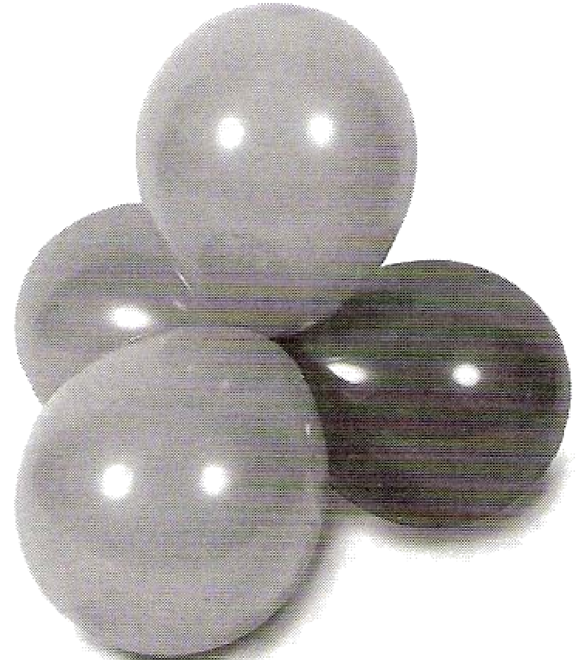
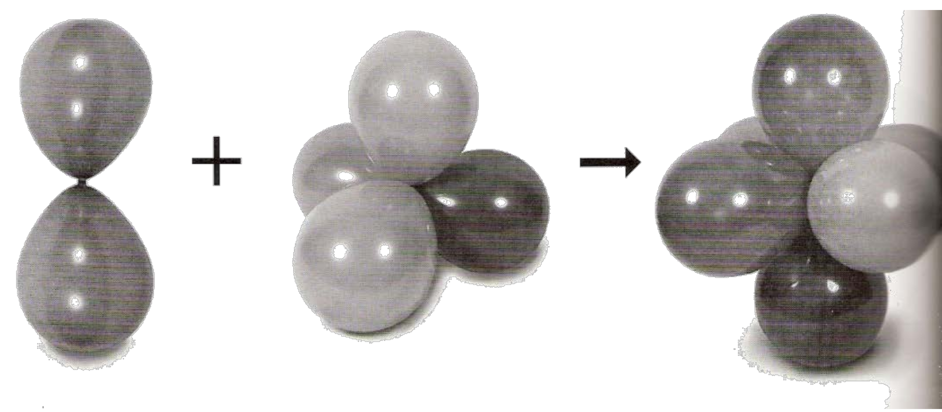
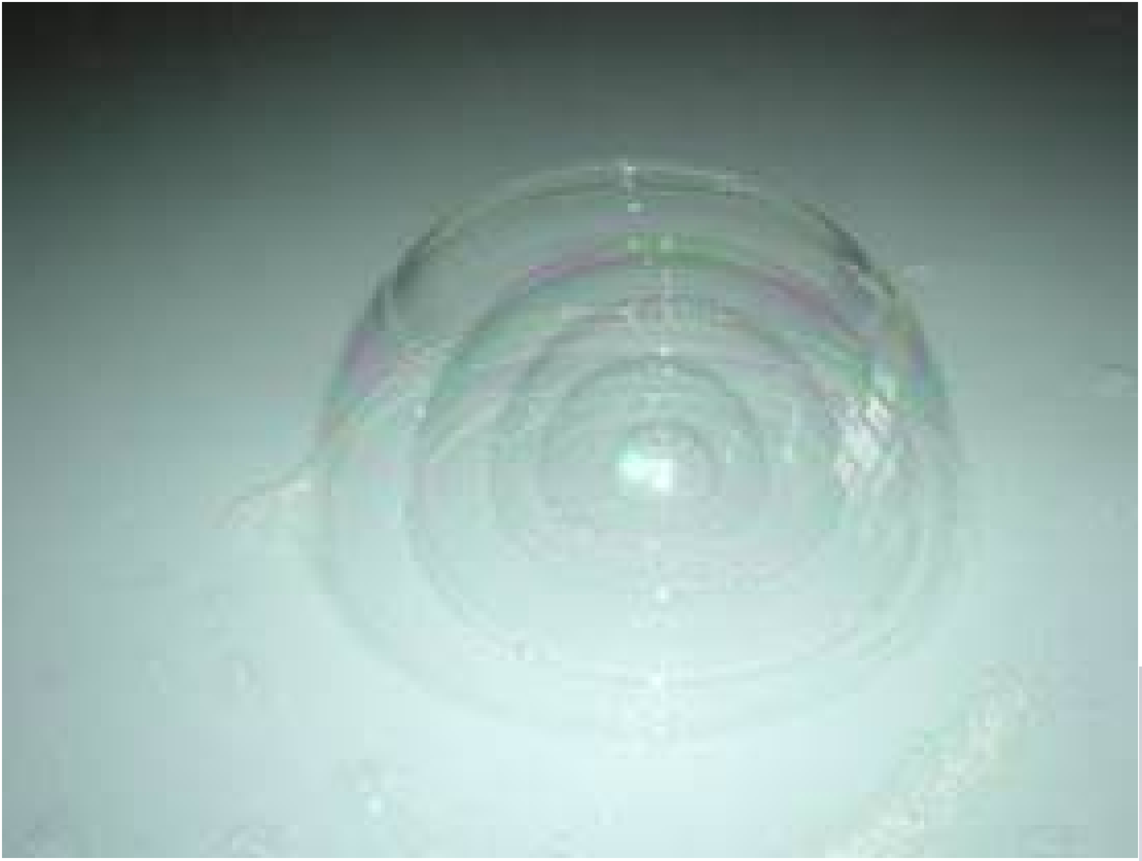
Pompas, “gominolas” y palillos

