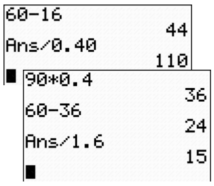
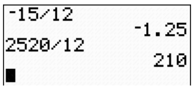
1a Tien broden kosten 16 euro $\Rightarrow$ blijft over voor bolletjes $60-16=44$ euro.
Hij kan nog $\frac{44}{0{,}40}=110$ bolletjes kopen.



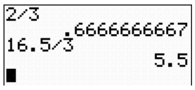
1b 90 bolletjes kosten 36 euro $\Rightarrow$ blijft over voor broden $60-36=24$ euro.
Hij kan nog $\frac{24}{1{,}60}=15$ broden kopen.

1c $1{,}6x+0{,}4y=60$.

2a $15x+12y=2520$
$12y=-15x+2520$
$y=-1\frac{1}{4}x+210$.



2b $3p-2q=16\frac{1}{2}$
$3p=2q+16\frac{1}{2}$
$p=\frac{2}{3}q+5\frac{1}{2}$.



2c $5a-2b=16$
$-2b=-5a+16$
$b=2\frac{1}{2}a-8$.

3a l: $3x-y=6$

x	0	2
y	-6	0

m: $x+y=1$

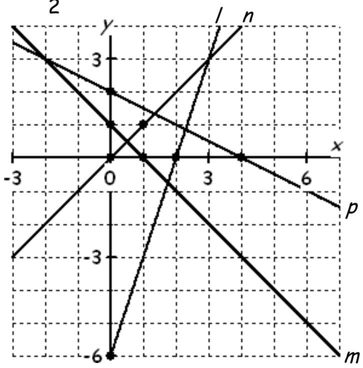
x	0	1
y	1	0

n: $x-y=0$

x	0	1
y	0	1

p: $x+2y=4$

x	0	4
y	2	0



3b l: $3x-y=6$
$-y=-3x+6$
$y=3x-6$
$rc_l=3$.

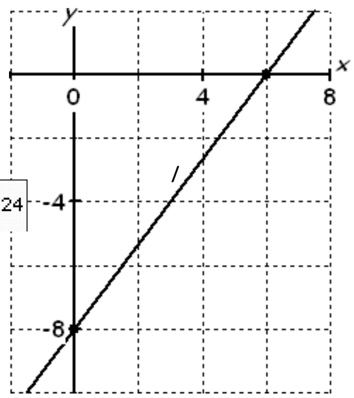
m: $x+y=1$
$y=-x+1$
$rc_m=-1$.

n: $x-y=0$
$-y=-x$
$y=x$
$rc_n=1$.

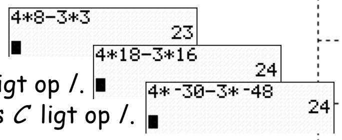
p: $x+2y=4$
$2y=-x+4$
$y=-\frac{1}{2}x+2$
$rc_p=-\frac{1}{2}$.

4a l: $4x-3y=24$
snijden met de x-as ($y=0$)
$4x-0=24\Rightarrow x=6\Rightarrow(6,\ 0)$.

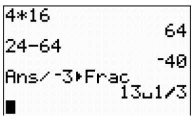
l: $4x-3y=24$
snijden met de y-as ($x=0$)
$-3y=24\Rightarrow y=-8\Rightarrow(0,\ -8)$.



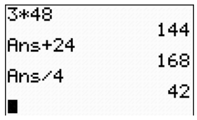
4b $A(8,3)$ invullen in l: $4x-3y=24$ geeft $4\cdot8-3\cdot3=24$.
Klopt niet, dus A ligt niet op l.
$B(18,16)$ invullen geeft $4\cdot18-3\cdot16=24$. Klopt, dus B ligt op l.
$C(-30,\ -48)$ invullen $\Rightarrow 4\cdot-30-3\cdot-48=24$. Klopt, dus C ligt op l.



4c $(16,p)$ invullen geeft
$4\cdot16-3\cdot p=24$
$64-3p=24$
$-3p=-40$
$p=\frac{40}{3}=13\frac{1}{3}$.



4d $(q,48)$ invullen geeft
$4\cdot q-3\cdot48=24$
$4q-144=24$
$4q=168$
$q=42$.



5a l: $3x-4y=7$
$-4y=-3x+7$
$y=\frac{3}{4}x-\frac{7}{4}$
$rc_l=\frac{3}{4}$.

m: $3x-4y=-8$
$-4y=-3x-8$
$y=\frac{3}{4}x+2$
$rc_m=\frac{3}{4}$.

5c $A(5,1)$ invullen in
$3x-4y=c$ geeft
$3\cdot5-4\cdot1=c$
$15-4=c$
$c=11$.

5d $B(3,\ -1)$ invullen in
$3x-4y=c$ geeft
$3\cdot3-4\cdot-1=c$
$9+4=c$
$c=13$.
k: $3x-4y=13$.

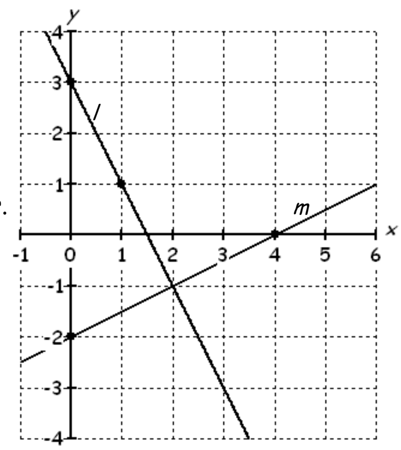
5b Ze hebben dezelfde richtingscoëfficiënt, namelijk $\frac{3}{4}$.

6 $A(5,8)$ invullen in $2x+y=c$ geeft $2\cdot5+8=c\Rightarrow18=c$. Dus m: $2x+y=18$.

7 $12x+4y=242{,}4$.

8 Stel x kaartjes van 10 euro en y kaartjes van 15 euro.
Dan geldt: $10x+15y=4300$.

9 50 munten van 1 euro heeft een waarde van 50 euro $\Rightarrow$ het is 37 euro meer.
Hij heeft dus 37 munten van 2 euro en $50-37=13$ munten van 1 euro.



10a De lijn l: $2x+y=3$ gaat door $(0,3)$ en $(1,1)$ (zie de grafiek hiernaast)
en de lijn m: $x-2y=4$ gaat door $(4,0)$ en $(0,\ -2)$ (zie hiernaast).

10b Het snijpunt van l en m is $(2,\ -1)$.

10c $(2,\ -1)$ is zowel oplossing van $2x+y=3$ als van $x-2y=4$.

11a $\begin{cases} 5x - 4y = -8 & \textbf{(1)} \\ -x + 4y = -12 & \textbf{(2)} \end{cases}$ +

$4x = -20 \Rightarrow x = -5$ in **(2)** $\Rightarrow 5 + 4y = -12 \Rightarrow 4y = -17 \Rightarrow y = -\frac{17}{4}$. De oplossing is $(-5,\ -4\frac{1}{4})$.

11b $\begin{cases} -2x + y = 7 & \textbf{(1)} \\ -2x + 3y = -1 & \textbf{(2)} \end{cases}$ −

$-2y = 8 \Rightarrow y = -4$ in **(1)** $\Rightarrow -2x - 4 = 7 \Rightarrow -2x = 11 \Rightarrow x = -5\frac{1}{2}$. De oplossing is $(-5\frac{1}{2},\ -4)$.

11c $\begin{cases} -x - 3y = -8 & \textbf{(1)} \\ -2x + 3y = -1 & \textbf{(2)} \end{cases}$ +

$-3x = -9 \Rightarrow x = 3$ in **(2)** $\Rightarrow -6 + 3y = -1 \Rightarrow 3y = 5 \Rightarrow y = \frac{5}{3}$. De oplossing is $(3, 1\frac{2}{3})$.

12a $\begin{cases} 3x - 4y = 7 & \textbf{(1)} \\ 2x + 3y = 16 & \textbf{(2)} \end{cases}$ +

$5x - y = 23$

Geen variabele is geëlimineerd (uitgestoten).

12b $\begin{cases} 3x - 4y = 7 & \textbf{(1)} \\ 2x + 3y = 16 & \textbf{(2)} \end{cases}$ −

$x - 7y = 23$

Geen variabele is geëlimineerd (uitgestoten).

13a $\begin{cases} 3x + 5y = -7 & \textbf{(1)} \\ 2x + y = 0 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 1 \\ \times 5 \end{vmatrix} \Rightarrow \begin{cases} 3x + 5y = -7 & \textbf{(1)} \\ 10x + 5y = 0 & \textbf{(3)} \end{cases}$ −

$-7x = -7 \Rightarrow x = 1$ in **(2)** $\Rightarrow 2 + y = 0 \Rightarrow y = -2$. De oplossing is $(1,\ -2)$.

13b $\begin{cases} 2x - 4y = 6 & \textbf{(1)} \\ 3x - y = 19 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 1 \\ \times 4 \end{vmatrix} \Rightarrow \begin{cases} 2x - 4y = 6 & \textbf{(1)} \\ 12x - 4y = 76 & \textbf{(3)} \end{cases}$ −

$-10x = -70 \Rightarrow x = 7$ in **(2)** $\Rightarrow 21 - y = 19 \Rightarrow y = 2$. De oplossing is $(7, 2)$.

13c $\begin{cases} 4x + y = 13 & \textbf{(1)} \\ x - 2y = 1 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 2 \\ \times 1 \end{vmatrix} \Rightarrow \begin{cases} 8x + 2y = 26 & \textbf{(3)} \\ x - 2y = 1 & \textbf{(2)} \end{cases}$ +

$9x = 27 \Rightarrow x = 3$ in **(1)** $\Rightarrow 12 + y = 13 \Rightarrow y = 1$. De oplossing is $(3, 1)$.

14a $\begin{cases} 5x + 2y = 69 & \textbf{(1)} \\ x + 3y = -7 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 1 \\ \times 5 \end{vmatrix} \Rightarrow \begin{cases} 5x + 2y = 69 & \textbf{(1)} \\ 5x + 15y = -35 & \textbf{(3)} \end{cases}$ −

$-13y = 104 \Rightarrow y = -8$ in **(2)** $\Rightarrow x - 24 = -7 \Rightarrow x = 17$. De oplossing is $(17,\ -8)$.

