Gr 9 Wiskunde: Inhoudsarea 2
Patrone, Algebra & Grafieke
ANTWOORDE

- Patrone
- Algebraïese Uitdrukkings
- Faktorisering
- Algebraïese Vergelykings
- Grafieke

PATRONE

1.1 **C** ◄ ... 1^2 ; 3^2 ; 5^2 ; $\mathbf{7^2}$

1.2 **C** ◄ ... $18 \xrightarrow{+18} 36 \xrightarrow{+18} \mathbf{54} \xrightarrow{+18} 72 \xrightarrow{+18} \mathbf{90}$

1.3 **A** ◄ ... $\frac{1}{2^0}$; $\frac{1}{2^1}$; $\frac{1}{2^2}$; $\mathbf{\frac{1}{2^3}}$; $\frac{1}{2^4}$

1.4 **A** ◄ ... $\frac{1}{3}$; $\mathbf{\frac{1}{6}}$; $\frac{1}{12}$; $\frac{1}{24}$; $\frac{1}{48}$

1.5 **D** ◄ ... 1^2+2 ; 2^2+2 ; 3^2+2 ; 4^2+2 ; $\mathbf{5^2+2}$

2.1 a) $T_n = 3n$:
3 ; 6 ; 9 ◄ ... $3(\mathbf{1})$; $3(\mathbf{2})$; $3(\mathbf{3})$

b) $T_n = 5n$:
5 ; 10 ; 15 ◄ ... $5(\mathbf{1})$; $5(\mathbf{2})$; $5(\mathbf{3})$

c) $T_n = 3n + 1$:
4 ; 7 ; 10 ◄ ... $3(\mathbf{1}) + 1$; $3(\mathbf{2}) + 1$; $3(\mathbf{3}) + 1$

d) $T_n = 5n - 2$:
3 ; 8 ; 13 ◄ ... $5(\mathbf{1}) - 2$; $5(\mathbf{2}) - 2$; $5(\mathbf{3}) - 2$

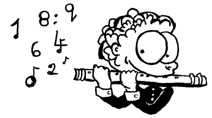
e) $T_n = n^2$:
1 ; 4 ; 9 ◄ ... $(\mathbf{1})^2$; $(\mathbf{2})^2$; $(\mathbf{3})^2$

f) $T_n = n^3$:
1 ; 8 ; 27 ◄ ... $(\mathbf{1})^3$; $(\mathbf{2})^3$; $(\mathbf{3})^3$

2.2 a) $T_{12} = 3(\mathbf{12}) = \mathbf{36}$ ◄

b) $T_{12} = 5(\mathbf{12}) = \mathbf{60}$ ◄

c) $T_{12} = 3(\mathbf{12}) + 1 = \mathbf{37}$ ◄



d) $T_{12} = 5(\mathbf{12}) - 2 = \mathbf{58}$ ◄

e) $T_{12} = (\mathbf{12})^2 = \mathbf{144}$ ◄

f) $T_{12} = (\mathbf{12})^3 = \mathbf{1\,728}$ ◄

3.1 $\mathbf{y = 3x}$ ◄

3.2 **a = 7** ◄ ... $\mathbf{7} \times 3 = 21$
b = 30 ◄ ... $10 \times 3 = \mathbf{30}$

4.1 Die konstante verskil = **7** ◄

4.2 3 ; 10 ; 17 ; 24 ; 31 ; **38** ; **45** ◄

4.3 Die konstante **verskil** is **7** *... sien Vraag 4.1*

Skryf dus **die veelvoude van 7** neer ... waar $T_n = 7n$:

7 ; 14 ; 21 ; 28 ; 35 ; ...

en vergelyk die gegewe ry :

3 ; 10 ; 17 ; 24 ; 31 ; ...

Elke term is **4 minder** as die veelvoude van 7.

$\therefore$ $\mathbf{T_n = 7n - 4}$ ◄

5.1

Posisie in patroon	1	2	3	4	5
Term	1	8	27	**64**	**125**

◄

5.2 $\mathbf{T_n = n^3}$ ◄

5.3 As $T_n = 512$, dan is $\mathbf{n = 8}$ ◄

$$\begin{array}{r|l} 2 & 512 \\ 2 & 256 \\ 2 & 128 \\ 2 & 64 \\ 2 & 32 \\ 2 & 16 \\ 2 & 8 \\ 2 & 4 \\ & 2 \end{array}$$

$$\begin{aligned} \ldots\ 512 &= 2^9 \\ &= 2^3 \times 2^3 \times 2^3 \\ &= 8 \times 8 \times 8 \\ &= \mathbf{8^3} \text{ ◄} \end{aligned}$$

6.1 7 ; 11 ; 15 ; **19** ; **23** ◄

6.2 Die algemene **verskil** is **4**

Vergelyk dus die **veelvoude van 4** ... waar $T_n = 4n$:

4 ; 8 ; 12 ; 16 ; ...

met die gegewe ry :

7 ; 11 ; 15 ; 19 ; ...

Elke term is **3 meer** as die veelvoude van 4.

$\therefore$ $\mathbf{T_n = 4n + 3}$ ◄ ... $7 \xrightarrow{+4} 11 \xrightarrow{+4} 15 \xrightarrow{+4} 19 \xrightarrow{+4} 23$

6.3 $T_{50} = 4(50) + 3$
$= \mathbf{203}$ ◄

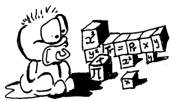
7.1 3 ; 8 ; 13 ; **18** ; **23** ◄

7.2 Elke term is 5 meer as die vorige term ◄

7.3 Vergelyk $T_n = 5n$: 5 ; 10 ; 15 ; . . .
to : 3 ; 8 ; 13 ; . . .

Elke term is **2 minder** as die veelvoude van 5

$\therefore$ $\mathbf{T_n = 5n - 2}$ ◄



7.4 38 is 2 minder as 40 ; 40 = 5 **x 8**

$\therefore$ 38 is die **8^ste^** term ◄

OF: Los die vergelyking op:

$5n - 2 = 38$ . . . *die n^{de} term = 38*

Tel 2 by: $\therefore\ 5n = 40$

Deel deur 5: $n = 8$

$\therefore$ Die **8ste** term ◄

8.1

Figuur	1	2	3	4
Aantal sye	5	9	**13**	**17**

◄

8.2 Elke figuur het vier meer sye as die vorige figuur ◄

8.3 $\mathbf{T_n = 4n + 1}$ ◄ . . . $5 \overset{+4}{\frown} 9 \overset{+4}{\frown} 13 \overset{+4}{\frown} 17$

*& elke term is **1 meer** as die veelvoude van 4*

9.

Figuur	1	2	3
Aantal vuurhoutjies	6	9	12

9.1 Aantal vuurhoutjies in Figuur 4 = **15** ◄

9.2 $\mathbf{T_n = 3n + 3}$ ◄ . . . $6 \overset{+3}{\frown} 9 \overset{+3}{\frown} 12$

*& elke term is **3 meer** as die veelvoude van 3*

9.3 $T_{20} = 3(\mathbf{20}) + 3$
$= \mathbf{63}$ **vuurhoutjies** ◄

10.1

Figuur	1	2	3	4
Aantal swart teëls	1	2	3	4
Aantal wit teëls	6	**10**	**14**	**18**

◄

10.2 $\mathbf{T_n = 4n + 2}$ ◄ . . . $6 \overset{+4}{\frown} 10 \overset{+4}{\frown} 14 \overset{+4}{\frown} 18$

*& elke term is **2 meer** as die veelvoude van 4*

11. Kyk na die patroon wat gevorm word deur die eerste getalle van elke reël:

1 ; 4 ; 9 ; . . . die vierkante!

ry **1**	ry **2**	ry **3**
$(\mathbf{1}^2)$	$(\mathbf{2}^2)$	$(\mathbf{3}^2)$

$\therefore$ Die eerste getal in die **20ste** ry sal $\mathbf{20}^2 = \mathbf{400}$ wees ◄

NOTAS

ALGEBRAÏESE UITDRUKKINGS

Terminologie

1.1 $\mathbf{-8}$ ◄ . . . $\mathbf{-8}x^2$

1.2 $\mathbf{-7}$ ◄ . . . *die term met geen veranderlike nie*

1.3 $\mathbf{-8x^2 + 2x - 7}$ ◄

1.4 $\mathbf{1}$ ◄ . . . $2x^{\mathbf{1}}$

1.5 $2x - 7 - 8x^2$

$x = \frac{1}{2}$: $\quad 2\left(\frac{1}{2}\right) - 7 - 8\left(\frac{1}{2}\right)^2$

$= \left(\frac{2}{1}\right)\left(\frac{1}{2}\right) - 7 - \left(\frac{8}{1}\right)\left(\frac{1}{4}\right)$

$= 1 - 7 - 2$

$= \mathbf{-8}$ ◄

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2. **B** ◄ . . . *x is deel van die breuk $\frac{x - y}{3}$, wat ook as $\frac{1}{3}(x - y) = \frac{1}{3}x - \frac{1}{3}y$ geskryf kan word.*

$\therefore$ Die koëffisiënt van x is $\frac{1}{3}$.

Die twee veranderlikes is x en y.

