^2b^5)^2$
- c.  $2a^2b(-2a^2b)^2(-2a^2b)^3$
- d.  $3a^4b^2(-3a^2b^4)^3(-2a^3b^2)^2$
- e.  $(2a^3)^4(-3b^2)^2(2a^2b^3)^3$

4.19

- a.  $(3a^2b^3c^4)^2(2ab^2c^3)^3$
- b.  $(-2a^3c^4)^2(-a^2b^3)^3(2b^3c^2)^4$
- c.  $2a^2c^3(3a^3b^2c)^4(-5ab^2c^5)$
- d.  $(-2a^3c)^6(5a^3b^2)^2(-5b^3c^4)^4$
- e.  $-(-3a^2b^2c^2)^3(-2a^3b^3c^3)^2$

4.20

- a.  $((a^3)^4)^3$
- b.  $((-a^2)^3(2a^3)^2)^2$
- c.  $((2a^2b^3)^2(-3a^3b^2)^3)^2$
- d.  $(-2a(-a^3)^2)^5$
- e.  $(-2(-a^2)^3)^2(-3(-a^4)^2)^3$

## Antwoorden

### Breuken

2.9 a) $7/12$ b) $1/30$ c) $16/63$ d) $2/99$ e) $17/30$	2.15 a) $3/8$ b) $1/4$ c) $-13/24$ d) $-1/36$ e) $1/3$	2.21 a) 3 b) 1 c) $20/27$ d) $10/49$ e) $2/3$
2.10 a) $1\ 5/12$ b) $1/35$ c) $1\ 1/28$ d) $5/72$ e) $119/165$	2.16 a) $7/27$ b) $7/15$ c) $-59/180$ d) 1 e) $11/30$	2.22 a) $14/15$ b) $2/3$ c) 30 d) $1\ 2/25$ e) $1\ 3/25$
2.11 a) $5/12$ b) $-1/45$ c) $11/24$ d) $1\ 1/6$ e) $-1/30$	2.17 a) $11/70$ b) $1\ 1/3$ c) $71/84$ d) $85/286$ e) $57/170$	2.23 a) $1\ 1/2$ b) $1/2$ c) 6 d) $14/15$ e) $2/3$
2.12 a) $29/315$ b) $17/108$ c) $67/360$ d) $1/10$ e) $13/42$	2.18 a) $10/21$ b) $8/45$ c) $10/91$ d) $2\ 11/26$ e) $13/300$	2.24 a) $8/9$ b) $1\ 1/3$ c) $2\ 2/3$
2.13 a) $47/60$ b) $13/42$ c) $29/180$	2.19 a) 3 b) $2/3$ c) $1\ 1/3$	2.25 a) 2 b) $-6\ 4/25$ c) $7/26$

d) $\frac{1}{42}$ e) $\frac{31}{120}$	d) $1\frac{1}{14}$ e) $1\frac{7}{9}$	
2.14 a) $\frac{7}{8}$ b) $\frac{3}{4}$ c) $-\frac{7}{24}$ d) $\frac{1}{12}$ e) $\frac{1}{5}$	2.20 a) $\frac{14}{15}$ b) $2\frac{4}{5}$ c) $3\frac{3}{8}$ d) $1\frac{7}{8}$ e) $\frac{4}{9}$	2.26 a) $1\frac{71}{399}$ b) $13\frac{1}{8}$

### Machten

3.1 a) 8 b) 9 c) 1024 d) 625 e) 256	3.6 a) 1 b) 0 c) $\frac{1}{12}$ d) 49 e) $-\frac{1}{128}$	3.11 a) $\frac{36}{49}$ b) 1 c) $1\frac{13}{36}$ d) $\frac{4}{49}$
3.2 a) -8 b) 9 c) -1024 d) 625 e) 64	3.7 a) $\frac{4}{9}$ b) $\frac{1}{16}$ c) $\frac{64}{125}$ d) $\frac{4}{49}$	3.12 a) $\frac{64}{729}$ b) $\frac{27}{125}$ c) $\frac{25}{121}$
3.3 a) $\frac{1}{8}$ b) $\frac{1}{16}$ c) $\frac{1}{81}$ d) $\frac{1}{128}$	3.8 a) $2\frac{1}{4}$ b) 8 c) $1\frac{2}{7}$ d) $\frac{16}{81}$	
3.4 a) 1 b) $\frac{1}{9}$ c) $\frac{1}{121}$ d) $\frac{1}{729}$ e) $\frac{1}{10000}$	3.9 a) $\frac{9}{16}$ b) 16 c) $1\frac{1}{4}$ d) $\frac{32}{243}$	



<p>3.5</p> <p>a) -64 b) 1/234 c) -1/27 d) 16 e) 1/16</p>	<p>3.10</p> <p>a) 4 b) 1 c) 71/9 d) 16/625</p>	
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### Variablen