14b $\begin{cases} 2x - 5y = -19 & \textbf{(1)} \\ 5x + 4y = 35 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 5 \\ \times 2 \end{vmatrix} \Rightarrow \begin{cases} 10x - 25y = -95 & \textbf{(3)} \\ 10x + 8y = 70 & \textbf{(4)} \end{cases}$ −

$-33y = -165 \Rightarrow y = 5$ in **(2)** $\Rightarrow 5x + 20 = 35 \Rightarrow 5x = 15 \Rightarrow x = 3$. De oplossing is $(3, 5)$.

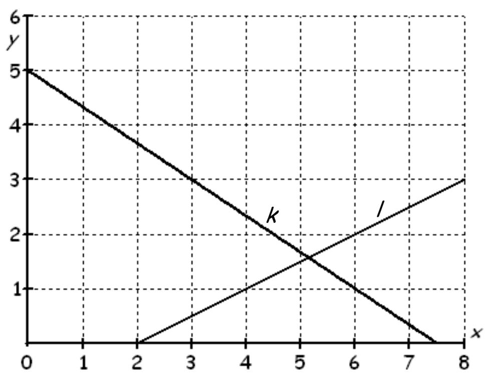
14c $\begin{cases} 0{,}8x + 0{,}2y = 1 & \textbf{(1)} \\ 0{,}3x - 0{,}3y = 1{,}5 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 5 \\ :0{,}3 \end{vmatrix} \Rightarrow \begin{cases} 4x + y = 5 & \textbf{(3)} \\ x - y = 5 & \textbf{(4)} \end{cases}$ +

$5x = 10 \Rightarrow x = 2$ in **(4)** $\Rightarrow 2 - y = 5 \Rightarrow -y = 3 \Rightarrow y = -3$. De oplossing is $(2,\ -3)$.

15a k: $2x + 3y = 15$ $\quad l$: $x - 2y = 1$ (zie de lijnen in de figuur hiernaast)

x	0	3
y	5	3

x	3	1
y	1	0



15b $\begin{cases} 2x + 3y = 15 & \textbf{(1)} \\ x - 2y = 1 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 1 \\ \times 2 \end{vmatrix} \Rightarrow \begin{cases} 2x + 3y = 15 & \textbf{(1)} \\ 2x - 4y = 2 & \textbf{(3)} \end{cases}$ −

$7y = 13 \Rightarrow$

$y = \frac{13}{7}$ in **(2)** $x - \frac{26}{7} = 1 \Rightarrow x = \frac{33}{7}$. Het snijpunt is $(\frac{33}{7}, \frac{13}{7})$.

16 $\begin{cases} 3x - 2y = -12 & \textbf{(1)} \\ x + 4y = 38 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 2 \\ \times 1 \end{vmatrix} \Rightarrow \begin{cases} 6x - 4y = -24 & \textbf{(3)} \\ x + 4y = 38 & \textbf{(2)} \end{cases}$ +

$7x = 14 \Rightarrow x = 2$ in **(2)** $\Rightarrow 2 + 4y = 38 \Rightarrow 4y = 36 \Rightarrow y = 9$. Het snijpunt is $(2, 9)$.

17 $\begin{cases} 2x + 3y = 12 & \textbf{(1)} \\ -4x + y = -10 & \textbf{(2)} \end{cases} \begin{vmatrix} \times 2 \\ \times 1 \end{vmatrix} \Rightarrow \begin{cases} 4x + 6y = 24 & \textbf{(3)} \\ -4x + y = -10 & \textbf{(2)} \end{cases}$ +

$7y = 14 \Rightarrow y = 2$ in **(1)** $\Rightarrow 2x + 6 = 12 \Rightarrow 2x = 6 \Rightarrow x = 3$. Het snijpunt is $(3, 2)$.

18a $\begin{cases} 2x+2y=9 & \textbf{(1)} \\ y=4x-3 & \textbf{(2)} \end{cases}$ **(2)** in **(1)** geeft $2x+2(4x-3)=9 \Rightarrow 2x+8x-6=9 \Rightarrow 10x=15 \Rightarrow$
$x=1\frac{1}{2}$ in **(2)** $\Rightarrow y=4\cdot 1\frac{1}{2}-3=6-3=3$. De oplossing is $(1\frac{1}{2},3)$.

18b $\begin{cases} y=\frac{1}{2}x+1 & \textbf{(1)} \\ 3x+6y=8 & \textbf{(2)} \end{cases}$ **(1)** in **(2)** geeft $3x+6(\frac{1}{2}x+1)=8 \Rightarrow 3x+3x+6=8 \Rightarrow 6x=2 \Rightarrow$
$x=\frac{2}{6}=\frac{1}{3}$ in **(1)** $\Rightarrow y=\frac{1}{2}\cdot\frac{1}{3}+1=\frac{7}{6}$. De oplossing is $(\frac{1}{3},\frac{7}{6})$.

18c $\begin{cases} x=5y-3 & \textbf{(1)} \\ 3x+4y=29 & \textbf{(2)} \end{cases}$ **(1)** in **(2)** geeft $3(5y-3)+4y=29 \Rightarrow 15y-9+4y=29 \Rightarrow 19y=38 \Rightarrow$
$y=2$ in **(1)** $\Rightarrow x=5\cdot 2-3=7$. De oplossing is $(7,2)$.

19a $(3,8)$ invullen bij k: $y=5x-7$ geeft $8=5\cdot 3-7$. Dit klopt dus ligt $(3,8)$ op k.

19b $(2,6)$ invullen bij l: $y=ax+b$ geeft $6=a\cdot 2+b \Rightarrow 6=2a+b$ ofwel $2a+b=6$.

19c $(-1,4)$ invullen bij l: $y=ax+b$ geeft $4=a\cdot -1+b \Rightarrow 4=-a+b$ ofwel $-a+b=4$.

20 $(1,8)$ invullen bij $y=ax^2+c$ geeft $8=a\cdot 1^2+c \Rightarrow 8=a+c$ ofwel $a+c=8$.
$(2,17)$ invullen bij $y=ax^2+c$ geeft $17=a\cdot 2^2+c \Rightarrow 17=4a+c$ ofwel $4a+c=17$.
$\begin{cases} a+c=8 & \textbf{(1)} \\ \underline{4a+c=17} \; - & \textbf{(2)} \end{cases}$
$-3a=-9 \Rightarrow a=3$ in **(1)** $\Rightarrow 3+c=8 \Rightarrow c=5$. Dus $a=3$ en $c=5$.

21 $(2,8)$ invullen bij k: $y=ax+b$ geeft $8=a\cdot 2+b \Rightarrow 8=2a+b$ ofwel $2a+b=8$.
$(2,8)$ invullen bij l: $y=bx+a$ geeft $8=b\cdot 2+a \Rightarrow 8=2b+a$ ofwel $a+2b=8$.
$\begin{cases} 2a+b=8 & \textbf{(1)} & \times 1 \\ a+2b=8 & \textbf{(2)} & \times 2 \end{cases} \Rightarrow \begin{cases} 2a+b=8 & \textbf{(1)} \\ \underline{2a+4b=16} \; - & \textbf{(3)} \end{cases}$
$-3b=-8 \Rightarrow b=\frac{8}{3}=2\frac{2}{3}$ in **(2)** $\Rightarrow a+5\frac{1}{3}=8 \Rightarrow a=2\frac{2}{3}$. Dus $a=2\frac{2}{3}$ en $b=2\frac{2}{3}$.

22a $(2,-1)$ invullen bij $y=x^2+px+q$ geeft $-1=2^2+p\cdot 2+q \Rightarrow -1=4+2p+q$ ofwel $2p+q=-5$.
$(2,-1)$ invullen bij $y=2px-q$ geeft $-1=2p\cdot 2-q \Rightarrow -1=4p-q$ ofwel $4p-q=-1$.
$\begin{cases} 2p+q=-5 & \textbf{(1)} \\ \underline{4p-q=-1} \; + & \textbf{(2)} \end{cases}$
$6p=-6 \Rightarrow p=-1$ in **(1)** $\Rightarrow -2+q=-5 \Rightarrow q=-3$. Dus $p=-1$ en $q=-3$.

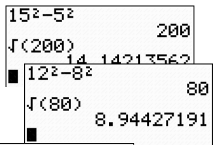
22b $y=x^2-1x-3$ snijden met $y=-2x+3$ geeft
$x^2-x-3=-2x+3 \Rightarrow x^2+x-6=0 \Rightarrow (x+3)(x-2)=0 \Rightarrow x=-3 \vee x=2$ (hoort bij het gegeven snijpunt).
$x=-3$ in $y=-2x+3 \Rightarrow y=-2\cdot -3+3=6+3=9$. Het andere snijpunt is $(-3,9)$.

23 $(-2,-10)$ invullen bij $y=ax^2+bx+c$ geeft $-10=a\cdot(-2)^2+b\cdot -2+c \Rightarrow -10=4a-2b+c$ **(1)**
$(0,4)$ invullen bij $y=ax^2+bx+c$ geeft $4=a\cdot 0^2+b\cdot 0+c \Rightarrow 4=c$ **(2)** nu invullen **(1)** in **(3)**
$(3,-5)$ invullen bij $y=ax^2+bx+c$ geeft $-5=a\cdot 3^2+b\cdot 3+c \Rightarrow -5=9a+3b+c$ **(3)**
$c=4$ invullen in **(1)** geeft $-10=4a-2b+4 \Rightarrow -14=4a-2b$ ofwel $2a-b=-7$ **(4)**
$c=4$ invullen in **(3)** geeft $-5=9a+3b+4 \Rightarrow -9=9a+3b$ ofwel $3a+b=-3$ **(5)**
$\begin{cases} 2a-b=-7 & \textbf{(4)} \\ \underline{3a+b=-3} \; + & \textbf{(5)} \end{cases}$
$5a=-10 \Rightarrow a=-2$ in **(5)** $\Rightarrow -6+b=-3 \Rightarrow b=3$. Dus $a=-2$, $b=3$ en $c=4$.