Substitusie

3.1 $\quad 2x^3 - 3x^2 + 9x + 2$

$\underline{x = -2}$: $\quad 2(-2)^3 - 3(-2)^2 + 9(-2) + 2$

$= 2(-8) - 3(4) + 9(-2) + 2$

$= -16 - 12 - 18 + 2$

$= \mathbf{-44}$ ◄

3.2 $\quad y = 2x^2 - 3x + 5$

$\underline{x = -1}$: $\quad y = 2(-1)^2 - 3(-1) + 5$

$= 2 + 3 + 5$

$= \mathbf{10}$ ◄

3.3 $\quad \frac{5ac}{b}$

$= \dfrac{\frac{5}{1}\left(\frac{2}{1}\right)\left(\frac{1}{2}\right)}{(-3)}$ . . . *wanneer mens met breuke werk, is dit nuttig om heelgetalle oor 1 te skryf.*

$= \frac{5(1)}{-3}$

$= \mathbf{-\frac{5}{3}}$ ◄

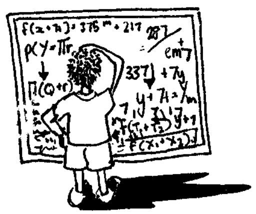
3.4 $\quad 3x^2 - 2xy - y^2$

$= 3(2)^2 - 2(2)(-3) - (-3)^2$

$= 3(4) - 2(-6) - (9)$

$= 12 + 12 - 9$

$= \mathbf{15}$ ◄



Optel, Aftrek, Vermenigvuldig en Deel

4.1 $\quad (2b - 3a - c) + (a - 4b + 2c)$

$= 2b - 3a - c + a - 4b + 2c$

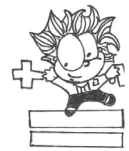
$= -3a + a + 2b - 4b - c + 2c$

$= \mathbf{-2a - 2b + c}$ ◄

OF :	$-3a + 2b - c$
Tel op	$\underline{a - 4b + 2c}$
	$-2a - 2b + c$ ◄

4.2 $\quad -4x^2(5x^2 - 3x)$

$= \mathbf{-20x^4 + 12x^3}$ ◄



Distributiewe Eienskap :

$a(b + c) = ab + ac$

4.3 $\quad \dfrac{8a + 16a^2 - 4a^3}{2a}$

$= \frac{8a}{2a} + \frac{16a^2}{2a} - \frac{4a^3}{2a}$ . . . *Elke **term** in die teller moet deur 2a gedeel word.*

$= \mathbf{4 + 8a - 2a^2}$ ◄

4.4 $\quad -3(x)(x) + 2x(-x)$

$= -3x^2 - 2x^2$ . . . *GELYKSOORTIGE TERME* ☺

$= \mathbf{-5x^2}$ ◄

4.5 $\quad -3m^2n(4m - 3mn^5 + 2n)$ . . . *Distributiewe Eienskap*

$= \mathbf{-12m^3n + 9m^3n^6 - 6m^2n^2}$ ◄

4.6 $\quad 3ab - (-2ab)$

$= 3ab + 2ab$ . . . *GELYKSOORTIGE TERME* ☺

$= \mathbf{5ab}$ ◄

5.1 $(3x)^3 + 2x^3$ . . . *$(3x)^3 = 3^3 . x^3$*

$= 27x^3 + 2x^3$ . . . *GELYKSOORTIGE TERME* ☺

$= \mathbf{29x^3}$ ➤

5.2 $(2x)^2 \times 3x^2$ . . . *$(2x)^2 = 2x \times 2x$*

$= 4x^2 \times 3x^2$

$= \mathbf{12x^4}$ ➤

5.3 $(a^2b^3)^2 . ab^2$

$= a^4b^6 . ab^2$

$= \mathbf{a^5b^8}$ ➤

5.4 $2^5 - 1^5$ . . . *$2^5 = 2 \times 2 \times 2 \times 2 \times 2$*

$= 32 - 1$ *$1^5 = 1 \times 1 \times 1 \times 1 \times 1$*

$= \mathbf{31}$ ➤

Breuke (+, −, ×, ÷)

5.5 $\dfrac{x_{\times 5}}{2_{\times 5}} + \dfrac{x_{\times 2}}{5_{\times 2}}$

$= \dfrac{5x + 2x}{10}$

$= \mathbf{\dfrac{7x}{10}}$ ➤

Wanneer ons breuke optel of aftrek, moet ons 'n gemene noemer bepaal.

5.6 $\dfrac{5a_{\times 3}}{8_{\times 3}} - \dfrac{5a_{\times 2}}{12_{\times 2}}$

$= \dfrac{15a - 10a}{24}$

$= \mathbf{\dfrac{5a}{24}}$ ➤

LW: *Hou die noemer! Moenie daarmee vermenigvuldig nie.*

5.7 $\dfrac{a^2b^2}{ac^2} \times \dfrac{4a^2bc}{20b^3}$

Wanneer ons breuke vermenigvuldig, mag ons FAKTORE kanselleer.

$= \dfrac{ab^2}{c^2} \times \dfrac{a^2c}{5b^2}$

$= \mathbf{\dfrac{a^3}{5c}}$

LW: **Verstaan** die uitdrukking

$\dfrac{a \times a \times b \times b}{a \times c \times c} \times \dfrac{4 \times a \times a \times b \times c}{20 \times b \times b \times b}$

. . . en kanselleer daarna!

5.8 $\dfrac{6x^5}{x^4} - \dfrac{15x^3}{3x^2}$

$= 6x - 5x$ . . . *GELYKSOORTIGE TERME* ☺

$= \boldsymbol{x}$ ➤

LW: **Verstaan** die uitdrukking

$\dfrac{6 \times x \times \cancel{x} \times \cancel{x} \times \cancel{x} \times \cancel{x}}{\cancel{x} \times \cancel{x} \times \cancel{x} \times \cancel{x}} - \dfrac{{}^{5}\cancel{15} \times x \times \cancel{x} \times \cancel{x}}{\cancel{3} \times \cancel{x} \times \cancel{x}}$

5.9 $\dfrac{2x+1}{4} - \dfrac{x+2}{2} - \dfrac{1}{4}$

$= \dfrac{2x + 1 - 2(x + 2) - 1}{4}$

$= \dfrac{2x + 1 - 2x - 4 - 1}{4}$

$= \dfrac{-4}{4}$

$= \mathbf{-1}$ ➤

*Dit is 'n **uitdrukking**:*

*hou die waarde dieselfde; moet dit **nie** vermenigvuldig **nie**!*

Alle terme moet oor 'n gemene (dieselfde) noemer geskryf word.

5.10 $\dfrac{x - y}{y + x} \times \dfrac{(x + y)^2}{x - y}$

$= \dfrac{\cancel{(x - y)}}{\cancel{(x + y)}} \times \dfrac{(x + y)^{\cancel{2}}}{\cancel{(x - y)}}$

$= \dfrac{x + y}{1}$

$= \mathbf{x + y}$ ➤

Vergelyk met: $\dfrac{a}{b} \times \dfrac{b^2}{a}$

$= b$ ➤

5.11 $\dfrac{x - 2}{2x} - \dfrac{x - 3}{3x}$ . . . *Moenie vermenigvuldig nie!*

$= \dfrac{3\mathbf{(}x - 2\mathbf{)} - 2\mathbf{(}x - 3\mathbf{)}}{6x}$ . . . *LW: Hakies!*

$= \dfrac{3x - 6 - 2x + 6}{6x}$ . . . *Hou die noemer, 6x!*

$= \dfrac{x}{6x}$

$= \mathbf{\dfrac{1}{6}}$ ➤

LW:

Dit is slegs wanneer ons **IN VERGELYKINGS** met breuke werk (Bladsy V6, Vraag 4), dat dit **logies** is om albei kante van die vergelyking te vermenigvuldig!

5.12 $\dfrac{4x^2}{2a^2} \div \dfrac{4x}{2a^2}$

$= \dfrac{4x^2}{2a^2} \times \dfrac{2a^2}{4x}$

$= \boldsymbol{x}$ ➤

5.13 $\dfrac{15x^2y^3 + 9x^2y^3}{8x^2y^3}$ . . . *GELYKSOORTIGE TERME* ☺

$= \dfrac{24x^2y^3}{8x^2y^3}$

$= \mathbf{3}$ ➤

5.14 $\dfrac{5a^2b}{3ab} \div \dfrac{20a^3b}{27}$

$= \dfrac{5a}{3} \times \dfrac{27}{20a^3b}$

$= \mathbf{\dfrac{9}{4a^2b}}$ ➤

5.15 $\dfrac{5}{b} - \dfrac{4}{a} - \dfrac{a-b}{ab}$ . . . *Moenie vermenigvuldig nie!*

$= \dfrac{5a - 4b - (a - b)}{ab}$ . . . *LW: Hakies!*

$= \dfrac{5a - 4b - a + b}{ab}$ . . . *Hou die noemer, ab!*

$= \boldsymbol{\dfrac{4a - 3b}{ab}}$ ➤

5.16 $\dfrac{3a^{-2}b \times 24b^{-1}a^{-1}}{9a^{-4}b^{-3}}$

$= \dfrac{72a^{-3}}{9a^{-4}b^{-3}}$

$= \mathbf{8ab^3}$ ➤ . . . $\dfrac{a^{-3}}{a^{-4}} = a^{-3-(-4)} = a^1$

& $\dfrac{1}{b^{-3}} = b^3$

5.17 $\dfrac{x^2}{2} + \dfrac{2x^2}{3} - \dfrac{7x^2}{6}$

$= \dfrac{3x^2 + 2(2x^2) - 7x^2}{6}$ . . . *Skryf al 3 terme oor 'n gemene noemer, 6.*

