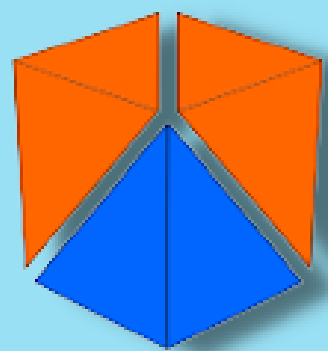




OriNidaZoom

Una primavera di rombi

Luciana Piras
I.C. V. Galilei (Pi)

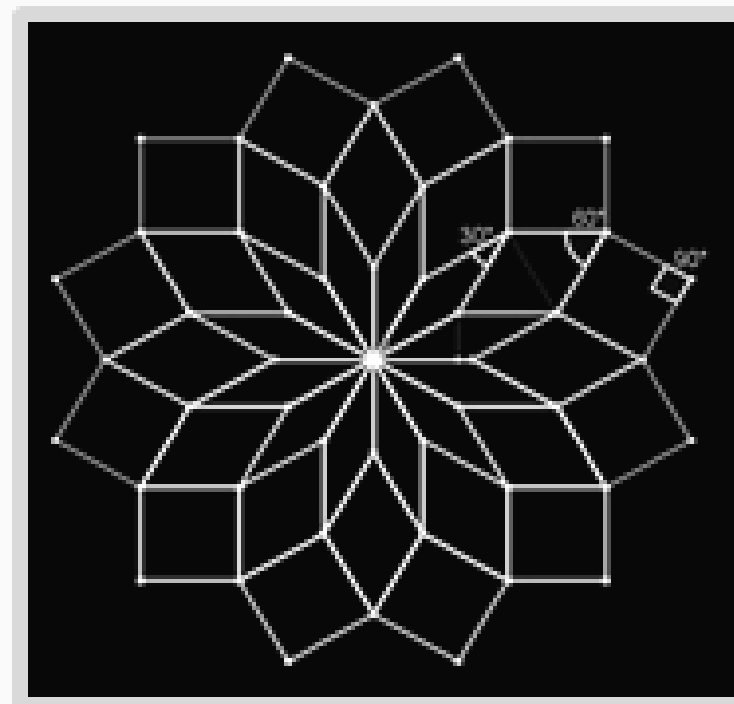
Barbara Sbrega
I.C. Manziana (Rm)



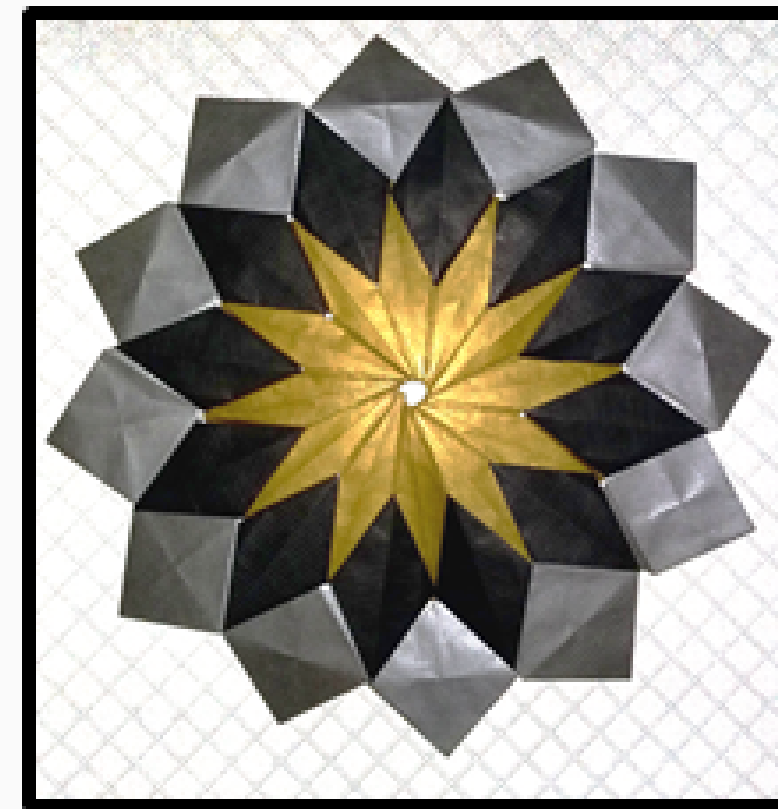
Rosone della facciata della chiesa di S. Agostino a Trapani



