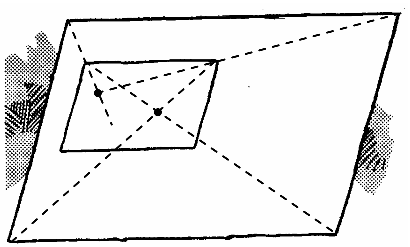
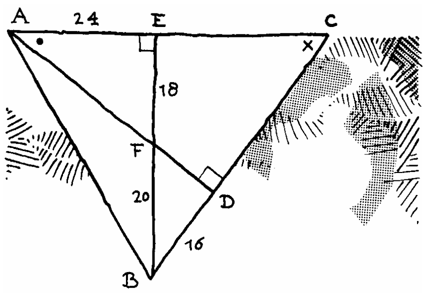
$x+10=\frac{40}{16}\cdot 10=25$

Dus $x=15$

$y+20=\frac{40}{16}\cdot 20=50$

Dus $y=30$





$DF=\frac{16}{24}\cdot 18=12$; $AF=\frac{18}{12}\cdot 20=30$

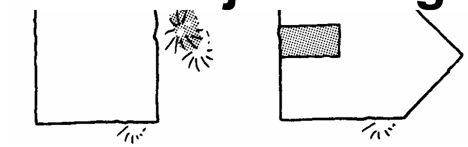
$EC=\frac{38}{24}\cdot 18=28\frac{1}{2}$; $DC=\frac{42}{24}\cdot 18=31\frac{1}{2}$

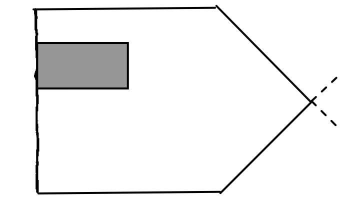
$AC=\frac{42}{24}\cdot 30=52\frac{1}{2}$

oppervlakte FDCE =
$\frac{1}{2}\cdot 38\cdot 28\frac{1}{2}-\frac{1}{2}\cdot 12\cdot 16=445\frac{1}{2}$

oppervlakte AFB $=\frac{1}{2}\cdot 42\cdot 16-\frac{1}{2}\cdot 12\cdot 16=$
240

15 Gelijkvormigheid





$\frac{3}{4}$ bij $1\frac{1}{2}$ cm

Alle $1\frac{1}{2}$ keer zo groot

hoeken veranderen niet van grootte

met A : H

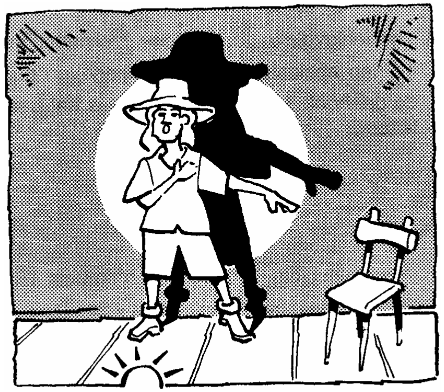
met B: D, E, G

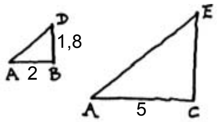
De verhouding van lengte en breedte moet voor beide hetzelfde zijn.

$\frac{4}{7}\approx 0,57$

meet bijvoorbeeld de spanwijdte: met 26/46 $\approx$ 0,57. Preciezer: met $\frac{4}{7}$

Nee, ze zijn even breed maar verschillend in hoogte.



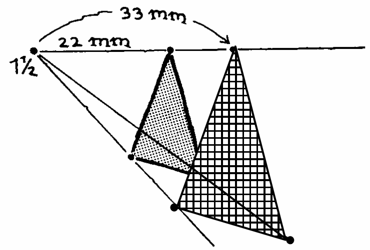


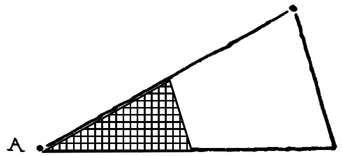
Uitvergroting is $\frac{5}{2} = 2\frac{1}{2}$,
dus $EC = 2\frac{1}{2} \cdot 1{,}8 = 4{,}5$

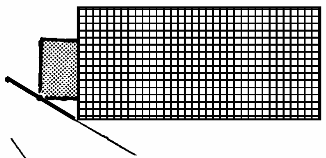
3

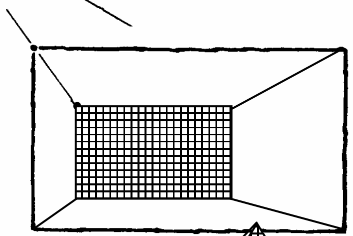
Die van het beeld zijn 3 keer zo groot.