$= \dfrac{3x^2 + 4x^2 - 7x^2}{6}$ . . . *Moenie vermenigvuldig (met 6) nie!*

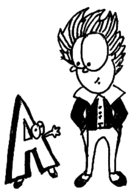
$= \dfrac{0}{6}$

$= \mathbf{0}$ ➤

5.18 $\dfrac{6x^2}{7xy} \times \dfrac{3y^3}{2x}$

$= \dfrac{6x}{7y} \times \dfrac{3y^3}{2x}$

$= \boldsymbol{\dfrac{9y^2}{7}}$ ➤



Vierkantswortels en derdemagswortels

5.19 $\sqrt{225x^4} - \sqrt[3]{125x^6}$

$= 15x^2 - 5x^2$

$= \mathbf{10x^2}$ ➤

$\begin{array}{r|l} 3 & 225 \\ 3 & 75 \\ 5 & 25 \\ & 5 \end{array}$

$\therefore\ 225 = 3^2 \times 5^2$

$\therefore\ \sqrt{225} = 3 \times 5$

$\begin{array}{r|l} 5 & 125 \\ 5 & 25 \\ & 5 \end{array}$

$\therefore\ 125 = 5^3$

$\therefore\ \sqrt[3]{125} = 5$

5.20 $\sqrt{16x^{16} \times 25x^4}$

$= \sqrt{16x^{16}} \,.\, \sqrt{25x^4}$

$= 4x^8 \,.\, 5x^2$

$= \mathbf{20x^{10}}$ ➤

OF: $= \sqrt{400x^{20}}$

$= \sqrt{20x^{10}}$

5.21 $\sqrt[3]{27x^{27}}$

$= \mathbf{3x^9}$ ➤ . . . $3 \times 3 \times 3 = 27$; $x^9 \times x^9 \times x^9 = x^{27}$

5.22 $\sqrt{16a^2 + 9a^2}$ . . . *tel eers GELYKSOORTIGE TERME op*

$= \sqrt{25a^2}$

$= \mathbf{5a}$ ➤

LW: $\sqrt{16a^2 + 9a^2} \neq 4a + 3a$!

6.1 $4ab(5a^2b^2 + 2ab - 3)$

$= \mathbf{20a^3b^3 + 8a^2b^2 - 12ab}$ ➤

6.2 $3a^2bc^2(3a^2 - 4b - c)$

$= \mathbf{9a^4bc^2 - 12a^2b^2c^2 - 3a^2bc^3}$ ➤

Distributiewe Eienskap:

$a(b + c)$
$= ab + ac$

en

$a(b - c)$
$= ab - ac$

6.3 $(x + 5)(x + 2) = x^2 + 2x + 5x + 10$

$= x^2 + 7x + 10$

6.4 $(x - 2)(x - 3) = x^2 - 3x - 2x + 6$

$= x^2 - 5x + 6$

6.5 $(x + 7)(x - 1) = x^2 - x + 7x - 7$

$= x^2 + 6x - 7$

6.6 $(2x - 3)(x + 1)$

$= 2x^2 + 2x - 3x - 3$

$= \mathbf{2x^2 - x - 3}$ ➤

6.7 $x(x + 2) - (x - 1)(x - 3)$

$= x^2 + 2x - (x^2 - 3x - x + 3)$

$= x^2 + 2x - (x^2 - 4x + 3)$

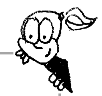
$= x^2 + 2x - x^2 + 4x - 3$

$= \mathbf{6x - 3}$ ➤

6.8 $(x - 3)^2 - x(x + 4)$

$= x^2 - 6x + 9 - x^2 - 4x$

$= \mathbf{-10x + 9}$ ➤



$(x - 3)^2$

$= (x - 3)(x - 3)$

$= x^2 \mathbf{- 3x - 3x} + 9$

$= x^2 \mathbf{- 6x} + 9$

Volkome Vierkant Drieterm ➚

6.9 $(2x-1)^2 - (x+1)(x-1)$

$= (2x-1)(2x-1) - (x^2-1)$

$= 4x^2 - 4x + 1 - x^2 + 1$

$= \mathbf{3x^2 - 4x + 2}$ ➤

Volkome Vierkant Drieterm ➔

$(2x-1)^2 = (2x-1)(2x-1)$

$= 4x^2 \mathbf{- 2x - 2x} + 1$

$= 4x^2 \mathbf{- 4x} + 1$

Verskil van Vierkante ➔

& $(x+1)(x-1) = x^2 - x + x - 1$

$= x^2 - 1$

6.10 $2(x+2)^2 - (2x-1)(x+2)$

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

$= 2(x^2 + 4x + 4) - (2x^2 + 3x - 2)$

$= 2x^2 + 8x + 8 - 2x^2 - 3x + 2$

$= \mathbf{5x + 10}$ ➤

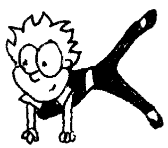
Volkome Vierkant Drieterm ➔

$(x+2)^2$

$= (x+2)(x+2)$

$= x^2 \mathbf{+ 2x + 2x} + 4$

$= x^2 \mathbf{+ 4x} + 4$



7.1 ➔ 7.4:
Volkome Vierkant Drieterme

7.1 $(x+5)^2 = (x+5)(x+5)$

$= x^2 \mathbf{+ 5x + 5x} + 25$

$= \mathbf{x^2 + 10x + 25}$ ➤

7.2 $(p-3)^2 = (p-3)(p-3)$

$= p^2 \mathbf{- 3p - 3p} + 9$

$= \mathbf{p^2 - 6p + 9}$ ➤

7.3 $(2a+3)^2 = (2a+3)(2a+3)$

$= 4a^2 \mathbf{+ 6a + 6a} + 9$

$= \mathbf{4a^2 + 12a + 9}$ ➤

7.4 $(4x-1)^2 = (4x-1)(4x-1)$

$= 16x^2 \mathbf{- 4x - 4x} + 1$

$= \mathbf{16x^2 - 8x + 1}$ ➤

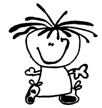
7.5 ➔ 7.8:
Verskil van Vierkante

7.5 $(x+5)(x-5) = \mathbf{x^2 - 5x + 5x - 25} = \mathbf{x^2 - 25}$

7.6 $(p-3)(p+3) = \mathbf{p^2 + 3p - 3p - 9} = \mathbf{p^2 - 9}$

7.7 $(2a+3)(2a-3) = \mathbf{4a^2 - 6a + 6a - 9} = \mathbf{4a^2 - 9}$

7.8 $(4x-1)(4x+1) = \mathbf{16x^2 + 4x - 4x - 1} = \mathbf{16x^2 - 1}$



7.9 ➔ 7.12:
Let op **hoe** die **drieterm** in elke geval verkry word.

7.9 $(x+3)(x+4) = x^2 + 4x + 3x + 12 = \mathbf{x^2 + 7x + 12}$ ➤

7.10 $(x-3)(x-4) = x^2 - 4x - 3x + 12 = \mathbf{x^2 - 7x + 12}$ ➤

7.11 $(x+3)(x-4) = x^2 - 4x + 3x - 12 = \mathbf{x^2 - x - 12}$ ➤

7.12 $(x-3)(x+4) = x^2 + 4x - 3x - 12 = \mathbf{x^2 + x - 12}$ ➤

8.1 **B** ➤ . . . $-(-2)^2 - (2(-2) - 1)$

$= -(4) - (-4 - 1)$

$= -4 - (-5)$

$= -4 + 5$

$= 1$

8.2 **C** ➤

8.3 **D** ➤ . . . $\dfrac{x}{y} - \dfrac{1^{\times y}}{1_{\times y}} = \dfrac{x-y}{y}$ . . . *Skryf die terme oor dieselfde noemer.*

8.4 **D** ➤ . . . $\left(\dfrac{x}{3} - 3y\right)\left(\dfrac{x}{3} + 3y\right)$

$= \left(\dfrac{x}{3}\right)^2 - (3y)^2$ . . . *verskil van vierkante*

$= \dfrac{x^2}{9} - 9y^2$

FAKTORISERING

1. Gemene Faktor

Toets elke antwoord deur terug te vermenigvuldig (na die begin)

1.1 $8p^3 + 4p^2$
$= \mathbf{4p^2(2p + 1)}$ ◄

1.2 $10t^2 - 5t$
$= \mathbf{5t(2t - 1)}$ ◄

1.3 $3x^2y - 9xy^2 + 12x^3y^3$
$= \mathbf{3xy(x - 3y + 4x^2y^2)}$ ◄

1.4 $2p^2 + 2$
$= \mathbf{2(p^2 + 1)}$ ◄

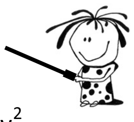
1.5 $2(x + y) + a(x + y)$
$= \mathbf{(x + y)(2 + a)}$ ◄