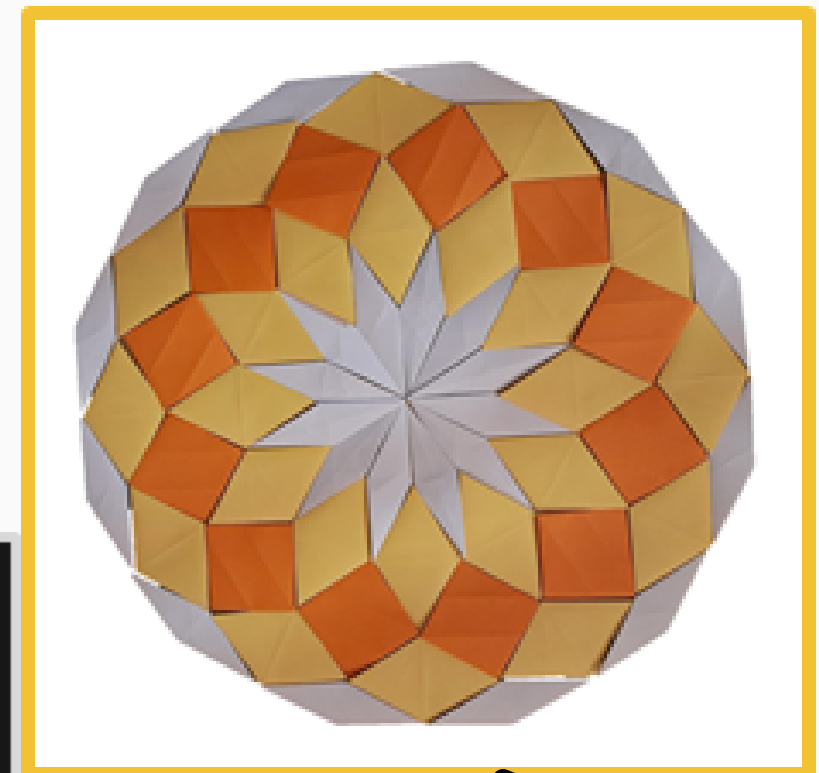
realizzazione con
strisce di carta

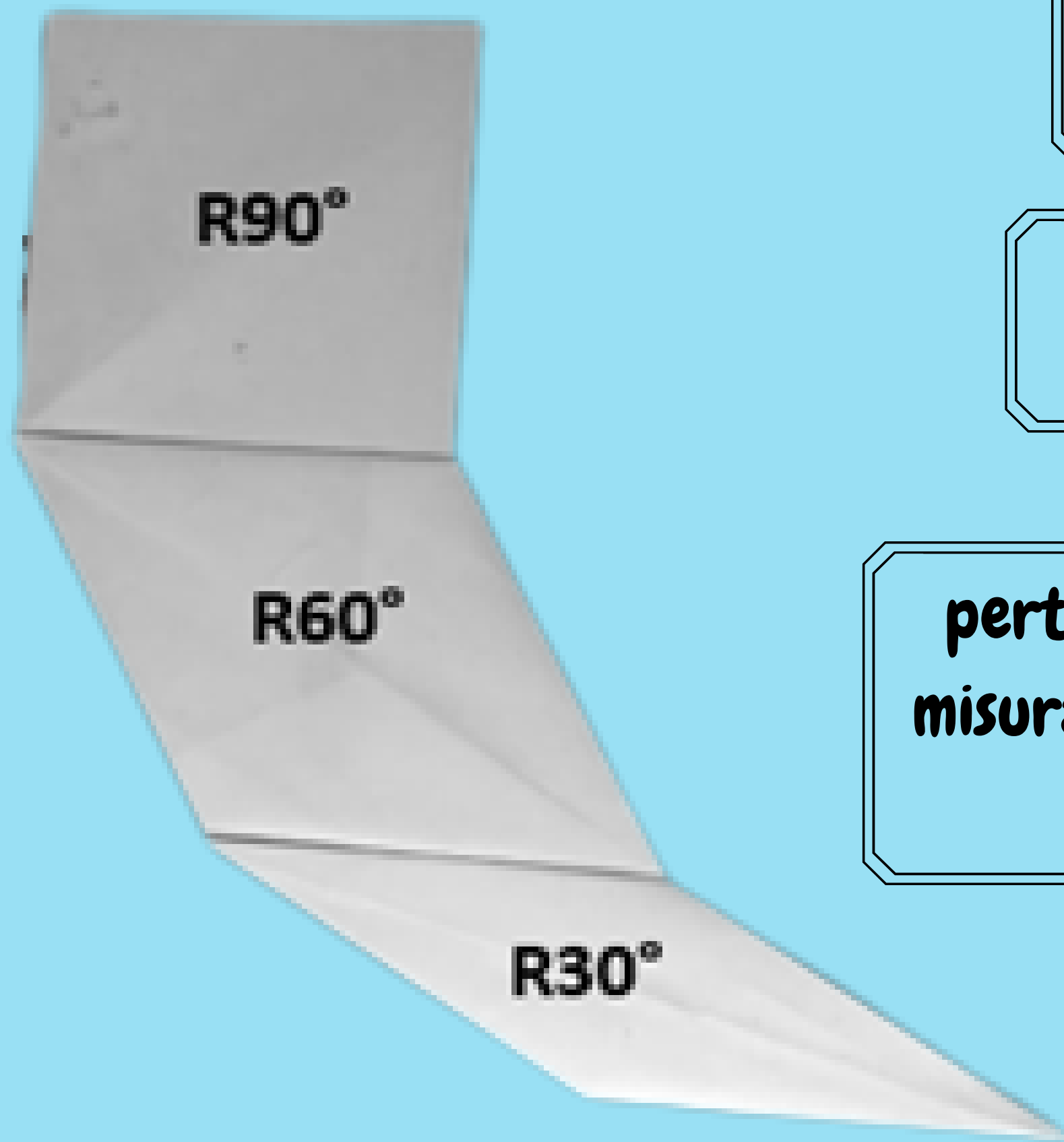


Analisi con
GeoGebra



realizzazione con
moduli





I 3 moduli necessari

sono rombi ISOPERIMETRICI

**pertanto è necessario prevedere la giusta
misura del quadrato di partenza per avere i
lati del modulo finale uguali**

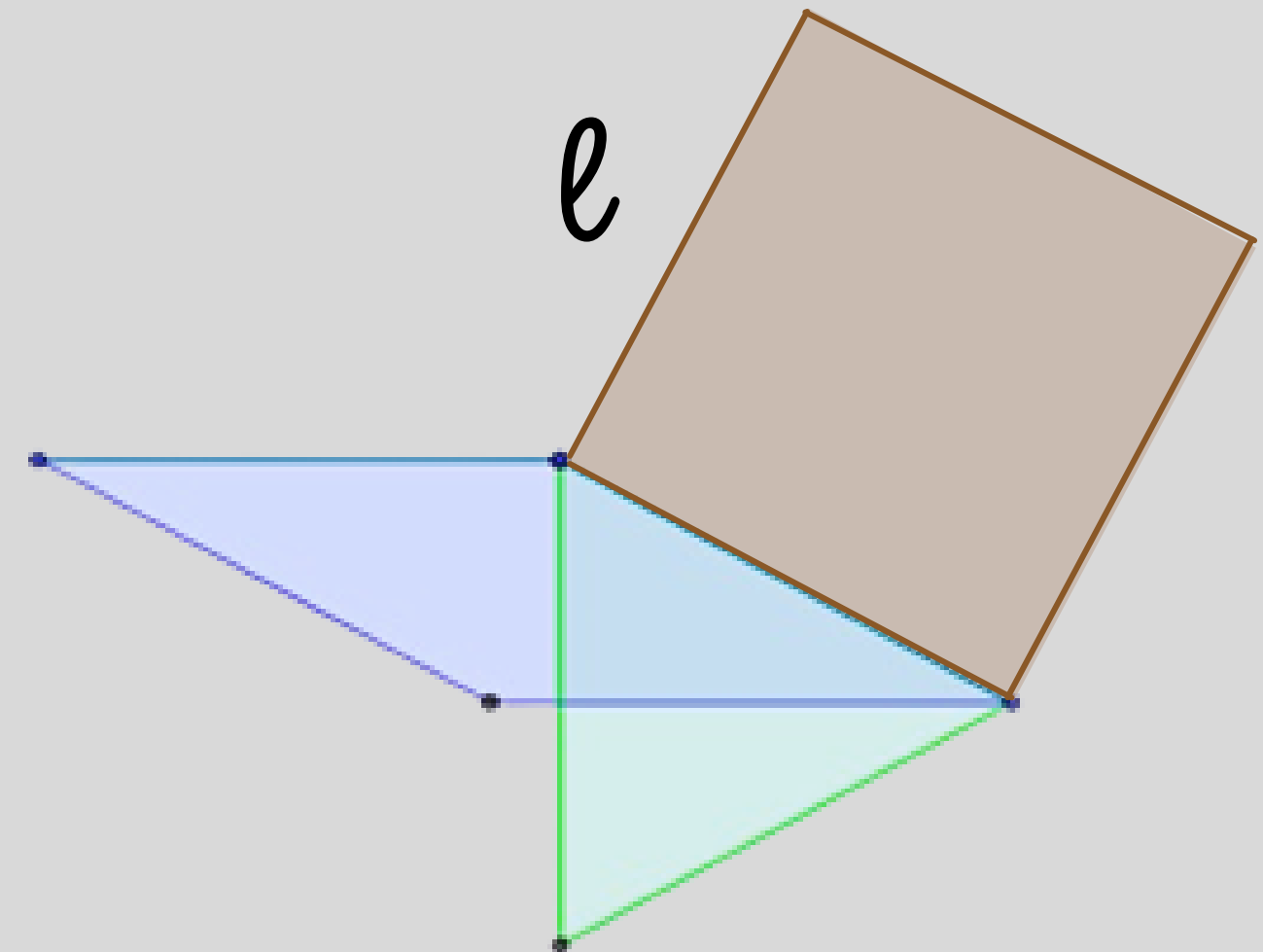
RELAZIONE TRA LE DIVERSE AREE

$$A_{R90^\circ} = \ell^2$$

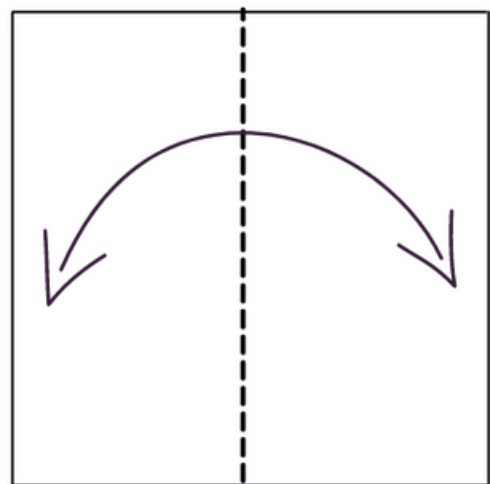
$$A_{R60^\circ} = \frac{1}{2} \ell^2 \sqrt{3}$$

$$A_{R30^\circ} = \frac{1}{2} \ell^2$$

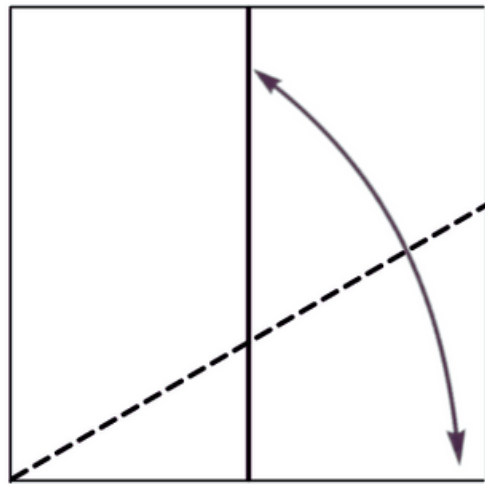
l'altezza del rombo $R30^\circ$ è uguale a metà del lato
come si può notare se si sovrappone ad un
triangolo equilatero di lato ℓ



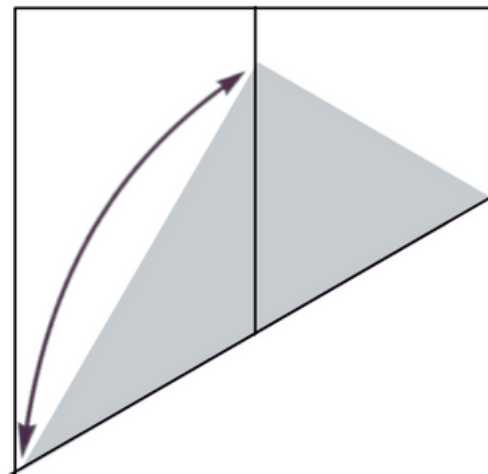
1



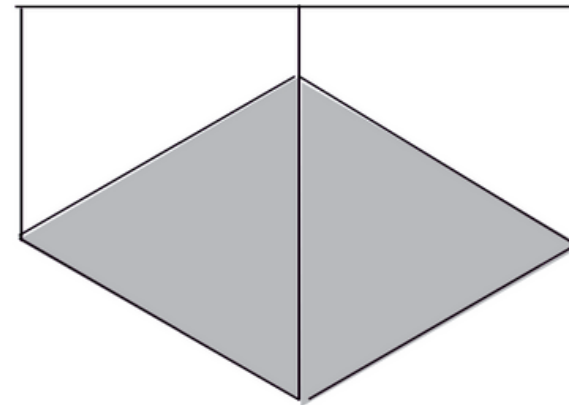
2



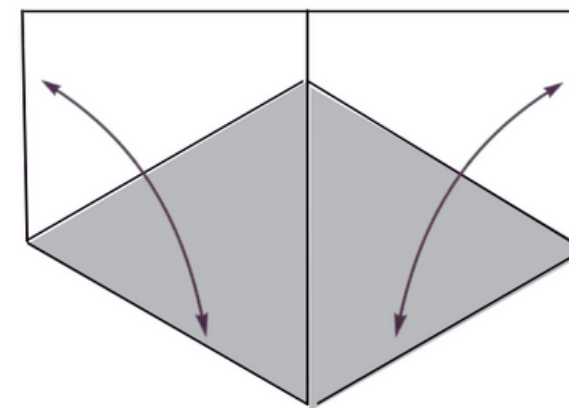
3



4

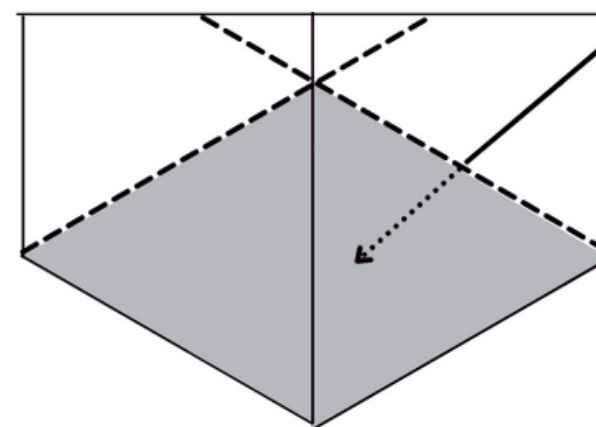


5

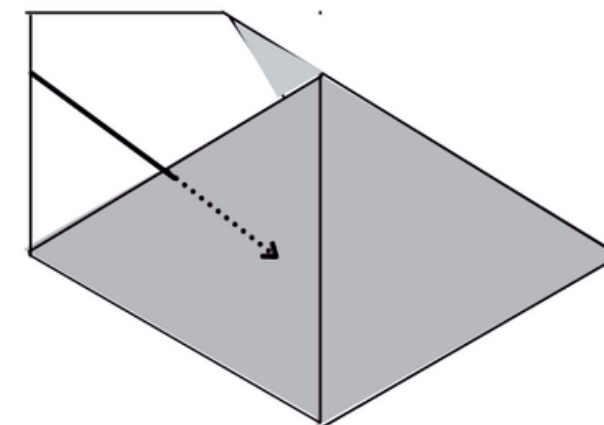


6

*inserire
l'aletta sotto*

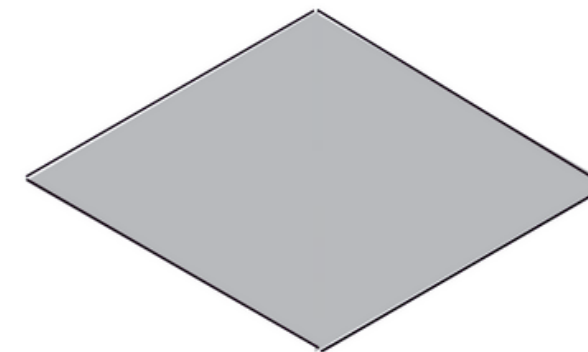
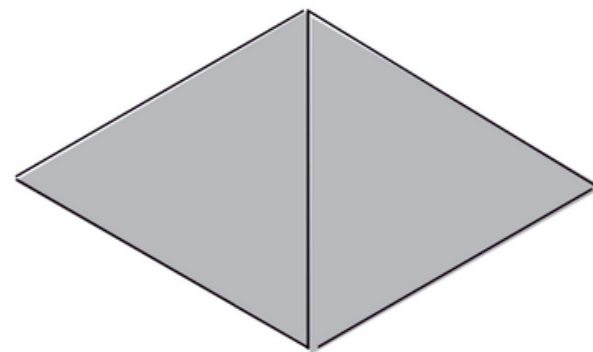