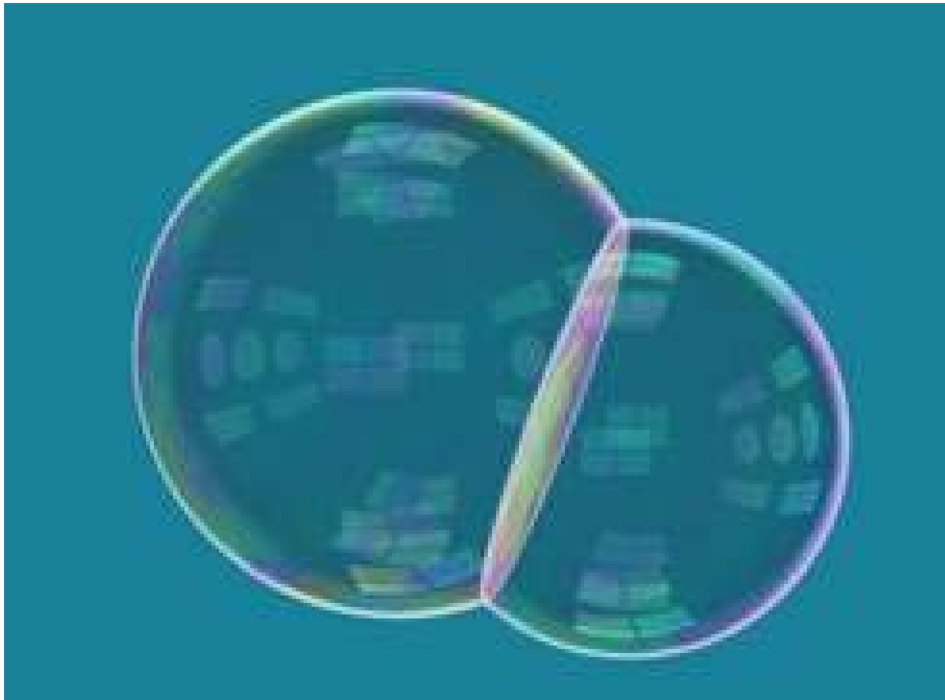


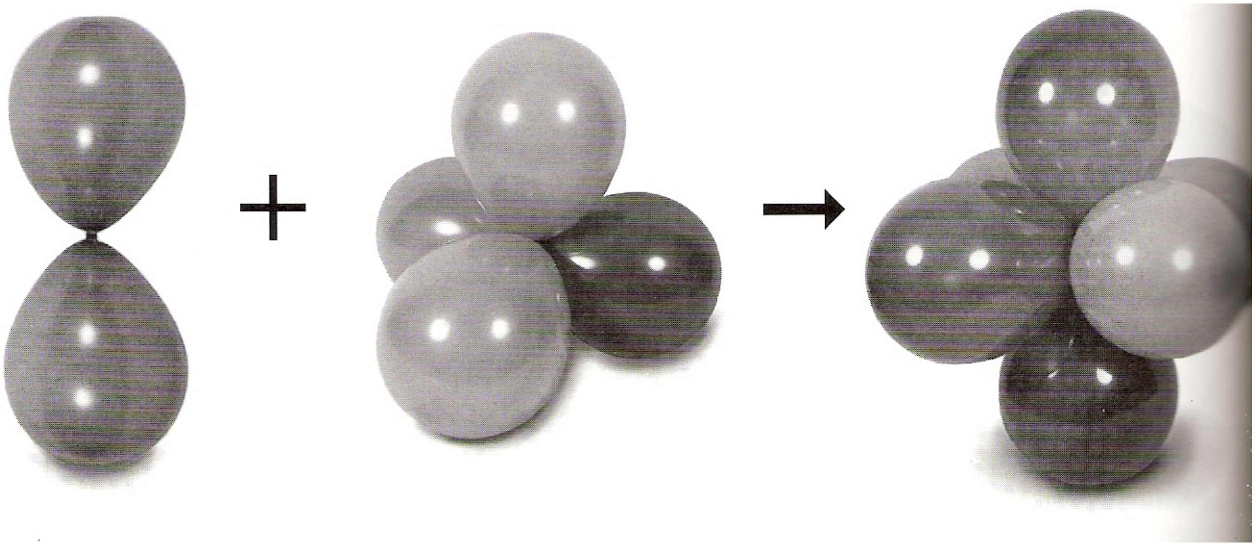
POMPAS



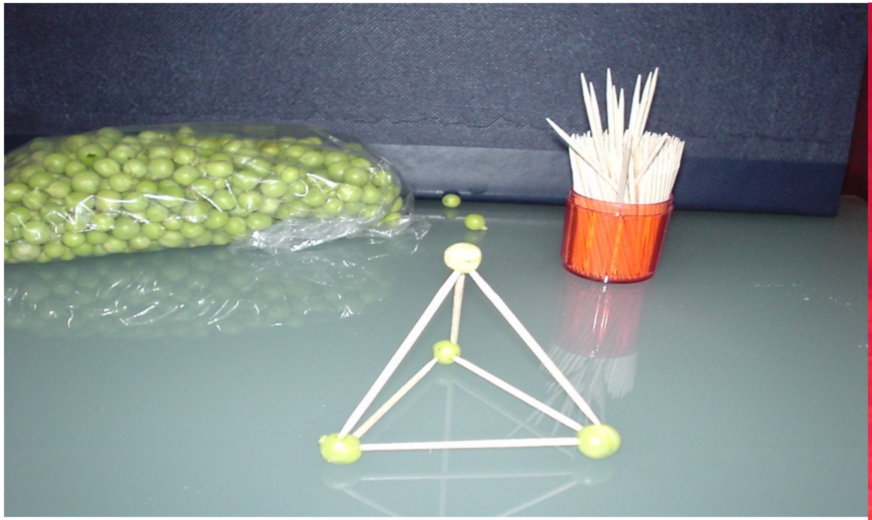


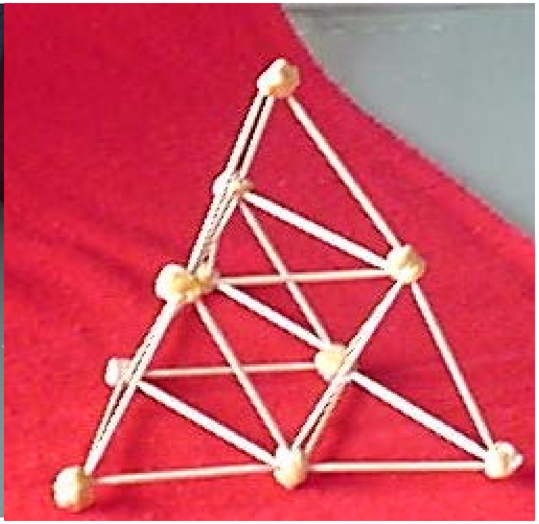


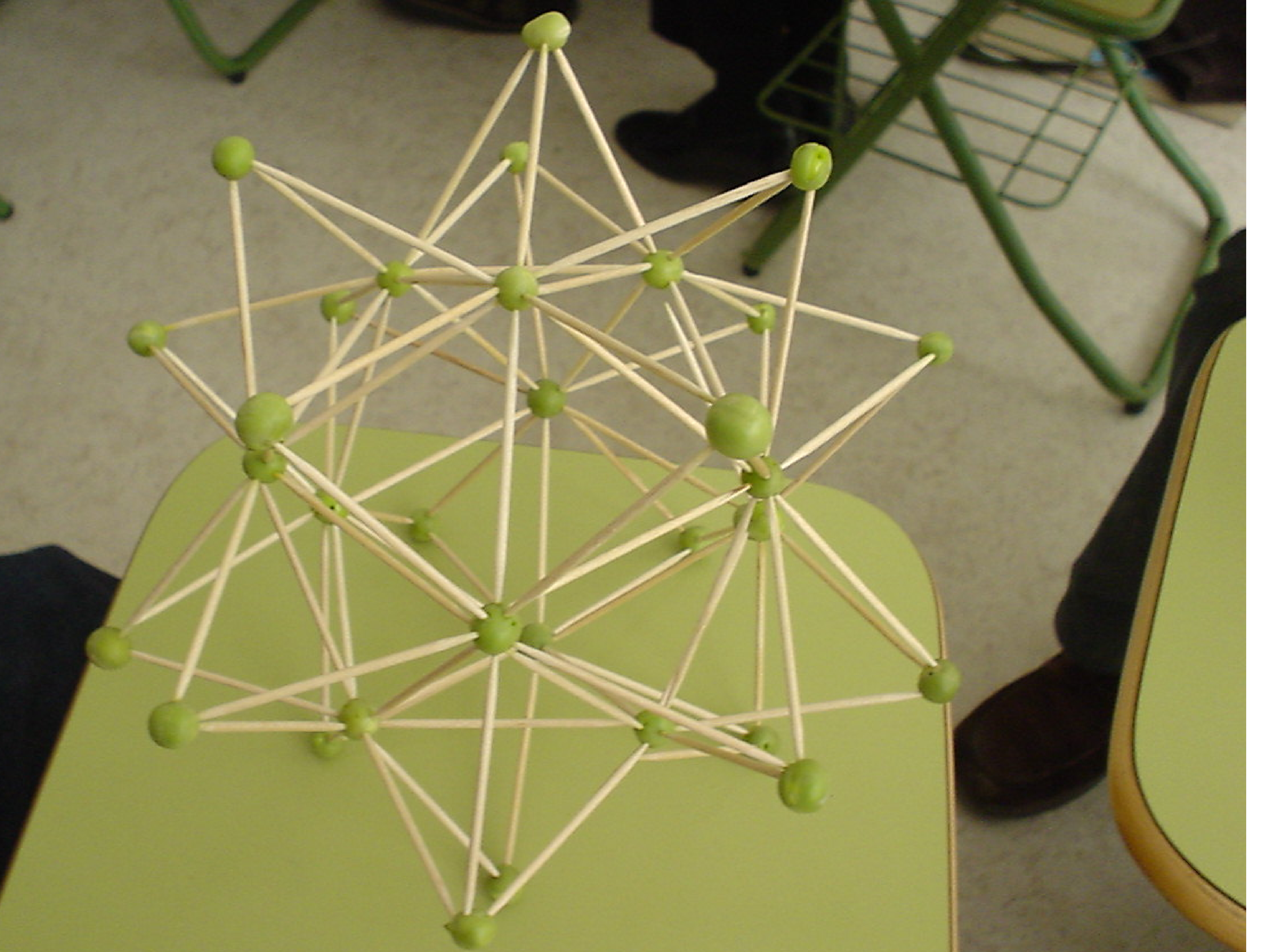


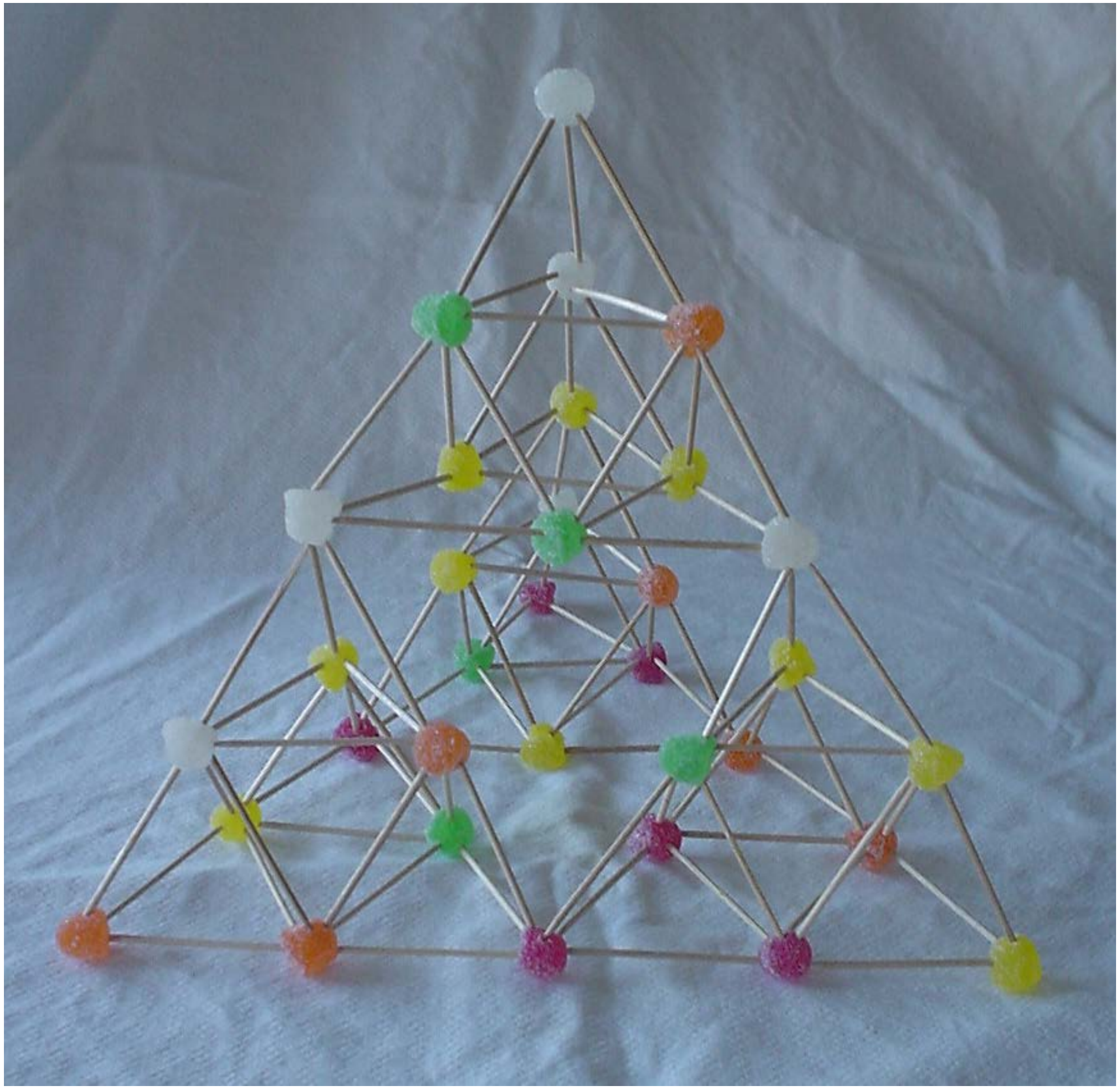
PALILLOS Y “GOMINOLAS”



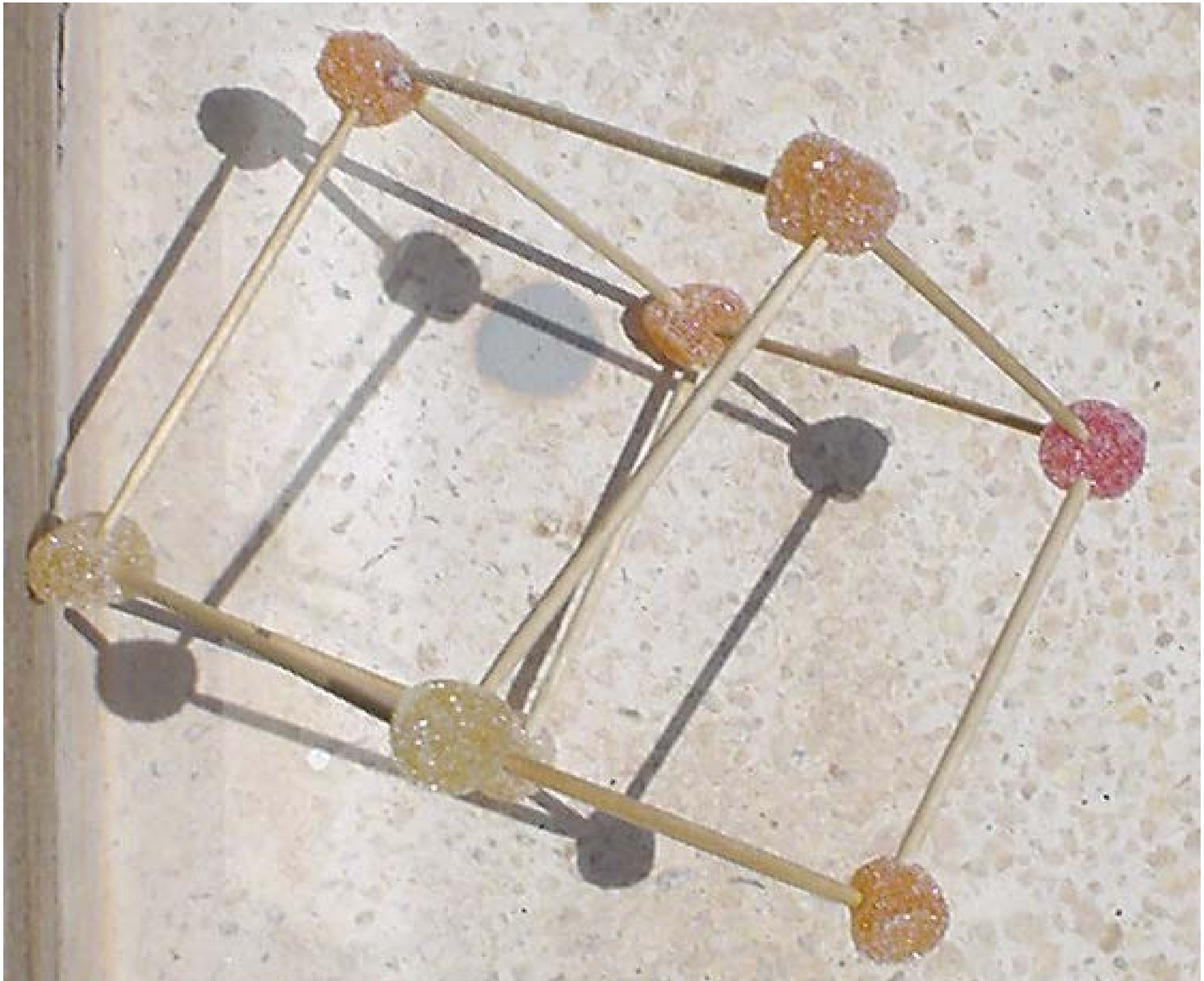


Uns quants furgadents i pésols, cigrons o gominoles ens permetran construir poliedres i retícules a l'aula amb gran facilitat.

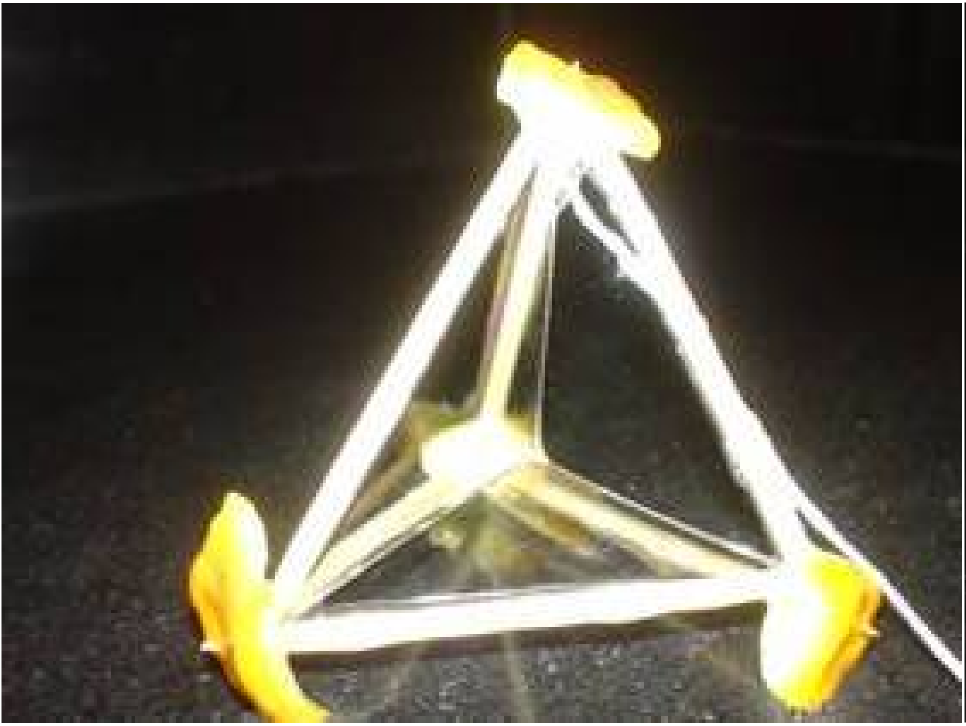


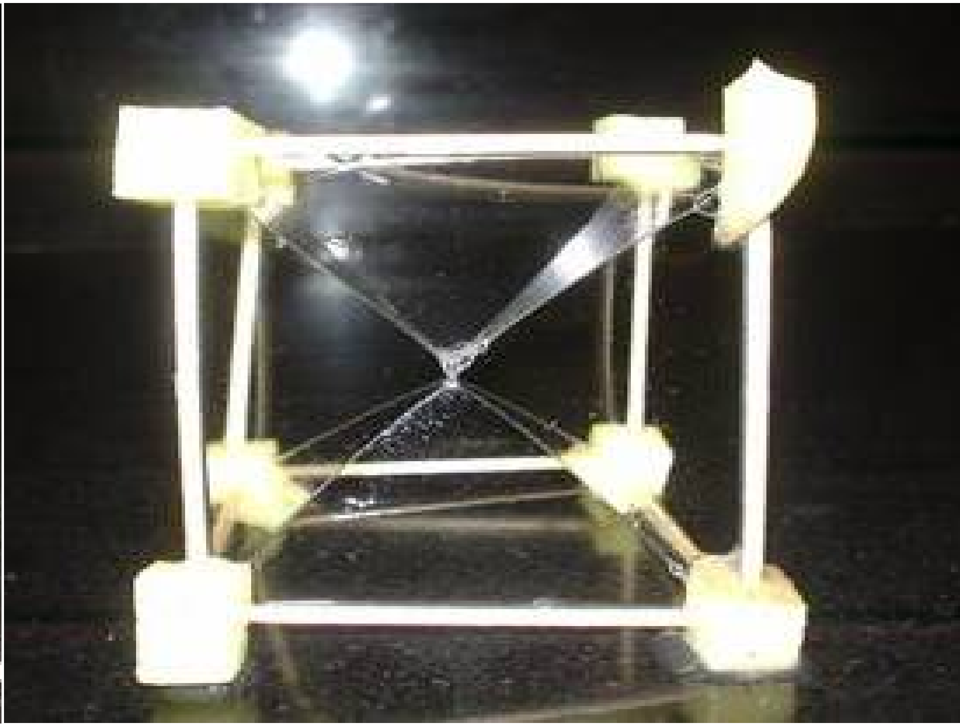


Proyecciones en el plano



POMPAS, PALILLOS Y “GOMINOLAS”





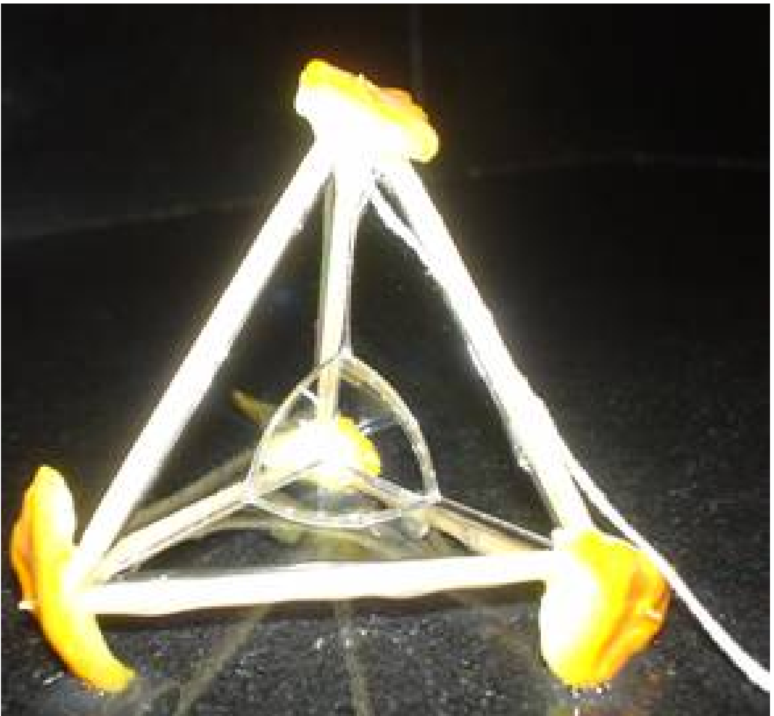
Observar los planos de simetría y las pirámides centrales que forman.