24a *

24b $AP=5 \Rightarrow AP+PD=5+PD=20 \Rightarrow PD=15$ en $AD=\sqrt{15^2-5^2}=\sqrt{225-25}=\sqrt{200}\approx 14{,}1$ cm.

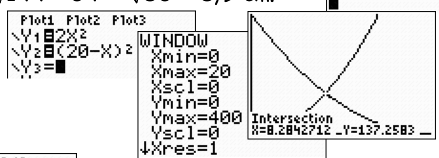
24c $AP=8 \Rightarrow AP+PD=8+PD=20 \Rightarrow PD=12$ en $AD=\sqrt{12^2-8^2}=\sqrt{144-64}=\sqrt{80}\approx 8{,}9$ cm.



24d $AP=x \Rightarrow AP+PD=x+PD=20 \Rightarrow PD=20-x$ en $AD=AP=x$.

24e Pythagoras in ΔAPD: $AP^2+AD^2=PD^2 \Rightarrow x^2+x^2=(20-x)^2$.

24fg $2x^2=(20-x)^2$ intersect $\Rightarrow x\approx 8{,}3$ cm.

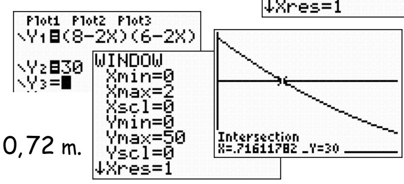


25a $AB=8=x+PQ+x \Rightarrow 8=2x+PQ \Rightarrow PQ=8-2x$.

25b $AD=6=x+PS+x \Rightarrow 6=2x+PS \Rightarrow PS=6-2x$.

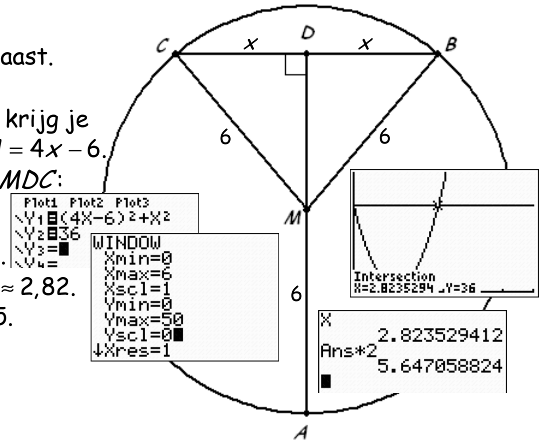
25c $O(PQRS)=PQ\cdot PS=(8-2x)(6-2x)$.

25d $O(PQRS)=30 \Rightarrow (8-2x)(6-2x)=30$ intersect $\Rightarrow x\approx 0{,}72$ m.

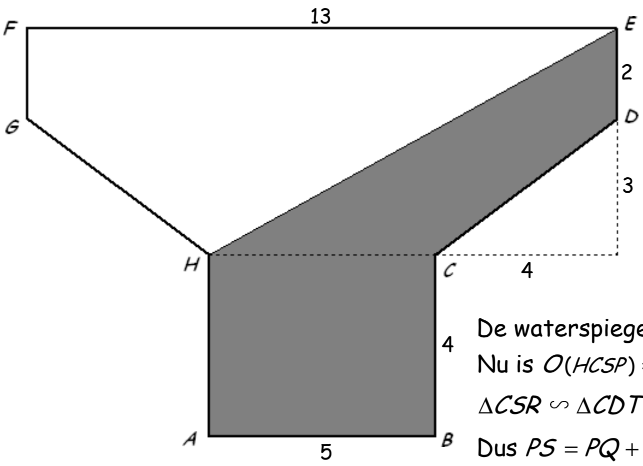


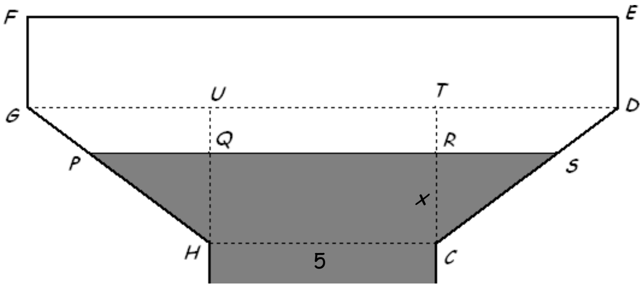
26 Stel $AP = x \Rightarrow AS = PB = 7 - x$.
$O(PQRS) = 25 = 5^2 \Rightarrow$ zijde $PS = 5$.
Nu Pythagoras in ΔAPS:
$AP^2 + AS^2 = PS^2$
$x^2 + (7 - x)^2 = 5^2$
$x^2 + 49 - 14x + x^2 = 25$
$2x^2 - 14x + 24 = 0$
$x^2 - 7x + 12 = 0$
$(x - 4)(x - 3) = 0$
$x = AP = 3 \vee x = AP = 4$.

27 Zie de figuur hiernaast.
Stel $CD = BD = x$.
Omdat $AD = 2 \cdot BC$ krijg je
$6 + DM = 4x \Rightarrow DM = 4x - 6$.
Nu Pythagoras in ΔMDC:
$DM^2 + DC^2 = CM^2$
$(4x - 6)^2 + x^2 = 6^2$.
Intersect geeft $x \approx 2{,}82$.
Dus $BC = 2x \approx 5{,}65$.



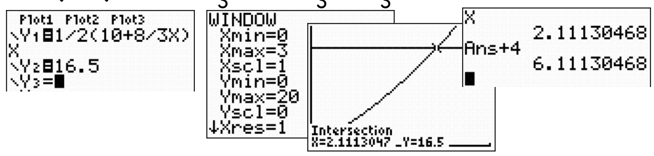
28 $O(ABCDEH) = 5 \cdot 4 + \frac{1}{2} \cdot 9 \cdot 5 - \frac{1}{2} \cdot 4 \cdot 3 = 20 + 22\frac{1}{2} - 6 = 36\frac{1}{2}$.





De waterspiegel na het rechtop zetten van de bak is PS (zie hierboven).
Nu is $O(HCSP) = 36\frac{1}{2} - O(ABCH) = 36\frac{1}{2} - 5 \cdot 4 = 36\frac{1}{2} - 20 = 16\frac{1}{2}$. Stel $CR = x$.
$\Delta CSR \backsim \Delta CDT$ (snavelfiguur) $\Rightarrow \frac{CR}{CT} = \frac{RS}{TD} \Rightarrow \frac{x}{3} = \frac{RS}{4} \Rightarrow 3RS = 4x \Rightarrow RS = \frac{4}{3}x$.
Dus $PS = PQ + QR + RS = \frac{4}{3}x + 5 + \frac{4}{3}x = \frac{8}{3}x + 5$.

$O(HCSP) = \frac{1}{2}(HC + PS) \cdot CR = \frac{1}{2}(5 + \frac{8}{3}x + 5) \cdot x$.
$O(HCSP) = 16\frac{1}{2}$ met intersect geeft $x \approx 2{,}111$.
Dus het water staat $4 + x \approx 6{,}1$ dm hoog.

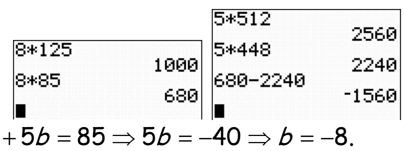


29a $x = 20$ geeft $h = 0 \Rightarrow 0 = a \cdot 20^2 + b \cdot 20$ ofwel $400a + 20b = 0$.

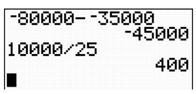
29b $x = 10$ geeft $h = 8 \Rightarrow 8 = a \cdot 10^2 + b \cdot 10$ ofwel $100a + 10b = 8$.

29c $\begin{cases} 400a + 20b = 0 \ \textbf{(1)} & \times 1 \\ 100a + 10b = 8 \ \textbf{(2)} & \times 2 \end{cases} \Rightarrow \begin{cases} 400a + 20b = 0 & \textbf{(1)} \\ \underline{200a + 20b = 16} \ - & \textbf{(3)} \end{cases}$
$200a = -16 \Rightarrow a = -\frac{16}{200} = -\frac{8}{100} = -0{,}08$ in **(2)**
$100 \cdot -0{,}08 + 10b = 8 \Rightarrow -8 + 10b = 8 \Rightarrow 10b = 16 \Rightarrow b = 1{,}6$. Dus $a = -0{,}08$ en $b = 1{,}6$.

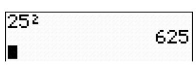
30 $t = 5$ geeft $N = 285 \Rightarrow 285 = a \cdot 5^3 + b \cdot 5 + 200$ ofwel $125a + 5b = 85$.
$t = 8$ geeft $N = 648 \Rightarrow 648 = a \cdot 8^3 + b \cdot 8 + 200$ ofwel $512a + 8b = 448$.
$\begin{cases} 125a + 5b = 85 \ \textbf{(1)} & \times 8 \\ 512a + 8b = 448 \ \textbf{(2)} & \times 5 \end{cases} \Rightarrow \begin{cases} 1000a + 40b = 680 & \textbf{(3)} \\ \underline{2560a + 40b = 2240} \ - & \textbf{(4)} \end{cases}$
$-1560a = -1560 \Rightarrow a = 1$ in **(1)** $\Rightarrow 125 + 5b = 85 \Rightarrow 5b = -40 \Rightarrow b = -8$.



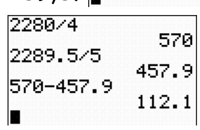
31 $T = 2{,}5$ geeft $A = 40\,000 \Rightarrow 40\,000 = a \cdot 2{,}5^2 + b \cdot 2{,}5 + 60\,000$ ofwel $6{,}25a + 2{,}5b = -20\,000$.
$T = 5$ geeft $A = 25\,000 \Rightarrow 25\,000 = a \cdot 5^2 + b \cdot 5 + 60\,000$ ofwel $25a + 5b = -35\,000$.
$\begin{cases} 6{,}25a + 2{,}5b = -20\,000 \ \textbf{(1)} & \times 4 \\ 25a + 5b = -35\,000 \ \textbf{(2)} & \times 1 \end{cases} \Rightarrow \begin{cases} 25a + 10b = -80\,000 & \textbf{(3)} \\ \underline{25a + 5b = -35\,000} \ - & \textbf{(2)} \end{cases}$
$5b = -45\,000 \Rightarrow b = -9\,000$ in **(2)**
$25a - 45\,000 = -35\,000 \Rightarrow 25a = 10\,000 \Rightarrow a = 400$.