7

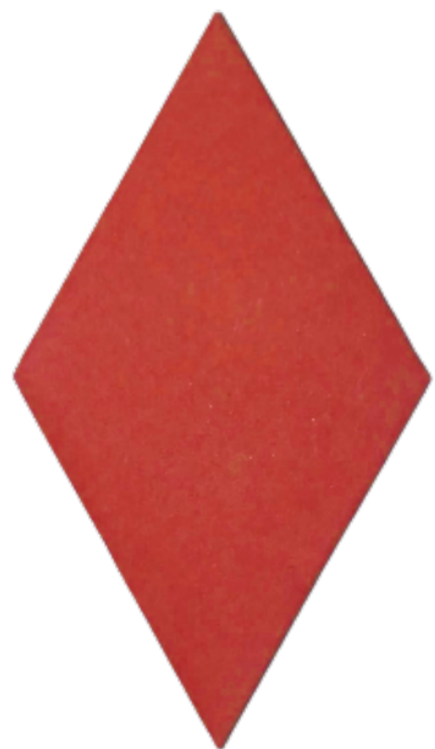


*questo secondo lembo si incastra
in una tasca interna*

8

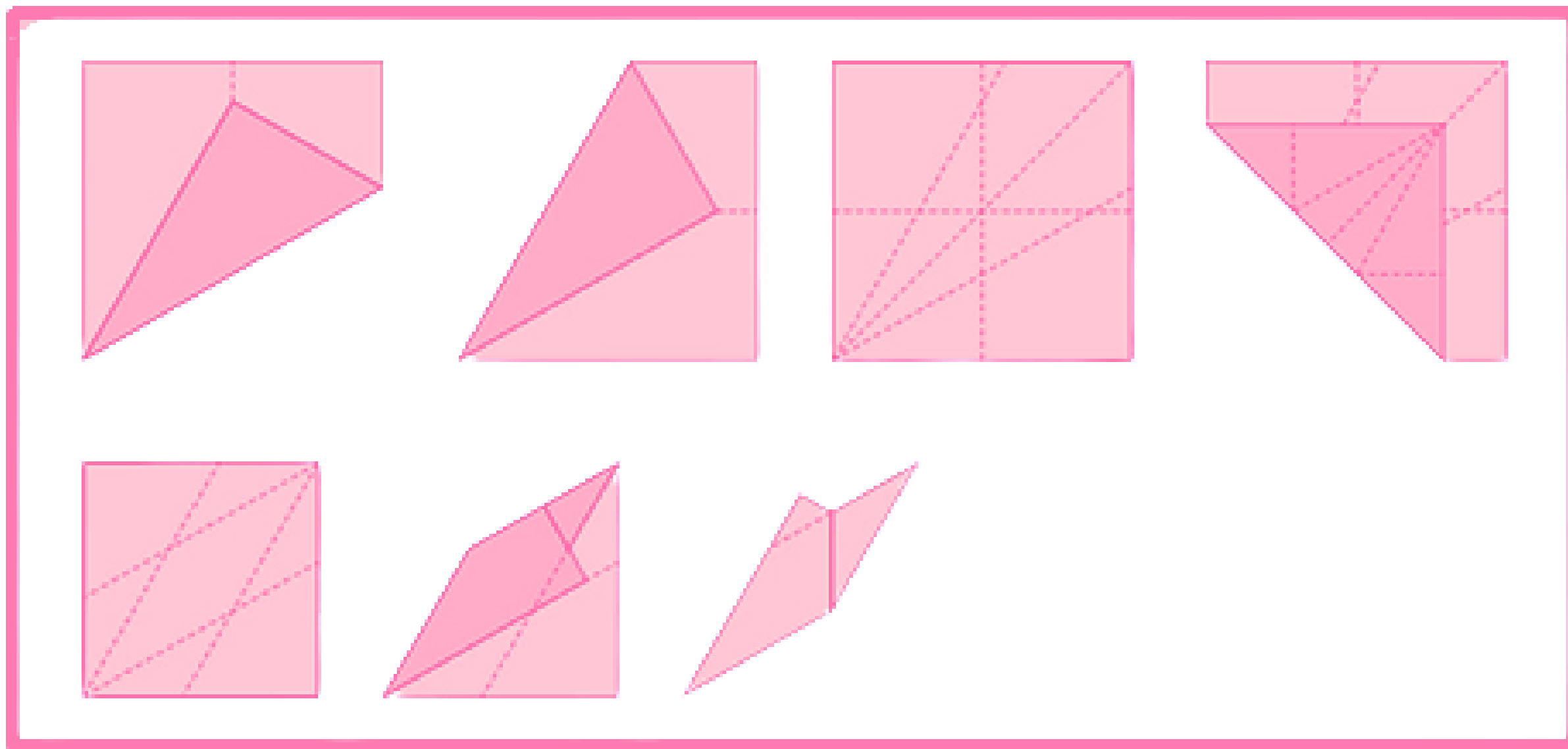


*modulo terminato
rombo con angoli a
60° e 120°*



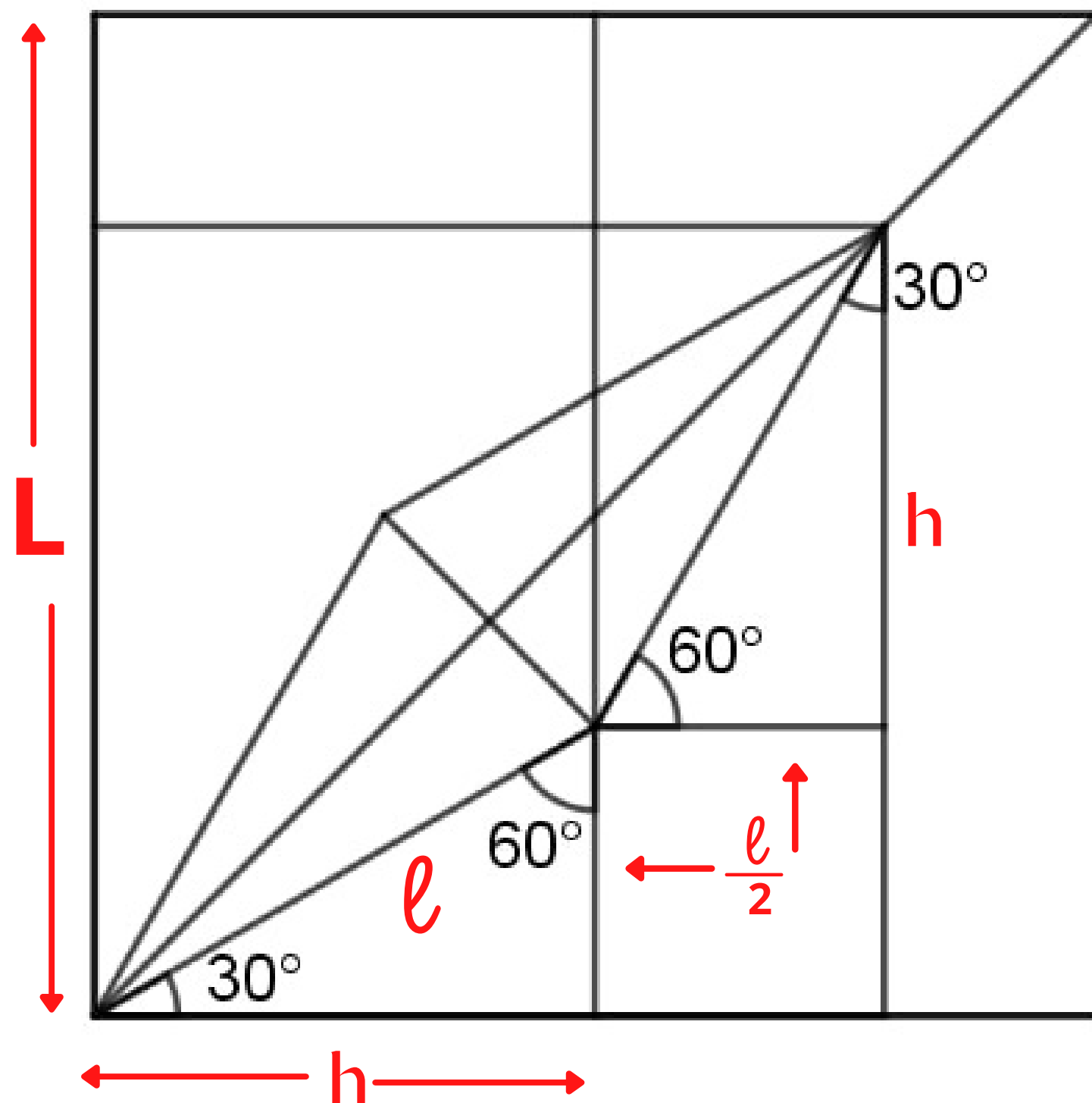
**rombo a
60°-120°**

riduzione del quadrato di partenza



**rombo a
30°-150°**





La riduzione del foglio dal punto di vista geometrico e algebrico

$$\frac{L}{2} = h$$

$$\frac{\ell}{2} = \frac{h}{\sqrt{3}}$$

Se **L** è il lato del foglio per creare il rombo a 60° si ricava che la misura del foglio per il rombo a 30° sarà:

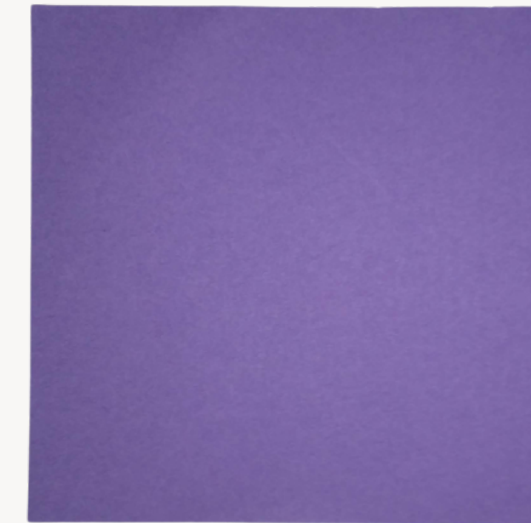
$$\frac{L}{2} \cdot \left(1 + \frac{1}{\sqrt{3}} \right)$$

con **L** = lato del foglio per il rombo a 60°
con **ℓ** = lato dei rombi

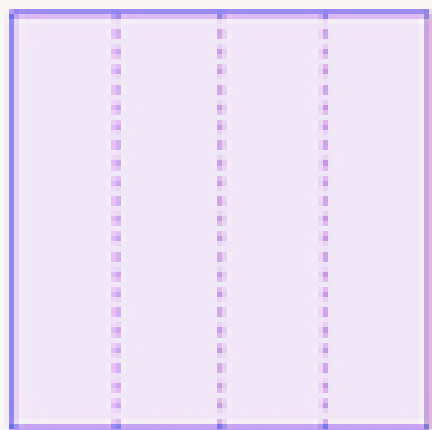
es. se L è 15 cm
il foglio per il rombo a 30° è 11.8 cm
un formato di carta origami!

quadrato

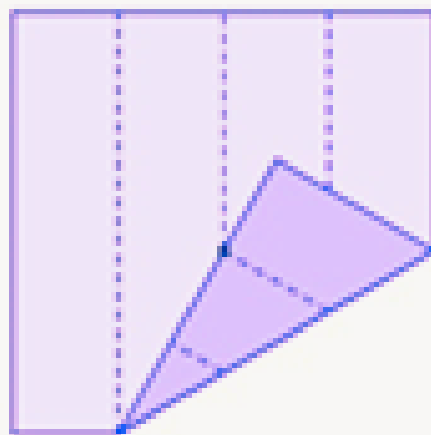
**Mentre il quadrato viene piegato
dal foglietto intero
ed avrà l'area $\frac{1}{3}$ del foglio di
partenza:**