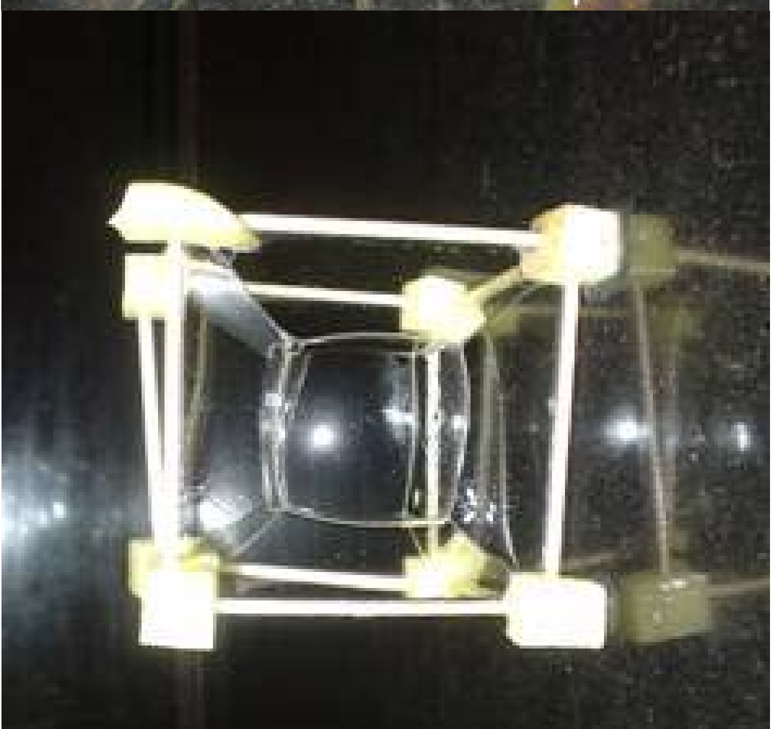
Cada una de ellas es la estructura básica del caleidoscopio correspondiente a ese poliedro.

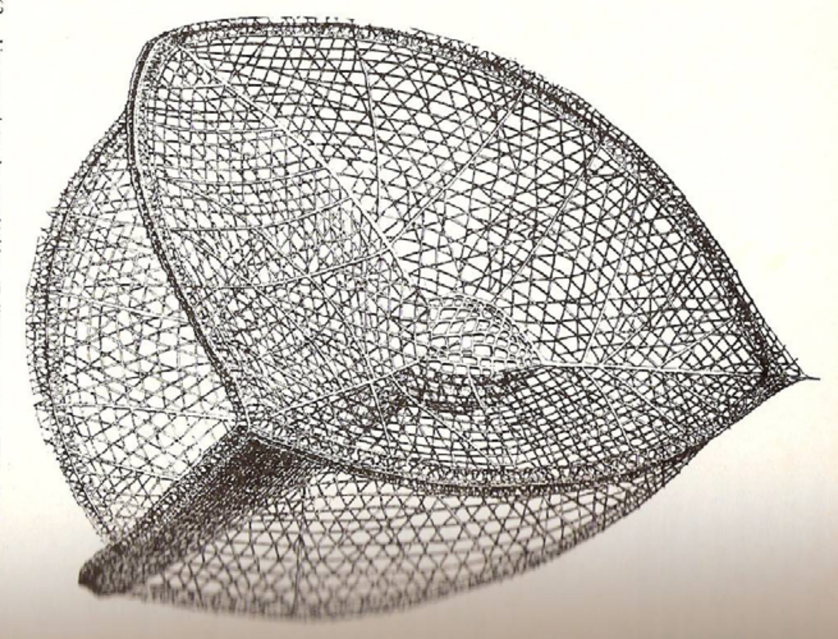
Pinchar aquí para obtener instrucciones para su construcción.

Ampliar

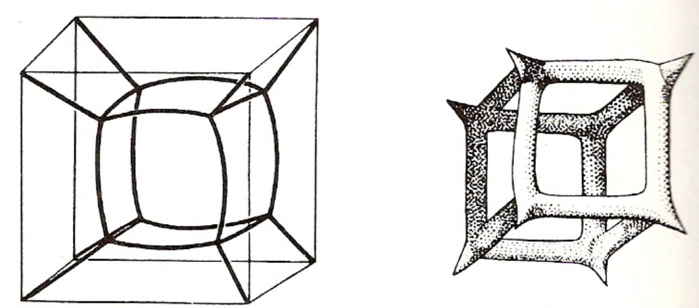
NATURALEZA





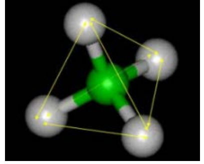
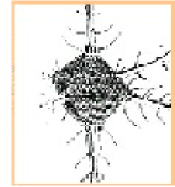
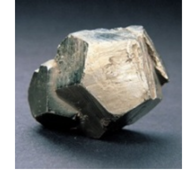
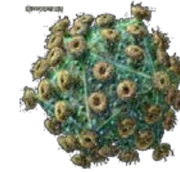


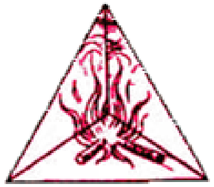
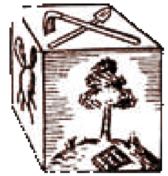
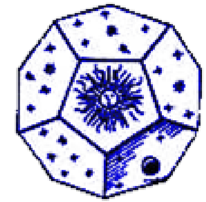
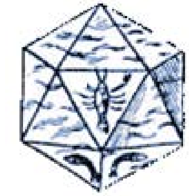
...ura 62. Un esqueleto de naselárido. *Callimitra agnesae* Hkl. (0.15 mm. de ...



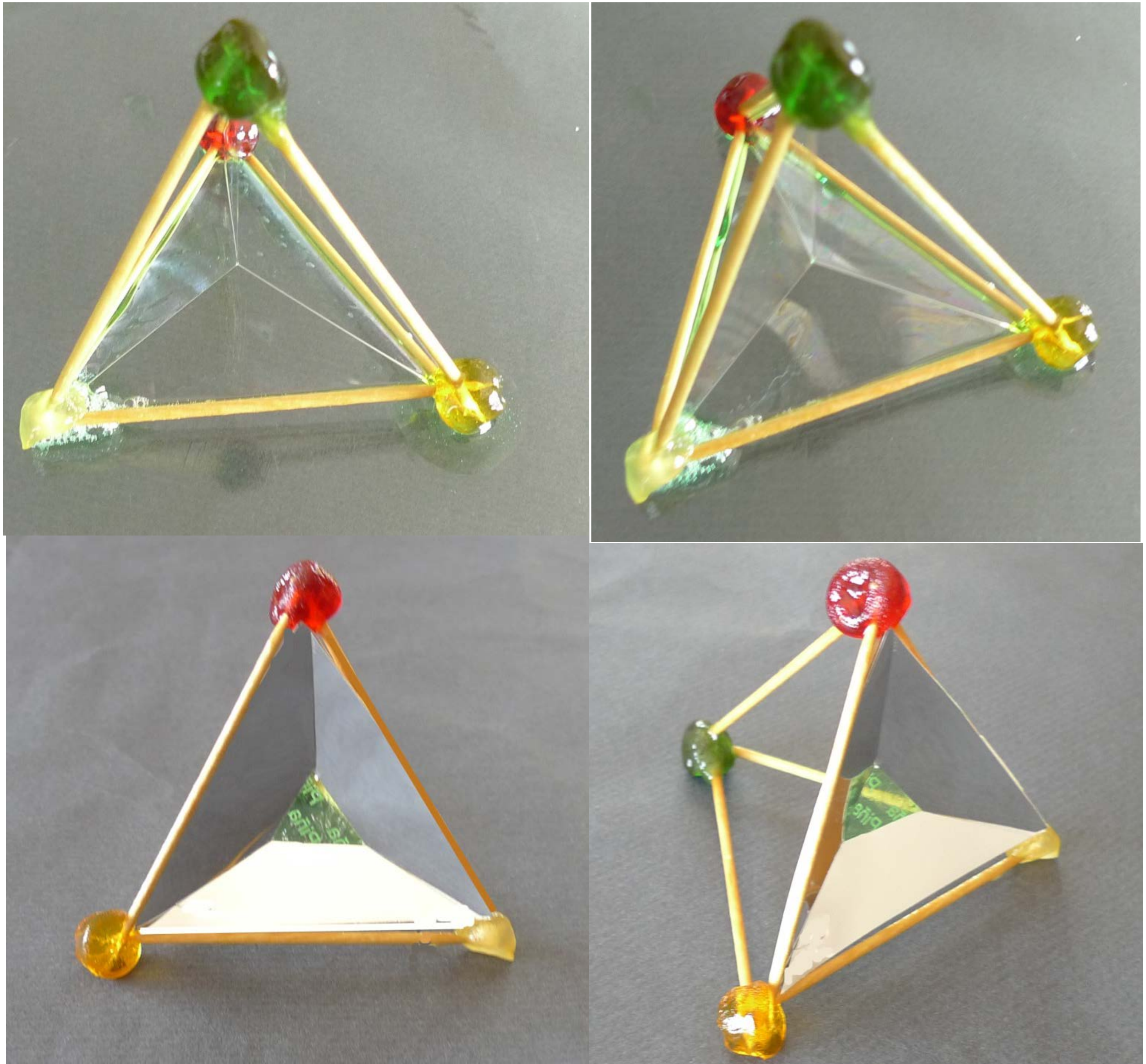
(a) (b)

Figura 64. (*a*) Burbuja suspendida dentro de un recinto cúbico; (*b*) *Lithocubus geometricus* Hkl.

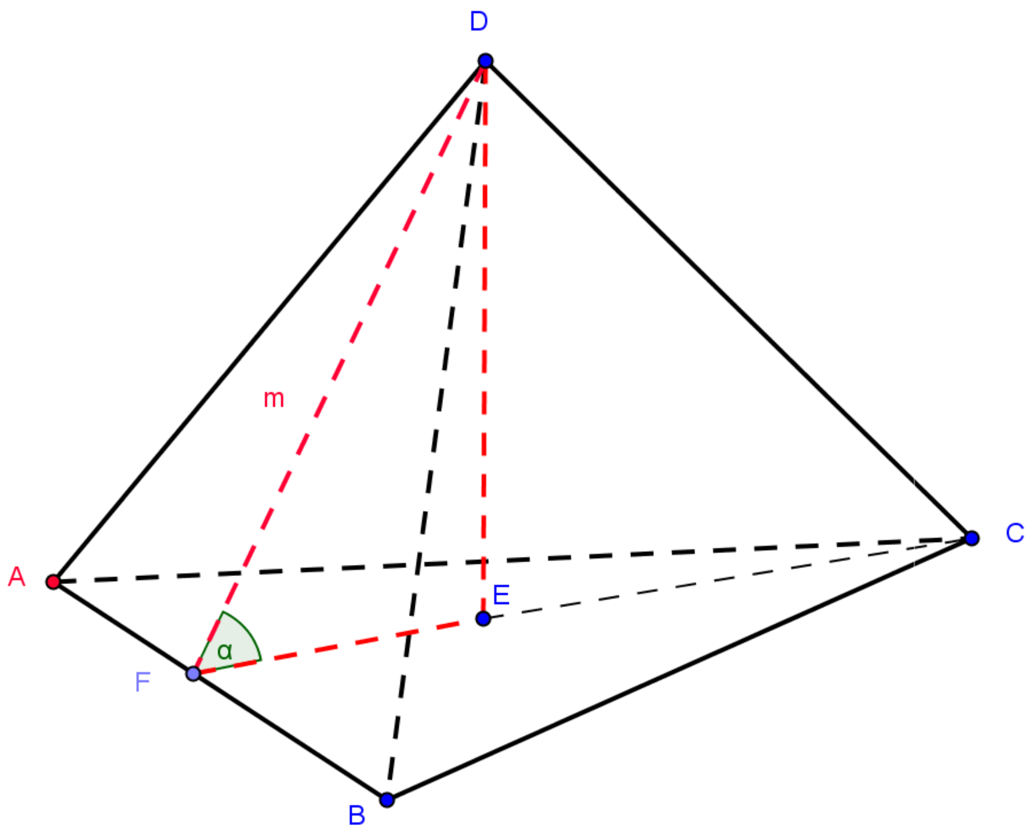
    

Sólidos Platónicos	Tetraedro	Hexaedro, Cubo	Octaedro	Dodecaedro	Icosaedro
Número de caras	4 (t)	6 (c)	8 (t)	12 (p)	20 (t)
Número de vértices	4	8	6	20	12
Número de aristas	6	12	12	30	30
Ángulo diedro	70°32’	90°	109°28’	116°34’	138°11’
Angulo en las caras del caleidoscopio	109º 28’	70º 32’	90º	41º 49’	63º 26’
Arista lateral del caleidoscopio	$(a\sqrt{6})/4$	$(a\sqrt{3})/2$	$(a\sqrt{2})/2$	$(a\sqrt{18+6\sqrt{5}})/4$	$(a\sqrt{10+2\sqrt{5}})/4$



CALEIDOSCOPIOS



FC es la mediana de ACB

E es su baricentro

EC mide 2/3 de FC que mide igual que FD=m

FE mide 1/3

DFE es un triángulo rectángulo en E

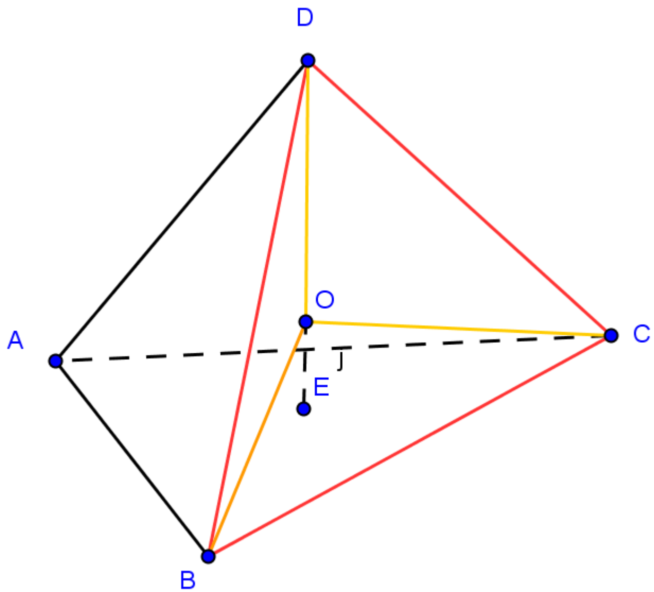
luego

$\cos(\alpha) = (m/3)/m$

es decir $\cos(\alpha) = 1/3$

por lo que

$\alpha = 70º\ 32'$



Podemos descomponer el tetraedro ABCD

en cuatro pirámides iguales a BCDO,

como las que vimos en película jabonosa

hace tres semanas.