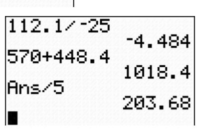


32 $t = 20$ geeft $P = 80 \Rightarrow 80 = a \cdot 20^2 + b \cdot 20 - 2\,200$ ofwel $400a + 20b = 2\,280$.
$t = 25$ geeft $P = 89{,}5 \Rightarrow 89{,}5 = a \cdot 25^2 + b \cdot 25 - 2\,200$ ofwel $625a + 25b = 2\,289{,}5$.



$\begin{cases} 400a + 20b = 2\,280 \ \textbf{(1)} & :4 \\ 625a + 25b = 2\,289{,}5 \ \textbf{(2)} & :5 \end{cases} \Rightarrow \begin{cases} 100a + 5b = 570 & \textbf{(3)} \\ \underline{125a + 5b = 457{,}9} \ - & \textbf{(4)} \end{cases}$
$-25a = 112{,}1 \Rightarrow a = -4{,}484$ in **(3)**
$-448{,}4 + 5b = 570 \Rightarrow 5b = 1018{,}4 \Rightarrow b = 203{,}68$.





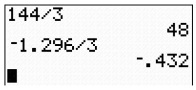
33 $n = 20$ geeft $E = 7{,}2 \Rightarrow 7{,}2 = a \cdot 20^2 + b \cdot 20$ ofwel $400a + 20b = 7{,}2$.
$n = 30$ geeft $E = 9{,}0 \Rightarrow 9{,}0 = a \cdot 30^2 + b \cdot 30$ ofwel $900a + 30b = 9{,}0$.

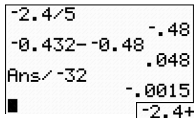
$$\begin{cases} 400a + 20b = 7{,}2 \ \textbf{(1)} \\ 900a + 30b = 9{,}0 \ \textbf{(2)} \end{cases} \begin{vmatrix} :2 \\ :3 \end{vmatrix} \Rightarrow \begin{cases} 200a + 10b = 3{,}6 \ \textbf{(3)} \\ \underline{300a + 10b = 3{,}0} \ \_ \ \textbf{(4)} \end{cases}$$

$$-100a \qquad = 0{,}6 \Rightarrow a = -0{,}006 \text{ in } \textbf{(3)} \Rightarrow -1{,}2 + 10b = 3{,}6 \Rightarrow 10b = 4{,}8 \Rightarrow b = 0{,}48.$$

34a $h = 1$ voor $x = 12$ betekent "de bal raakt het net" $\Rightarrow$ "netbal" (de opslag telt niet). Dus er moet gelden $h > 1$ voor $x = 12$.
$h = 0$ voor $x = 21$ betekent "de bal op de lijn" (de opslag telt nog net). Dus er moet gelden $h = 0$ voor $(12 <) x \le 21$.

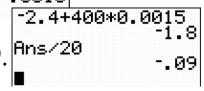
34b $h = 1{,}104$ geeft $x = 12 \Rightarrow 1{,}104 = a \cdot 12^2 + b \cdot 12 + 2{,}4$ ofwel $144a + 12b = -1{,}296$.
$h = 0$ geeft $x = 20 \Rightarrow 0 = a \cdot 20^2 + b \cdot 20 + 2{,}4$ ofwel $400a + 20b = -2{,}4$.





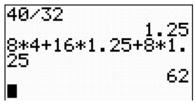
$$\begin{cases} 144a + 12b = -1{,}296 \ \textbf{(1)} \\ 400a + 20b = -2{,}4 \ \ \textbf{(2)} \end{cases} \begin{vmatrix} :3 \\ :5 \end{vmatrix} \Rightarrow \begin{cases} 48a + 4b = -0{,}432 \ \textbf{(3)} \\ \underline{80a + 4b = -0{,}48} \ \_ \ \textbf{(4)} \end{cases}$$

$$-32a \qquad = \ 0{,}048 \Rightarrow a = -0{,}0015 \text{ in } \textbf{(2)} \Rightarrow 20b = -1{,}8 \Rightarrow b = -0{,}09.$$



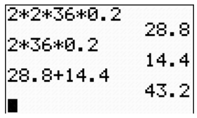
35a $I = 2x \cdot x \cdot h$ (met $x = 2$) $= 4 \cdot 2 \cdot h = 8h = 40 \Rightarrow h = \frac{40}{8} = 5$.
$M = 2x \cdot x + 2 \cdot 2x \cdot h + 2 \cdot x \cdot h$ (met $x = 2$ en $h = 5$) $= 4 \cdot 2 + 2 \cdot 4 \cdot 5 + 2 \cdot 2 \cdot 5 = 8 + 40 + 20 = 68$.

35b $I = 2x \cdot x \cdot h$ (met $x = 4$) $= 8 \cdot 4 \cdot h = 32h = 40 \Rightarrow h = \frac{40}{32} = 1{,}25$.
$M = 2x \cdot x + 2 \cdot 2x \cdot h + 2 \cdot x \cdot h$ (met $x = 4$ en $h = 2{,}5$) $= 8 \cdot 4 + 2 \cdot 8 \cdot 1{,}25 + 2 \cdot 4 \cdot 1{,}25 = 32 + 20 + 10 = 62$.



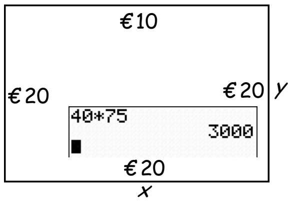
35c $M = 2x \cdot x + 2 \cdot 2x \cdot h + 2 \cdot x \cdot h = 2x^2 + 4xh + 2xh = 2x^2 + 6xh$.

36 $I = 2x \cdot x \cdot h = 2x^2 h = 72 \Rightarrow h = \frac{72}{2x^2} = \frac{36}{x^2}$.
$K = 2x \cdot x \cdot 0{,}4 + 2 \cdot 2x \cdot \frac{36}{x^2} \cdot 0{,}2 + 2 \cdot x \cdot \frac{36}{x^2} \cdot 0{,}2 = 0{,}8x^2 + \frac{28{,}8}{x} + \frac{14{,}4}{x} = 0{,}8x^2 + \frac{43{,}2}{x}$.

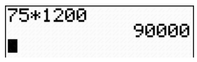


37 $I = x \cdot x \cdot h = x^2 h = 16 \Rightarrow h = \frac{16}{x^2}$. Dus $O = x \cdot x + 4 \cdot x \cdot h = x \cdot x + 4 \cdot x \cdot \frac{16}{x^2} = x^2 + \frac{64}{x}$.

38 Stel de zijden waarvan de kosten 10 euro per meter bedragen x.
$O = x \cdot y = 75 \Rightarrow y = \frac{75}{x}$. Dus $K = 2 \cdot y \cdot 20 + x \cdot 10 + x \cdot 20 = 40 \cdot \frac{75}{x} + 30x = 30x + \frac{3000}{x}$.



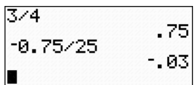
39 $O = x \cdot y = 1200 \Rightarrow y = \frac{1200}{x}$. Dus $K = y \cdot 60 + y \cdot 15 + x \cdot 15 = 15x + 75 \cdot \frac{1200}{x} = 15x + \frac{90000}{x}$.

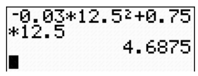


40 $I = \pi r^2 h = 100 \Rightarrow h = \frac{100}{\pi r^2}$. Dus $O = \pi r^2 + \pi r^2 + 2\pi r h = 2\pi r^2 + 2\pi r \cdot \frac{100}{\pi r^2} = 2\pi r^2 + \frac{200}{r}$.

41 $x = 5$ geeft $h = 3 \Rightarrow 3 = a \cdot 5^2 + b \cdot 5$ ofwel $25a + 5b = 3$.
$x = 25$ geeft $h = 0 \Rightarrow 0 = a \cdot 25^2 + b \cdot 25$ ofwel $625a + 25b = 0$ ofwel $25a + b = 0$.

$$\begin{cases} 25a + 5b = 3 \ \ \textbf{(1)} \\ \underline{25a + \ \ b = 0} \ \_ \ \textbf{(2)} \end{cases}$$



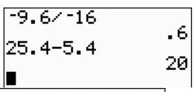


$4b = 3 \Rightarrow b = 0{,}75$ in **(2)** $\Rightarrow 25a + 0{,}75 = 0 \Rightarrow 25a = -0{,}75 \Rightarrow a = -0{,}03$. Dus $h = -0{,}03x^2 + 0{,}75x$.
De top ligt bij $x = \frac{0 + 25}{2} = 12\frac{1}{2}$. Dus de maximale hoogte is $h(12\frac{1}{2}) = -0{,}03 \cdot (12\frac{1}{2})^2 + 0{,}75 \cdot 12\frac{1}{2} \approx 4{,}69$ (m).

42a $t = 3$ geeft $x = 25{,}4 \Rightarrow 25{,}4 = a \cdot 3^2 + b$ ofwel $9a + b = 25{,}4$.
$t = 5$ geeft $x = 35{,}0 \Rightarrow 35{,}0 = a \cdot 5^2 + b$ ofwel $25a + b = 35{,}0$.

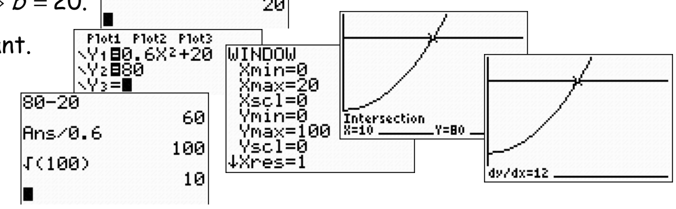
$$\begin{cases} \ 9a + b = 25{,}4 \ \ \textbf{(1)} \\ \underline{25a + b = 35{,}0} \ \_ \ \textbf{(2)} \end{cases}$$

$$-16a \qquad = -9{,}6 \Rightarrow a = 0{,}6 \text{ in } \textbf{(1)} \Rightarrow 5{,}4 + b = 25{,}4 \Rightarrow b = 20.$$

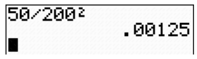


42b $x(0) = 0{,}6 \cdot 0^2 + 20 = 20$. Dus 20 cm van de linkerkant.