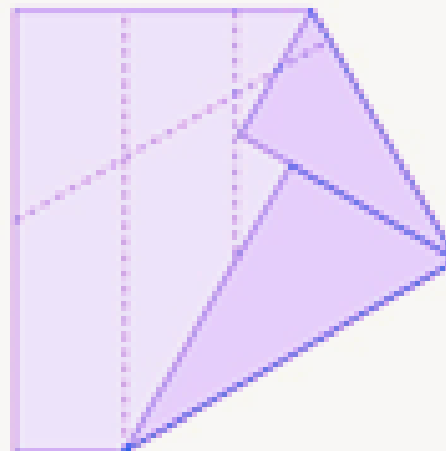
1



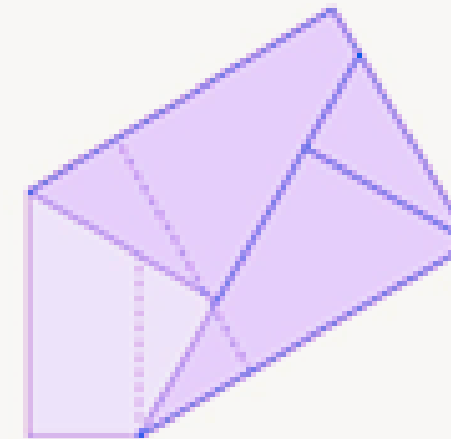
2



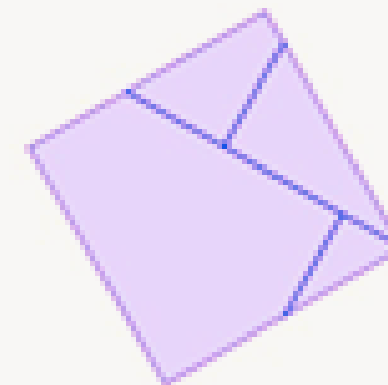
3

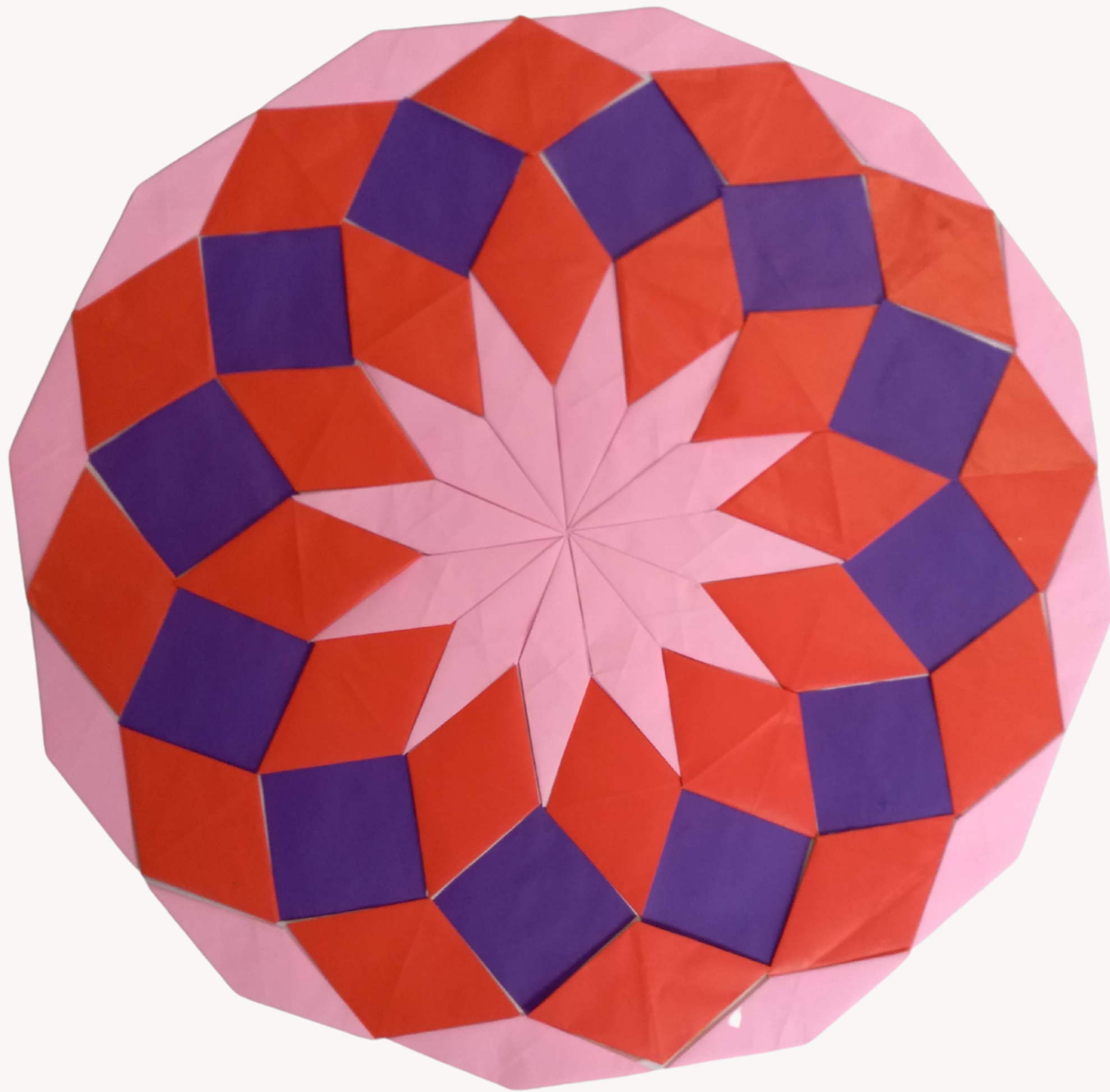


4



5

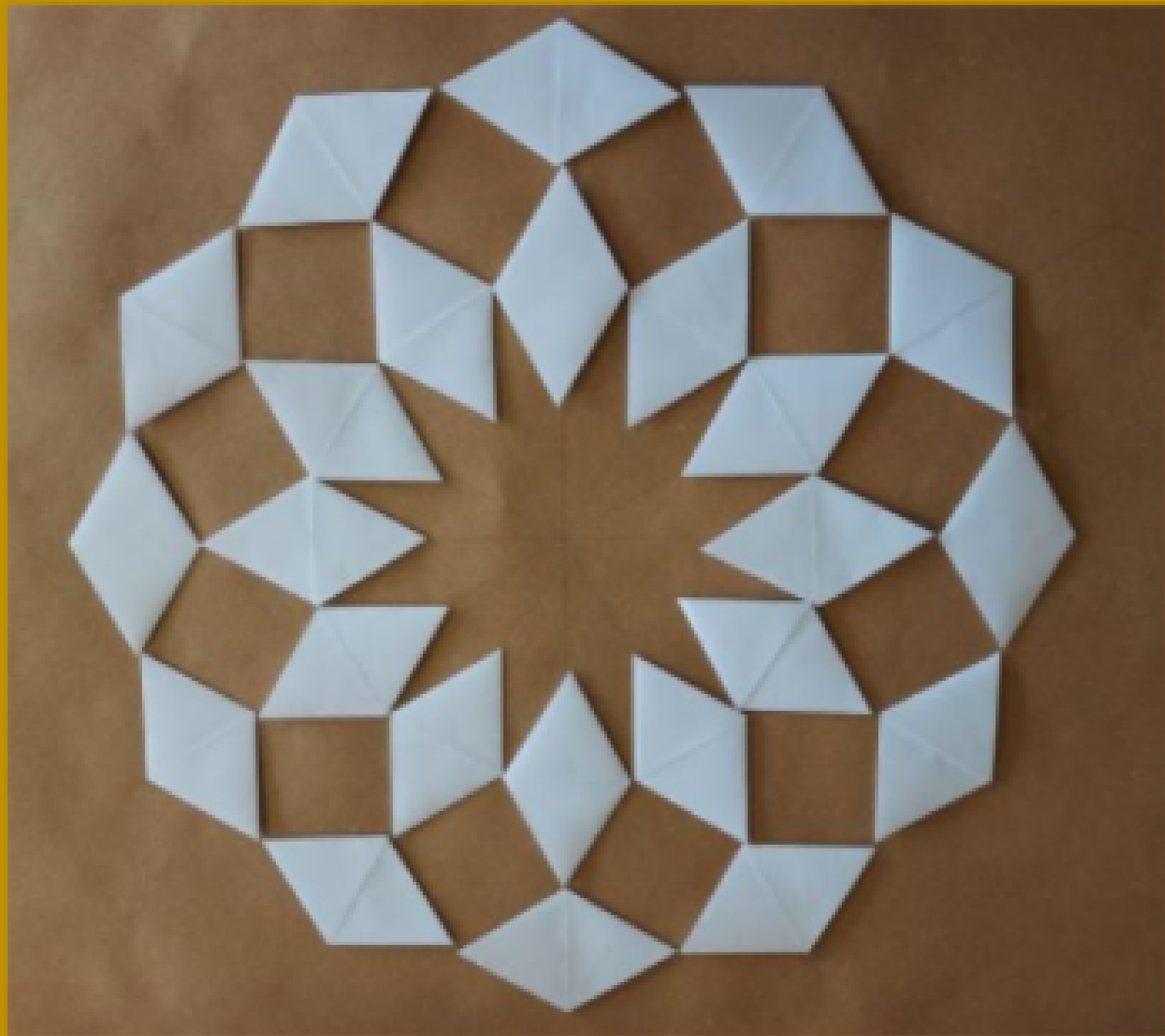




**Per realizzare il rosone
completo servono:
24 rombi 30° - 150°
24 rombi 60° - 120°
12 quadrati**

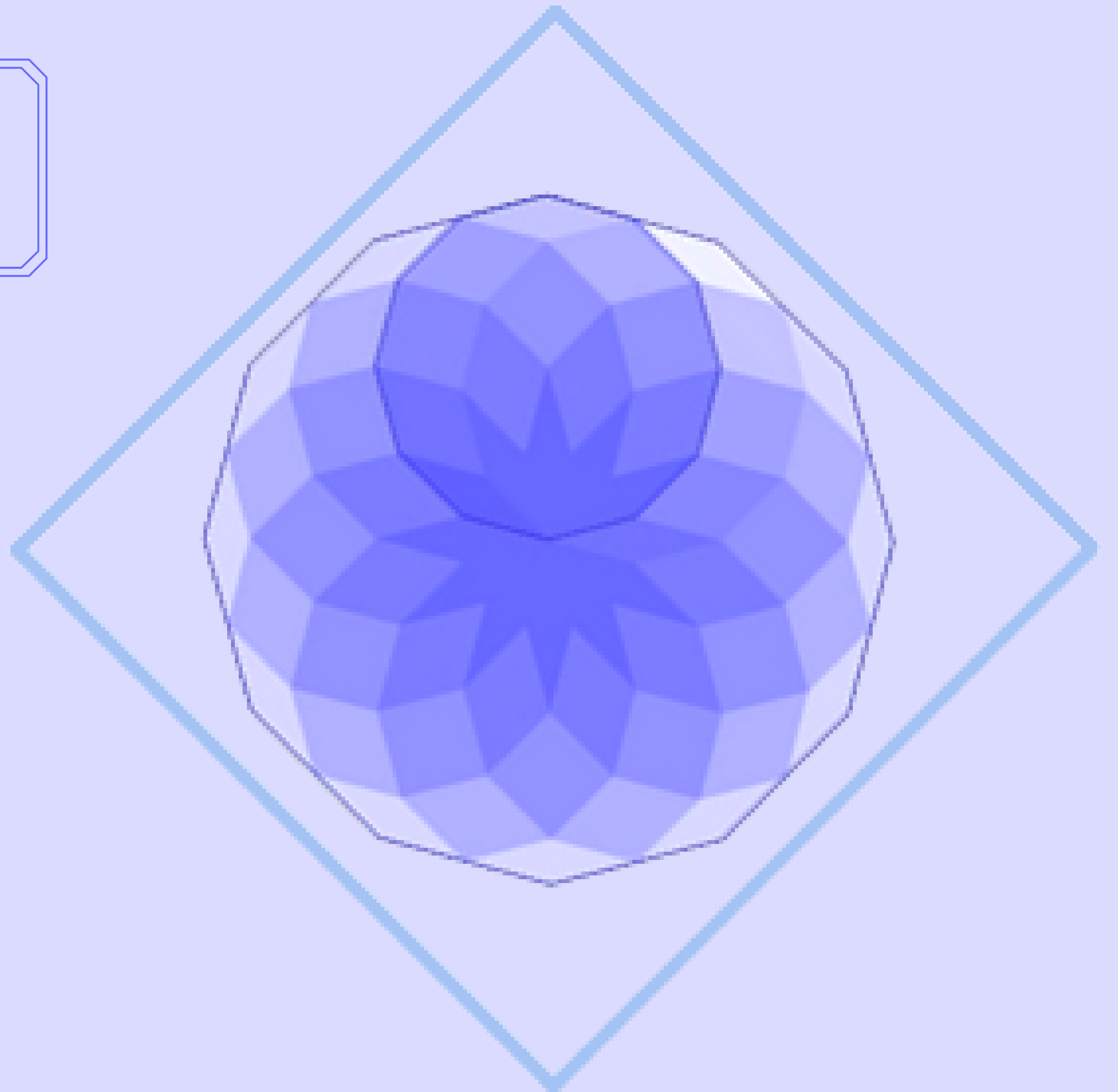
**questo realizzato da una classe
seconda media**

**Anche solo la realizzazione dei
rombi a 60° - 120° permette il
riconoscimento
dei quadrati ed una stella a 12
punte centrale.**

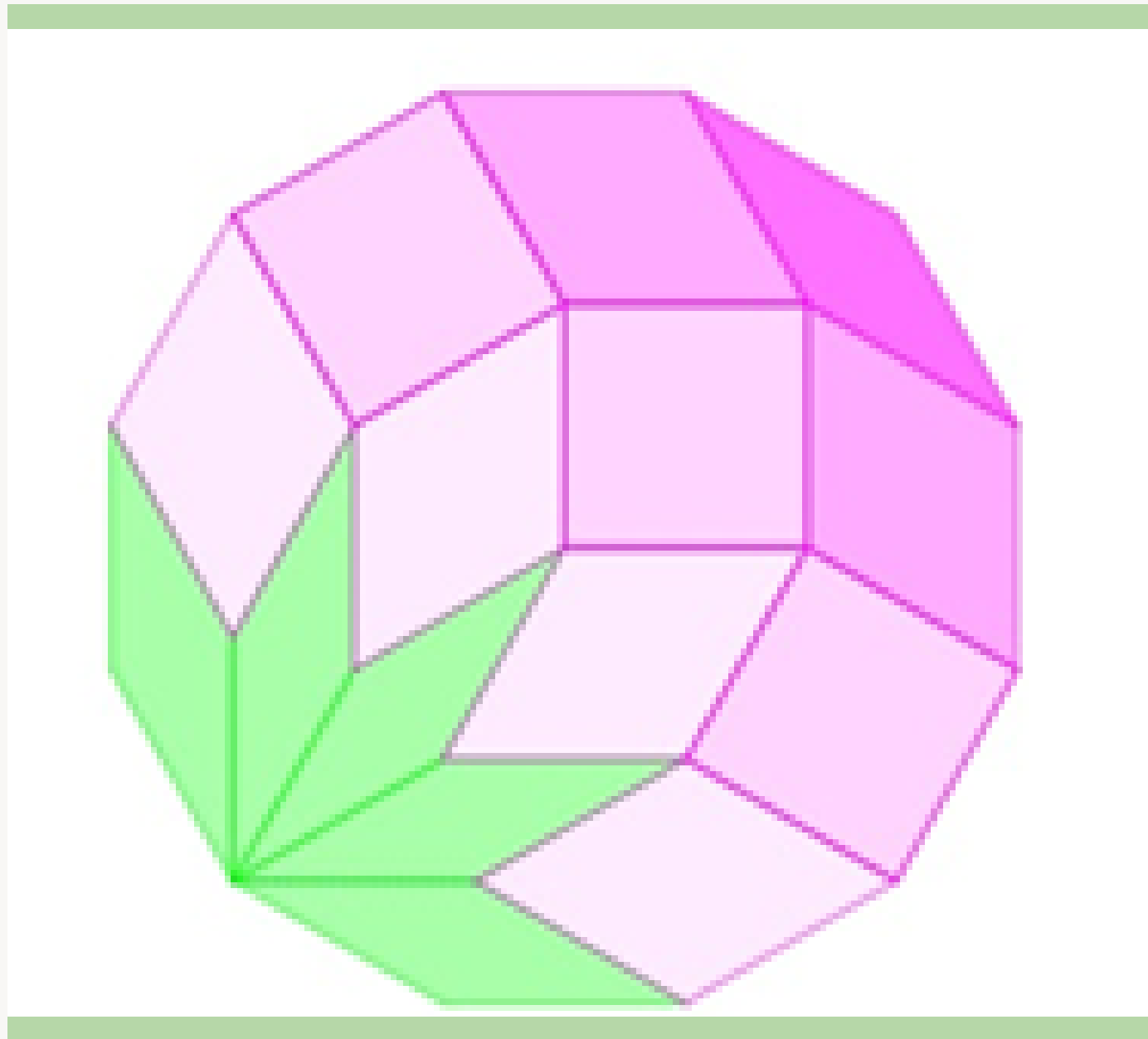


**possiamo tuttavia realizzare
una sezione del dodecagono**

**per questa servono:
6 rombi $30^\circ-150^\circ$
6 rombi $60^\circ-120^\circ$
3 quadrati**



ed è qui che abbiamo intravisto il bocciolo di un fiore...da cui il nome del progetto