De ello se desprende que

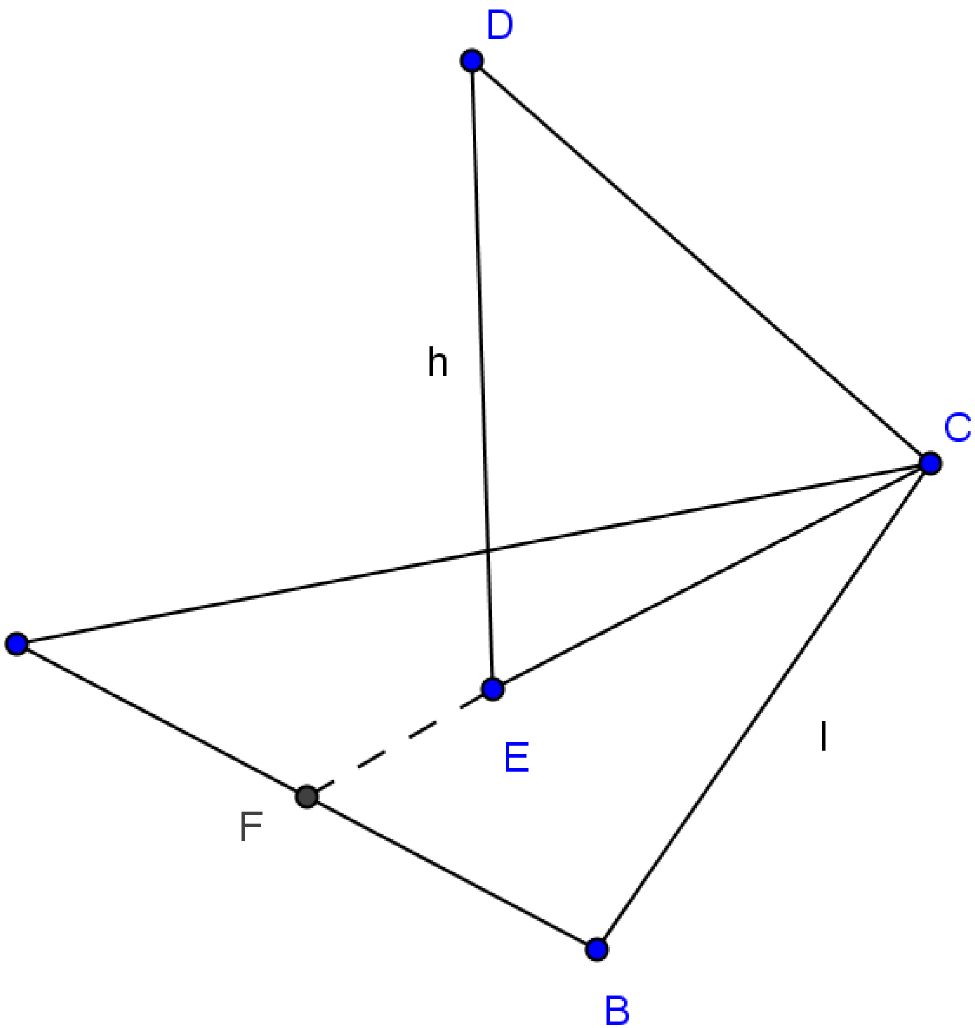
dado que tienen la misma base y 1/4 del volumen

la altura de cada piráide OE

será 1/4 de la altura DE del tetraedro $\overline{OE} = \frac{1}{3}\overline{DE}$

y la arista lateral de cada pirámide

medirá el resto, es decir 3/4 de la altura del tetraedro $\overline{OD} = \frac{3}{4}\overline{DE}$



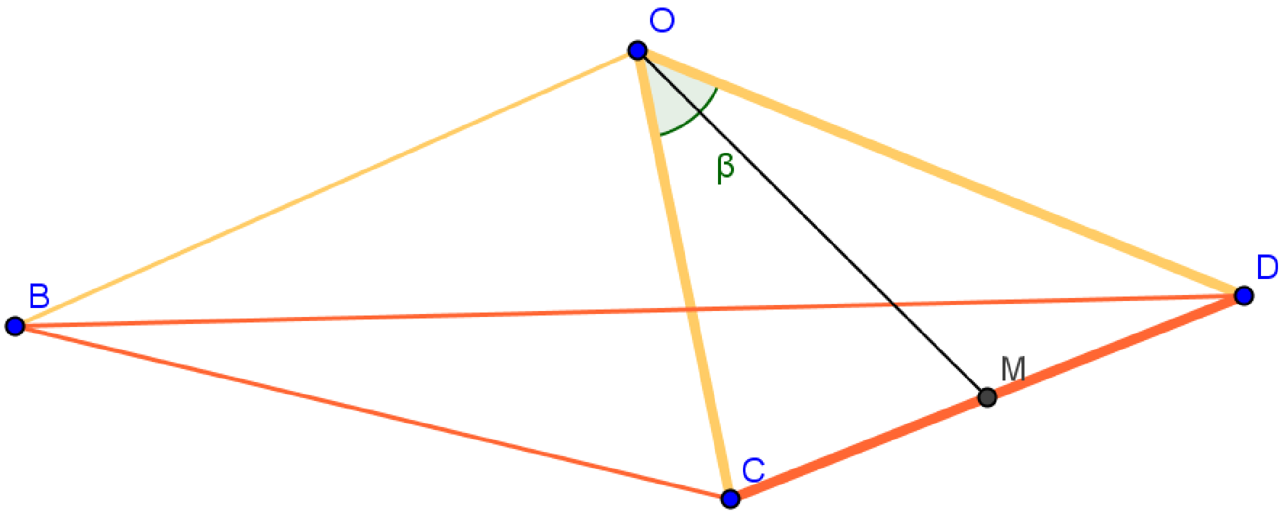
$$l = 1$$

$$\overline{FB} = \frac{1}{2}$$

$$m = \overline{FC} = \sqrt{1 - \frac{1}{4}} = \frac{\sqrt{3}}{2}$$

$$\overline{EC} = \frac{2}{3} m = \frac{\sqrt{3}}{3}$$

$$h = \sqrt{1 - \left(\frac{\sqrt{3}}{3}\right)^2} = \sqrt{\frac{2}{3}}$$

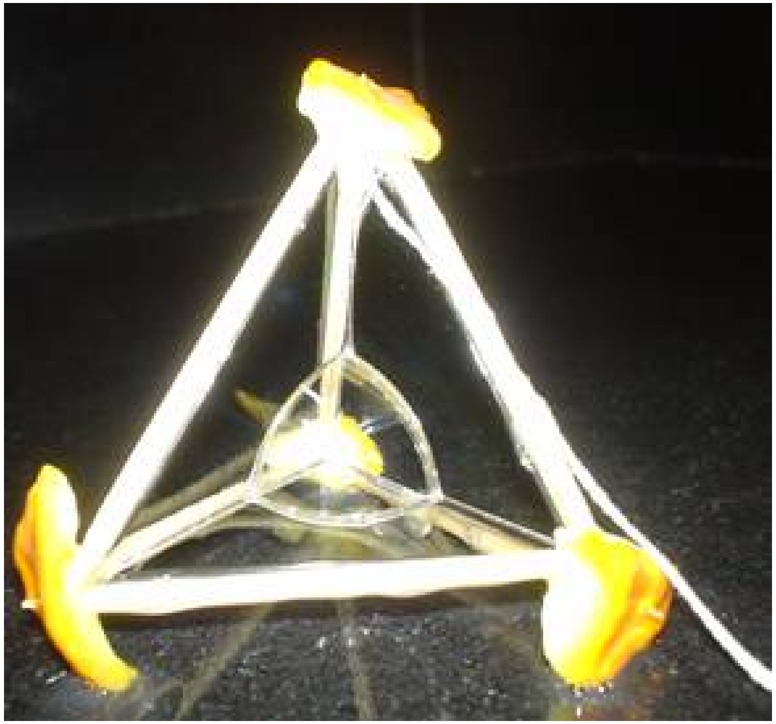


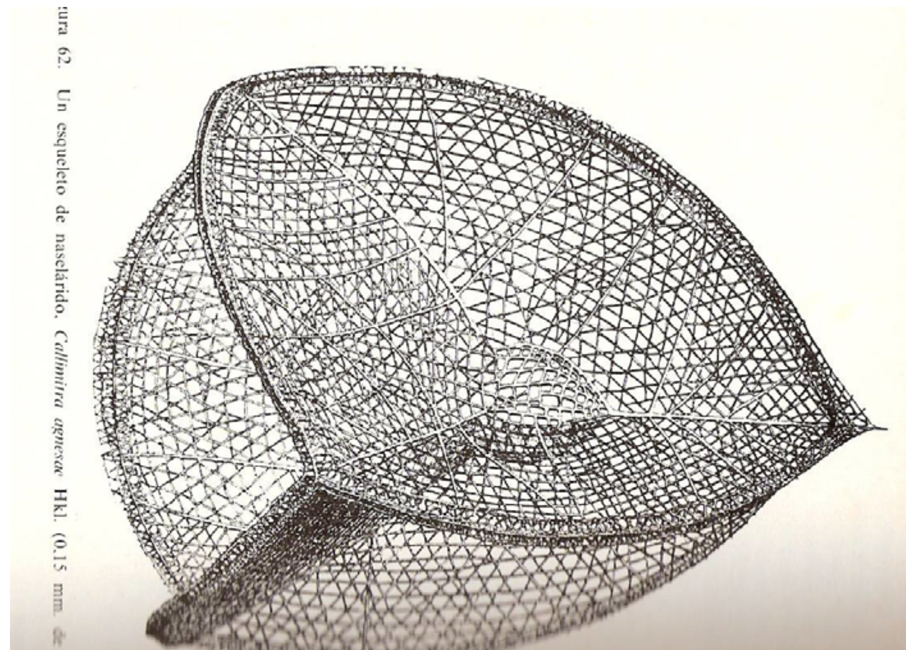
$CD = 1$ $\qquad CM = \frac{1}{2}$ $\qquad OC = \frac{3}{4}h$ $\qquad OC = \frac{3}{4}\sqrt{\frac{2}{3}} = \frac{\sqrt{6}}{4}$

$\operatorname{sen}(\beta/2) = \frac{\frac{1}{2}}{\frac{\sqrt{6}}{4}} = \frac{\sqrt{6}}{3}$ $\qquad \beta = 109º\ 28'$