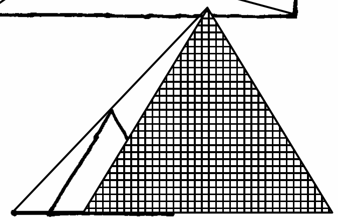
De hoeken van het beeld veranderen niet.

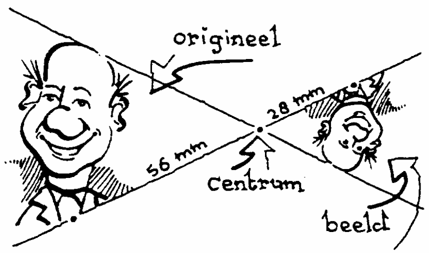


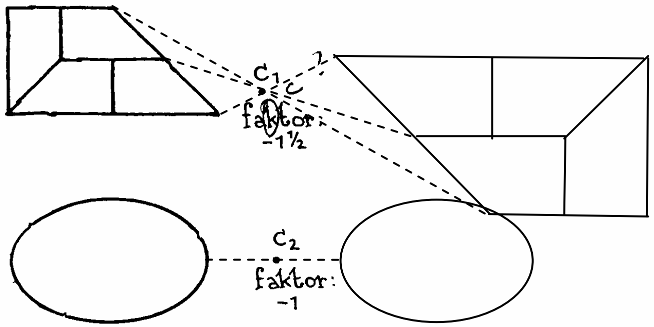


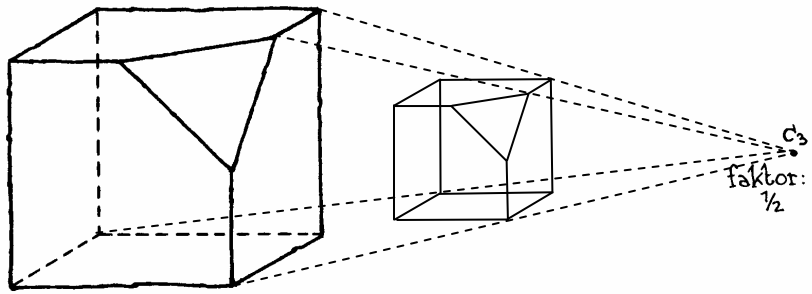




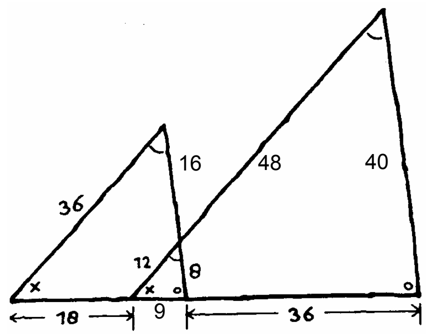


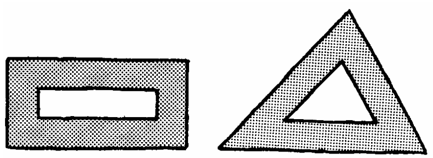






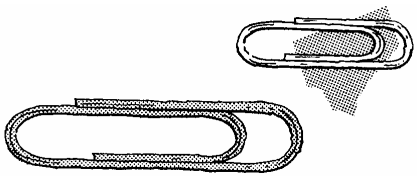
$\frac{1}{4}$	$\frac{1}{8}$





Ja, gelijke hoeken

Nee, de verhouding van de zijden is veranderd.