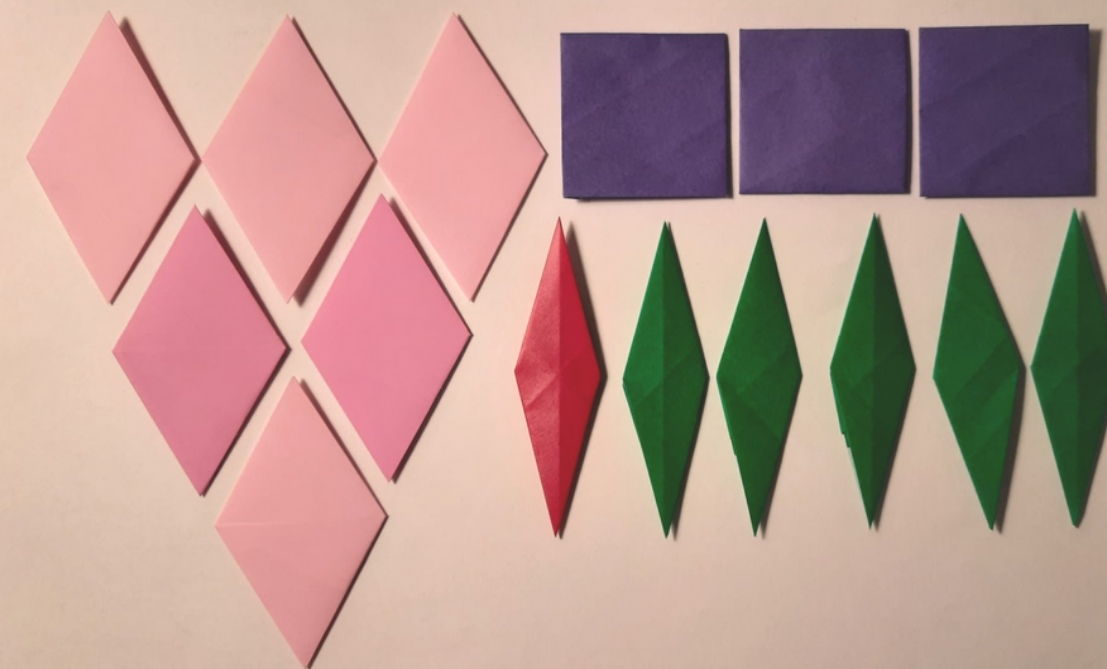
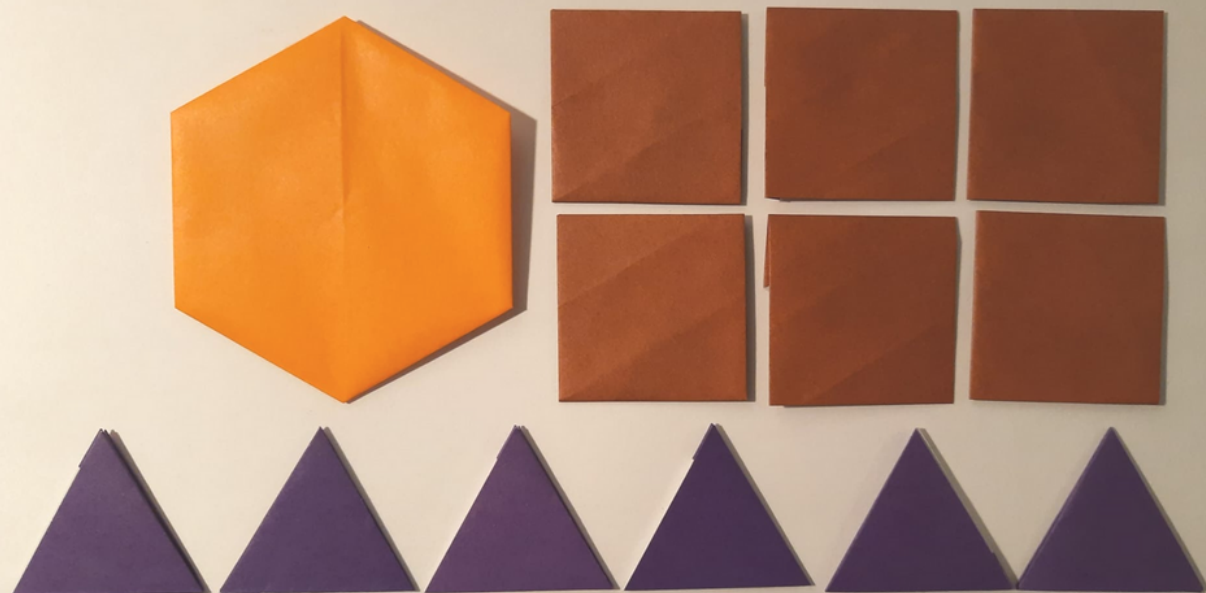
GeoGebra

vs



Origami

diverse scomposizioni



Tassellazione 3.4.6.4

- 1 esagono = 6 triangoli equilateri
- 6 triangoli equilateri
- 6 quadrati

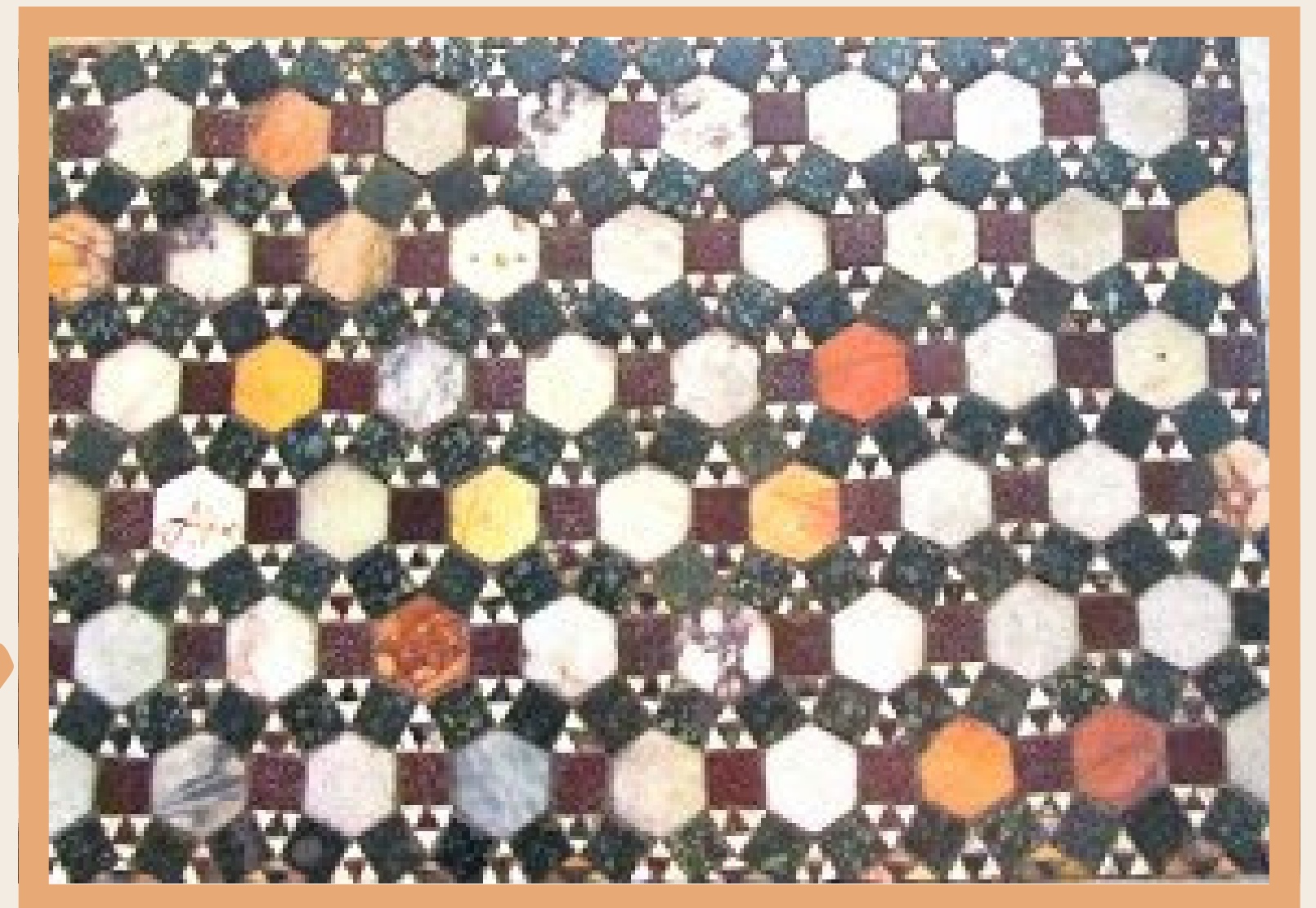
Composizione di rombi

- 6 rombi a 60° - 120° = 12 triangoli equilateri
- 6 rombi a 30° - 150° = 3 quadrati
- 3 quadrati