1.6 $2(x + y) - t(x + y)$
$= \mathbf{(x + y)(2 - t)}$ ◄

1.7 $tx - ty - 2x + 2y$
$= (tx - ty) - (2x - 2y)$
$= t(x - y) - 2(x - y)$
$= \mathbf{(x - y)(t - 2)}$ ◄

2. Verskil van vierkante

Toets elke antwoord deur terug te vermenigvuldig (na die begin)



2.1 $4x^2 - y^2$
$= \mathbf{(2x + y)(2x - y)}$ ◄

2.2 $4x^2 - 4y^2$
$= 4(x^2 - y^2)$
$= \mathbf{4(x + y)(x - y)}$ ◄

Vergelyk Vraag 2.1 en Vraag 2.2!
*In Vraag 2.1: 4 is **nie** 'n gemene faktor nie.*
*In Vraag 2.2: 4 **is** 'n gemene faktor.*

2.3 $81 - 100a^2$
$= \mathbf{(9 + 10a)(9 - 10a)}$ ◄

2.4 $9p^2 - 36q^2$
$= 9(p^2 - 4q^2)$
$= \mathbf{9(p + 2q)(p - 2q)}$ ◄

2.5 $7x^2 - 28$
$= 7(x^2 - 4)$
$= \mathbf{7(x + 2)(x - 2)}$ ◄

3. Drieterme

3 TERME

Let op hierdie PRODUKTE:

▹ **Volkome Vierkante ➡ Volkome Vierkant DRIETERME**

$(x+3)^2 = (x+3)(x+3) = x^2 \mathbf{+ 3x + 3x} + 9 = x^2 \mathbf{+ 6x} + 9$
& $(x-3)^2 = (x-3)(x-3) = x^2 \mathbf{- 3x - 3x} + 9 = x^2 \mathbf{- 6x} + 9$
$\therefore\ x^2 + 6x + 9 = \mathbf{(x + 3)^2}$
& $x^2 - 6x + 9 = \mathbf{(x - 3)^2}$

$(a+b)^2 = (a+b)(a+b) = a^2 \mathbf{+ ab + ab} + b^2 = a^2 \mathbf{+ 2ab} + b^2$
& $(a-b)^2 = (a-b)(a-b) = a^2 \mathbf{- ab - ab} + b^2 = a^2 \mathbf{- 2ab} + b^2$
$\therefore\ a^2 + 2ab + b^2 = \mathbf{(a + b)^2}$
& $a^2 - 2ab + b^2 = \mathbf{(a - b)^2}$

▹ **Ander produkte ➡ DRIETERME**

$(x + 2)(x + 3) = \mathbf{x^2 + 2x + 3x + 6} = \mathbf{x^2 + 5x + 6}$
$(x - 2)(x - 3) = \mathbf{x^2 - 2x - 3x + 6} = \mathbf{x^2 - 5x + 6}$
$(x + 2)(x - 3) = \mathbf{x^2 + 2x - 3x - 6} = \mathbf{x^2 - x - 6}$
$(x - 2)(x + 3) = \mathbf{x^2 - 2x + 3x - 6} = \mathbf{x^2 + x - 6}$

Kyk na die resultate hierbo om faktorisering van drieterme te verstaan

Toets elke antwoord deur terug te vermenigvuldig (na die begin)

3.1 $a^2 + 8a + 16 = (a + 4)(a + 4) = \mathbf{(a + 4)^2}$ ◄

3.2 $p^2 - 10p + 25 = (p - 5)(p - 5) = \mathbf{(p - 5)^2}$ ◄

3.3 $x^2 + 5x + 6 = \mathbf{(x + 3)(x + 2)}$ ◄ . . . $\begin{array}{cc|c} 1 & +3 & +3 \\ 1 & +2 & +2 \\ \hline & & +5 \end{array}$

3.4 $x^2 - 5x + 6 = \mathbf{(x - 3)(x - 2)}$ ◄ . . . $\begin{array}{cc|c} 1 & -3 & -3 \\ 1 & -2 & -2 \\ \hline & & -5 \end{array}$

3.5 $x^2 + x - 6 = \mathbf{(x + 3)(x - 2)}$ ◄ . . . $\begin{array}{cc|c} 1 & +3 & +3 \\ 1 & -2 & -2 \\ \hline & & +1 \end{array}$

3.6 $x^2 - x - 6 = \mathbf{(x - 3)(x + 2)}$ ◄ . . . $\begin{array}{cc|c} 1 & -3 & -3 \\ 1 & +2 & +2 \\ \hline & & -1 \end{array}$

3.7 $x^2 - 11x + 18 = \mathbf{(x - 9)(x - 2)}$ ◄ . . . $\begin{array}{cc|c} 1 & -9 & -9 \\ 1 & -2 & -2 \\ \hline & & -11 \end{array}$

3.8 $x^2 + 11x + 18 = \mathbf{(x + 9)(x + 2)}$ ◄ . . . $\begin{array}{cc|c} 1 & +9 & +9 \\ 1 & +2 & +2 \\ \hline & & +11 \end{array}$

3.9 $x^2 - 7x - 18 = \mathbf{(x - 9)(x + 2)}$ ◄ . . . $\begin{array}{cc|c} 1 & -9 & -9 \\ 1 & +2 & +2 \\ \hline & & -7 \end{array}$

3.10 $x^2 + 7x - 18 = \mathbf{(x + 9)(x - 2)}$ ◄ . . . $\begin{array}{l} 1 \;\; +9 \\ 1 \;\; -2 \end{array}$ $\begin{array}{r} +9 \\ -2 \\ \hline +7 \end{array}$

3.11 $x^2 + 9x + 18 = \mathbf{(x + 6)(x + 3)}$ ◄ . . . $\begin{array}{l} 1 \;\; +6 \\ 1 \;\; +3 \end{array}$ $\begin{array}{r} +6 \\ +3 \\ \hline +9 \end{array}$

3.12 $x^2 - 9x + 18 = \mathbf{(x - 6)(x - 3)}$ ◄ . . . $\begin{array}{l} 1 \;\; -6 \\ 1 \;\; -3 \end{array}$ $\begin{array}{r} -6 \\ -3 \\ \hline -9 \end{array}$

3.13 $x^2 + 3x - 18 = \mathbf{(x + 6)(x - 3)}$ ◄ . . . $\begin{array}{l} 1 \;\; +6 \\ 1 \;\; -3 \end{array}$ $\begin{array}{r} +6 \\ -3 \\ \hline +3 \end{array}$

3.14 $x^2 - 3x - 18 = \mathbf{(x - 6)(x + 3)}$ ◄ . . . $\begin{array}{l} 1 \;\; -6 \\ 1 \;\; +3 \end{array}$ $\begin{array}{r} -6 \\ +3 \\ \hline -3 \end{array}$

FAKTORISERING

Daar is **3 TIPES** faktorisering:

❶ **Gemene Faktor (GF):** Probeer altyd hierdie eerste!

❷ **Verskil van Vierkante (VvV):** 2 terme

❸ **Drieterme:** 3 terme

HERKEN HIERDIE!

Gemengde Faktorisering

Toets elke antwoord deur terug te vermenigvuldig (na die begin)

4.1 $3a^3 - 9a^2 - 6a$

$= \mathbf{3a(a^2 - 3a - 2)}$ ◄ . . . *let wel: hierdie faktoriseer nie verder nie*

4.2 $2a^2 - 18a + 36$

$= 2(a^2 - 9a + 18)$ $\begin{array}{l} 1 \;\; -6 \\ 1 \;\; -3 \end{array}$ $\begin{array}{r} -6 \\ -3 \\ \hline -9 \end{array}$

$= \mathbf{2(a - 6)(a - 3)}$ ◄

4.3 $4(a + b) - x^2(a + b)$

$= (a + b)(4 - x^2)$ . . . *toets altyd of jy verder kan faktoriseer*

$= \mathbf{(a + b)(2 + x)(2 - x)}$ ◄

4.4 $6x^3(a - b) + x(b - a)$

$= 6x^3(a - b) - x(a - b)$ . . . *omruiling*

$= (a - b)(6x^3 - x)$ . . . *die 'nuwe' faktor kan verder faktoriseer*

$= (a - b) \,.\, x(6x^2 - 1)$

$= \mathbf{x(a - b)(6x^2 - 1)}$ ◄

4.5 $6a^3 - 12a^2 + 18a$

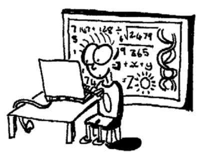
$= \mathbf{6a(a^2 - 2a + 3)}$ ◄ . . . *let wel: hierdie faktoriseer nie verder nie*

Gebruik faktorisering om die volgende breuke te vereenvoudig

5.1 $\dfrac{x^2 - 1}{3x + 3}$ . . . **VvV** . . . **GF**

$= \dfrac{\cancel{(x + 1)}(x - 1)}{3\cancel{(x + 1)}}$

$= \mathbf{\dfrac{x - 1}{3}}$ ◄



5.2 $\dfrac{x^2 - 4x}{x^2 - 2x - 8}$ . . . **GF** . . . **Drieterm** . . . $\begin{array}{l} 1 \;\; -4 \\ 1 \;\; +2 \end{array}$ $\begin{array}{r} -4 \\ +2 \\ \hline -2 \end{array}$

$= \dfrac{x\cancel{(x - 4)}}{\cancel{(x - 4)}(x + 2)}$

$= \mathbf{\dfrac{x}{x + 2}}$ ◄

5.3 $\dfrac{3a - 6b}{4b - 2a}$

$= \dfrac{3(a - 2b)}{2(2b - a)}$ . . . **Gemene Faktore**

$= \dfrac{3\cancel{(a - 2b)}}{-2\cancel{(a - 2b)}}$ . . . *$2b - a$* *$= -(a - 2b)$*

$= -\mathbf{\dfrac{3}{2}}$ ◄

5.4 $\dfrac{2x^2 - 8}{3x - 12} \times \dfrac{x^2 - 4x}{x - 2}$

$= \dfrac{2(x^2 - 4)}{3\cancel{(x - 4)}} \times \dfrac{x\cancel{(x - 4)}}{x - 2}$

$= \dfrac{2(x + 2)\cancel{(x - 2)}}{3\cancel{(x - 2)}}$

$= \mathbf{\dfrac{2(x + 2)}{3}}$ ◄

Moenie afgeskrik word deur hoe hierdie breuke lyk nie!