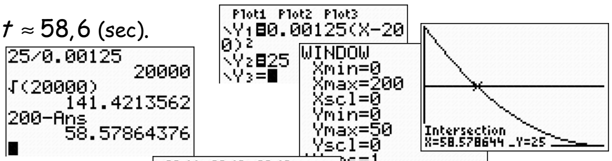
42c $x = 0{,}6 \cdot t^2 + 20 = 80$ (algebraïsch/intersect) $\Rightarrow t = 10$.
Dus na 10 seconden bereikt het karretje de rand.
De snelheid is $\left[\frac{dx}{dt}\right]_{t=10} = 12$ cm/s.



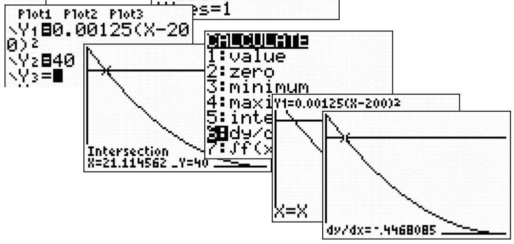
43a $t = 0$ geeft $h = 50 \Rightarrow 50 = a \cdot (0 - p)^2$ ofwel $ap^2 = 50$ **(1)**.
$t = 200$ geeft $h = 0 \Rightarrow 0 = a \cdot (200 - p)^2$ **(2)** $\Rightarrow p = 200$ in **(1)** $\Rightarrow a \cdot 200^2 = 50 \Rightarrow a = \frac{50}{200^2} = 0{,}00125.$



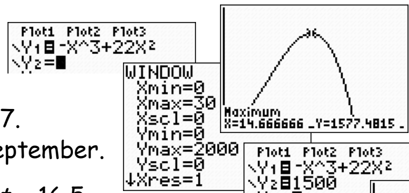
43b $h = 0{,}00125 \cdot (t - 200)^2 = 25$ (algebraïsch/intersect) $\Rightarrow t \approx 58{,}6$ (sec).
$(t - 200)^2 = 20\,000$
$t - 200 = \pm\sqrt{20\,000} \approx \pm 141{,}4$
$t = 141{,}4 + 200$ (vold. niet) $\vee$ $t = -141{,}4 + 200 \approx 58{,}6.$



43c $h = 0{,}00125 \cdot (t - 200)^2 = 40$ (algebraïsch/intersect) $\Rightarrow t \approx 21{,}1$ (sec).
$(t - 200)^2 = 32\,000$
$t - 200 = \pm\sqrt{32\,000} \approx \pm 141{,}4$
$t = -\sqrt{32\,000} + 200 \approx 21{,}1.$
De snelheid is $\left[\frac{dx}{dt}\right]_{t = -\sqrt{32000} + 200} \approx -0{,}45$ cm/s.
Dus het water zakt met een snelheid van 0,45 cm/seconde.

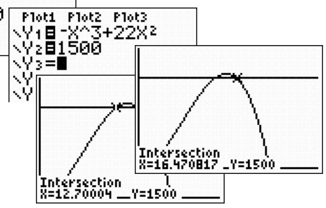


44a $t = 2$ geeft $A = 80 \Rightarrow 80 = a \cdot 2^3 + b \cdot 2^2$ ofwel $8a + 4b = 80$ ofwel $2a + b = 20$.
$t = 10$ geeft $A = 1200 \Rightarrow 1200 = a \cdot 10^3 + b \cdot 10^2$ ofwel $1000a + 100b = 1200$ ofwel $10a + b = 12$.
$\begin{cases} 2a + b = 20 & \textbf{(1)} \\ 10a + b = 12 & \textbf{(2)} \; - \end{cases}$
$-8a \quad = \; 8 \Rightarrow a = -1$ in **(1)** $\Rightarrow -2 + b = 20 \Rightarrow b = 22.$

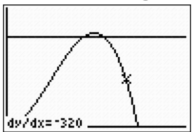


44b $A = -t^3 + 22t^2$ met de optie maximum geeft $t \approx 14{,}7$ en $A \approx 1577$.
Dus het aantal langpootmuggen is maximaal 1577 per ha op 16 september.

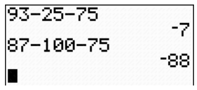
44c $A = -t^3 + 22t^2 = 1500$ met de optie intersect geeft $t \approx 12{,}7$ en $t \approx 16{,}5$.
Er zijn meer dan 1500 langpootmuggen per ha gedurende $16{,}5 - 12{,}7 \approx 4$ dagen.



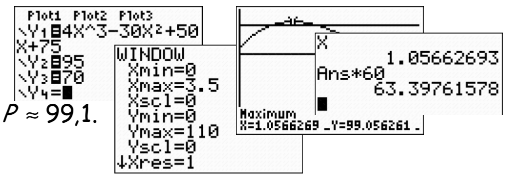
44d Op 21-9 om 12:00 uur is $t = 20$ en $\left[\frac{dx}{dt}\right]_{t=20} \approx -320.$
Dus het aantal neemt af met een snelheid van 320 per dag.



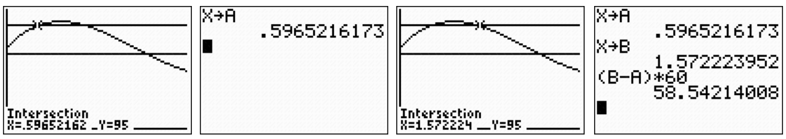
45a $t = \frac{1}{2}$ geeft $P = 93 \Rightarrow 93 = a \cdot (\frac{1}{2})^3 + b \cdot (\frac{1}{2})^2 + 50 \cdot \frac{1}{2} + 75$ ofwel $\frac{1}{8}a + \frac{1}{4}b = -7$ ofwel $a + 2b = -56$.
$t = 2$ geeft $P = 87 \Rightarrow 87 = a \cdot 2^3 + b \cdot 2^2 + 50 \cdot 2 + 75$ ofwel $8a + 4b = -88$ ofwel $4a + 2b = -44$.
$\begin{cases} a + 2b = -56 & \textbf{(1)} \\ 4a + 2b = -44 & \textbf{(2)} \; - \end{cases}$
$-3a \quad = -12 \Rightarrow a = 4$ in **(1)** $\Rightarrow 4 + 2b = -56 \Rightarrow 2b = -60 \Rightarrow b = -30.$



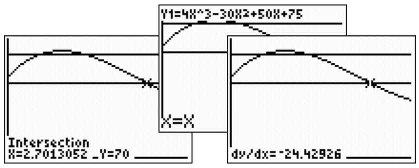
45b $P = 4t^3 - 30t^2 + 50t + 75$ met de optie maximum geeft $t \approx 1{,}05...$ en $P \approx 99{,}1$.
Dus de productiviteit is maximaal na $60 \cdot 1{,}05... \approx 63$ minuten.



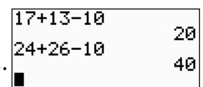
45c $P = 4t^3 - 30t^2 + 50t + 75 = 95$ met de optie intersect geeft $t \approx 0{,}59...$ en $t \approx 1{,}57...$
Dus productiviteit is gedurende $(1{,}57... - 0{,}59...) \cdot 60 \approx 59$ minuten hoger dan 95%.



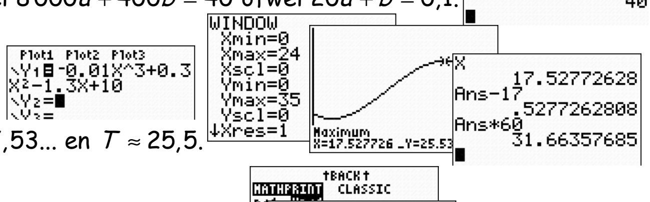
45d $P = 4t^3 - 30t^2 + 50t + 75 = 70$ met de optie intersect geeft $t \approx 2{,}7...$
$\left[\frac{dx}{dt}\right]_{t=Ans} \approx -24{,}4 \Rightarrow P$ af met een snelheid van 24,4% per uur.



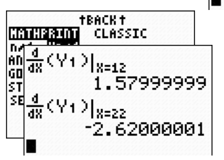
46a $t = 10$ geeft $T = 17 \Rightarrow 17 = a \cdot 10^3 + b \cdot 10^2 - 1{,}3 \cdot 10 + 10$ ofwel $1000a + 100b = 20$ ofwel $10a + b = 0{,}2$.
$t = 20$ geeft $T = 24 \Rightarrow 24 = a \cdot 20^3 + b \cdot 20^2 - 1{,}3 \cdot 20 + 10$ ofwel $8\,000a + 400b = 40$ ofwel $20a + b = 0{,}1$.
$\begin{cases} 10a + b = 0{,}2 & \textbf{(1)} \\ 20a + b = 0{,}1 & \textbf{(2)} \; - \end{cases}$
$-10a \quad = 0{,}1 \Rightarrow a = -0{,}01$ in **(1)** $\Rightarrow -0{,}1 + b = 0{,}2 \Rightarrow b = 0{,}3.$



46b $T = -0{,}01t^3 + 0{,}3t^2 - 1{,}3t + 10$ met de optie maximum $\Rightarrow t \approx 17{,}53...$ en $T \approx 25{,}5$.
Dus de temperatuur is maximaal 25,5 °C om ongeveer 17 : 32.



46cd $\left[\frac{dx}{dt}\right]_{t=12} \approx 1{,}6$ (°C/uur) $\Rightarrow$ de temperatuur stijgt met een snelheid van 1,6 °C/uur.
$\left[\frac{dx}{dt}\right]_{t=22} \approx -2{,}6$ (°C/uur) $\Rightarrow$ de temperatuur daalt met een snelheid van 2,6 °C/uur.