Possibili collegamenti con tecnologia (architettura) e arte



pavimentazione presente al Museo Archeologico
di Siviglia



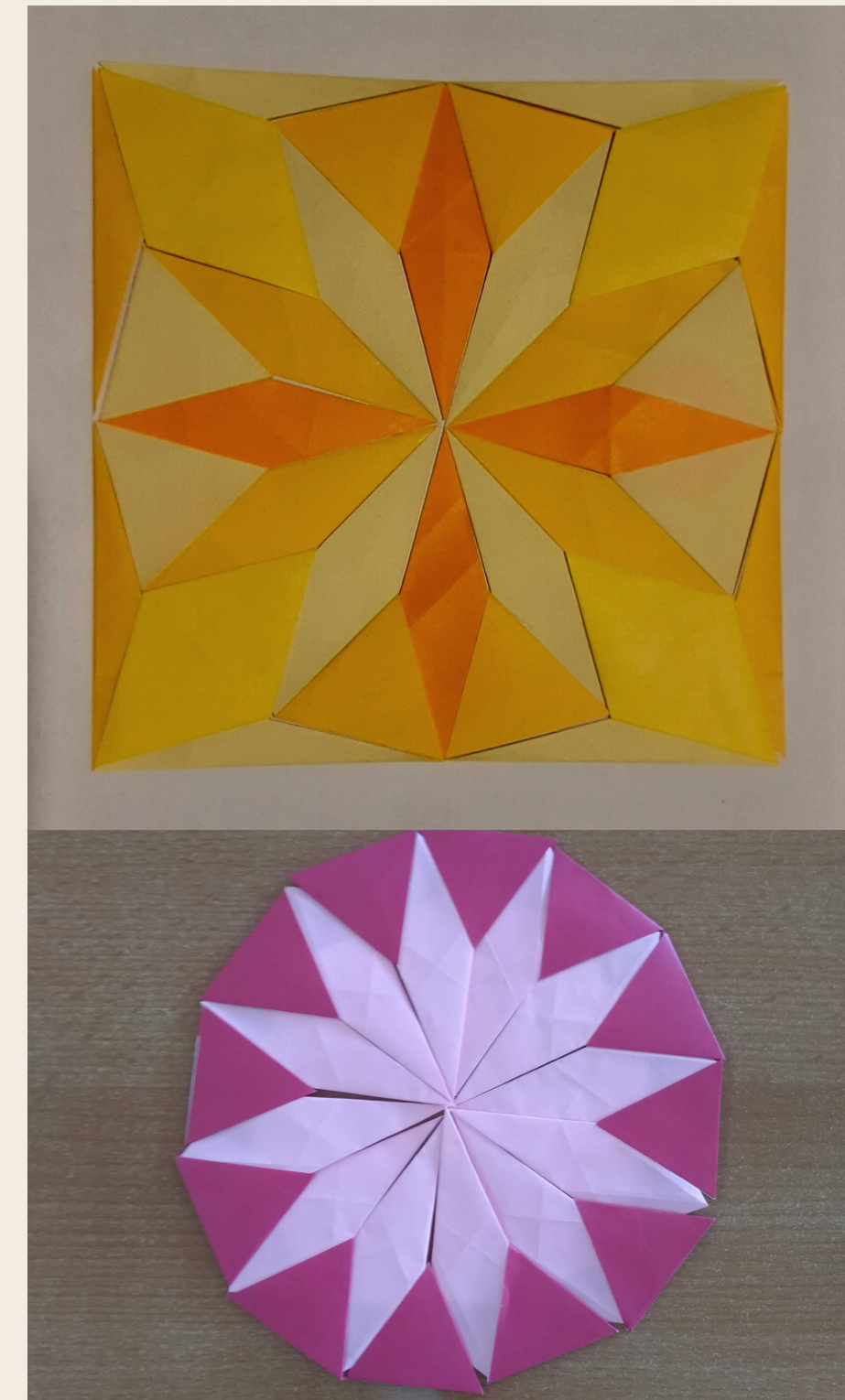
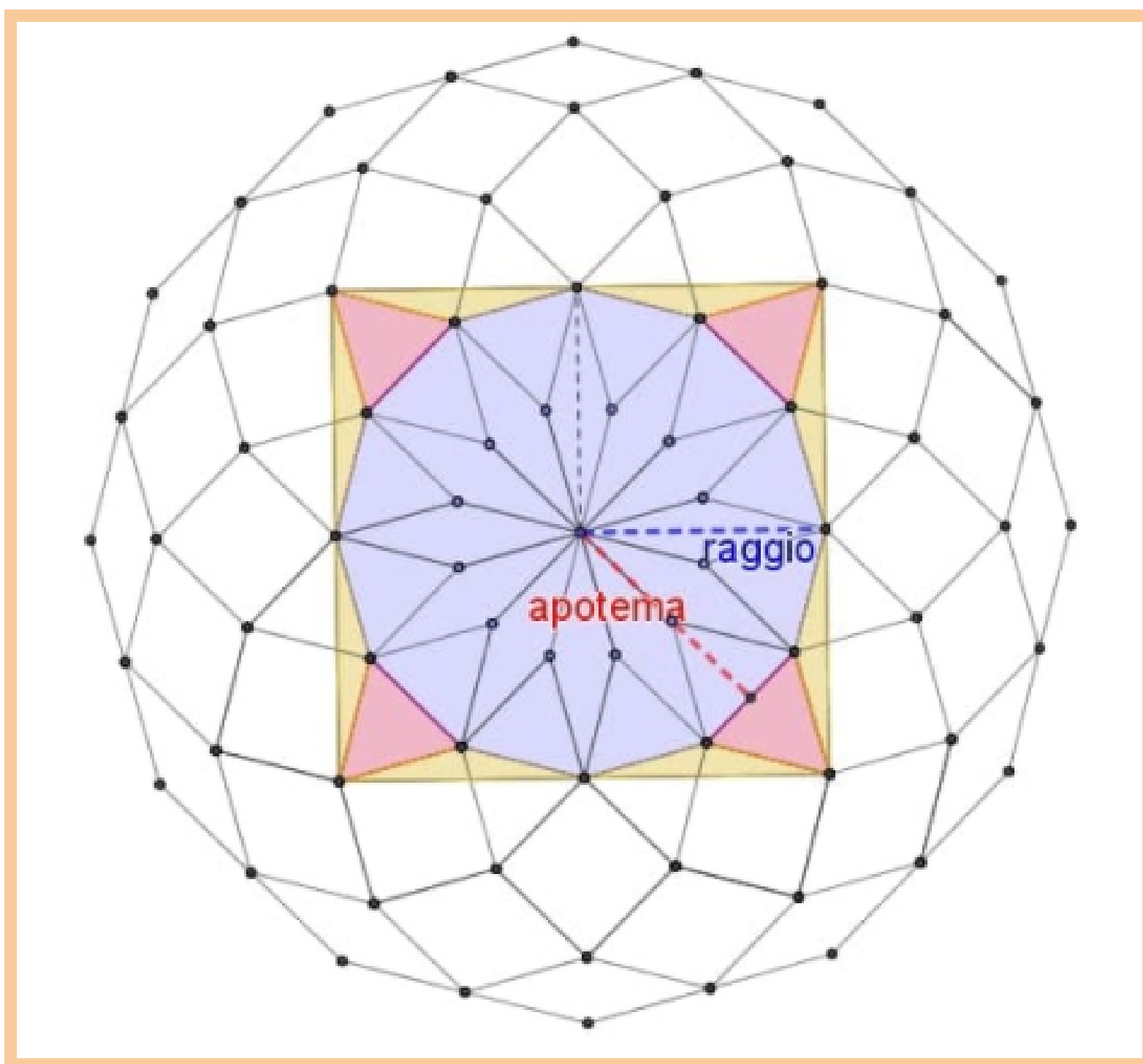
pavimentazione presente nella chiesa di S. Maria
in Cosmedin (Roma)

Mosaici Cosmateschi

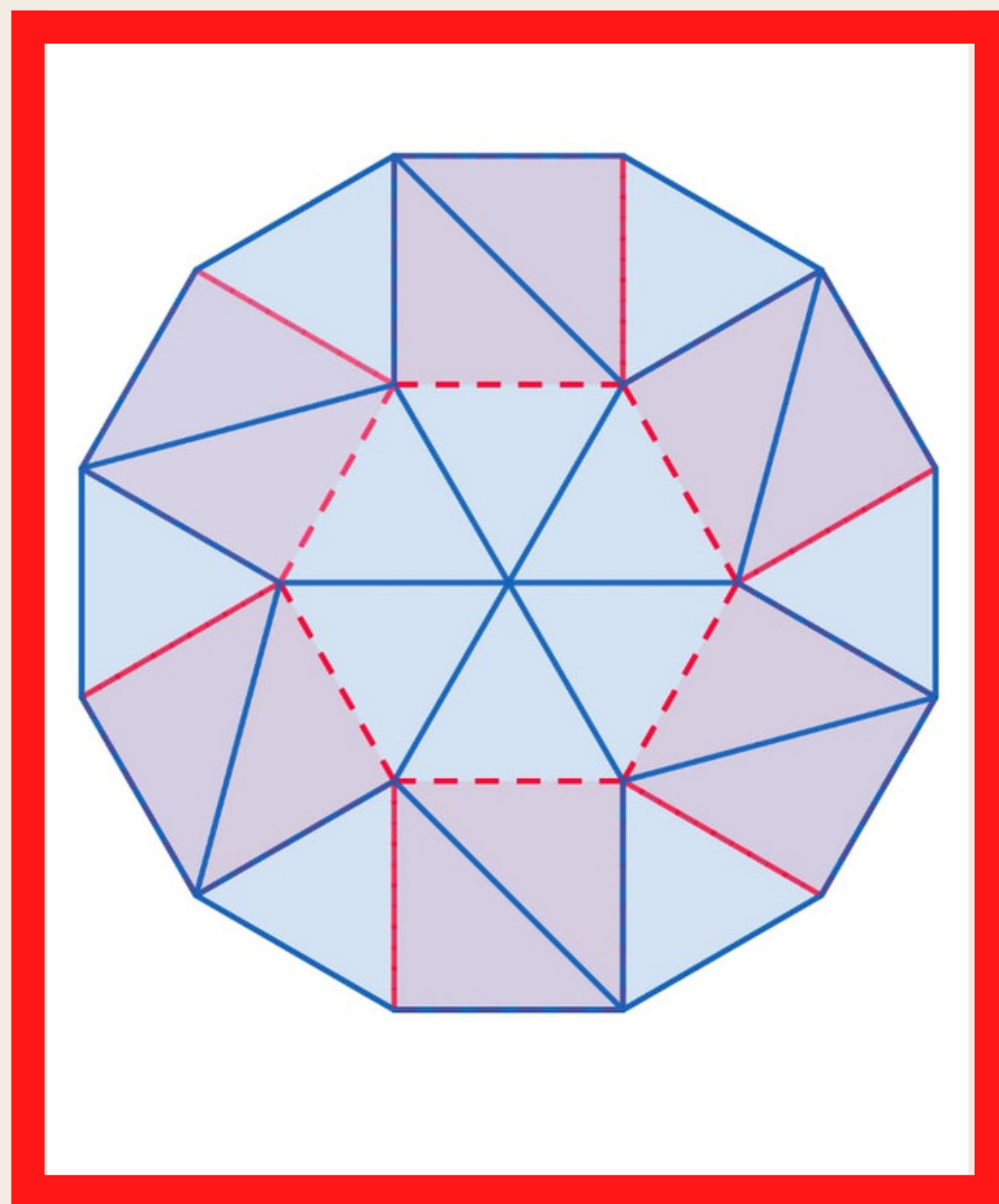


Un'altra interessante scomposizione del dodecagono è la “piastrella di Kürschák” che possiamo riconoscere all'interno del nostro rosone.

Come si può notare, il dodecagono centrale, equivale ai $\frac{3}{4}$ della piastrella quadrata