Fokus net op faktorisering waar moontlik; kanselleer daarna die faktore waar moontlik.

5.5 $\dfrac{x^2 + 2x}{x^3 - 2x} \div \dfrac{x^2 - 4}{x - 2}$

$= \dfrac{x^2 + 2x}{x^3 - 2x} \;\mathbf{x}\; \dfrac{x - 2}{x^2 - 4}$ . . . *let op die 'omgekeerde' breuk!*

$= \dfrac{\cancel{x}\cancel{(x + 2)}}{\cancel{x}(x^2 - 2)} \times \dfrac{\cancel{(x - 2)}}{\cancel{(x + 2)}\cancel{(x - 2)}}$

$= \mathbf{\dfrac{1}{x^2 - 2}}$ ◄

ALGEBRAÏESE VERGELYKINGS
(Lineêr en Kwadraties)

LOGIKA IS DIE SLEUTEL!

1.1 **B** ◄ . . . *As 3 'n wortel is, dan sal $x = 3$ die vergelyking waar maak*

d.w.s. $3^2 + 3 + t = 0$

$\therefore\ 9 + 3 + t = 0$

$\therefore\ t = -12$

1.2 **D** ◄ . . . $2p + 12 = 58$

$\therefore\ 2p = 46$

$\therefore\ p = 23$

OF: $? + 12 = 58$
Antwoord: 46
Dus, $2p = 46$
$\therefore\ 2 \times ? = 46$
$\therefore\ p = 23$

1.3 **B** ◄ . . . ***As*** $(x-1)(x+2) = 0$,

dan is $x - 1 = 0$ ***of*** $x + 2 = 0$

$\therefore\ x = 1$ $\quad\therefore\ x = -2$

1.4 **D** ◄ . . . $\frac{3x}{2} = -6$

$\therefore\ 3x = -12$

$x = -4$

OF: $\frac{?}{2} = -6$
Antwoord: -12
$\therefore\ 3x = -12$
Dus, $3 \times ? = -12$
$\therefore\ x = -4$

1.5 **B** ◄ . . . *Die produk van 'n getal, x, en 6 is gelyk aan* $x \times 6 = 6x$

2.1 $x + 5 = 2$ . . . *'5 meer as 'n getal is 2'*

$\therefore\ \boldsymbol{x = -3}$ ◄

2.2 $x - 3 = -4$ . . . *'3 minder as 'n getal is -4'*

$\therefore\ \boldsymbol{x = -1}$ ◄

2.3 $2x = 12$ . . . *'dubbel 'n getal is 12'*

$\therefore\ \boldsymbol{x = 6}$ ◄

2.4 $\frac{x}{5} = 6$ . . . *''n vyfde van 'n getal is 6'*

$\therefore\ \boldsymbol{x = 30}$ ◄

Toets jou antwoord deur substitusie in die gegewe vergelyking om te sien of dit 'waar' is vir die waarde van x.

3.1 $3x - 1 = 5$

$\therefore\ 3x = 6$

$\therefore\ \boldsymbol{x = 2}$ ◄

[Toets: LK $= 3x - 1 = 3(2) - 1 = 5 =$ **RK** ✓**]**

3.2 $2(x + 1) = 10$

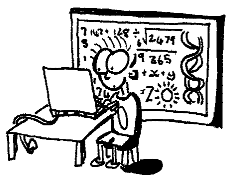
$\therefore\ 2x + 2 = 10$

$\therefore\ 2x = 8$

$\therefore\ \boldsymbol{x = 4}$ ◄

. . . *OF:* $x + 1 = 5$
$\therefore\ x = 4$ ◄

[Toets: LK $= 2(4 + 1) = 2 \times 5 = 10 =$ **RK** ✓**]**



3.3 $8x + 3 = 3x - 22$

$\therefore\ 8x - 3x = -22 - 3$ . . . *Trek $3x$ af & Trek 3 af*

$\therefore\ 5x = -25$

$\therefore\ \boldsymbol{x = -5}$ ◄ . . . $\left(\div 5,\ \ OF\!:\ 5 \times \boldsymbol{?} = -25\right)$

Toets: **LK** $= 8(-5) + 3 = -40 + 3 = -37$
& **RK** $= 3(-5) - 22 = -15 - 22 = -37$
$\therefore$ **LK** $=$ **RK** ✓ $\therefore$ Die antwoord is korrek.
d.w.s. Die vergelyking is 'waar' vir $x = -5$.
Ons sê dat -5 die **wortel** (of oplossing) van die vergelyking is.

3.4 $3(x + 6) = 12$

$\therefore\ 3x + 18 = 12$

$\therefore\ 3x = -6$

$\therefore\ \boldsymbol{x = -2}$ ◄

. . . *OF:* $x + 6 = 4$
$\therefore\ x = -2$ ◄

Toets jou antwoord deur substitusie in die gegewe vergelyking om te sien of dit 'waar' is vir die waarde van x.

3.5 $2x - 5 = 5x + 16$ . . . *Tel 5 by & Trek $5x$ af*

$\therefore\ 2x - 5x = 16 + 5$

$\therefore\ -3x = 21$

$\therefore\ \boldsymbol{x = -7}$ ◄ . . . *Deel deur -3*

Toets jou antwoord deur substitusie in die gegewe vergelyking om te sien of dit 'waar' is vir die waarde van x.

3.6 $x^3 + x^3 = 2$

$\therefore\ 2x^3 = 2$ . . . *GELYKSOORTIGE TERME*

$\therefore\ x^3 = 1$ . . . *deel deur 2*

$\therefore\ \boldsymbol{x = 1}$ ◄ . . . *neem derdemagswortel*

Toets jou antwoord deur substitusie in die gegewe vergelyking om te sien of dit 'waar' is vir die waarde van x.

Vergelykings insluitend breuke

LET WEL: *In* ***UITDRUKKINGS****, die vorige afdeling, het ons* ***nie*** *vermenigvuldig* ***nie****. Ons het die noemer gehou!*

Nou, in ***VERGELYKINGS*** *pas ons logika toe en vermenigvuldig!!! – 'wat ons aan die linkerkant* ***(LK)*** *van die vergelyking doen, doen ons ook aan die regterkant* ***(RK)****'.*

4.1 $\frac{x-2}{4} + \frac{2x+1}{3} = \frac{5}{3}$

LW: Hakies!

x12) $\therefore 3(x-2) + 4(2x+1) = 4(5)$

$\therefore 3x - 6 + 8x + 4 = 20$

$\therefore 11x - 2 = 20$

$\therefore 11x = 22$

$\therefore \mathbf{x = 2}$ ➤

Toets jou antwoord!

Die KGV van die noemers is 12.
Die logika: 12 × die ***LK*** *= 12 × die* ***RK***

4.2 $\frac{x+2}{3} - \frac{x-3}{4} = 0$

LW: Hakies!

x12) $\therefore 4(x+2) - 3(x-3) = 0$

$\therefore 4x + 8 - 3x + 9 = 0$

$\therefore x + 17 = 0$

$\therefore \mathbf{x = -17}$ ➤

Toets jou antwoord!

4.3 $\frac{2x-3}{2} - \frac{x+1}{3} = \frac{3x-1}{2}$

LW: Hakies!

x6) $3(2x-3) - 2(x+1) = 3(3x-1)$

$\therefore 6x - 9 - 2x - 2 = 9x - 3$

$\therefore 4x - 11 = 9x - 3$

$\therefore 4x - 9x = -3 + 11$

$\therefore -5x = 8$

$\therefore \mathbf{x = -\frac{8}{5}}$ ➤

6 keer die ***LK***
= 6 keer die ***RK***

Toets jou antwoord!

4.4 $\frac{x}{1} - \frac{x-1}{2} = \frac{3}{1}$

LW: Hakies!

x2) $\therefore 2x - (x-1) = 2(3)$

$\therefore 2x - x + 1 = 6$

$\therefore x + 1 = 6$

$\therefore \mathbf{x = 5}$ ➤

2 keer die ***LK***
= 2 keer die ***RK***

Toets jou antwoord!