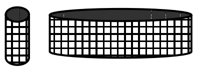


$\frac{5}{3} \cdot 96 = 160$ mm

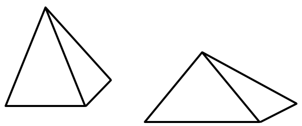
$\left(\frac{5}{3}\right)^2 \cdot 18 = 50$

$\left(\frac{5}{3}\right)^3 \cdot 0{,}54 = 2\frac{1}{2}$ gram

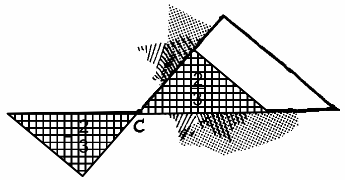
3.



4.

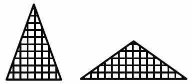


Alle gelijkbenige driehoeken met dezelfde tophoek zijn gelijkvormig.
Alle viervlakken met alle ribben even lang zijn gelijkvormig.



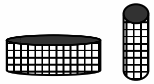
even groot (congruent)

1 en 3 zijn waar!

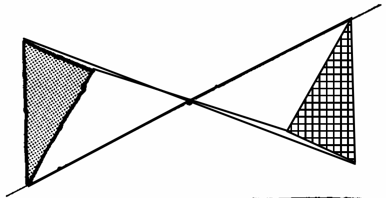


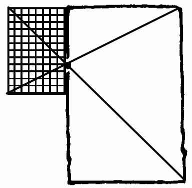
2 niet

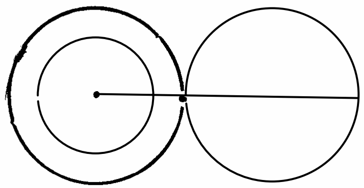
4 niet

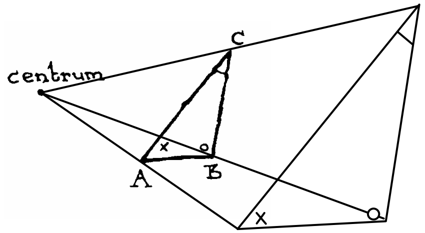


gelijkzijdige driehoeken, kubussen en bollen





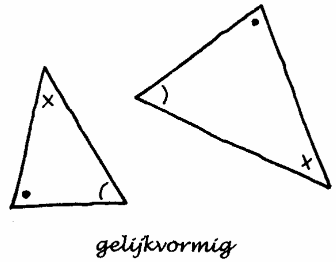


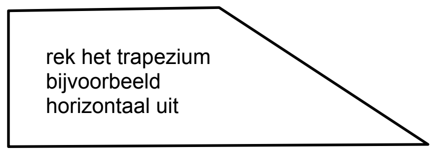


ja

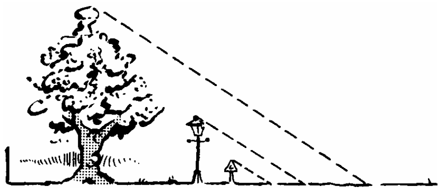
ja

Nee: bijvoorbeeld twee rechthoeken hoeven niet gelijkvormig te zijn.





rek het trapezium bijvoorbeeld horizontaal uit



$7 \cdot 2 = 14$ meter

$1\frac{1}{2} \cdot 7 = 10\frac{1}{2}$ meter

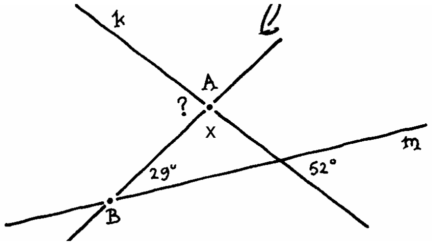
$\angle R = 180 - 20 - 135 = 25°$, dus ze hebben twee gelijke hoeken.