Entonces, el diedro del tetraedro y la cara de su pirámide-caleidoscopio,

son suplementarios pues: $\alpha + \beta = 70º\ 32' + 109º\ 28' = 180º$



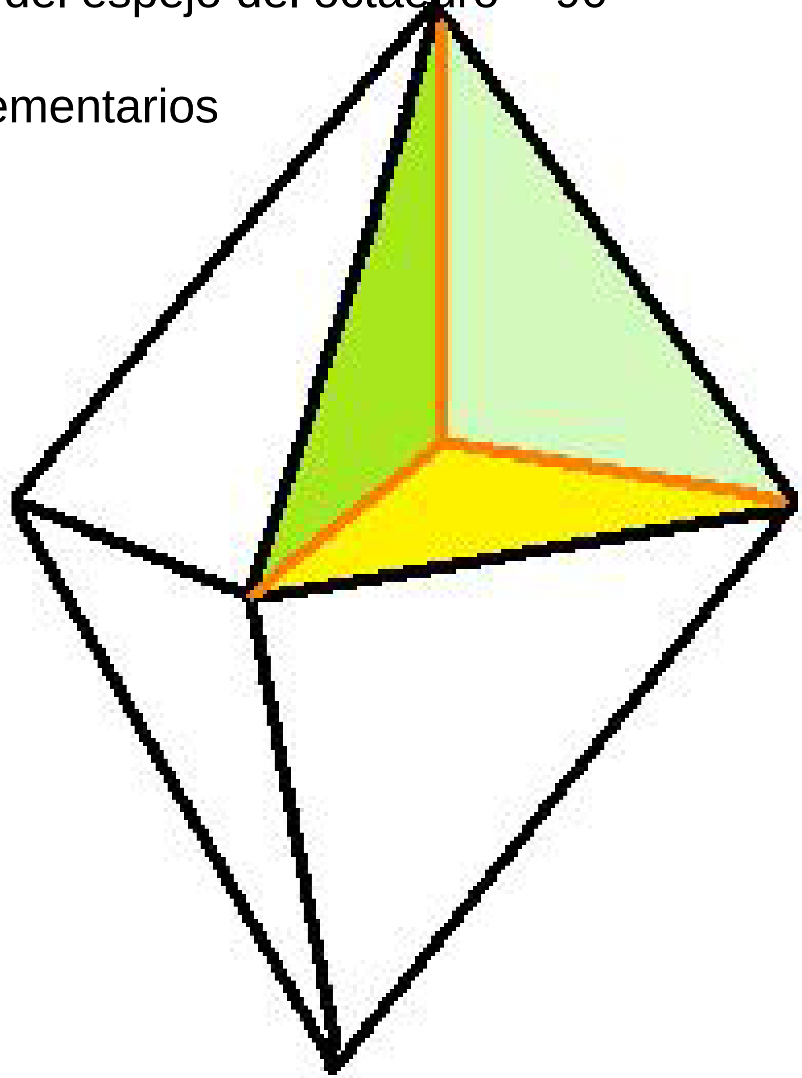


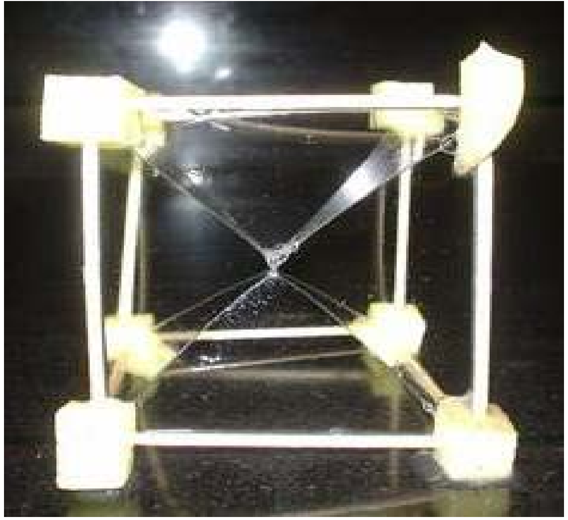
Esqueleto de un naserálido

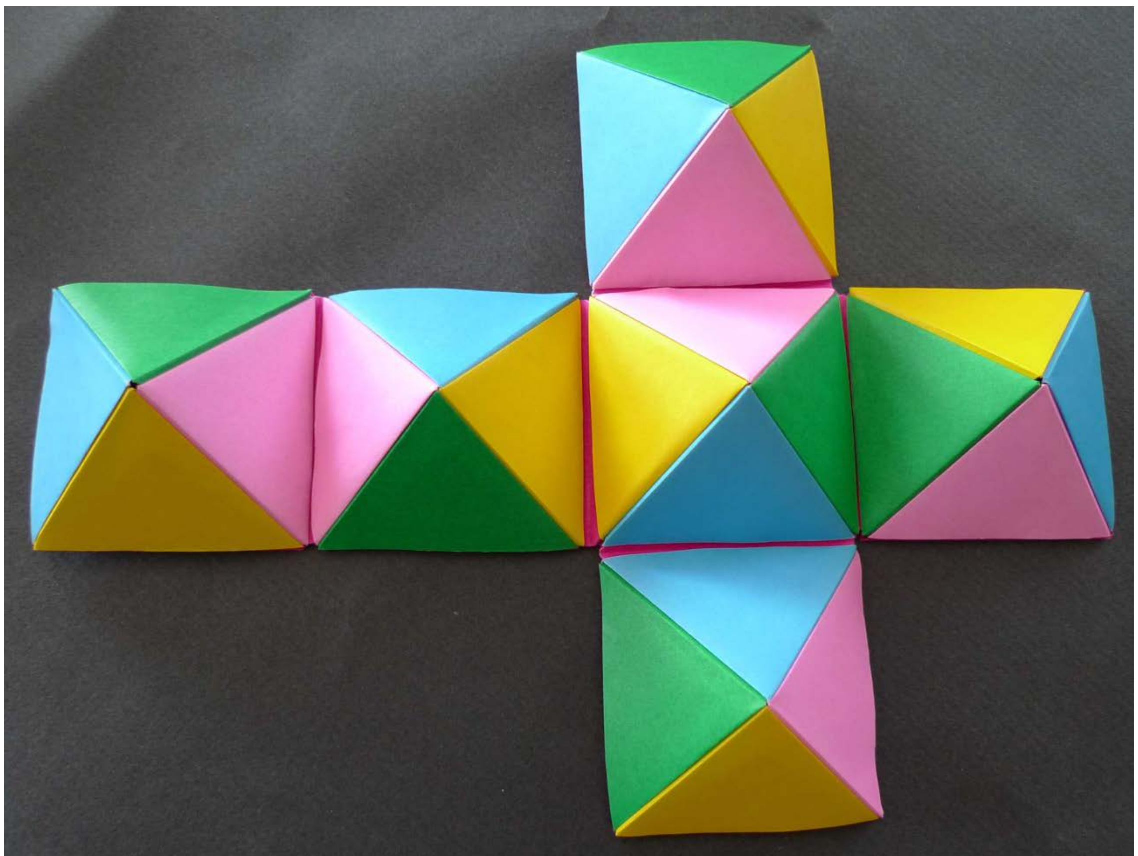
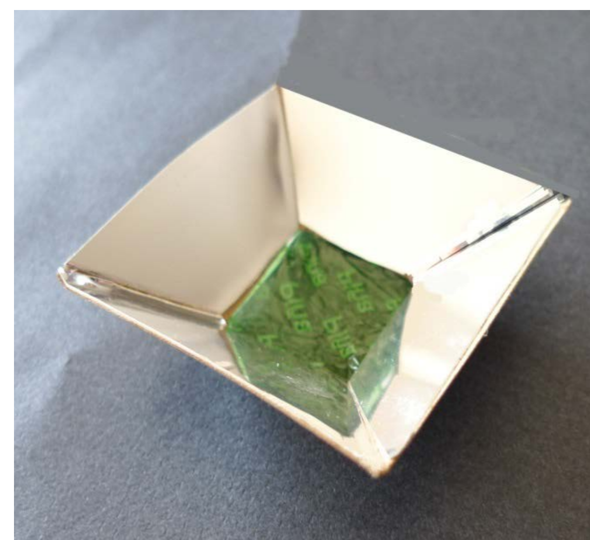
Diedro del cubo = 90º

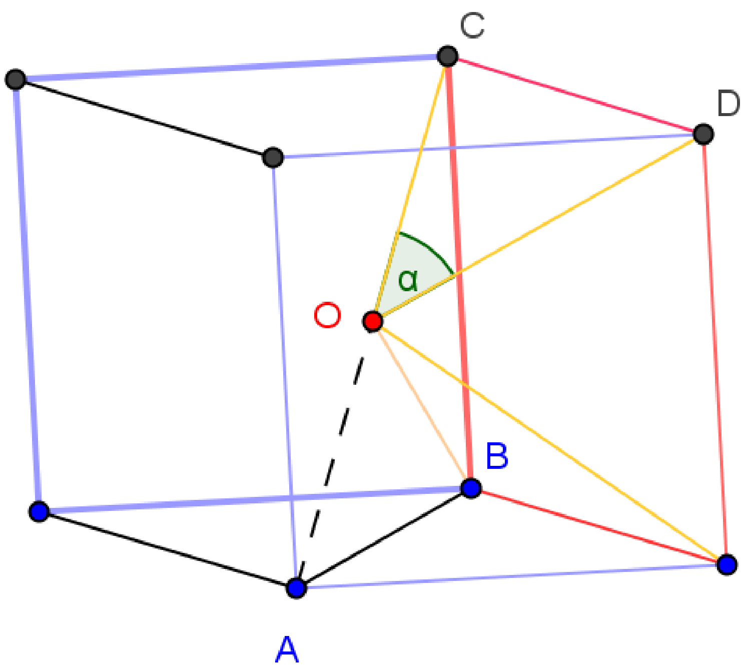
Cara del espejo del octaedro = 90º

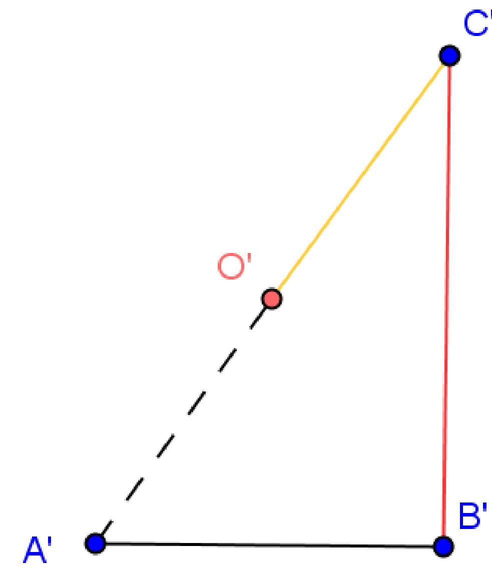
Suplementarios





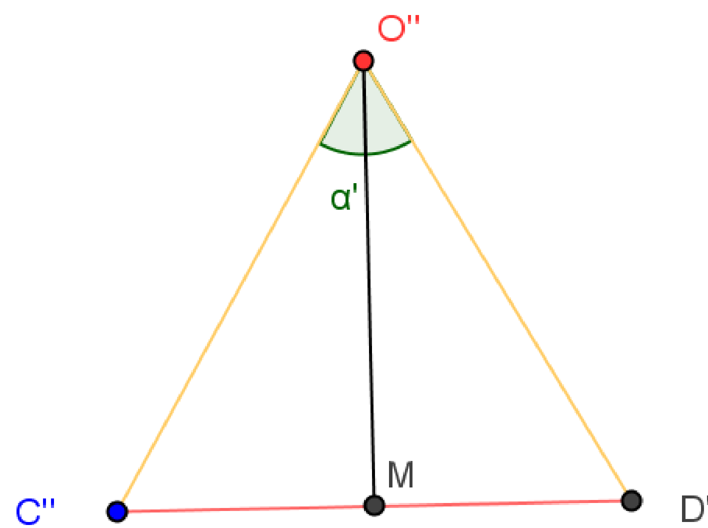


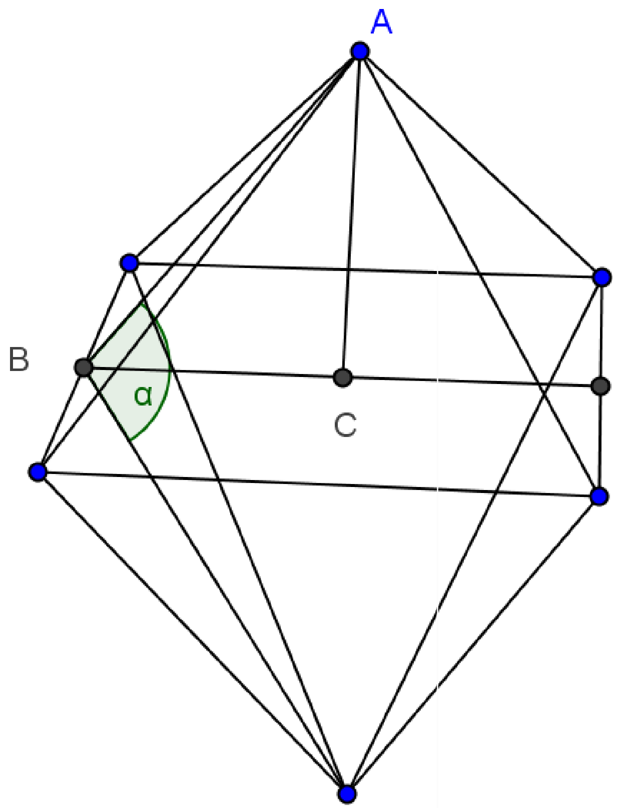


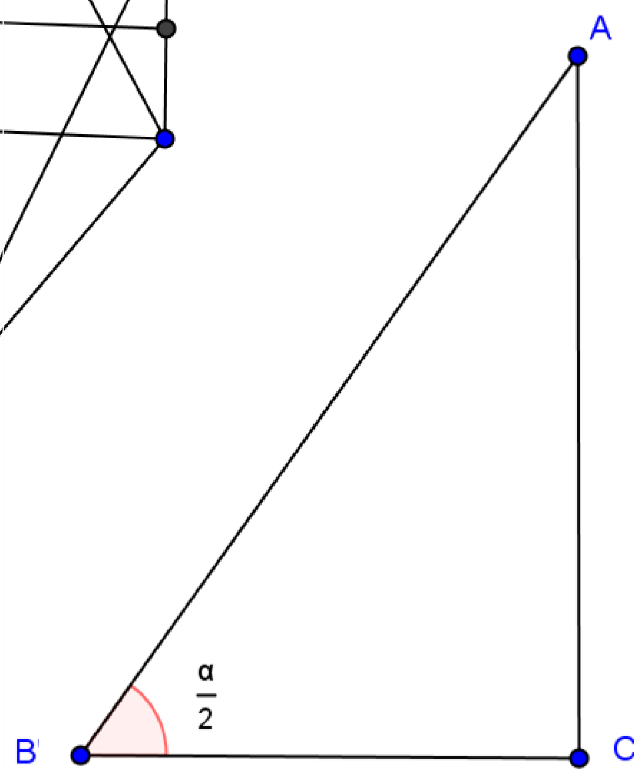
$\overline{CD}=1$ $\qquad \overline{CM}=\frac{1}{2}$ $\qquad \overline{AB}=\sqrt{1+1}=\sqrt{2}$

$\overline{CO}=(1/2)\overline{AC}=(1/2)\sqrt{1+2}=\frac{\sqrt{3}}{2}$

$sen(\alpha/2)=\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}=\frac{\sqrt{3}}{3}$ $\qquad \alpha = 70º\ 32'$