4.5 $\frac{x+1}{3} - \frac{x-1}{6} = \frac{1}{1}$

LW: Hakies!

x6) $\therefore 2(x+1) - (x-1) = 6(1)$

$\therefore 2x + 2 - x + 1 = 6$

$\therefore x + 3 = 6$

$\therefore \mathbf{x = 3}$ ➤

6 keer die ***LK***
= 6 keer die ***RK***

Toets jou antwoord!

Vergelyk die posisie van die = tekens

In Algebraïese Uitdrukkings *(in die vorige afdeling):*
Die ***= tekens*** *is* ***links*** *af*

In Algebraïese Vergelykings *(V4.1 tot 4.5 hierbo):*
Die ***= tekens*** *is in die* ***middel***
en die ***∴ tekens*** *is aan die* ***linkerkant***

Kwadratiese Vergelykings

Die LOGIKA:

As die produk van 2 getalle = 0 is, dan moet óf die een óf die ander getal = 0 wees.

5.1 $(x-3)(x+4) = 0$ ... *die produk van $x-3$ en $x-4$ is gelyk aan 0, dus:*

Óf $x - 3 = 0$ **of** $x + 4 = 0$

$\therefore \mathbf{x = 3}$ ➤ $\therefore \mathbf{x = -4}$ ➤

Toets: **As $x = 3$:**
LK $= (3-3)(3+4) = 0(7) = 0 =$ **RK** ✓

As $x = -4$:
LK $= (-4-3)(-4+4) = (-7)\times 0 = 0 =$ **RK** ✓

∴ Albei antwoorde is korrek

5.2 $x^2 - 5x - 6 = 0$ ... *Faktoriseer die* ***drieterm*** *sodat jy 'n produk het*

$\therefore (x-6)(x+1) = 0$

$\therefore$ **Óf** $x - 6 = 0$ **of** $x + 1 = 0$

$\therefore \mathbf{x = 6}$ ➤ $\mathbf{x = -1}$ ➤

1	−6	−6
1	1	+1
		−5

Toets jou antwoorde!

5.3 $x^2 - 1 = 0$ ... *Faktoriseer!* ***(Verskil van vierkante)***

$\therefore (x+1)(x-1) = 0$

$\therefore$ **Óf** $x + 1 = 0$ **of** $x - 1 = 0$

$\therefore \mathbf{x = -1}$ ➤ $\mathbf{x = 1}$ ➤

OF: $x^2 - 1 = 0$
$x^2 = 1$
$x = \pm 1$

Toets jou antwoorde!

5.4 $x^2 - 2x = 0$ . . . *Faktoriseer!* ***(Gemene Faktor)***

$\therefore\ x(x-2) = 0$

$\therefore$ **Óf** $\boldsymbol{x = 0}$ ◄ **of** $x - 2 = 0$

$\therefore\ \boldsymbol{x = 2}$ ◄

Toets jou antwoorde!

In Vrae 6.1 en 6.2:

$(x-2)^2$
$= (x-2)(x-2)$
$= x^2 \boldsymbol{- 2x - 2x} + 4$
$= x^2 \boldsymbol{- 4x} + 4$

In Vraag 6.3:

$(x+3)^2$
$= (x+3)(x+3)$
$= x^2 \boldsymbol{+ 3x + 3x} + 9$
$= x^2 \boldsymbol{+ 6x} + 9$

Nou, die vergelykings . . .

6.1 $2(x-2)^2 = (2x-1)(x-3)$

$\therefore\ 2(x-2)(x-2) = 2x^2 - 6x - x + 3$

$\therefore\ 2(x^2 - 4x + 4) = 2x^2 - 7x + 3$

$\therefore\ 2x^2 - 8x + 8 = 2x^2 - 7x + 3$

$\therefore\ -8x + 7x = 3 - 8$ . . . *die twee $2x^2$ terme kanselleer mekaar en die vergelyking word* ***lineêr*** *(nie meer* ***kwadraties****) nie.*

$\therefore\ -x = -5$

$\therefore\ \boldsymbol{x = 5}$ ◄

Toets jou antwoord!

6.2 $(x-2)^2 + 3x - 2 = (x+3)^2$

$\therefore\ (x-2)(x-2) + 3x - 2 = (x+3)(x+3)$

$\therefore\ x^2 - 4x + 4 + 3x - 2 = x^2 + 6x + 9$

$\therefore\ -x + 2 = 6x + 9$ . . . *die twee $2x^2$ terme kanselleer mekaar en die vergelyking word* ***lineêr****.*

$\therefore\ -x - 6x = 9 - 2$

$\therefore\ -7x = 7$

$\therefore\ \boldsymbol{x = -1}$ ◄

Toets jou antwoord!

6.3 $(x-3)^2 = 16$

$(x-3)(x-3) = 16$

$\therefore\ x^2 - 6x + 9 - 16 = 0$

$\therefore\ x^2 - 6x - 7 = \boldsymbol{0}$ ⬅ *Onthou die logika? Die produk moet* ***= 0*** *wees!*

$\therefore\ (x-7)(x+1) = 0$ ⬅ *Die* ***drieterm*** *is gefaktoriseer*

Die logika:

$(x-7)$ keer $(x+1)$ is gelyk aan 0, dus is . . . .

Óf $x - 7$ gelyk aan 0 **of** $x + 1$ gelyk aan 0

d.w.s. **Óf** $x - 7 = 0$ **of** $x + 1 = 0$

$\therefore\ \boldsymbol{x = 7}$ ◄ **of** $\boldsymbol{x = -1}$ ◄

Toets jou antwoorde!

Ander . . .

Let Wel:
Die oplossing van vergelykings vereis die ***omkeer van bewerkings***

+ ⟷ -	**x ⟷ ÷**	**magte ⟷ wortels**
$x \boldsymbol{+ 3} = 8$ $\therefore\ x + 3 \boldsymbol{- 3} = 8 \boldsymbol{- 3}$ $\therefore\ x = 5$ ◄	$\boldsymbol{3}x = 12$ $\therefore\ \frac{3x}{\boldsymbol{3}} = \frac{12}{\boldsymbol{3}}$ $\therefore\ x = 4$ ◄	$x^{\boldsymbol{3}} = 8$ Neem $\sqrt[3]{\ }$ aan albei kante $\therefore\ x = 2$ ◄ ***Let Wel:*** $x^{\boldsymbol{2}} = 9$ $\therefore\ x = \boldsymbol{\pm}3$ *As die mag ewe is, dan is daar 2 wortels!*
$x \boldsymbol{- 3} = 8$ $\therefore\ x - 3 \boldsymbol{+ 3} = 8 \boldsymbol{+ 3}$ $\therefore\ x = 11$ ◄	$\frac{x}{\boldsymbol{3}} = 12$ $\therefore\ \frac{x}{3} \boldsymbol{\times 3} = 12 \boldsymbol{\times 3}$ $\therefore\ x = 36$ ◄	$\sqrt{x} = 5$ **Kwadreer** albei kante $(\sqrt{x})^2 = 5^2$ $\therefore\ x = 25$ ◄

TOETS ALTYD YOU ANTWOORD!

Dus, los op vir x:

(a) $\sqrt{x} = 2$

Kwadreer albei kante

$\therefore\ x = 4$ ◄

(b) $\sqrt{\sqrt{x}} = 2$

Kwadreer albei kante

$\therefore\ \sqrt{x} = 4$

Kwadreer albei kante weer

$\therefore\ x = 16$ ◄

Sien nou V7.1

7.1 $\sqrt{\sqrt{\sqrt{x}}} = 2$

Kwadreer albei kante $\therefore \left(\sqrt{\sqrt{\sqrt{x}}}\right)^2 = (2)^2$

$\therefore \sqrt{\sqrt{x}} = 4$

Kwadreer albei kante weer $\therefore \left(\sqrt{\sqrt{x}}\right)^2 = (4)^2$

$\therefore \sqrt{x} = 16$

Kwadreer albei kante weer! $\therefore \left(\sqrt{x}\right)^2 = (16)^2$

$\therefore \boldsymbol{x} = \mathbf{256}$

Toets jou antwoord! 

7.2 $\sqrt{\dfrac{1}{\sqrt{x}}} = 2$

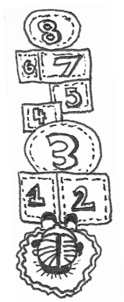
$\therefore \left(\sqrt{\dfrac{1}{\sqrt{x}}}\right)^2 = (2)^2$

$\therefore \dfrac{1}{\sqrt{x}} = 4$

$\therefore \left(\dfrac{1}{\sqrt{x}}\right)^2 = (4)^2$

$\therefore \dfrac{1}{x} = \dfrac{16}{1}$

$\therefore \boldsymbol{x} = \mathbf{\dfrac{1}{16}}$



Toets jou antwoord! 