$\frac{25}{45} = \frac{5}{9}$

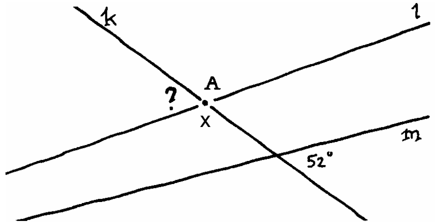
$\frac{5}{9} \cdot 27 = 15$

$\frac{50}{30} = 1\frac{2}{3}$ $\quad y = 15 : 1\frac{2}{3} = 25$

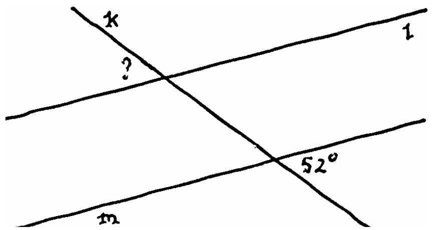
$x = 1\frac{2}{3} \cdot 27 = 45$



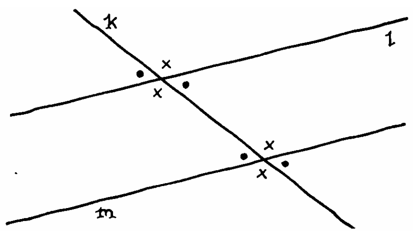
$x = 180 - 29 - 52 = 99°$,
dus $? = 180 - 99 = 81°$



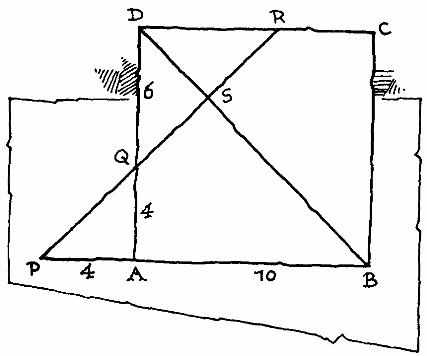
$x = 180 - 52 - 3 = 125°$,
dus $? = 180 - 125 = 55°$



52°

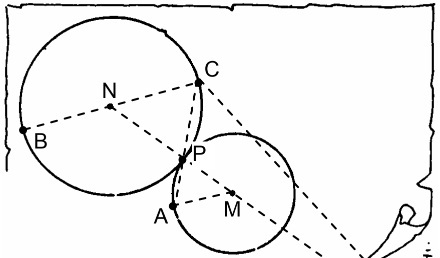


Oefenen	1	Parallel in een driehoek
	2	Parallel in een trapezium
	3	Parallel in een rechthoek
	4	Lucky Luke en zijn schaduw
	5	Rechthoekige driehoek met hoogtelijn
	6	Wat zien de astronauten ?
	7	Een dubbele zandloper
	8	Een zandloper in de ruimte
Uitdaging	9	De-Gelijke-Vorm-Test
Anders	a	Ander grafisch scherm, nu E/VGA
	q	Stopppen met dit programma



Driehoek PAQ is gelijkvormig met driehoek RQD, dys DR = 6. Driehoek DRS is gelijkvormig met driehoek BPS, dus DR: BP = DS : SB, dus 6:14 = DS :SB, dus:

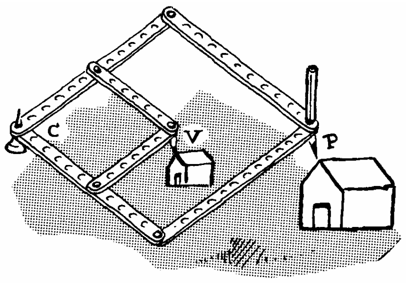
$DS = \frac{6}{20} \cdot DB$



A is willekeurig gekozen op de kleine cirkel.
M is middelpunt van de kleine cirkel en N van de grote. BC gaat door N en is evenwijdig met AM.

Q

B of C is het beeld van A.
Als B het beeld is, dan is Q het centrum en de factor $1\frac{1}{2}$. Als C het centrum is ,dan is P het centrum en de factor $-1\frac{1}{2}$.

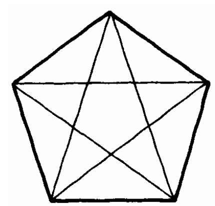


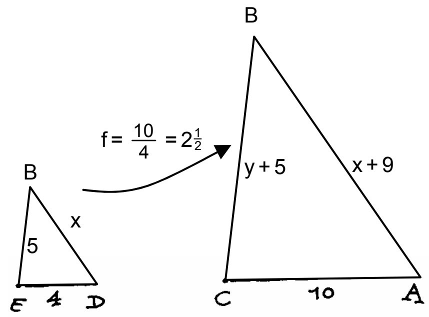
Een term is de som van zijn twee voorgangers.