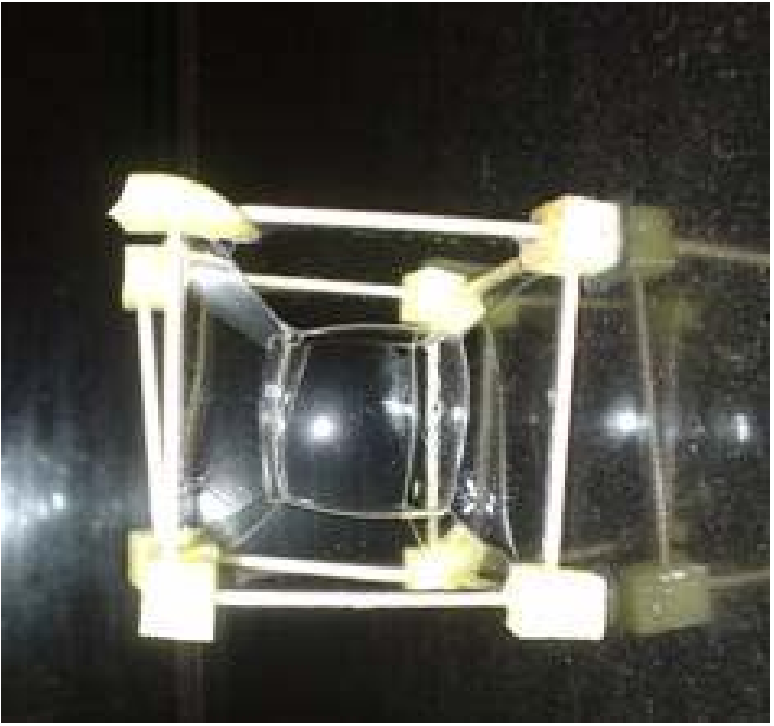


$$\overline{AC}=\frac{\sqrt{2}}{2}$$

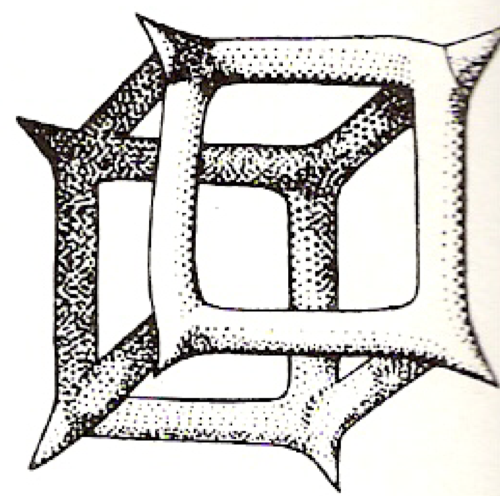
$$\overline{BC}=\frac{1}{2}$$

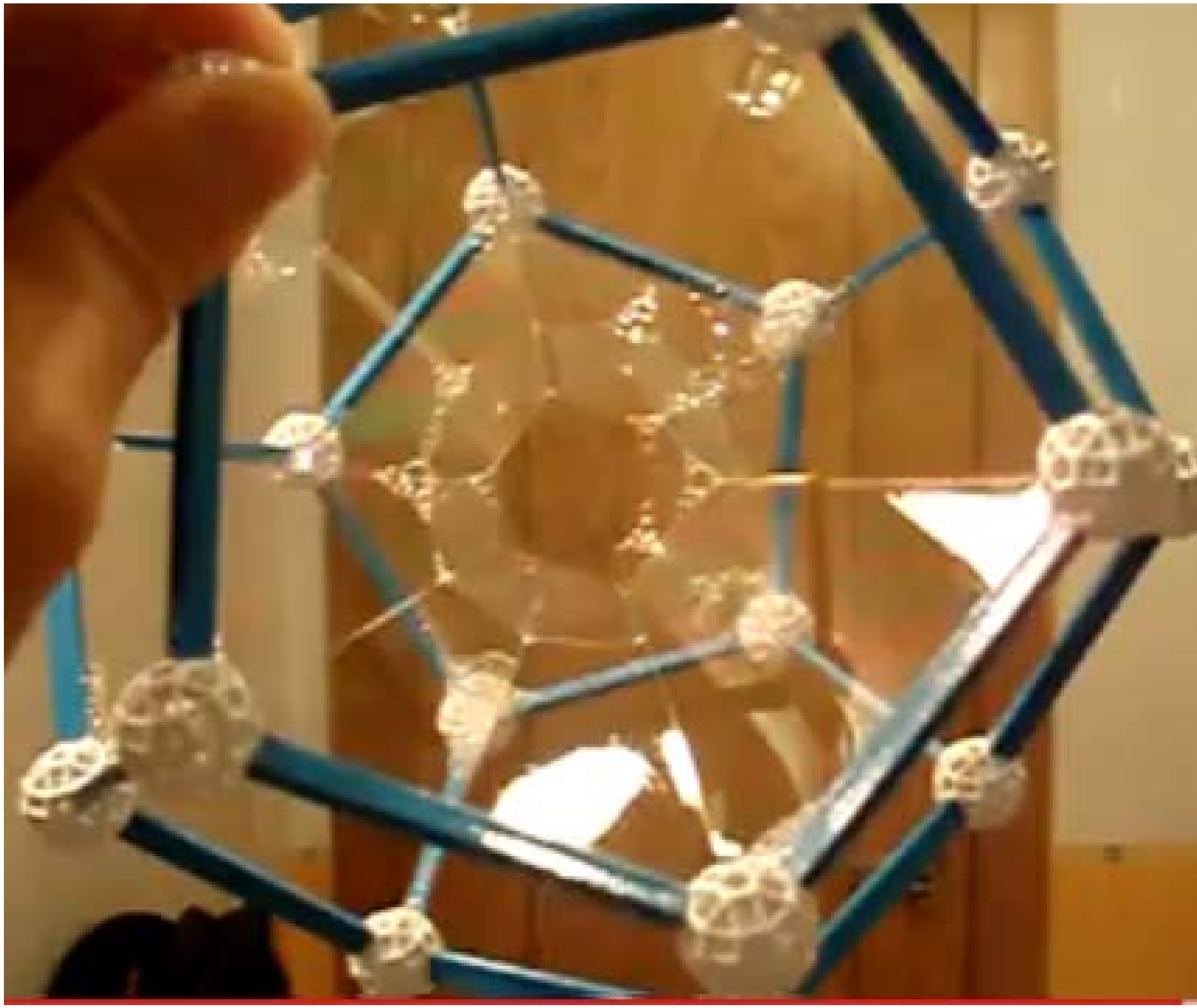
$$\text{tang}(\alpha/2)=\frac{\frac{\sqrt{2}}{2}}{\frac{1}{2}}=\sqrt{2}$$

α = 109º 28'

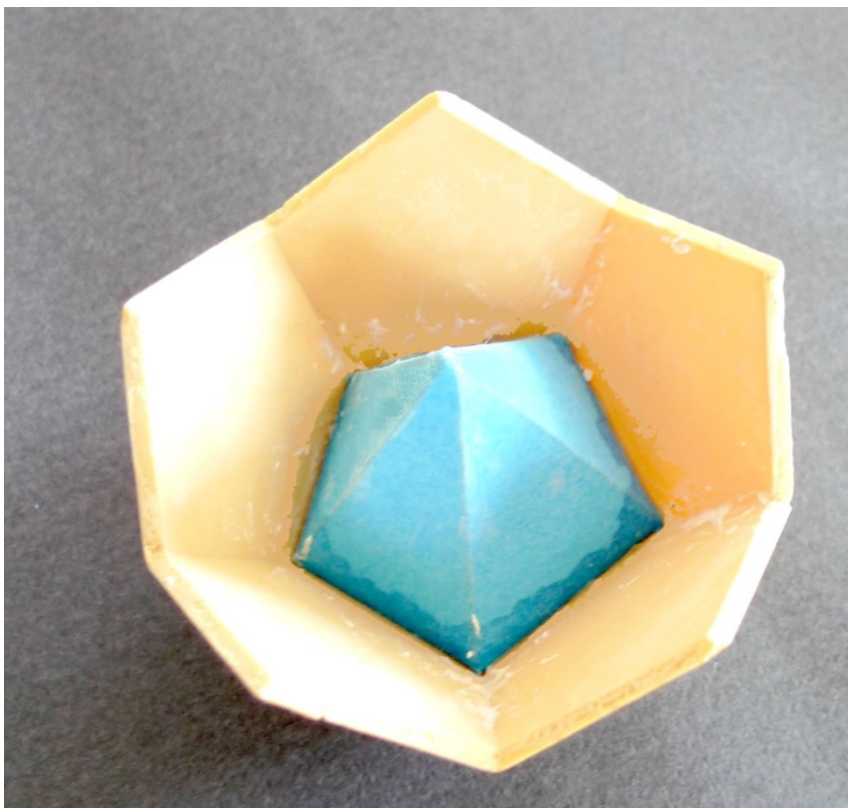
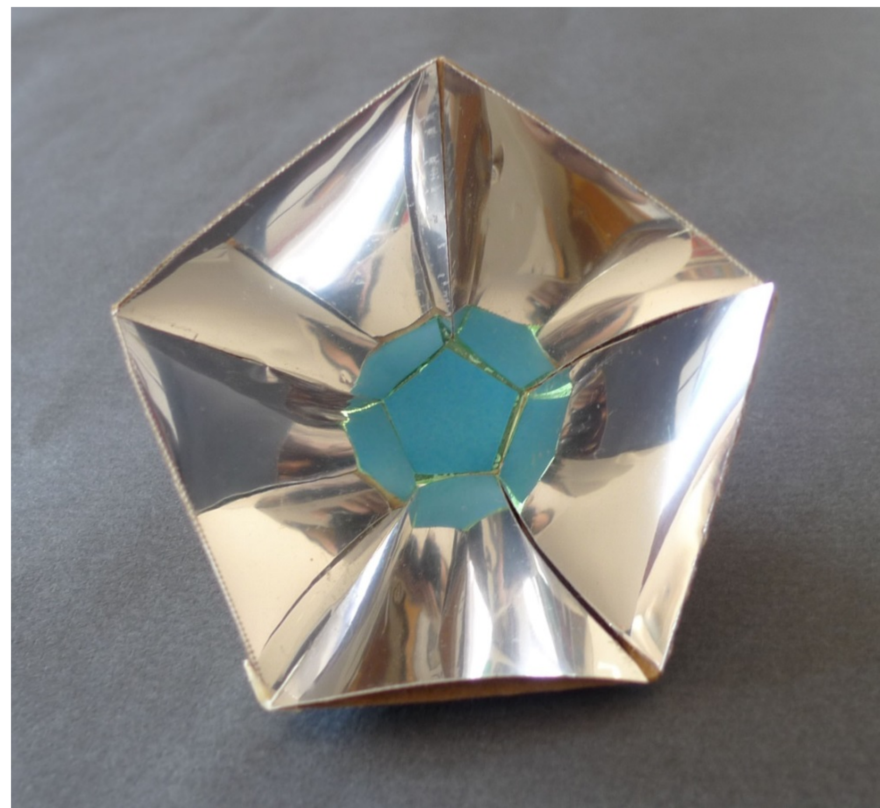