NOTAS

GRAFIEKE

1.1 **B** ◄ . . . *f(x) = 2x + 4:*

- *positiewe gradiënt van* $\frac{2}{1}$ . . . **2***x*,
- *y-afsnit van 4* . . . *y = 4 wanneer x = 0*

> As 'n punt op 'n lyn lê, dan sal die **vergelyking** van die grafiek **waar** wees vir sy koördinate. *(Sien Vraag 1.2)*

1.2 **D** ◄ . . . *Die vergelyking is y = x, dus sal x en y gelyk moet wees (d.w.s. die koördinate moet dieselfde waarde hê)*

1.3 **B** ◄ . . . $\frac{d}{6} = \frac{2}{3}$ $\therefore$ *d = 4* . . . *ekwivalente breuke*

> **Baie belangrik om te weet:**
>
> Op die **Y-as**, is die ***x***-koördinaat (altyd) **0** *(Sien Vraag 1.4)*
>
> Op die **X-as**, is die **y**-koördinaat (altyd) **0** *(Sien Vraag 1.5)*

1.4 **C** ◄ . . . *Stel x = 0 in; dan is*

$$y\text{-afsnit: } 4(0) + 2y = 12$$
$$\therefore 2y = 12$$
$$\therefore y = 6$$

Dus is die punt op die y-as (0; 6)

1.5 **B** ◄ . . . *Stel y = 0; dan is*

$$x\text{-afsnit: } 3(0) + 2x + 1 = 0$$
$$\therefore 2x = -1$$
$$\therefore x = -\frac{1}{2}$$

$\therefore \left(-\frac{1}{2}; 0\right)$ . . . *die koördinate van die x-afsnit*

2. P is die snypunt van die lyne y = x en y = 3 en dus moet albei hierdie vergelykings by punt P 'waar wees'. Dus moet y gelyk wees aan x en y moet gelyk wees aan 3.

$\therefore$ y = x = 3

$\therefore$ **P(3; 3)** ◄

3.1 y = 3x – 5

x	–2	–1	0	1
y	–11	–8	–5	–2

y = 3(–2) – 5 = –11

y = 3(–1) – 5 = –8

y = 3(0) – 5 = –5

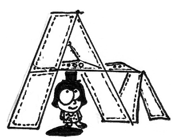
y = 3(1) – 5 = –2

> *Ons vervang die waardes van x in die vergelyking om y te bepaal.*

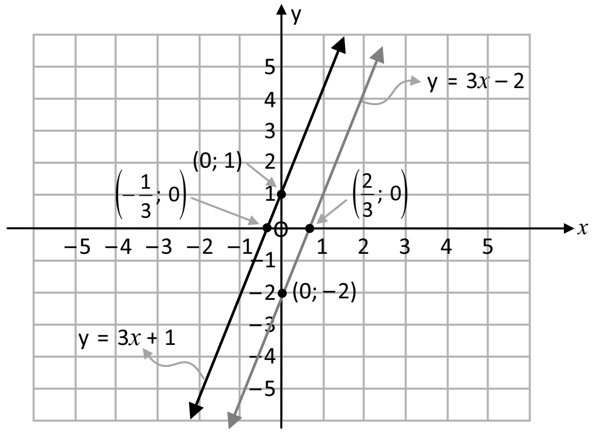
3.2 y = $-\frac{2}{3}x - 1$

x	–3	–1	0	1
y	1	$-\frac{1}{3}$	–1	$-\frac{5}{3}$

$$y = -\frac{2}{3}\left(-\frac{3}{1}\right) - 1 = 2 - 1 = 1$$
$$y = -\frac{2}{3}(-1) - 1 = \frac{2}{3} - 1 = -\frac{1}{3}$$
$$y = -\frac{2}{3}(0) - 1 = -1$$
$$y = -\frac{2}{3}(1) - 1 = -\frac{2}{3} - 1 = -\frac{5}{3}$$



4.1



Om die punte te bepaal waar die grafieke die asse sny:

y = 3*x* – 2: | **y = 3*x* + 1:**

Vir die **Y-afsnit**, stel ***x* = 0** in

$\therefore$ y = 3(0) – 2 = –2

$\therefore$ Die grafiek sny die **y–as** by –2.

Die **punt** is (**0**; 2)

$\therefore$ y = 3(0) + 1 = 1

$\therefore$ Die grafiek sny die **y–as** by 1.

Die **punt** is (**0**; 1)

Vir die **X-afsnit**, stel **y = 0** in

$\therefore$ 0 = 3x – 2

$\therefore$ 3x = 2

$\therefore$ $x = \frac{2}{3}$

$\therefore$ Die grafiek sny die ***x*–as** by $\frac{2}{3}$.

Die **punt** is $\left(\frac{2}{3}; \mathbf{0}\right)$

$\therefore$ 0 = 3x + 1

$\therefore$ 3x = –1

$\therefore$ $x = -\frac{1}{3}$

$\therefore$ Die grafiek sny die ***x*–as** by $-\frac{1}{3}$.

Die **punt** is $\left(-\frac{1}{3}; \mathbf{0}\right)$

4.2 Hulle is parallel ➤ . . . *hulle het gelyke gradiënte*

5.1 **AD:** Die gradiënt $= -\frac{4}{2} = -2$ . . . $\therefore\ m = -2$

& die y-afsnit is 4 . . . $\therefore\ c = 4$

$\therefore$ Die vergelyking is $y = -2x + 4$ ➤ . . . $m = -2$ & $c = 4$ *in* $y = mx + c$

BC: Die gradiënt $= -\frac{4}{2} = -2$ . . . $\therefore\ m = -2$

& die y-afsnit is -4 . . . $\therefore\ c = -4$

$\therefore$ Die vergelyking is $y = -2x - 4$ ➤ . . . $m = -2$ & $c = -4$ *in* $y = mx + c$

> Die standaardvorm van die vergelyking van 'n reguitlyn is $\mathbf{y = m}x\mathbf{ + c}$, waar **m** = die gradiënt en **c** = die y-afsnit.

5.2 Hulle is parallel.
Hulle het albei gradiënte van -2.

> *Albei gradiënte is negatief en word gemeet as* $\frac{\textit{aantal eenhede afwaarts}}{\textit{aantal eenhede dwarsoor}}$
>
> *d.w.s.* $\frac{\textit{vertikale verandering}}{\textit{horisontale verandering}}$

6.1 Die gradiënt $= -\frac{5}{1} = \mathbf{-5}$ ➤

> Deur inspeksie
> - negatiewe gradiënt
> - $\frac{\text{rise}}{\text{run}}$ of $\frac{\text{vertikale verandering}}{\text{horisontale verandering}}$
>
> Dus, **—** en $\frac{\textbf{5 eenhede afwaarts}}{\textbf{1 eenheid dwarsoor}}$

> *Die gebruik van 'n formule vir die gradiënt is nie ideaal vir Graad 9-leerders nie.*

6.2 $\mathbf{y = -5}x\mathbf{ + 5}$ ➤ . . . *gradiënt,* $m = -5$ & *y-afsnit,* $c = 5$

6.3 Die gradiënt van enige ander reguitlyn parallel tot hierdie lyn getrek is -5. ➤ . . . *parallelle lyne het dieselfde gradiënt*

7.1

	A	B	C
x-koördinaat	**0**	2	4
y-koördinaat	-2	**0**	2

> ***Let Wel:*** $\boldsymbol{x = 0}$ *op die* ***y–as*** *(by A)*
> & $\boldsymbol{y = 0}$ *op die* ***x–as*** *(by B)*

7.2 $\mathbf{y = }x\mathbf{ - 2}$ ➤ . . .

> Deur inspeksie:
> Die y-koördinate is almal 2 minder as die x-koördinate.

> **of**: Gradiënt $= +\frac{2}{2} = 1$
> & y–afsnit, $c = -2$

8.1 Die vergelyking van CD: $\boldsymbol{x = 2}$ ➤

. . . *want elke punt op (vertikale) lyn CD het 'n x-koördinaat gelyk aan 2*

$\therefore$ *x = 2 is die* ***vergelyking*** *van CD*

> *Die vergelyking van 'n lyn is 'n 'reël' wat waar is vir alle punte op die lyn.*

8.2 Die vergelyking van AB: $\mathbf{y = 2}\boldsymbol{x}$ ➤

> **Metode 1:**
> Kyk na verskeie punte op die grafiek:
> bv. $(-2; -4)$; $(-1; -2)$; $(1; 2)$
> en let op dat y altyd gelyk is aan twee keer x
>
> **Metode 2:**
> m, die gradiënt $= +\frac{2}{1} = 2$
> & c, die y-afsnit, is 0

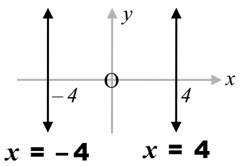
8.3 **E(2; −2)** ➤ . . . *x = 2 en y = −2 by punt E*

8.4 CE = **6 eenhede** ➤ . . . *CE = CD + DE = 4 + 2 = 6 eenhede*

> OF CE $= Y_C - Y_E$ . . . *die verskil van die y-koördinate van C en E.*
> $= 4 - (-2)$
> $= 6$

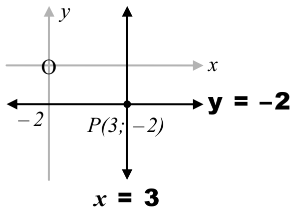
9.1 Die lyne $x = 4$ en $x = -4$ is **parallel aan** mekaar.