31, 51, 82, 133, 215, 318, 563

4, 9, 13, 22, 35, 57, 92, 149, 241, 390, 631

$\frac{89}{55} \approx 1{,}62$	$\frac{563}{348} \approx 1{,}62$	$\frac{631}{390} \approx 1{,}62$

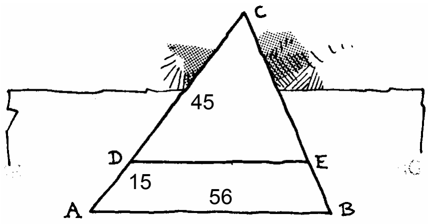




$\frac{10}{4} = 2\frac{1}{2}$

$BC = 2\frac{1}{2} \cdot BE$, dus $y + 5 = 2\frac{1}{2} \cdot 5 = 12\frac{1}{2}$,
dus $y = 7\frac{1}{2}$.

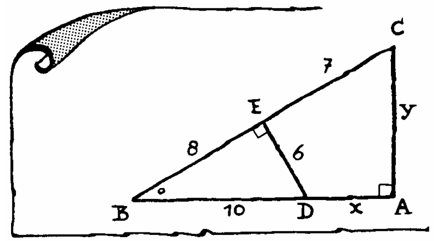
$x + 9 = 2\frac{1}{2}x$, dus $1\frac{1}{2}x = 9$, dus $x = 6$.



$\frac{60}{45} = \frac{4}{3}$

$DE = \frac{3}{4} \cdot 56 = 42$
$CE = \frac{3}{4} \cdot 52 = 39$

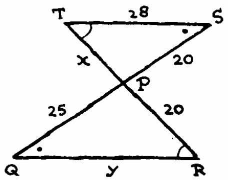
3 : 1



Ze hebben twee gelijke hoeken:
$\angle EBD = \angle ABC$ en $\angle BED = \angle BAC$

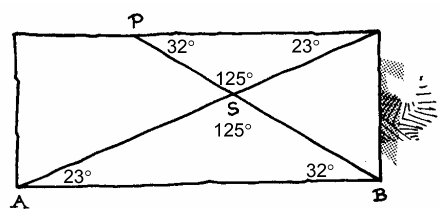
$\frac{15}{10} = 1\frac{1}{2}$

$y = 1\frac{1}{2} \cdot 6 = 9$
$x + 10 = 1\frac{1}{2} \cdot 8 = 12$, dus $x = 2$



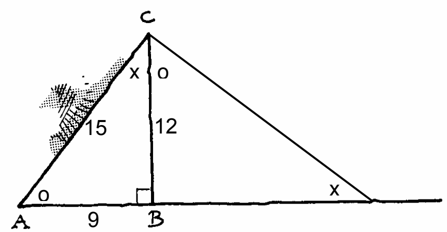
$-\frac{4}{5}$ of $-\frac{5}{4}$	5 : 4

$x = \frac{4}{5} \cdot 20 = 16$
$y = 1\frac{1}{4} \cdot 28 = 35$



23°, 32° en 125°, voor beide driehoeken, ze zijn dus gelijkvormig.

AS : SC = AB : PC = 6:4 = 3:2



∠D, want: ∠A + ∠D = 90°
en: ∠A + ∠ACB = 90°

gelijke hoeken, zie figuur

CB : BD = 9:12, dus BD = $\frac{12}{9}\cdot BC = 16$ en

CD = $\frac{12}{9}\cdot AC = 20$

$\frac{7{,}32+0{,}43}{7{,}32} = 1{,}0587...$

$\frac{2{,}44+0{,}16}{2{,}44} = 1{,}06557...$

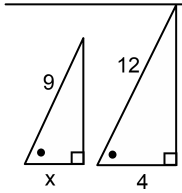
Nee, want de twee getallen hierboven zijn niet gelijk.