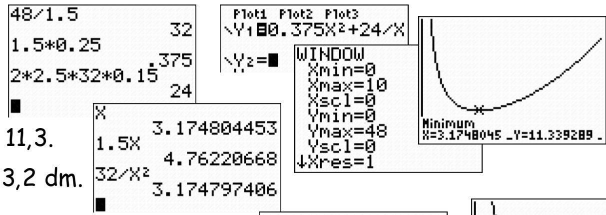


47a $I = 1\frac{1}{2}x \cdot x \cdot h = 1\frac{1}{2}x^2h = 48 \Rightarrow h = \frac{48}{1\frac{1}{2}x^2} = \frac{96}{3x^2} = \frac{32}{x^2}$.

$K = 1\frac{1}{2}x \cdot x \cdot 0{,}25 + 2 \cdot (1\frac{1}{2}x + x) \cdot \frac{32}{x^2} \cdot 0{,}15 = 0{,}375x^2 + \frac{24}{x}$.

47b $K = 0{,}375x^2 + \frac{24}{x}$ met de optie minimum $\Rightarrow x \approx 3{,}2$ en $K \approx 11{,}3$.

De afmetingen zijn dan $x \approx 3{,}2$ bij $1\frac{1}{2}x \approx 4{,}8$ bij $h = \frac{32}{x^2} \approx 3{,}2$ dm.

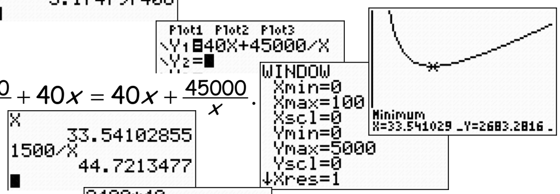


48 Stel de zijde waarvan de kosten 25 euro per meter bedragen x.

$O = x \cdot y = 1500 \Rightarrow y = \frac{1500}{x}$ en $K = 2 \cdot y \cdot 15 + x \cdot 15 + x \cdot 25 = 30 \cdot \frac{1500}{x} + 40x = 40x + \frac{45000}{x}$.

$K = 40x + \frac{45000}{x}$ met de optie minimum $\Rightarrow x \approx 33{,}5$ en $K \approx 2\,683{,}3$.

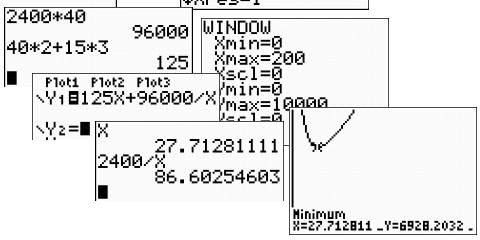
De afmetingen zijn dan $x \approx 33{,}5$ m bij $y = \frac{1500}{x} \approx 44{,}7$ m.



49 $O = x \cdot y = 2\,400 \Rightarrow y = \frac{2400}{x}$ en $K = 40y + 40x \cdot 2 + 15x \cdot 3 = 125x + \frac{96000}{x}$.

$K = 125x + \frac{96000}{x}$ met de optie minimum $\Rightarrow x \approx 27{,}7$ en $K \approx 6\,928{,}2$.

De afmetingen zijn dan $x \approx 27{,}7$ m bij $y = \frac{2400}{x} \approx 86{,}6$ m.

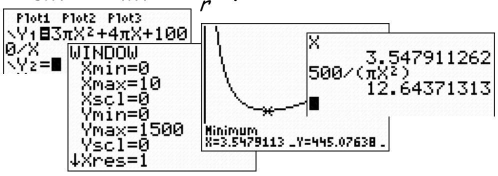


50a $I = \pi r^2 \cdot h = 500 \Rightarrow h = \frac{500}{\pi r^2}$ en

$K = \underbrace{\pi r^2 \cdot 1}_{\text{onderkant}} + \underbrace{\pi r^2 \cdot 2}_{\text{bovenkant}} + \underbrace{2\pi r \cdot 1 \cdot 2}_{\text{dekselrand}} + \underbrace{2\pi r \cdot h \cdot 1}_{\text{mantel}} = 3\pi r^2 + 4\pi r + 2\pi r \cdot \frac{500}{\pi r^2} = 3\pi r^2 + 4\pi r + \frac{1000}{r}$.

50b $K = 3\pi r^2 + 4\pi r + \frac{1000}{r}$ met de optie minimum $\Rightarrow r \approx 3{,}5$ en $K \approx 445{,}1$.

Minimaal bij de afmetingen $r \approx 3{,}5$ cm bij $h = \frac{500}{\pi r^2} \approx 12{,}6$ cm.

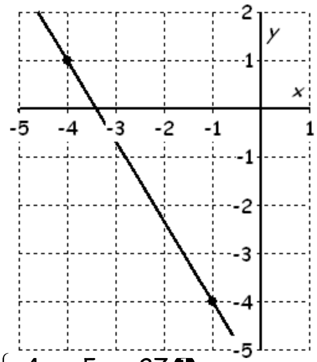


Diagnostische toets

D1a l: $5x + 3y = -17$ (met $5 \cdot -1 + 3 \cdot -4 = -17$ en $5 \cdot -4 + 3 \cdot 1 = -17$).

x	-1	-4
y	-4	1

Zie de lijn hiernaast.

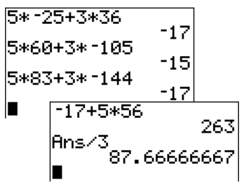


D1b $5 \cdot -25 + 3 \cdot 36 = -17 \Rightarrow A(-25, 36)$ ligt op l.

$5 \cdot 60 + 3 \cdot -105 = 15 \neq -17 \Rightarrow B(60, -105)$ ligt op l.

$5 \cdot 83 + 3 \cdot -144 = -17 \Rightarrow C(83, -144)$ ligt op l.

D1c $5 \cdot -56 + 3 \cdot q = -17 \Rightarrow 3q = 263 \Rightarrow q = \frac{263}{3}$.



D2a $\begin{cases} 2x - 5y = -9 \;❶ \\ 3x + 5y = 24 \;❷ \end{cases}$ +

$5x = 15 \Rightarrow x = 3$ in ❷ $\Rightarrow$

$3 \cdot 3 + 5y = 24 \Rightarrow 5y = 15 \Rightarrow y = 3$.

D2b $\begin{cases} 4x + 2y = 4 \;❶ \\ 4x - 7y = 40 \;❷ \end{cases}$ −

$9y = -36 \Rightarrow y = -4$ in ❶ $\Rightarrow$

$4x + 2 \cdot -4 = 4 \Rightarrow 4x = 12 \Rightarrow x = 3$.

D2c $\begin{cases} 4x + 5y = 27 \;❶ & \times 1 \\ -2x + 3y = 25 \;❷ & \times 2 \end{cases} \Rightarrow \begin{cases} 4x + 5y = 27 \;❶ \\ -4x + 6y = 50 \;❸ \end{cases}$ +

$11y = 77 \Rightarrow y = 7$ in ❶ $\Rightarrow$

$4x + 5 \cdot 7 = 27 \Rightarrow 4x = -8 \Rightarrow x = -2$.

D2d $\begin{cases} 6x - 3y = 19 \;❶ & \times 2 \\ -4x - 6y = 14 \;❷ & \times 1 \end{cases} \Rightarrow \begin{cases} 12x - 6y = 38 \;❸ \\ -4x - 6y = 14 \;❷ \end{cases}$ −

$16x = 24 \Rightarrow x = \frac{24}{16} = 1\frac{1}{2}$ in ❶ $\Rightarrow$

$6 \cdot 1\frac{1}{2} - 3y = 19 \Rightarrow 9 - 3y = 19 \Rightarrow -3y = 10 \Rightarrow y = \frac{10}{-3} = -3\frac{1}{3}$.

D3 $\begin{cases} 5x - 6y = -27 \;❶ & \times 3 \\ 15x + 8y = 10 \;❷ & \times 1 \end{cases} \Rightarrow \begin{cases} 15x - 18y = -81 \;❸ \\ 15x + 8y = 10 \;❷ \end{cases}$ −

$-26y = -91 \Rightarrow y = \frac{-91}{-26} = 3\frac{1}{2}$ in ❶ $\Rightarrow 5x - 6 \cdot 3\frac{1}{2} = -27 \Rightarrow 5x = -6 \Rightarrow x = \frac{-6}{5} = -1\frac{1}{5}$.

D4a $\begin{cases} 5x - 3y = 3 \;❶ \\ y = \frac{2}{3}x - 4 \;❷ \end{cases}$

❷ in ❶ $\Rightarrow 5x - 3(\frac{2}{3}x - 4) = 3$

$5x - 2x + 12 = 3$

$3x = -9$

$x = -3$ in ❷ $\Rightarrow y = \frac{2}{3} \cdot -3 - 4 = -2 - 4 = -6$.

D4b $\begin{cases} x = 1{,}4y - 3 \;❶ \\ -5x + 6y = 8 \;❷ \end{cases}$

❶ in ❷ $\Rightarrow -5(1{,}4y - 3) + 6y = 8$

$-7y + 15 + 6y = 8$

$-y = -7$

$y = 7$ in ❶ $\Rightarrow x = 1{,}4 \cdot 7 - 3 = 9{,}8 - 3 = 6{,}8$.

D5 $y = ax^2 - 5x + c$ door $(-3,\ -6) \Rightarrow -6 = 9a + 15 + c$ ofwel $9a + c = -21$.

$y = ax^2 - 5x + c$ door $(1,\ -2) \Rightarrow -2 = a - 5 + c$ ofwel $a + c = 3$.

$$\begin{cases} 9a + c = -21 & ❶ \\ a + c = 3 & ❷ \end{cases} \quad -$$

$8a = -24 \Rightarrow a = -3$ in ❷ $\Rightarrow -3 + c = 3 \Rightarrow c = 6$.

D6 $y = ax + b$

door $(-1, 4) \Rightarrow 4 = -a + b$ ofwel $a - b = -4$,

door $(5,\ -8) \Rightarrow -8 = 5a + b$ ofwel $5a + b = -8$.

$$\begin{cases} a - b = -4 & ❶ \\ 5a + b = -8 & ❷ \end{cases} \quad +$$

$6a = -12 \Rightarrow a = -2$ in ❶ $\Rightarrow$

$-2 - b = -4 \Rightarrow -b = -2 \Rightarrow b = 2$.