. . . *Die lyne* $\boldsymbol{x = 4}$ *en* $\boldsymbol{x = -4}$*:*
is albei parallel aan die y–as



9.2 Die vergelyking van die horisontale lyn deur die punt P(3; –2) is **y = –2**.

. . . *Die horisontale lyn deur P(3; –2) is* $\boldsymbol{y = -2}$*;*
Die vertikale lyn deur P(3; –2) is $\boldsymbol{x = 3}$*;*

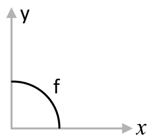


9.3 Die gradiënt van die lyn gedefinieer deur $y - 4x + 5 = 0$ is gelyk aan **4**.

$$\ldots\ y - 4x + 5 = 0$$
$$\therefore\ y = \mathbf{4}x - 5 \qquad \ldots\ y = \mathbf{m}x + c$$

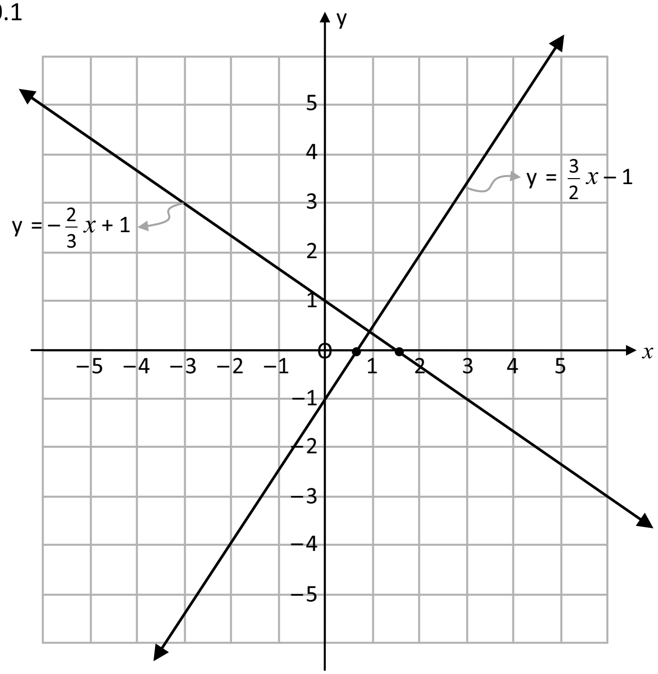
$\therefore$ *Die gradiënt, wat die koëffisiënt van x is, is* **4**

9.4 Die grafiek van f hieronder stel 'n **nie-lineêre** funksie voor.



. . . *'n Lineêre funksie*
is 'n reguitlyn,
nie 'n kurwe nie.

10.1



Om die punte te bepaal waar die grafieke die asse sny :

$$\mathbf{y = -\frac{2}{3}x + 1:} \qquad \mathbf{y = \frac{3}{2}x - 1:}$$

Vir die **Y-afsnit**, stel $\boldsymbol{x = 0}$ in

$y = -\frac{2}{3}x + 1$	$y = \frac{3}{2}x - 1$
$\therefore\ y = -\frac{2}{3}(0) + 1$	$\therefore\ y = \frac{3}{2}(0) - 1$
$= 1$	$= -1$
$\therefore$ Die grafiek sny die **y–as** by 1.	$\therefore$ Die grafiek sny die **y–as** by –1.
Die **punt** is (**0**; 1)	Die **punt** is (**0**; –1)

Vir die **X-afsnit**, stel **y = 0** in

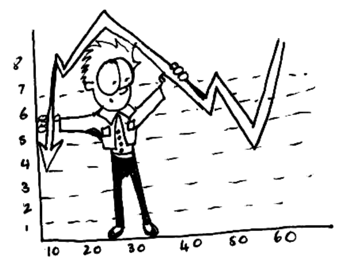
$y = -\frac{2}{3}x + 1$	$y = \frac{3}{2}x - 1$
$\therefore\ 0 = -\frac{2}{3}x + 1$	$\therefore\ 0 = \frac{3}{2}x - 1$
$\therefore\ \frac{2}{3}x = 1$	$\therefore\ \frac{3}{2}x = 1$
$\therefore\ 2x = 3 \quad \ldots \times 3$	$\therefore\ 3x = 2 \quad \ldots \times 2$
$\therefore\ x = \frac{3}{2} \quad \ldots \div 2$	$\therefore\ x = \frac{2}{3} \quad \ldots \div 3$
$\therefore$ Die grafiek sny die ***x*–as** by $\frac{3}{2}$.	$\therefore$ Die grafiek sny die ***x*–as** by $\frac{2}{3}$.
Die **punt** is $\left(\frac{3}{2}; \mathbf{0}\right)$	Die **punt** is $\left(\frac{2}{3}; \mathbf{0}\right)$

10.2 Hulle is loodreg.

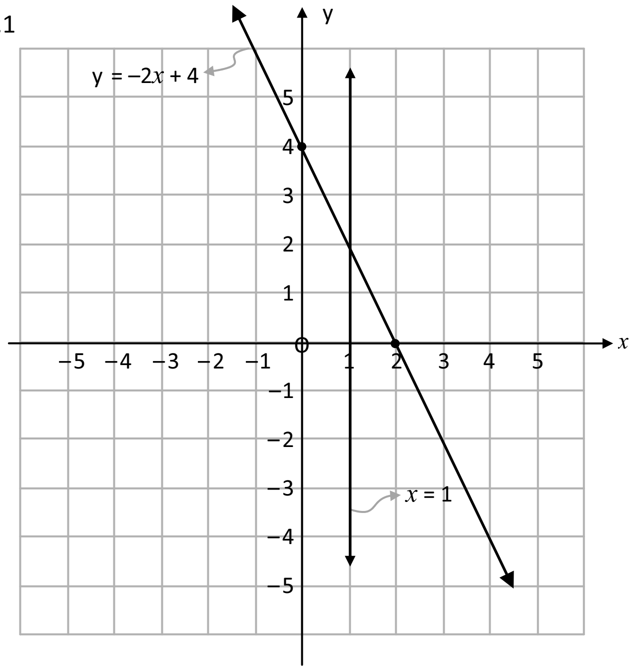
Interessantheidshalwe :

Vergelyk die gradiënte, $-\frac{2}{3}$ en $\frac{3}{2}$.

Hulle is negatiewe inverses van mekaar.



11.1



Om die punte te bepaal waar die grafieke die asse sny:

y = −2x + 4:

y–afsnit (stel **x = 0** in): y = −2(**0**) + 4
= 4

x–afsnit (stel **y = 0** in): **0** = −2x + 4
∴ 2x = 4
∴ x = 2

x = 1: Hierdie grafiek is 'n **vertikale** lyn deur x = 1. Elke punt op die grafiek het 'n x–koordinaat gelyk aan 1.

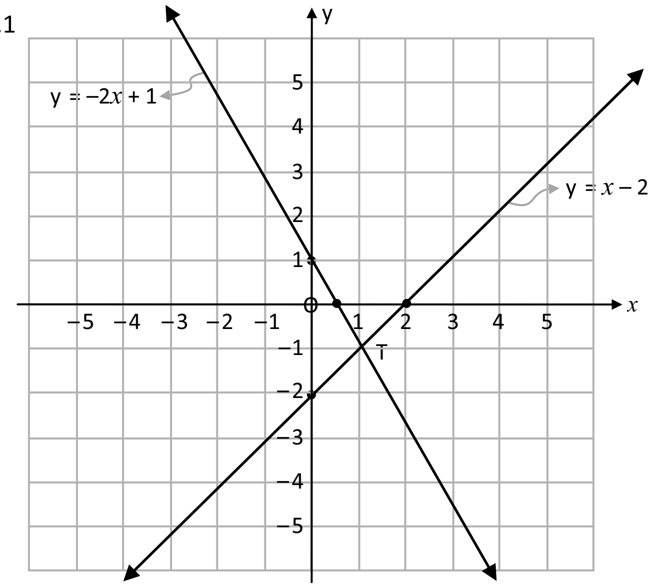
11.2 Die snypunt is (1; 2) ➤

. . . *By hierdie punt, x = 1 en y = –2x + 4 (d.w.s. albei vergelykings is waar)*

∴ y = –2(1) + 4
= 2

∴ Die punt is (1; 2)

12.1



Om die punte te bepaal waar die grafieke die asse sny:

y = −2x + 1:	**y = x − 2:**
Vir die **Y-afsnit**, stel **x = 0** in	
∴ y = −2(0) + 1 = 1	∴ y = (0) − 2 = −2
∴ Die grafiek sny die **y–as** by 1. Die **punt** is (**0**; 1)	∴ Die grafiek sny die **y–as** by −2. Die **punt** is (**0**; −2)
Vir die **X-afsnit**, stel **y = 0** in	
∴ 0 = −2x + 1 ∴ 2x = 1 ∴ x = $\frac{1}{2}$	∴ 0 = x − 2 ∴ x = 2
∴ Die grafiek sny die **x–as** by $\frac{1}{2}$. Die **punt** is $\left(\frac{1}{2}; \mathbf{0}\right)$	∴ Die grafiek sny die **x–as** by 2. Die **punt** is (2; **0**)

12.2 y = −2x + 1 . . . ❶ & y = x − 2 . . . ❷

❶ = ❷ : −2x + 1 = x − 2
∴ −2x − x = −2 − 1
∴ −3x = −3
∴ x = 1

Albei vergelykings moet waar wees by T, die snypunt.

Stel x = 1 in, in ❷ : y = (1) − 2 [OF in ❶ !]
= −1

∴ T(1; −1) ➤

NOTAS