1,0587…x 1,06557… = 1,12816…

$\frac{7{,}75 \text{x} 2{,}60}{7{,}32 \text{x} 2{,}44} = 1{,}12816...$

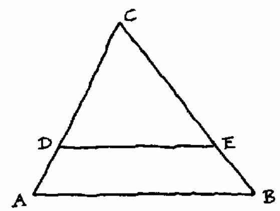
$\frac{7{,}75}{7{,}32}\cdot 2{,}44 - 2{,}44 = 0{,}14$, dus 14 cm

$1{,}1^2 = 1{,}21$



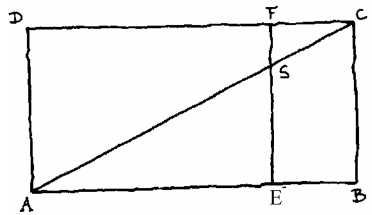
x = $\frac{9}{12}\cdot 4 = 3$ meter

Als ze even steil zouden staan, zou een ladder van 8 meter $\frac{8}{12}\cdot 4 = 2{,}67$ meter van de muur staan. Hij staat dus steiler.



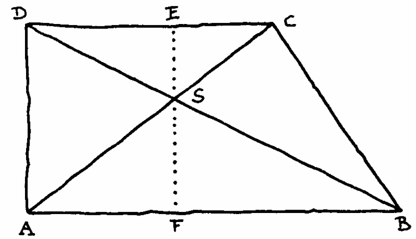
$\frac{DE}{AB} = \frac{6}{8} = \frac{3}{4}$ deel, | dus 3 : 1

EC = $\frac{3}{4}\cdot BC = 6$
EB = $\frac{1}{4}\cdot BC = 2$
CD = $\frac{3}{4}\cdot AC = 5\frac{1}{4}$
AD = $\frac{1}{4}\cdot AC = 1\frac{3}{4}$



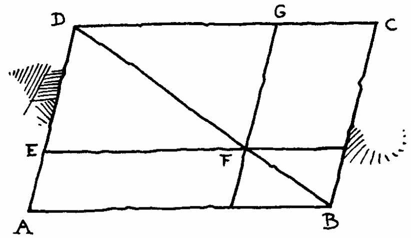
AE : FC = 9:3 = 3:1, dus SE = $\frac{3}{4}\cdot 6 = 4\frac{1}{2}$;
FS = $1\frac{1}{2}$

oppervlakte driehoek ASE = $\frac{1}{2}\cdot 9\cdot 4\frac{1}{2} = 20\frac{1}{4}$
oppervlakte driehoek FSC = $\frac{1}{2}\cdot 3\cdot 1\frac{1}{2} = 2\frac{1}{4}$
oppervlakte vierhoek ABCS = $6\cdot 3 - 2\frac{1}{4} = 15\frac{3}{4}$
oppervlakte vierhoek ASFD = $9\cdot 6 - 20\frac{1}{4}$ = $33\frac{3}{4}$



= AB : DC = 6:4 = 3:2

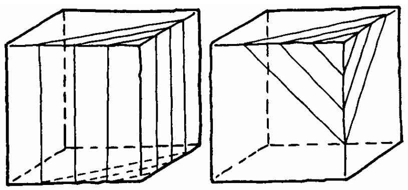
SE : SF = DC : AB, dus:
SE = $\frac{2}{5}\cdot AD = 1\frac{1}{5}$



AD = 3,6 ; dus de vergrotingsfactor om EFGD tot ABCD te vergroten is $\frac{3{,}6}{2{,}4} = 1\frac{1}{2}$.
Oppervlakte = $(1\frac{1}{2})^2\cdot 7{,}82 = 17{,}595$

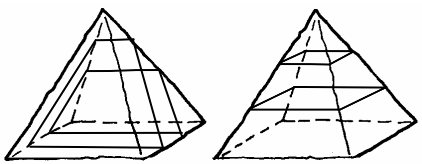
Oppervlakte ABD = Oppervlakte BDC
Oppervlakte DEF = Oppervlakte FDG) –
Oppervlakte ABFE = Oppervlakte BCGF

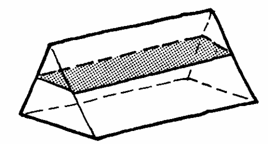
$\frac{1}{2}\cdot(17{,}595 - 7{,}82) = 4{,}8875\ \text{cm}^2$



Nee, de hoogte is steeds hetzelfde; de breedte verandert.