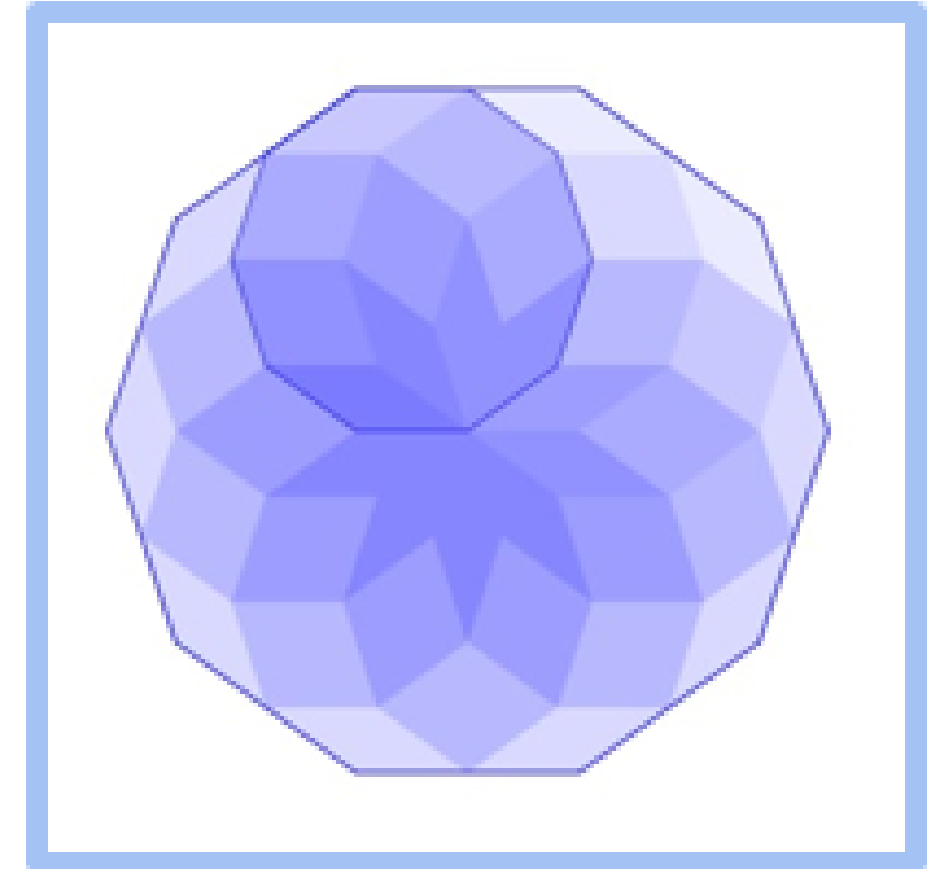
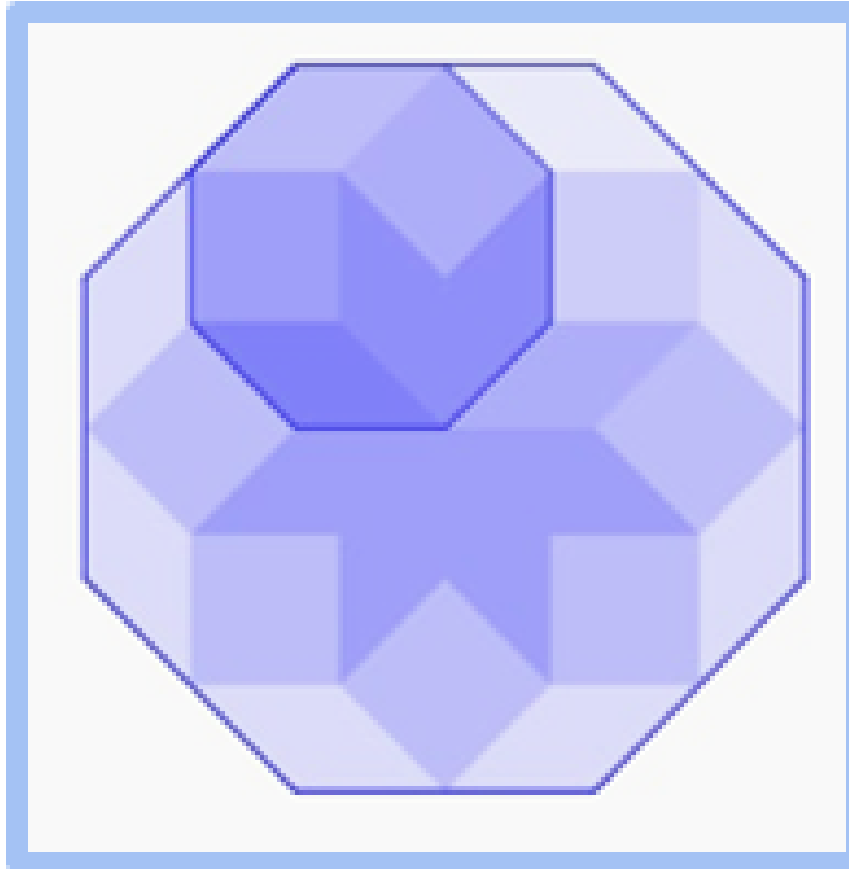
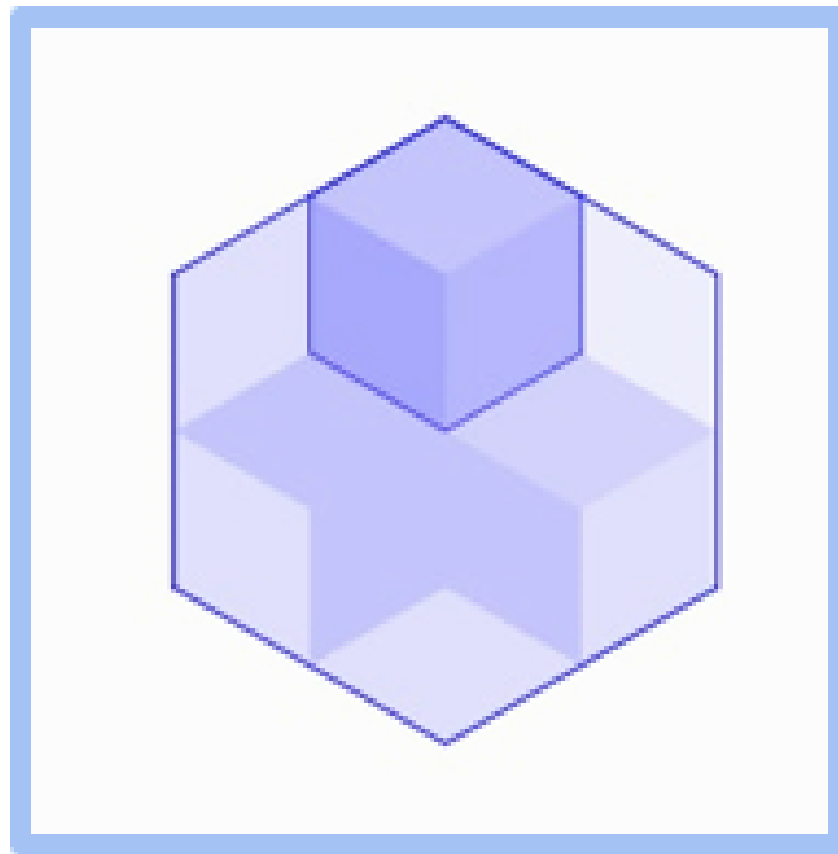


**infine un'ulteriore scomposizione con interessanti tessere è quella di F. Decio
Vista grazie alla condivisione delle attività svolte al corso organizzato dalla
collega Margherita Ambrosini**



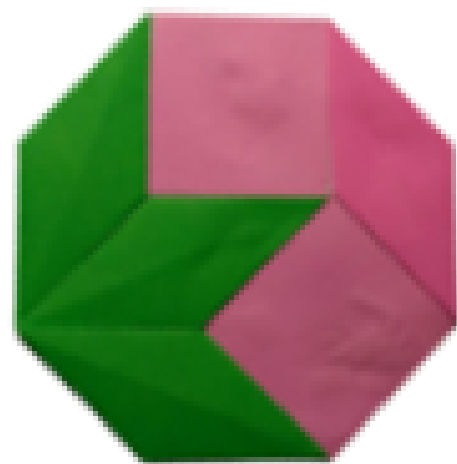
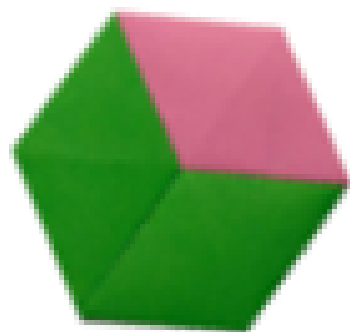
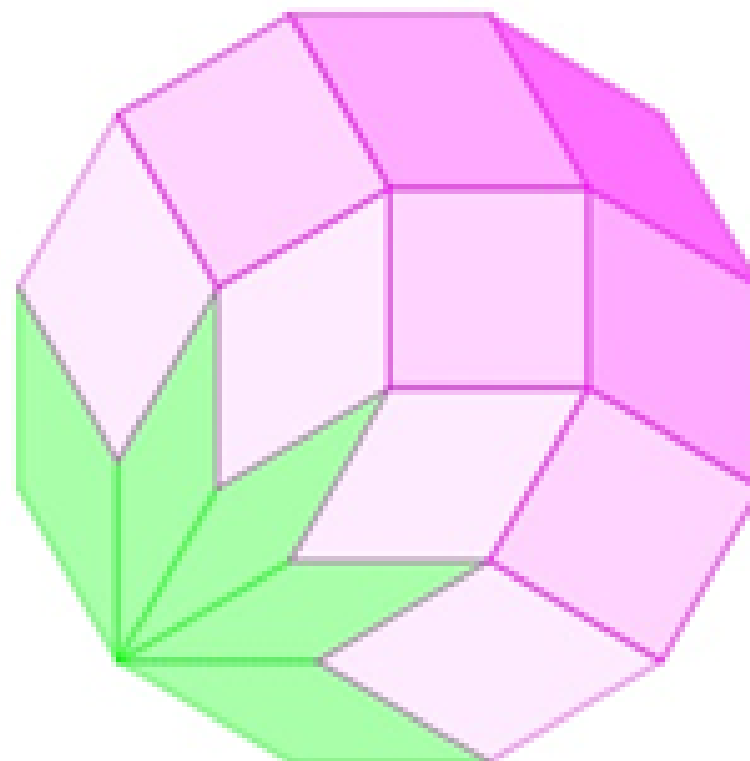
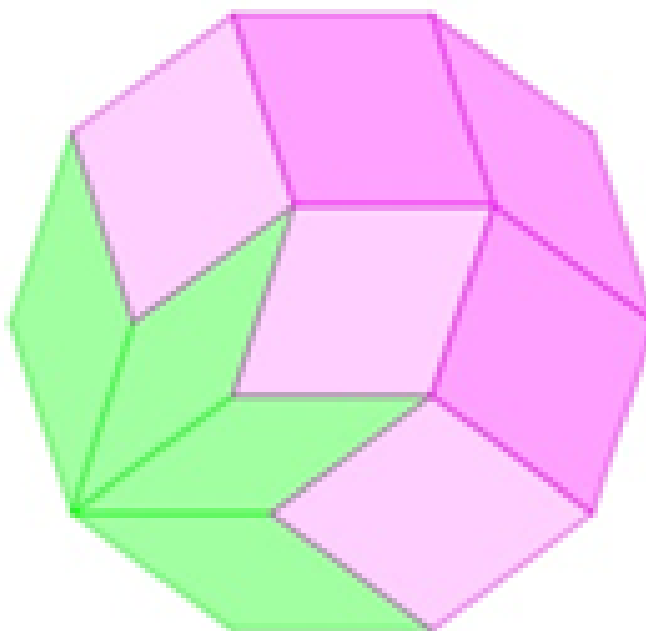
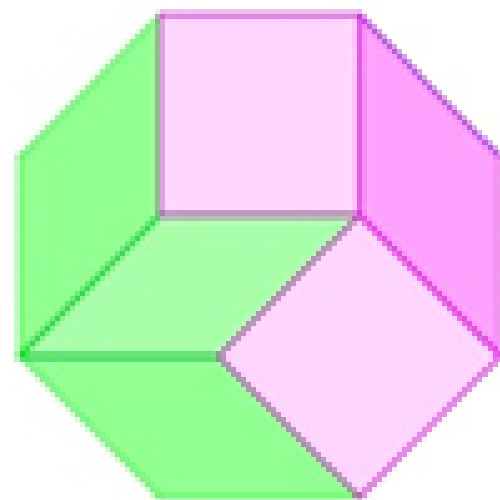
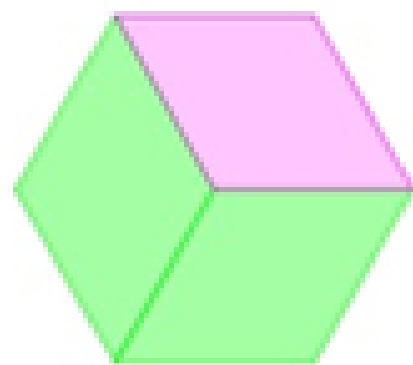
La composizione del dodecagono con i rombi può essere estesa anche ad altri poligoni regolari?

All'interno di ogni poligono è possibile disegnarne uno simile ma con il lato dimezzato in modo che, ruotandolo e sovrapponendolo ad altri, si crea una rete di rombi che riempie tutta la figura.