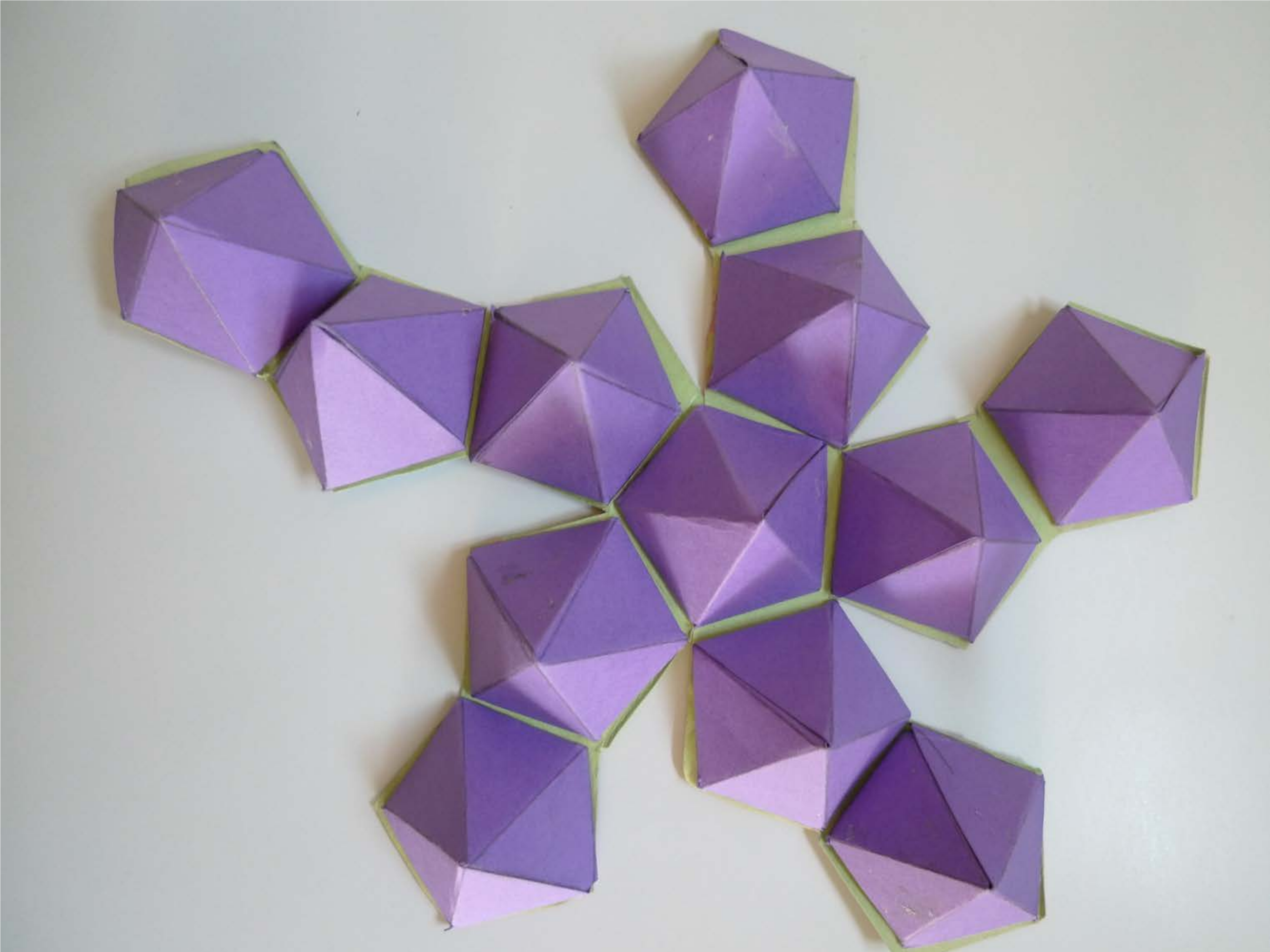
Litocubus geométricus

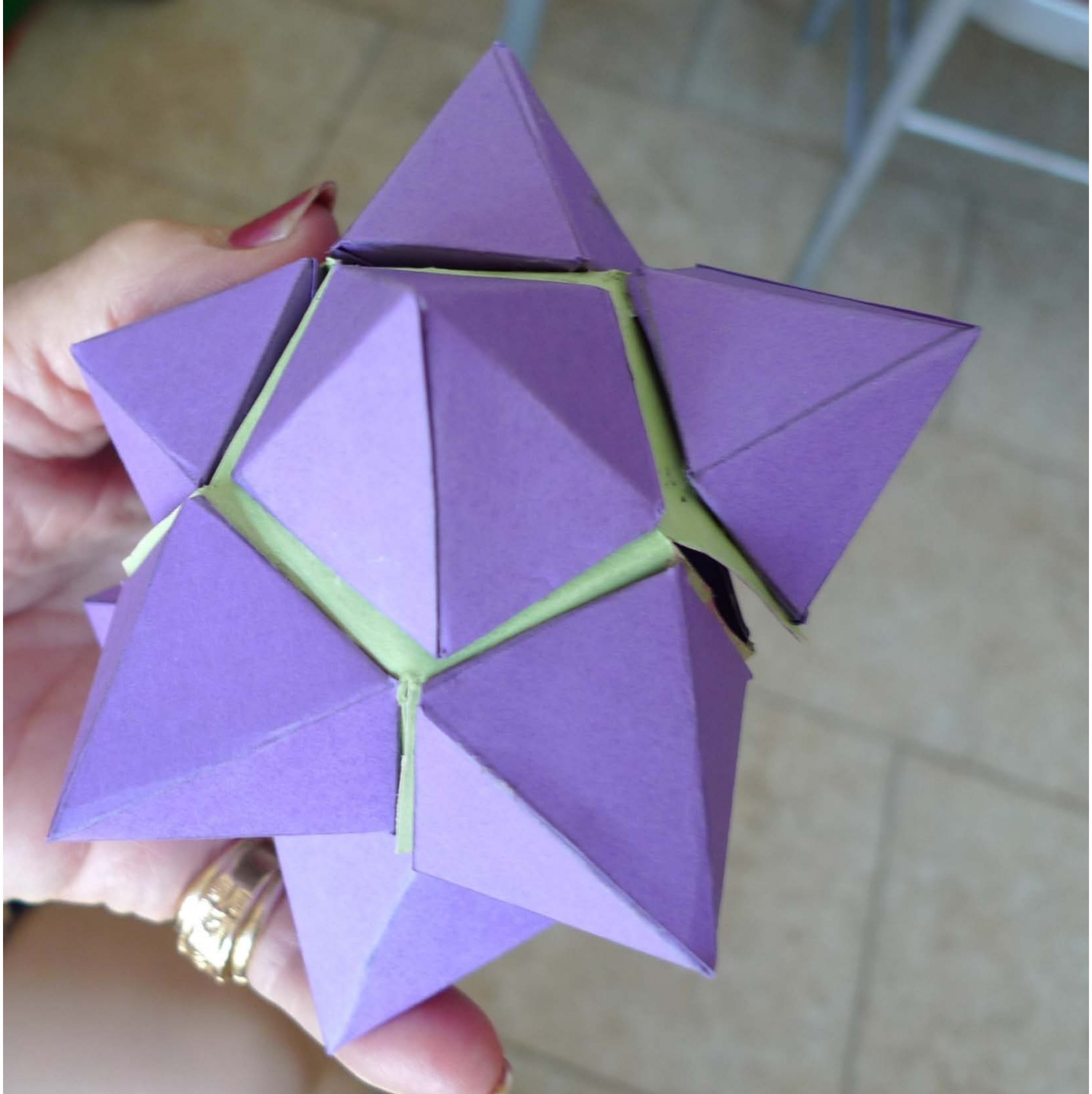


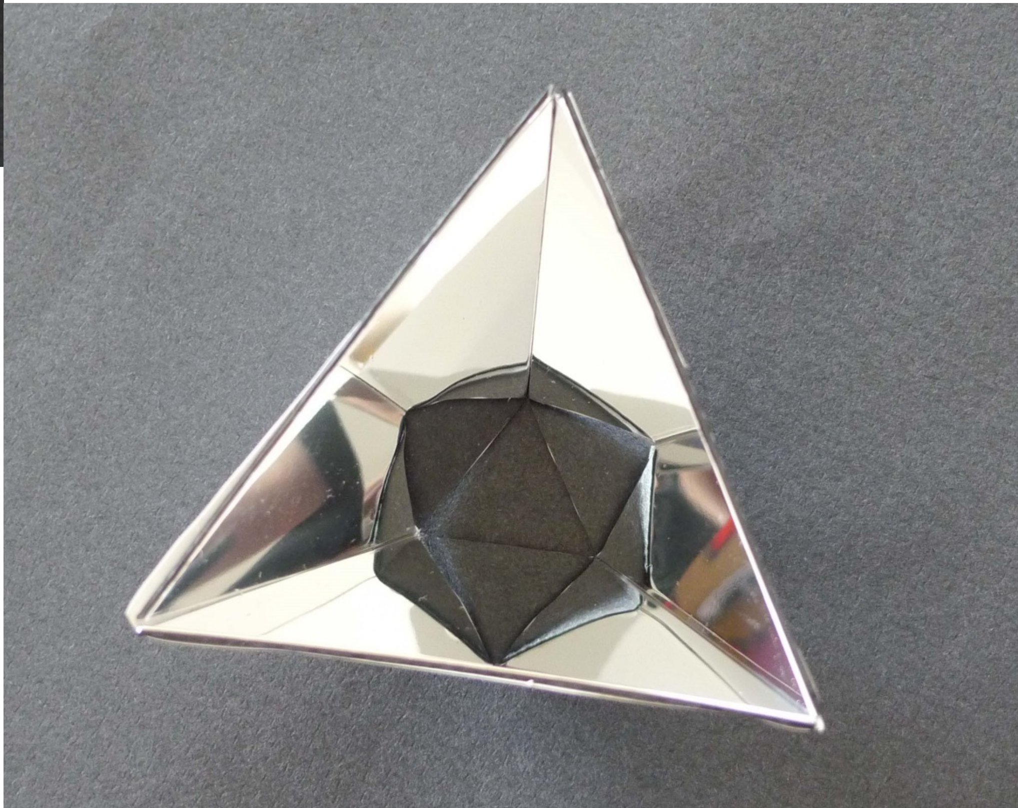




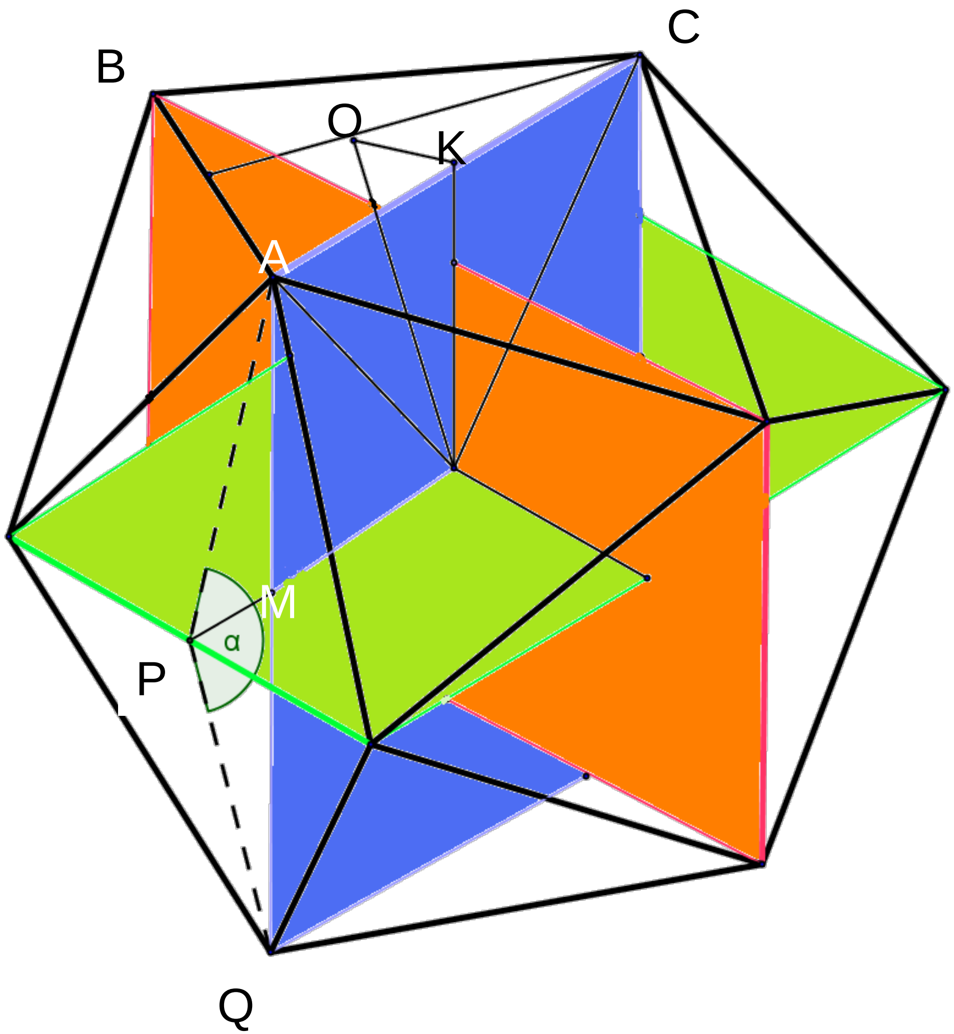











por internet y por
on line



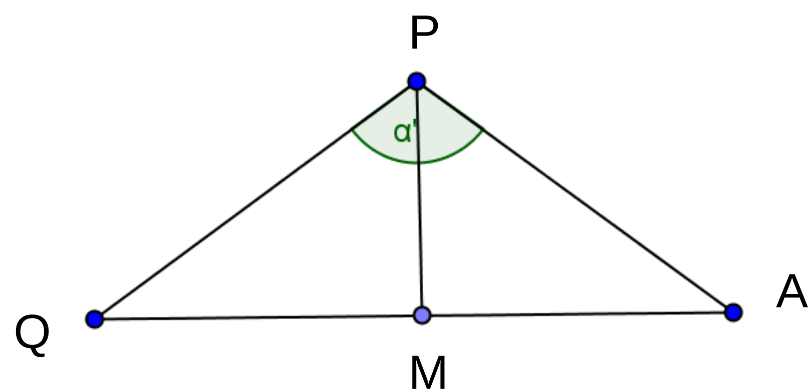
DIEDRO DEL ICOSAEDRO

$AQ = \Phi$

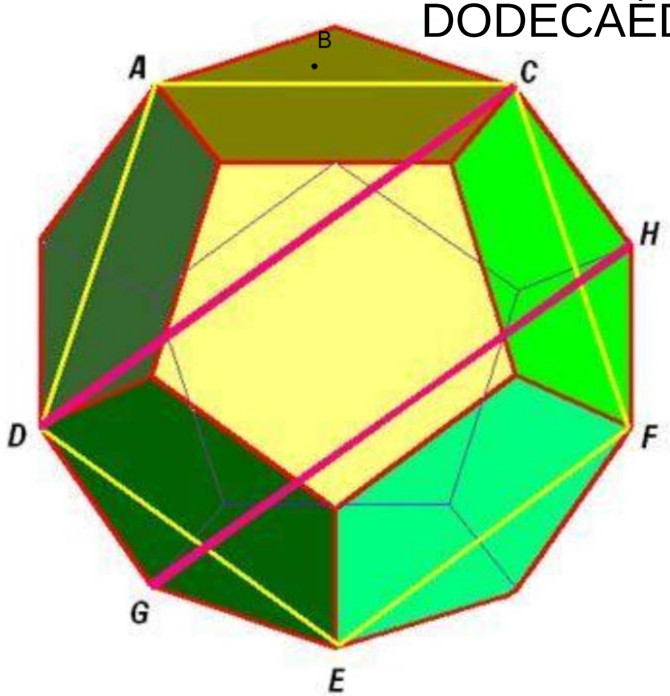
$AP = \frac{\sqrt{3}}{2}$

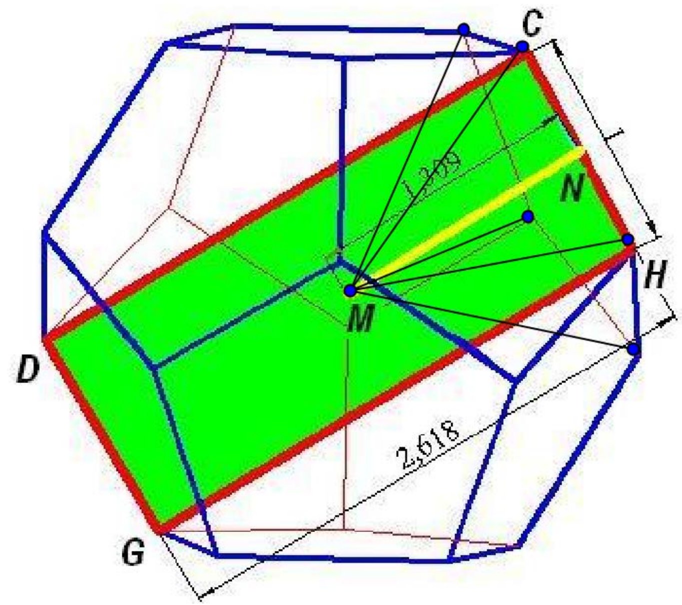
$\operatorname{sen}\left(\frac{\alpha}{2}\right) = \frac{\frac{\Phi}{2}}{\frac{\sqrt{3}}{2}}$

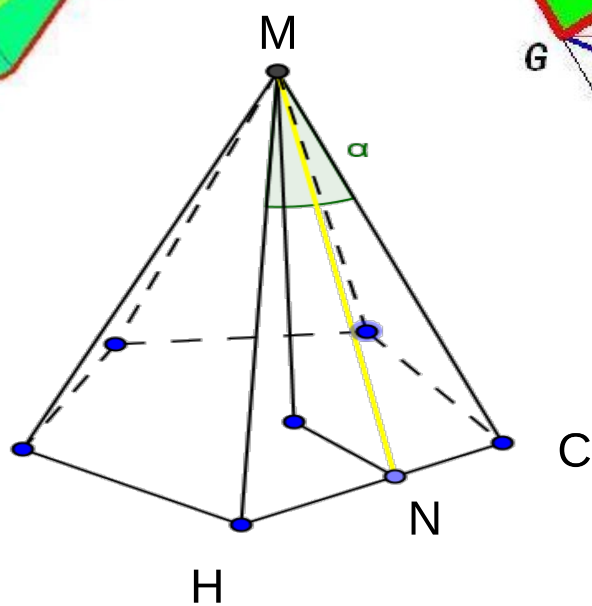
$\alpha = 138^{\circ}\ 11'$



CARA DEL ESPEJO DODECAÉDRICO







$$\frac{\overline{DC}}{\overline{AC}} = \frac{\overline{AC}}{\overline{AB}} = \Phi$$

$$\overline{DC} = \overline{AC}\Phi = \overline{AB}\Phi^2 = \Phi^2$$

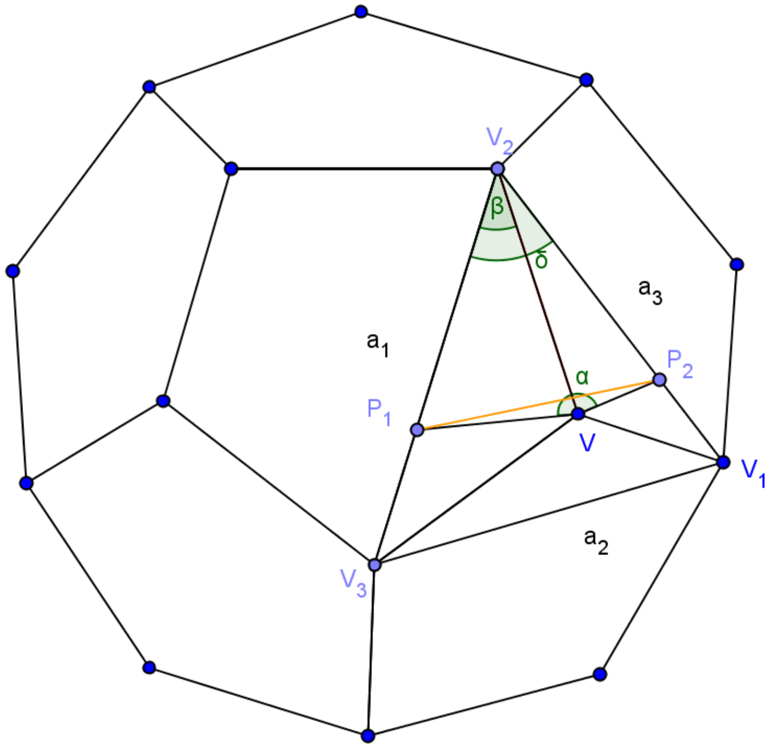
para $\overline{AB} = 1$

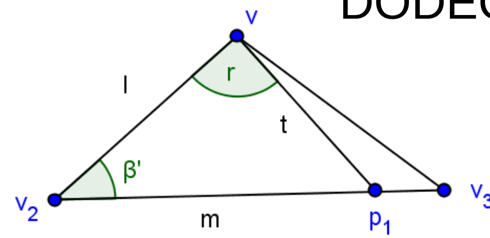
$$\tan\left(\frac{\alpha}{2}\right) = \frac{\frac{1}{2}}{\frac{\Phi^2}{2}}$$

α=41º 49'

VOLUMEN: 12* área pentágono*h

DIEDRO DEL DODECAEDRO



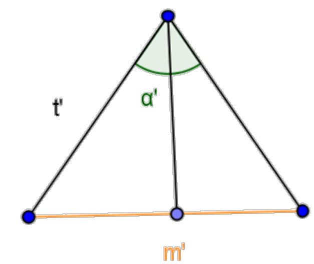


$$tang(\beta)=\frac{t}{1}=t=tang(36º)=0{,}726542528$$

$$cos(\beta)=\frac{l}{m}=\frac{1}{m}$$

$$m=\frac{1}{cos(\beta)}=\frac{1}{cos(36)}=1{,}236067977$$

$$\overline{P_1P_2}=m=1{,}236067977$$



$$sen(\frac{\alpha}{2})=\frac{\frac{1{,}236067977}{2}}{0{,}726542528}=0{,}8506508084$$