Ja, het zijn driehoeken met dezelfde hoeken.



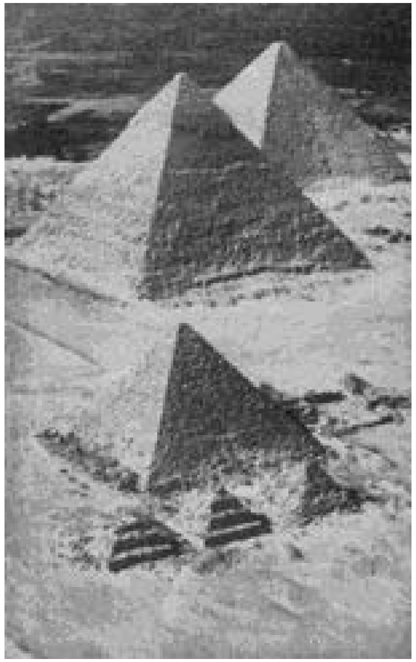


nee	

nee	

4 keer

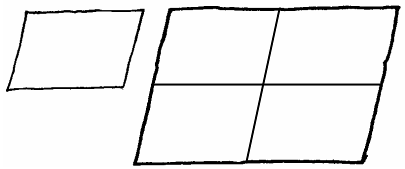
De vergrotingsfactor is 10.
De oppervlakte wordt 100 keer zo groot.
De inhoud wordt 1000 keer zo groot.
Dus 1 $dm^2 = 100$ cm^2
(Bekijk de voorkant bijvoorbeeld.)
en 1 $dm^3 = 1000$ cm^3
(Bekijk de inhoud.)

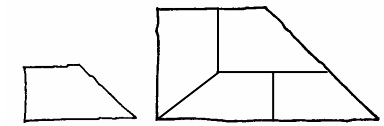


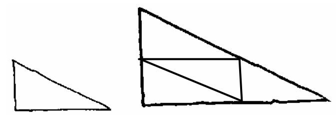
$\frac{230}{92} \cdot 58 = 145$ meter

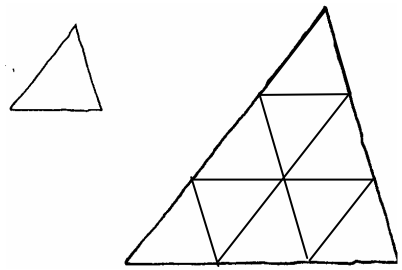
$125\,000 \cdot 4 = 500\,000$ ton

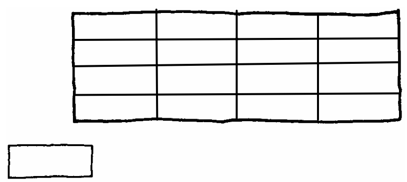
$(2\frac{1}{2})^3 \cdot 500\,000 = 7\,812\,500$ ton