$y = px^2 + q$

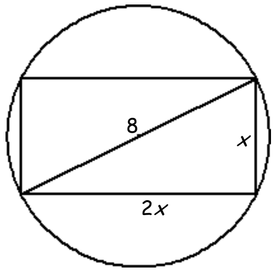
door $(-1, 4) \Rightarrow 4 = p + q$ ofwel $p + q = 4$,

door $(5,\ -8) \Rightarrow -8 = 25p + q$ ofwel $25p + q = -8$.

$$\begin{cases} p + q = 4 & ❶ \\ 25p + q = -8 & ❷ \end{cases} \quad -$$

$-24p = 12 \Rightarrow p = -\frac{1}{2}$ in ❶ $\Rightarrow -\frac{1}{2} + q = 4 \Rightarrow q = 4\frac{1}{2}$.

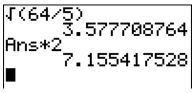
D7 Stel de breedte van de rechthoek x, de lengte is dan $2x$.



Pythagoras: $(2x)^2 + x^2 = 8^2$

$4x^2 + x^2 = 64$

$5x^2 = 64$



$x^2 = \frac{64}{5}$

$x = \sqrt{\frac{64}{5}} \approx 3{,}58$ (cm). De rechthoek is dus 7,2 cm lang en 3,6 cm breed.

D8 $t = 5$ en $N = 1250$ invullen geeft $1250 = a \cdot 5^3 + b \cdot 5 + 1400$ ofwel $125a + 5b = -150$ ofwel $25a + b = -30$.

$t = 10$ en $N = 2600$ invullen geeft $2600 = a \cdot 10^3 + b \cdot 10 + 1400$ ofwel $1000a + 10b = 1200$ ofwel $100a + b = 120$.

$$\begin{cases} 25a + b = -30 & ❶ \\ 100a + b = 120 & ❷ \end{cases} \quad -$$

$-75a = -150 \Rightarrow a = 2$ in ❶ $\Rightarrow 25 \cdot 2 + b = -30 \Rightarrow b = -80$.

D9 $O = 3x \cdot x + 3x \cdot h \cdot 2 + x \cdot h \cdot 2 = 3x^2 + 8xh$ ❶

$I = 3x \cdot x \cdot h = 3000\ (\text{cm}^3) \Rightarrow h = \frac{3000}{3x^2} = \frac{1000}{x^2}$ ❷ (cm).

1 liter is 1 dm^3 is 1000 cm^3

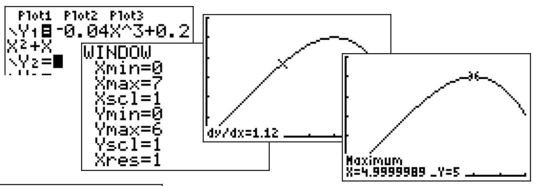
❷ in ❶ $\Rightarrow O = 3x^2 + 8x \cdot \frac{1000}{x^2} = 3x^2 + \frac{8000}{x}$ (cm^2).

D10a $t = 1$ en $B = 1{,}16$ invullen geeft $1{,}16 = a \cdot 1^3 + b \cdot 1^2 + 1$ ofwel $a + b = 0{,}16$.

$t = 2$ en $B = 2{,}48$ invullen geeft $2{,}48 = a \cdot 2^3 + b \cdot 2^2 + 2$ ofwel $8a + 4b = 0{,}48$ ofwel $2a + b = 0{,}12$.

$$\begin{cases} a + b = 0{,}16 & ❶ \\ 2a + b = 0{,}12 & ❷ \end{cases} \quad -$$

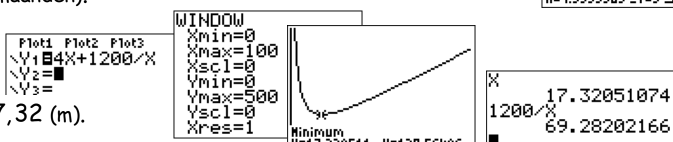
$-a = 0{,}04 \Rightarrow a = -0{,}04$ in ❶ $\Rightarrow -0{,}04 + b = 0{,}16 \Rightarrow b = 0{,}2$.



D10b De snelheid waarmee $B = -0{,}04t^3 + 0{,}2t^2 + t$ toeneemt op $t = 3$ is $\left[\frac{dB}{dt}\right]_{t=3}$ (optie dy/dx) $= 1{,}12$ (dm^2/maand). Dit is 112 cm^2/maand.

D10c $B = -0{,}04t^3 + 0{,}2t^2 + t$ (optie maximum) $\Rightarrow t = 5$ (maanden).

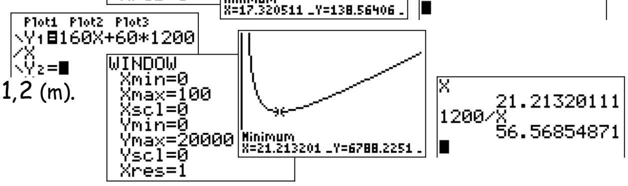
D11a $O = x \cdot y = 1200 \Rightarrow y = \frac{1200}{x}$ ❶ en $L = 4x + y$ ❷



❶ in ❷ $\Rightarrow L = 4x + \frac{1200}{x}$ (optie minimum) $\Rightarrow x \approx 17{,}32$ (m).

De afmetingen zijn 17,32 (m) bij 69,28 (m).

D11b $K = 2x \cdot 60 + 2x \cdot 20 + y \cdot 60 = 160x + 60y$ ❸



❶ in ❸ $\Rightarrow K = 160x + 60 \cdot \frac{1200}{x}$ (optie minimum) $\Rightarrow x \approx 21{,}2$ (m).

De afmetingen zijn 21,2 (m) bij 56,6 (m).

Gemengde opgaven 5. Werken met formules

G1a
$$\begin{cases} 3x - y = 9 \text{ ❶} & \times 3 \\ 2x + 3y = 6 \text{ ❷} & \times 1 \end{cases} \Rightarrow \begin{cases} 9x - 3y = 27 \text{ ❸} \\ 2x + 3y = 6 \text{ ❶} \end{cases} +$$
$11x = 33 \Rightarrow x = 3$ in ❶ $\Rightarrow 3 \cdot 3 - y = 9 \Rightarrow -y = 0 \Rightarrow y = 0.$

G1b
$$\begin{cases} 4x + 3y = 13 \text{ ❶} & \times 3 \\ 3x + 5y = 29 \text{ ❷} & \times 4 \end{cases} \Rightarrow \begin{cases} 12x + 9y = 39 \text{ ❸} \\ 12x + 20y = 116 \text{ ❹} \end{cases} -$$
$-11y = -77 \Rightarrow y = 7$ in ❶ $\Rightarrow 4x + 3 \cdot 7 = 13 \Rightarrow 4x = -8 \Rightarrow x = -2.$

G1c
$$\begin{cases} y = 6x - 3 \text{ ❶} \\ y = -2x + 17 \text{ ❷} \end{cases} -$$
$0 = 8x - 20 \Rightarrow 8x = 20 \Rightarrow x = 2{,}5$ in ❶ $\Rightarrow y = 15 - 3 = 12.$

G2 Eerst k en l snijden:
$$\begin{cases} 4x + 5y = 3 \text{ ❶} & \times 3 \\ -3x + 2y = -19\tfrac{1}{2} \text{ ❷} & \times 4 \end{cases} \Rightarrow \begin{cases} 12x + 15y = 9 \text{ ❸} \\ -12x + 8y = -78 \text{ ❹} \end{cases} +$$
$23y = -69 \Rightarrow y = -3$ in ❶ $\Rightarrow 4x + 5 \cdot -3 = 3 \Rightarrow 4x = 18 \Rightarrow x = 4\tfrac{1}{2}.$
Controleren of deze coördinaten voldoen aan m geeft $-3 = 6 \cdot 4\tfrac{1}{2} - 30 \Rightarrow -3 = 27 - 30.$ Dit klopt.
Dus drie lijnen k, l en m gaan door één punt.

G3 $(-2, 3)$ invullen bij k geeft $2 \cdot -2 + a \cdot 3 = 6 \Rightarrow 3a = 10 \Rightarrow a = \frac{10}{3} = 3\frac{1}{3}.$
$(-2, 3)$ en $a = 3\frac{1}{3}$ invullen bij l geeft $3\frac{1}{3} \cdot -2 + 3 \cdot 3 = b \Rightarrow -6\frac{2}{3} + 9 = b \Rightarrow b = 2\frac{1}{3}.$

G4 $(-4, 42)$ invullen bij f geeft
$42 = \frac{1}{2} \cdot (-4)^3 + a \cdot (-4)^2 + b \cdot -4 + 6$
$42 = -32 + 16a - 4b + 6$
$68 = 16a - 4b$
$17 = 4a - b$ ❶

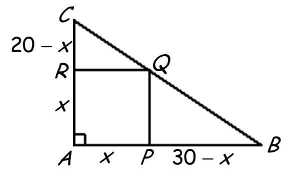
$(2, 12)$ invullen bij f geeft
$12 = \frac{1}{2} \cdot 2^3 + a \cdot 2^2 + b \cdot 2 + 6$
$12 = 4 + 4a + 2b + 6$
$2 = 4a + 2b$
$1 = 2a + b$ ❷

$$\begin{cases} 17 = 4a - b \text{ ❶} \\ 1 = 2a + b \text{ ❷} \end{cases} +$$
$18 = 6a \Rightarrow a = 3$ in ❷ $\Rightarrow 1 = 2 \cdot 3 + b \Rightarrow b = 1 - 6 = -5.$

G5a Stel $AR = x$. (zie de figuur hiernaast)
$\Delta ABC \backsim \Delta PBQ \backsim \Delta RQC$ (snavelfiguren)

ΔABC	$AB = 30$	$AC = 20$	$BC = ...$
ΔPBQ	$PB = 30 - x$	$PQ = x$	$BQ = ...$
ΔRQC	$RQ = x$	$RC = 20 - x$	$QC = ...$

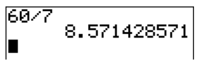
$30x = 20(30 - x)$
$30x = 600 - 20x$
$50x = 600$
$x = 12 = AR.$