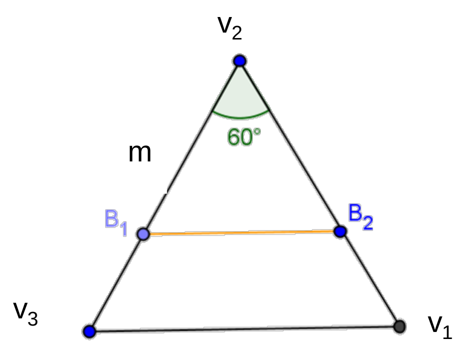
$\alpha=116º\ 34'$

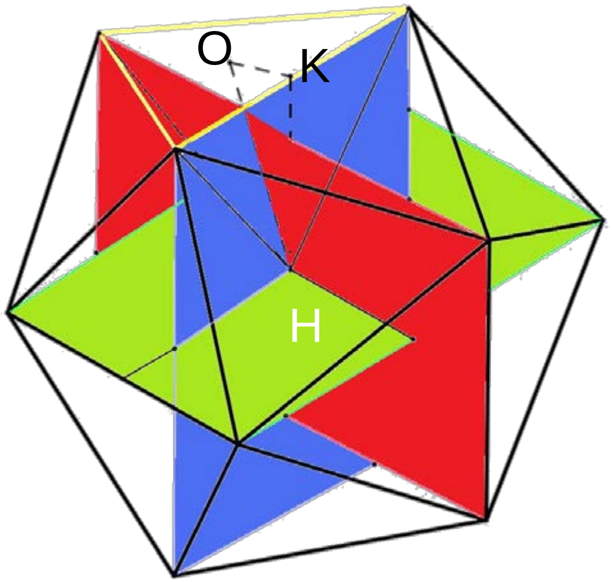
r=90º

β=36º

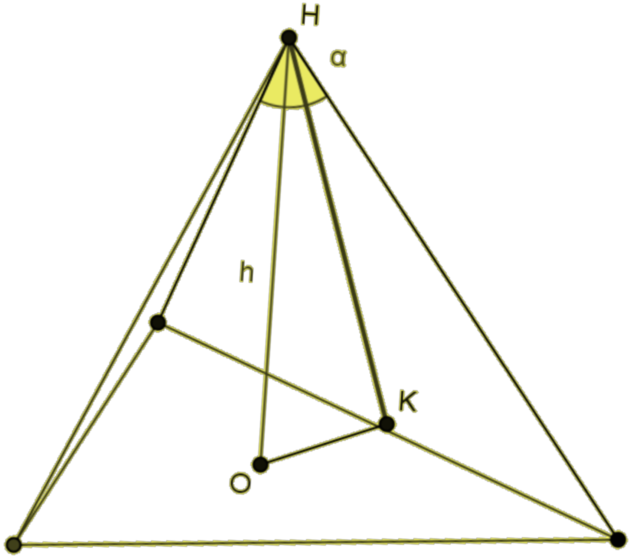
l = 1

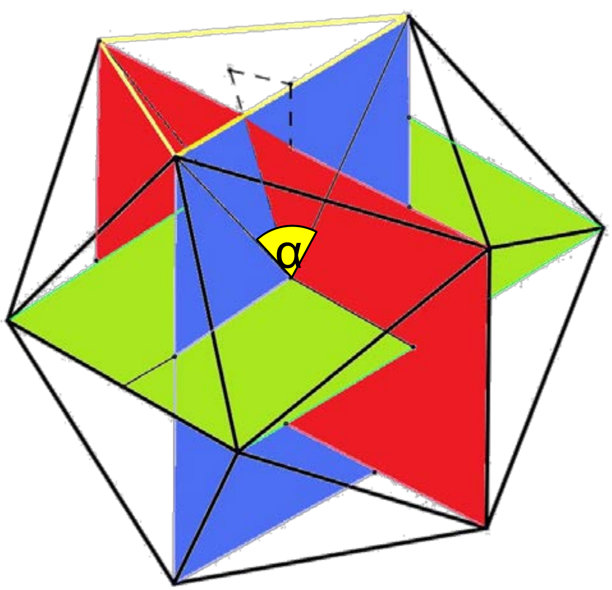
δ=60º





CARA DEL ESPEJO ICOSAÉDRICO

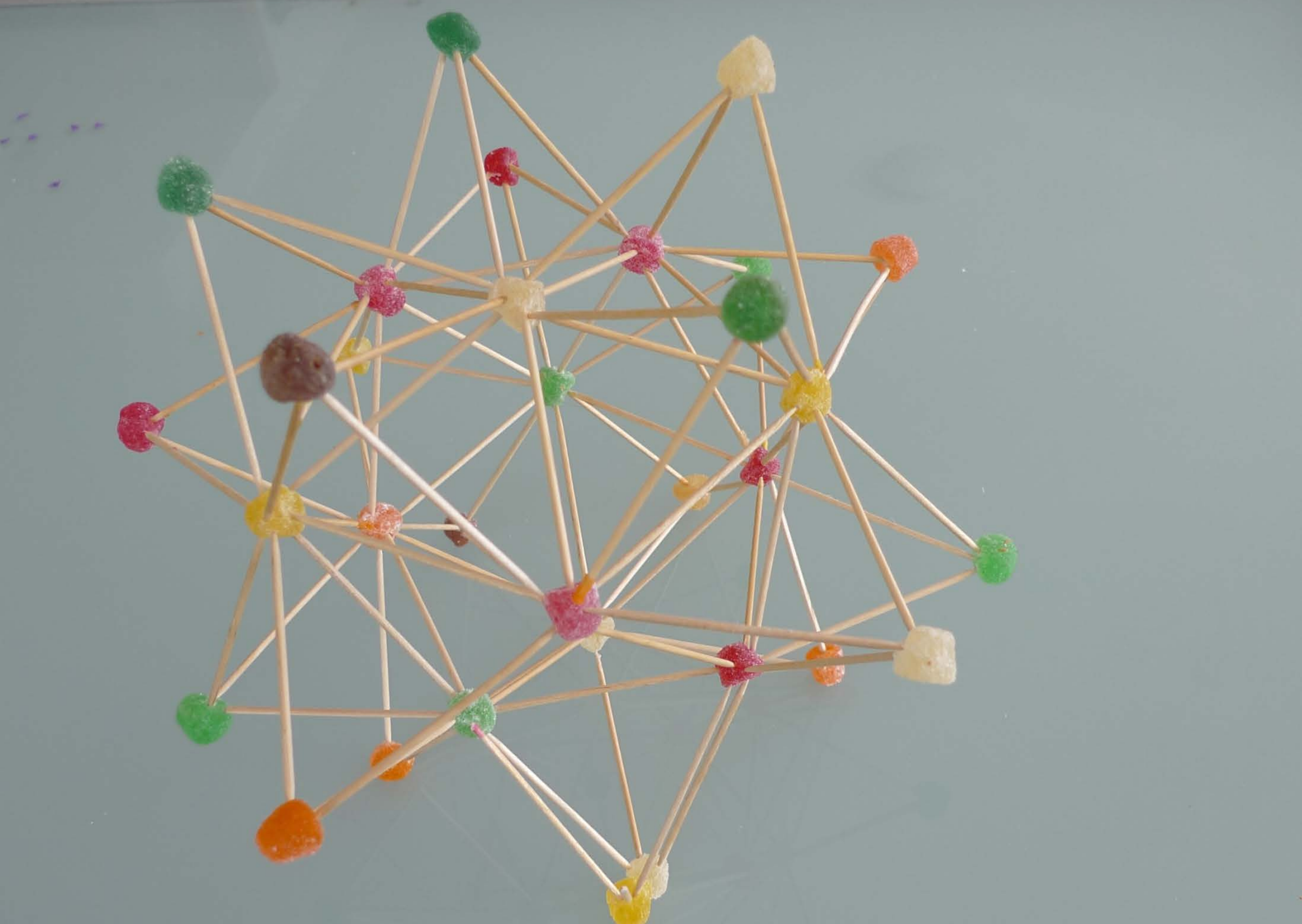




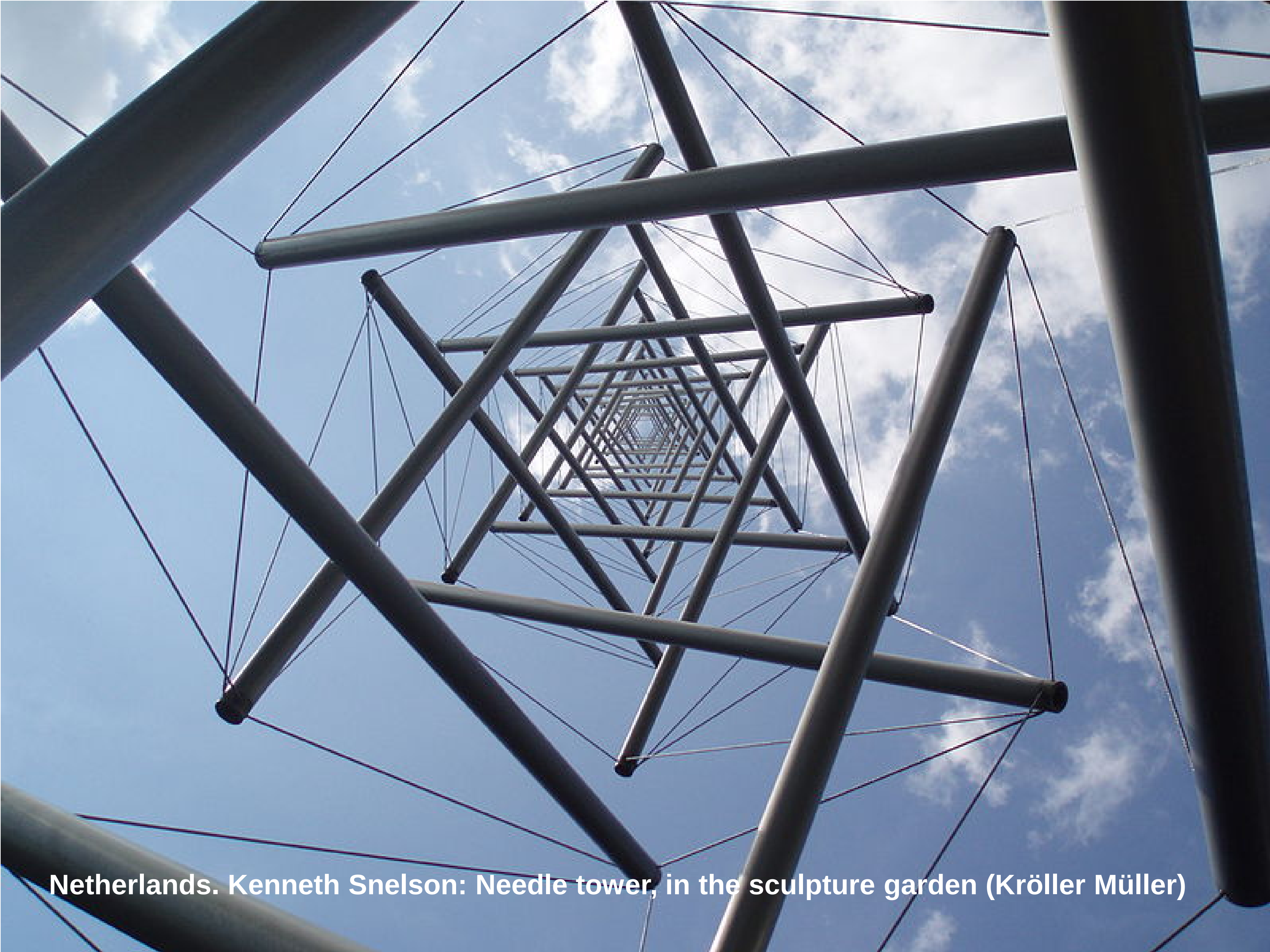
$$\mathrm{tang}\left(\frac{\alpha}{2}\right)=\frac{\frac{1}{2}}{\frac{\Phi}{2}}$$

α=63º26'α

VOLUMEN: 20*(1/3)base pirámide* h

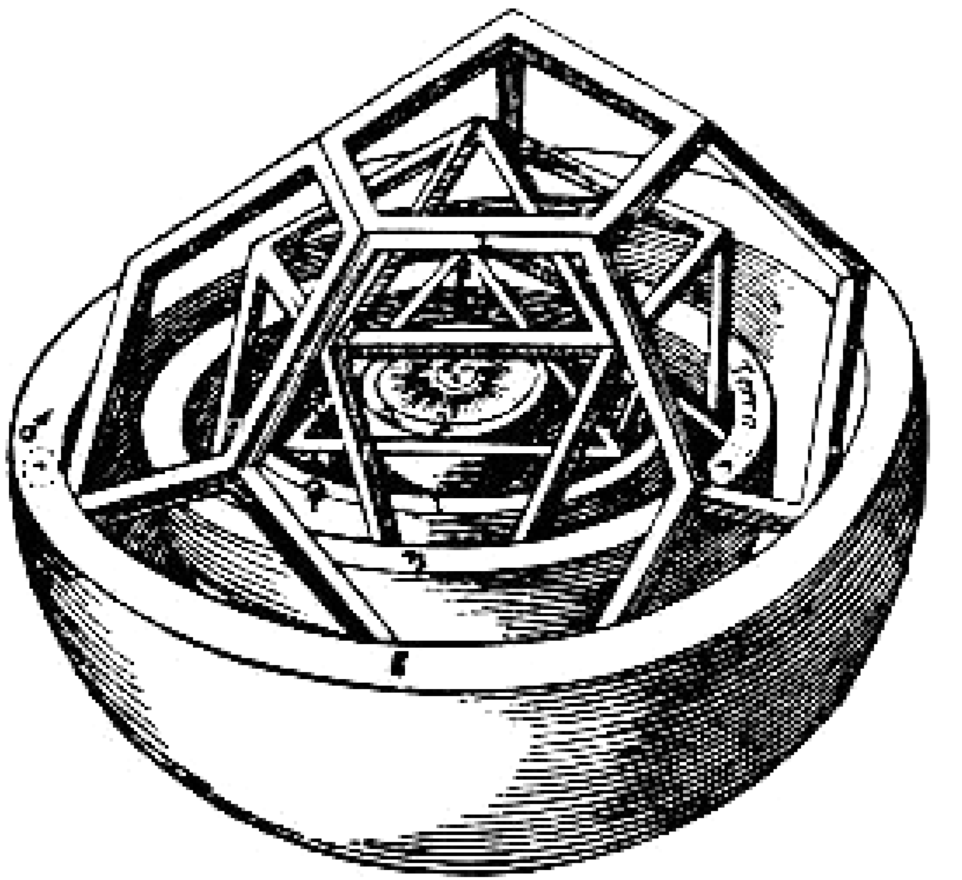


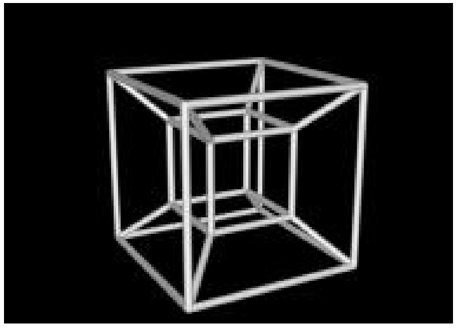
Tensigriti: formas rígidas y flexibes: el triángulo y el pentágono.



Netherlands. Kenneth Snelson: Needle tower, in the sculpture garden (Kröller Müller)

La conjetura de Keppler





Proyección plana de la proyección espacial del hipercubo