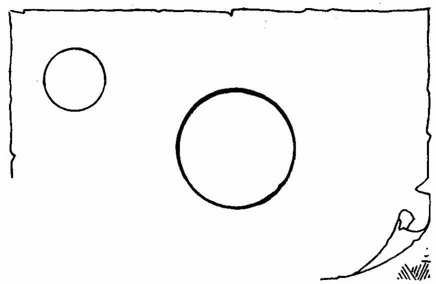


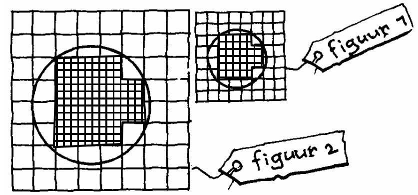




3	9

4	16

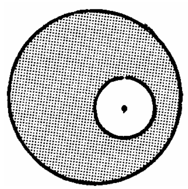




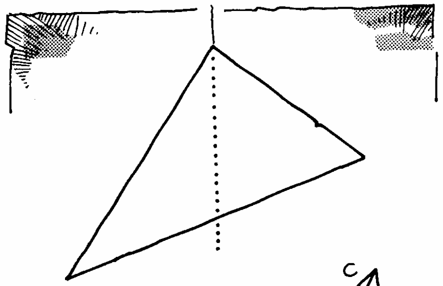
4 keer

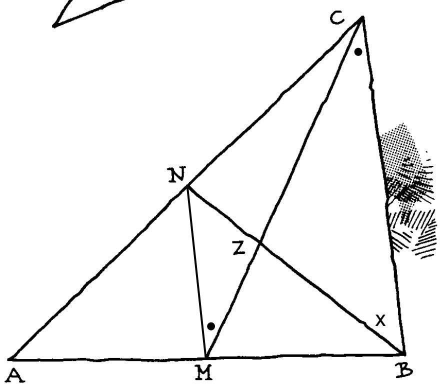
4 keer

kleinere hokjes



oppervlakte grote cirkel $= 3^2 \cdot 7 = 63$
oppervlakte grijze gebied $= 63 - 7 = 56$

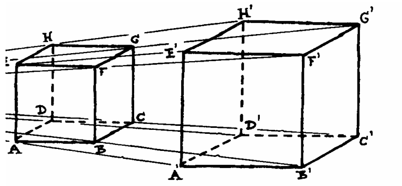




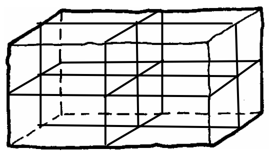
2

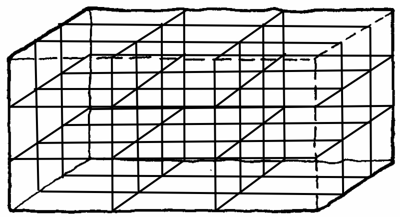
gelijke hoeken, zie figuur (kijk op bladzijde 8 onderaan).

= BC : MN = 2:1



$\frac{\text{ribbe grote}\cdots\text{kubus}}{\text{ribbe kleine kubus}} = \frac{21}{13}$ (meten !)

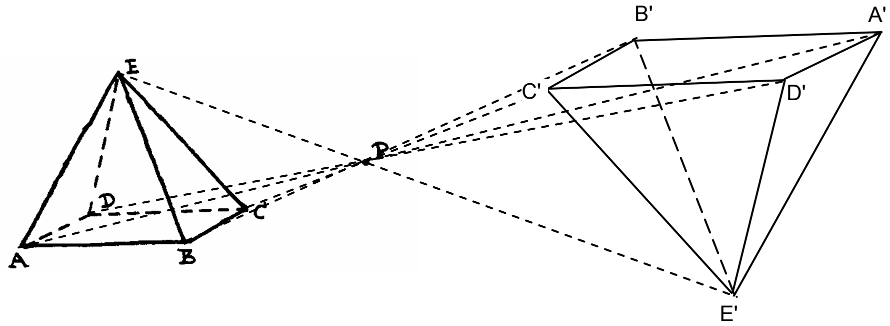




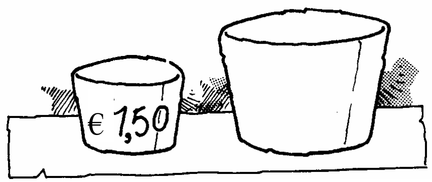
8	27

$32 \cdot 2 = 64$ cm	$32 \cdot 3 = 96$ cm

$36 \cdot 2^2 = 144$ cm^2	$36 \cdot 3^2 = 324$ cm^2



$1\frac{1}{2}$	$1\frac{1}{2}^2 = 2\frac{1}{4}$	$1\frac{1}{2}^3 = 3\frac{3}{8}$



$\frac{9}{6} \cdot 5 = 7\frac{1}{2}$ cm

$(1\frac{1}{2})^3 \cdot 1{,}50 = 5{,}06$ euro

We letten op de hoogte en breedte van de poppen en niet op de tekeningen.

Nagenoeg gelijkvormig
breedte jasje Jeltsin = 1,9 ; breedte jasje Brezjnew = 1,2. De hoogtes zijn 4,2 en 2,7.
$4{,}2 : 2{,}7 \approx 1{,}9 : 1{,}2$