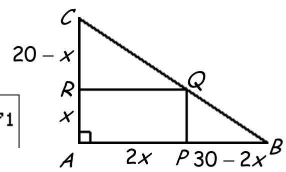


G5b Stel $AR = x$. (zie de figuur hiernaast)
$\Delta ABC \backsim \Delta PBQ \backsim \Delta RQC$ (snavelfiguren)

ΔABC	$AB = 30$	$AC = 20$	$BC = ...$
ΔPBQ	$PB = 30 - 2x$	$PQ = x$	$BQ = ...$
ΔRQC	$RQ = 2x$	$RC = 20 - x$	$QC = ...$

$30x = 20(30 - 2x)$
$30x = 600 - 40x$
$70x = 600$
$x = AR = \frac{600}{70} \approx 8{,}6.$

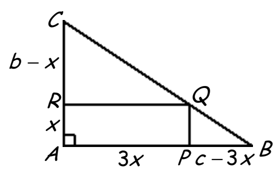




G5c Stel $AR = x$. (zie de figuur hiernaast)
$\Delta ABC \backsim \Delta PBQ \backsim \Delta RQC$ (snavelfiguren)

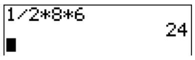
ΔABC	$AB = c$	$AC = b$	$BC = ...$
ΔPBQ	$PB = c - 3x$	$PQ = x$	$BQ = ...$
ΔRQC	$RQ = 3x$	$RC = b - x$	$QC = ...$

$cx = b(c - 3x)$
$cx = bc - 3bx$
$3bx + cx = bc$
$(3b + c)x = bc$
$x = AR = \frac{bc}{3b + c}.$

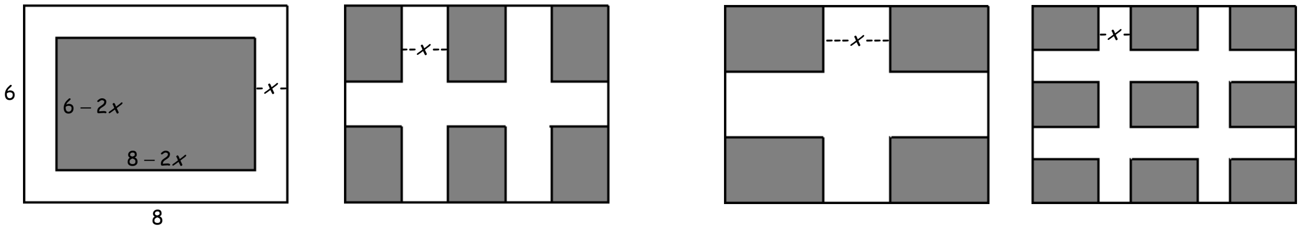


G6 $\Delta APS \backsim \Delta ADC$ (snavelfiguur) $\Rightarrow PS = 2AB = 2x.$
$\Delta BQR \backsim \Delta BDC$ (snavelfiguur) $\Rightarrow BQ = QR = 2x.$
$PD = AD - AP = 8 - x$ en $DQ = AB - AD - BQ = 24 - 8 - 2x = 16 - 2x \Rightarrow PQ = PQ + DQ = 8 - x + 16 - 2x = 24 - 3x.$
$O(PQRS) = PS \cdot PQ = 2x \cdot (24 - 3x) = 48 - 6x^2 = 90$ (gegeven).
$0 = 6x^2 - 48x + 90 \Rightarrow x^2 - 8x + 15 = 0 \Rightarrow (x - 5)(x - 3) = 0 \Rightarrow x = AP = 5 \vee x = AP = 3.$

G7a $O(\text{paden}) = O(\text{gras}) = (8-2x)\cdot(6-2x) = \frac{1}{2}\cdot 8\cdot 6.$

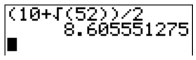


G7b



$(8-2x)\cdot(6-2x) = 24.$
$48 - 16x - 12x + 4x^2 = 24$
$4x^2 - 28x + 24 = 0$
$x^2 - 7x + 6 = 0$
$(x-6)(x-1) = 0$
$x = 6$ (vold. niet) $\vee$ $x = 1.$

$(8-2x)\cdot(6-x) = 24.$
$48 - 8x - 12x + 2x^2 = 24$
$2x^2 - 20x + 24 = 0$
$x^2 - 10x + 12 = 0$
$D = (-10)^2 - 4\cdot 1\cdot 12 = 100 - 48 = 52$
$x = \frac{10+\sqrt{52}}{2}$ (v.n.) $\vee$ $x = \frac{10-\sqrt{52}}{2}.$



$(8-x)\cdot(6-x) = 24.$
$48 - 8x - 6x + x^2 = 24$
$x^2 - 14x + 24 = 0$
$(x-12)(x-1) = 0$
$x = 12$ (vold. niet) $\vee$ $x = 2.$

$(8-2x)\cdot(6-2x) = 24.$
(zie de eerste figuur)
$x = 6$ (vold. niet) $\vee$ $x = 1.$

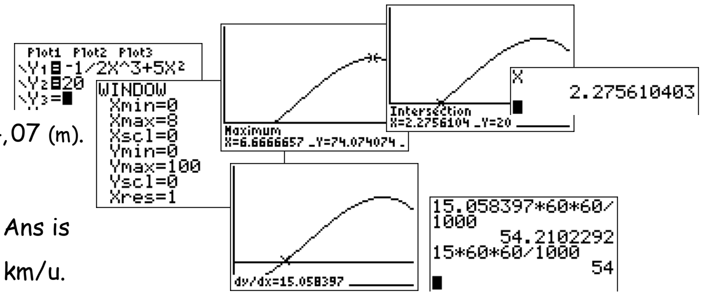
G8a $t = 2$ en $s = 16$ invullen geeft $16 = a\cdot 2^3 + b\cdot 2^2$ ofwel $8a + 4b = 16$ ofwel $2a + b = 4$.
$t = 4$ en $s = 48$ invullen geeft $48 = a\cdot 4^3 + b\cdot 4^2$ ofwel $64a + 16b = 48$ ofwel $4a + b = 3$.

$$\begin{cases} 2a + b = 4 \; ❶ \\ 4a + b = 3 \; ❷ \end{cases} \; -$$

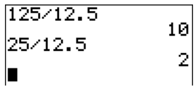
$-2a = 1 \Rightarrow a = -\frac{1}{2}$ in ❶ $\Rightarrow 2\cdot -\frac{1}{2} + b = 4 \Rightarrow b = 5.$

G8b $s = -\frac{1}{2}t^3 + 5t^2$ (optie maximum) $\Rightarrow$ ($t \approx 6{,}67$ en) $s_{max} \approx 74{,}07$ (m).

G8c $s = -\frac{1}{2}t^3 + 5t^2$ (intersect) $\Rightarrow t \approx 2{,}28.$
De snelheid waarmee $s = -\frac{1}{2}t^3 + 5t^2$ toeneemt op $t = \text{Ans}$ is
$\left[\frac{ds}{dt}\right]_{t=\text{Ans}}$ (optie dy/dx) ≈ 15 (m/s). Dat is (afgerond) 54 km/u.

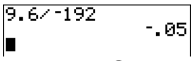


G9 $t = 5$ en $v = 12{,}5$ invullen geeft $12{,}5 = a\cdot 5^3 + b\cdot 5^2$ ofwel $125a + 25b = 12{,}5$ ofwel $10a + 2b = 1.$



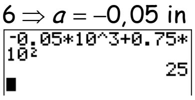
$t = 8$ en $v = 22{,}4$ invullen geeft $22{,}4 = a\cdot 8^3 + b\cdot 8^2$ ofwel $512a + 64b = 22{,}4$.

$$\begin{cases} 10a + 2b = 1 \; ❶ \\ 512a + 64b = 22{,}4 \; ❷ \end{cases} \begin{vmatrix} \times 32 \\ \times 1 \end{vmatrix} \Rightarrow \begin{cases} 320a + 64b = 32 \; ❸ \\ 512a + 64b = 22{,}4 \; ❷ \end{cases} \; -$$

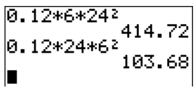


$-192a = 9{,}6 \Rightarrow a = -0{,}05$ in ❶ $\Rightarrow 10\cdot -0{,}05 + 2b = 1 \Rightarrow 2b = 1{,}5 \Rightarrow b = 0{,}75.$

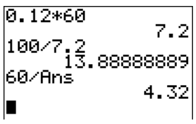
$t = 10 \Rightarrow v = -0{,}05\cdot 10^3 + 0{,}75\cdot 10^2 = 25$ (km/u).



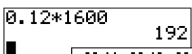
G10a In de verticale stand is $S = 0{,}12\cdot 6\cdot 24^2 = 0{,}12\cdot 6\cdot 24\cdot 24.$
In de horizontale stand is $S = 0{,}12\cdot 24\cdot 6^2 = 0{,}12\cdot 24\cdot 6\cdot 6.$
Dus in de verticale stand is A het grootst.



G10b $S = 0{,}12\cdot b\cdot h^2 = 0{,}12\cdot bh\cdot h = 100$ ❶ en $bh = 60$ ❷
❷ in ❶ $\Rightarrow 0{,}12\cdot 60\cdot h = 100 \Rightarrow h = \frac{100}{0{,}12\cdot 100} \approx 13{,}9$ (cm).
$h = \frac{100}{0{,}12\cdot 100}$ in ❷ $\Rightarrow b\cdot \frac{100}{0{,}12\cdot 100} = 60 \Rightarrow b \approx 4{,}3$ (cm).



G10c Pythagoras geeft: $b^2 + h^2 = 40^2 \Rightarrow h^2 = 40^2 - b^2 = 1600 - b^2$
Dus $S = 0{,}12bh^2 = 0{,}12b(1600 - b^2) = 192b - 0{,}12b^3.$



G10d $S = 192b - 0{,}12b^3$ (optie maximum) $\Rightarrow b \approx 23{,}1$ (cm).
$h^2 = 1600 - b^2$ (zie G10c) $\Rightarrow h \approx 32{,}7$ (cm).