<p>4.1</p> <p>a) 18 b) -6 c) 102 d) -108 e) 9</p>	<p>4.4</p> <p>a) -15 b) -9 c) -45 d) -77 e) 25</p>	<p>4.7</p> <p>a) 320 b) -55 c) 30 d) 6075 e) 8100</p>
<p>4.2</p> <p>a) 12 b) 6 c) 24 d) -10 e) -20</p>	<p>4.5</p> <p>a) 36 b) 96 c) -192 d) 36 e) -54</p>	<p>4.8</p> <p>a) 56 b) 196 c) -56 d) 15 e) 16</p>
<p>4.3</p> <p>a) 40 b) -32 c) -16 d) -8 e) 64</p>	<p>4.6</p> <p>a) 20 b) -36 c) 72 d) 42 e) 29</p>	

4.9 a)  $a^8$   
 b)  $b^5$   
 c)  $a^{11}$   
 d)  $b^4$   
 e)  $a^{14}$

4.10 a)  $a^6$   
 b)  $b^{12}$   
 c)  $a^{25}$   
 d)  $b^8$   
 e)  $a^{53}$

4.11 a)  $a^4 b^4$   
 b)  $a^4 b^6$   
 c)  $a^{12} b^3$   
 d)  $a^8 b^{12}$   
 e)  $a^{15} b^{20}$

4.12 a)  $a^8$   
 b)  $b a^{16}$   
 c)  $60 a^6$   
 d)  $210 a^8$   
 e)  $6 a^6$

4.13 a)  $8 a^6$   
 b)  $81 a^{12} b^{16}$   
 c)  $16 a^4 b^4$   
 d)  $125 a^{15} b^9$   
 e)  $16 a^4 b^{20}$

4.14 a)  $15 a^3 b^5$   
 b)  $24 a^9 b^6$   
 c)  $6 a^5 b^5$   
 d)  $35 a^6 b^8$   
 e)  $144 a^8 b^{10}$

4.15 a)  $24 a^{10}$   
 b)  $120 a^{10}$   
 c)  $40 a^{11}$   
 d)  $18 a^{15}$   
 e)  $-24 a^7$

4.16 a)  $-8 a^6$   
 b)  $9 a^9$   
 c)  $625 a^{16}$   
 d)  $-a^{10} b^{20}$   
 e)  $-128 a^{21} b^{35}$

4.17 a)  $12 a^8$   
 b)  $72 a^{12}$   
 c)  $-135 a^8$   
 d)  $750 a^{16}$   
 e)  $108 a^{12}$

4.18

a)  $= 2a^3 b^4 \cdot 9a^4 b^6 = 18a^7 b^{10}$

b)  $= -8a^6 b^{12} \cdot 9a^4 b^{10} = -72a^{10} b^{22}$

c)  $= 2a^2 b \cdot 4a^4 b^2 \cdot -8a^6 b^3 = -64a^{12} b^6$

d)  $= 3a^4 b^2 \cdot -27a^6 b^{12} \cdot 4a^6 b^4 = -324a^{16} b^{16}$

e)  $= 16a^{12} \cdot 9b^4 \cdot 8a^6 b^9 = 1152a^{18} b^{13}$

4.19

a)  $= 9a^4 b^6 c^8 \cdot 8a^3 b^6 c^9 = 72a^7 b^{12} c^{17}$

b)  $= 4a^6 c^8 \cdot -a^6 b^9 \cdot 16b^{12} c^9 = -64a^{12} b^{21} c^{16}$

c)  $= 2a^2 c^3 \cdot 81a^{12} b^8 c^4 \cdot -5ab^2 c^5 = -810a^{15} b^{10} c^{12}$

d)  $= 64a^{18} c^6 \cdot 25a^6 b^4 \cdot 625b^{12} c^{16} = 1000000a^{24} b^{16} c^{22}$

e)  $= -27a^6 b^6 c^6 \cdot 4a^6 b^6 \cdot c^6 = 108a^{12} b^{12} c^{12}$

$$\boxed{420} \quad a) = (a^3)^{12} = a^{36}$$

$$b) = (-a^6 \cdot 4a^6)^2 = (-4a^{12})^2 = 16a^{24}$$

$$c) = (4a^4 b^6 \cdot -27a^9 b^6)^2 = (-108 a^{13} b^{12})^2 = 11664 a^{26} b^{24}$$

$$d) = (-2a \cdot a^6)^5 = (-2a^7)^5 = -32a^{35}$$

$$e) = (-2 \cdot -a^6)^2 \cdot (-3 \cdot a^8)^3 = (2a^6)^2 \cdot (-3a^8)^3 \\ = 4a^{12} \cdot -27a^{24} = -108a^{36}$$