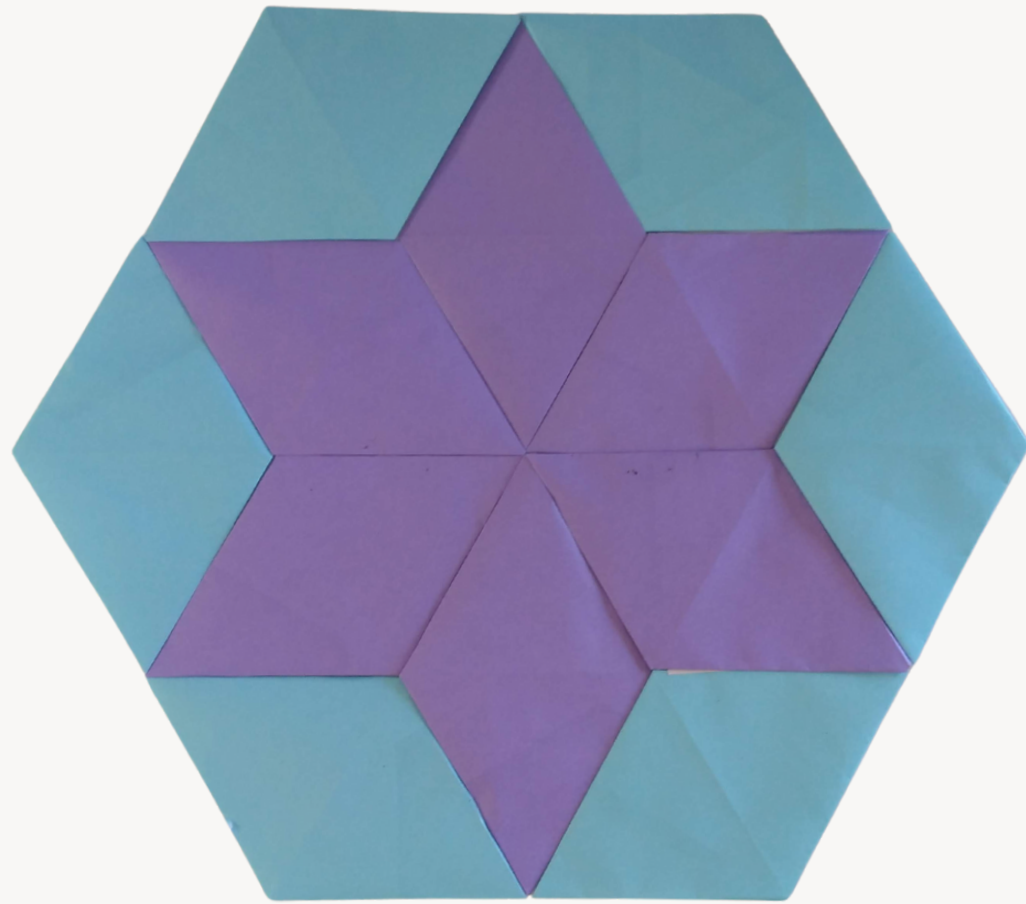
Come si può vedere in questa applet di Geogebra 

GeoGebra

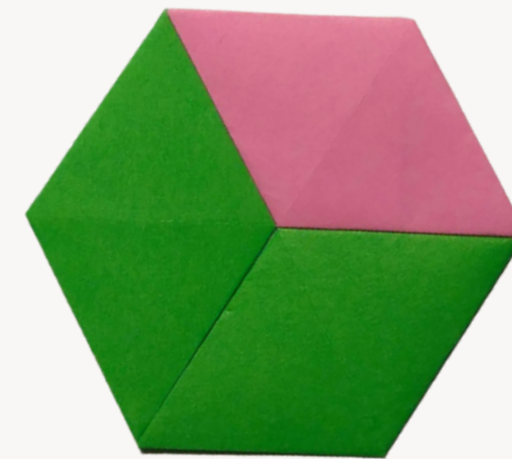


Origami

ESAGONO

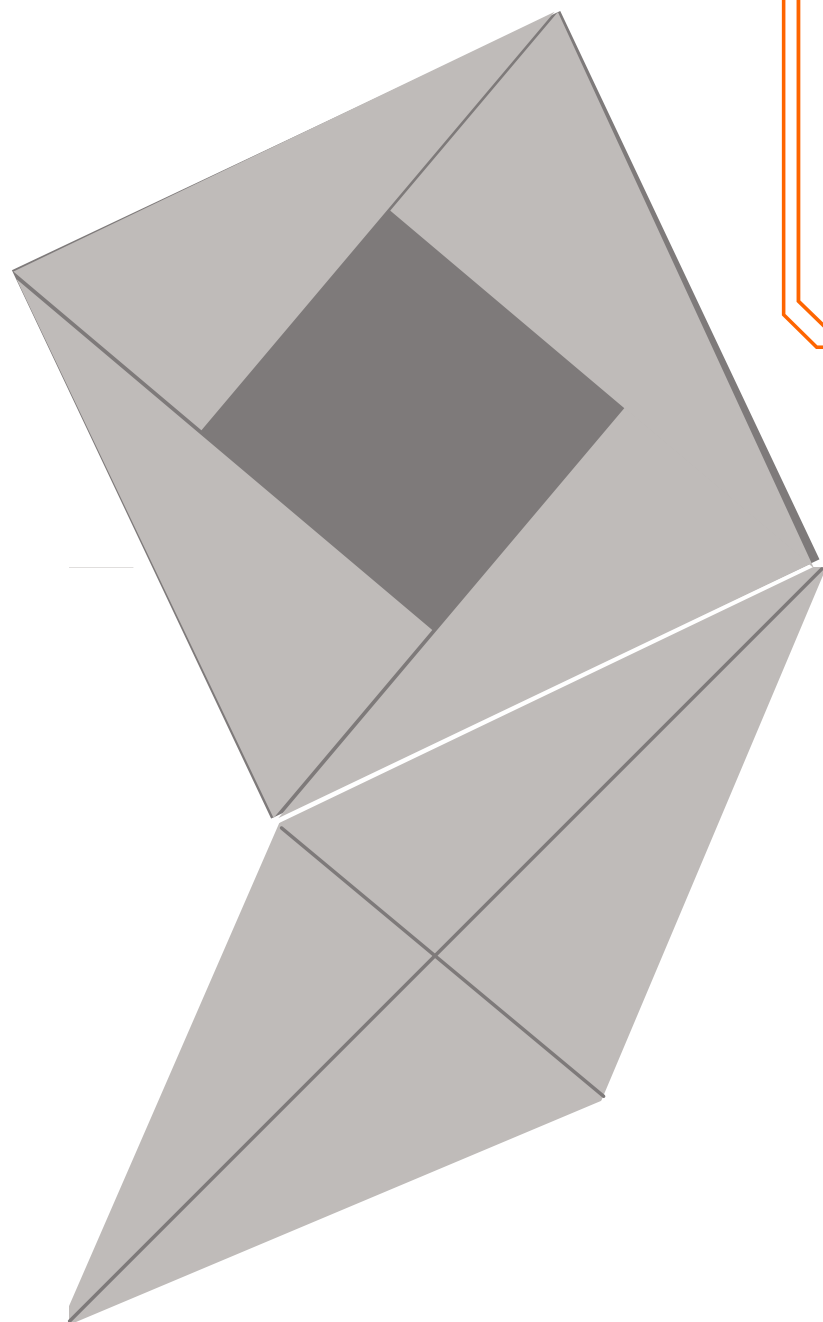


**per il rosone completo
servono 12 rombi
 $120^\circ-60^\circ$**



**per il bocciolo servono
3 rombi $120^\circ-60^\circ$**

OTTAGONO



**per ottenere il quadrato
isoperimetrico al rombo a 45° - 135°**

**ripiegare all'interno triangoli
rettangoli uguali a quelli in cui si può
suddividere il rombo**

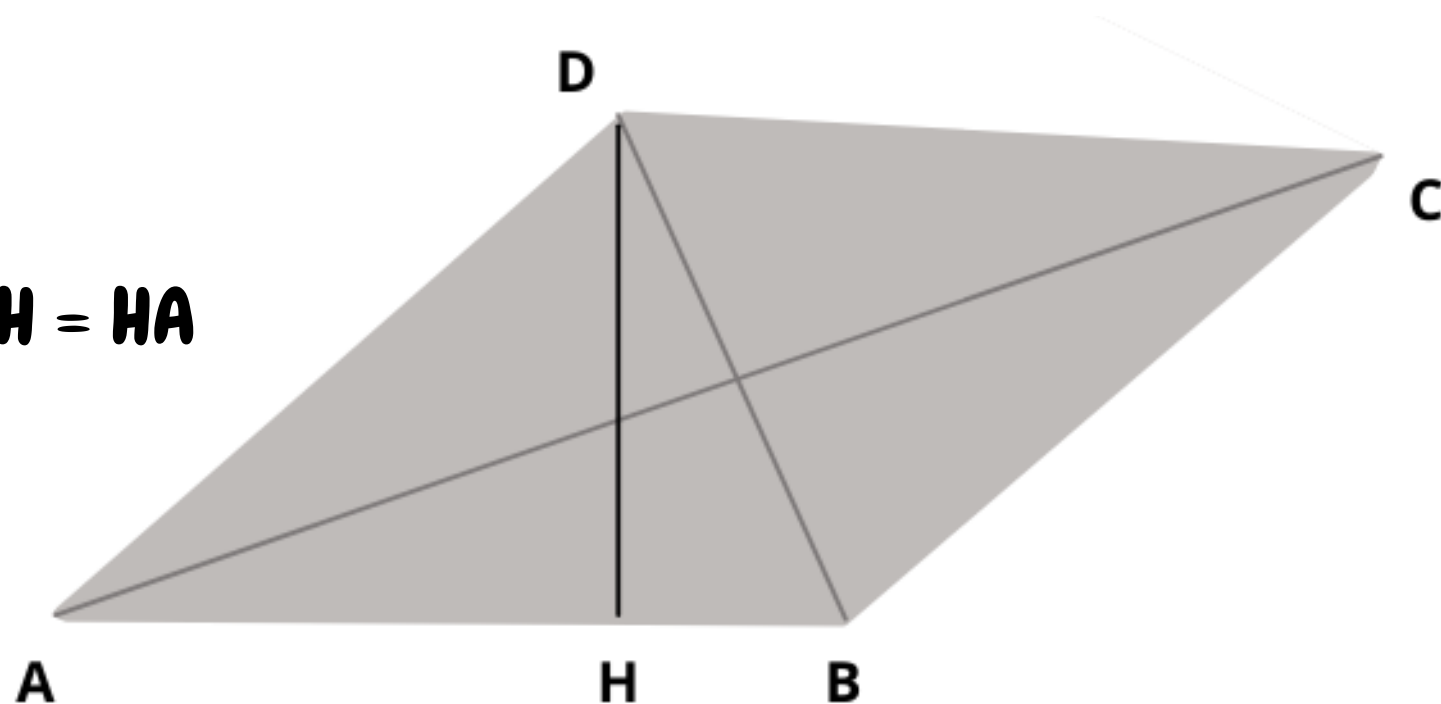


**per il bocciolo servono
4 rombi 45° - 135° e
2 quadrati**



**per il rosone completo
servono 16 rombi 45° - 135°
e 8 quadrati**

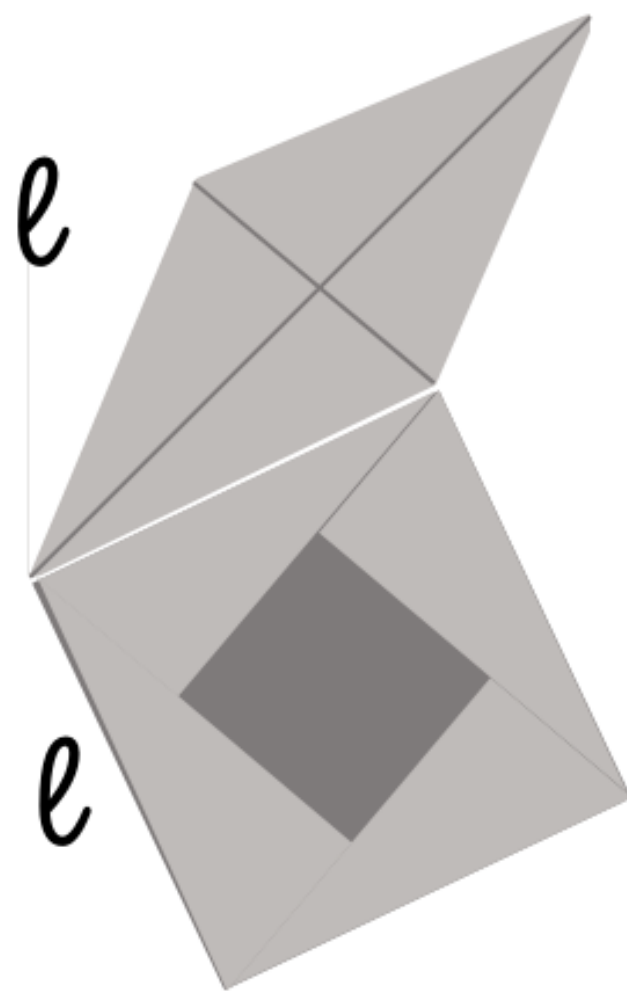
$$DH = HA$$



Per il Teorema di Pitagora si ha:

$$AD = DH \cdot \sqrt{2}$$

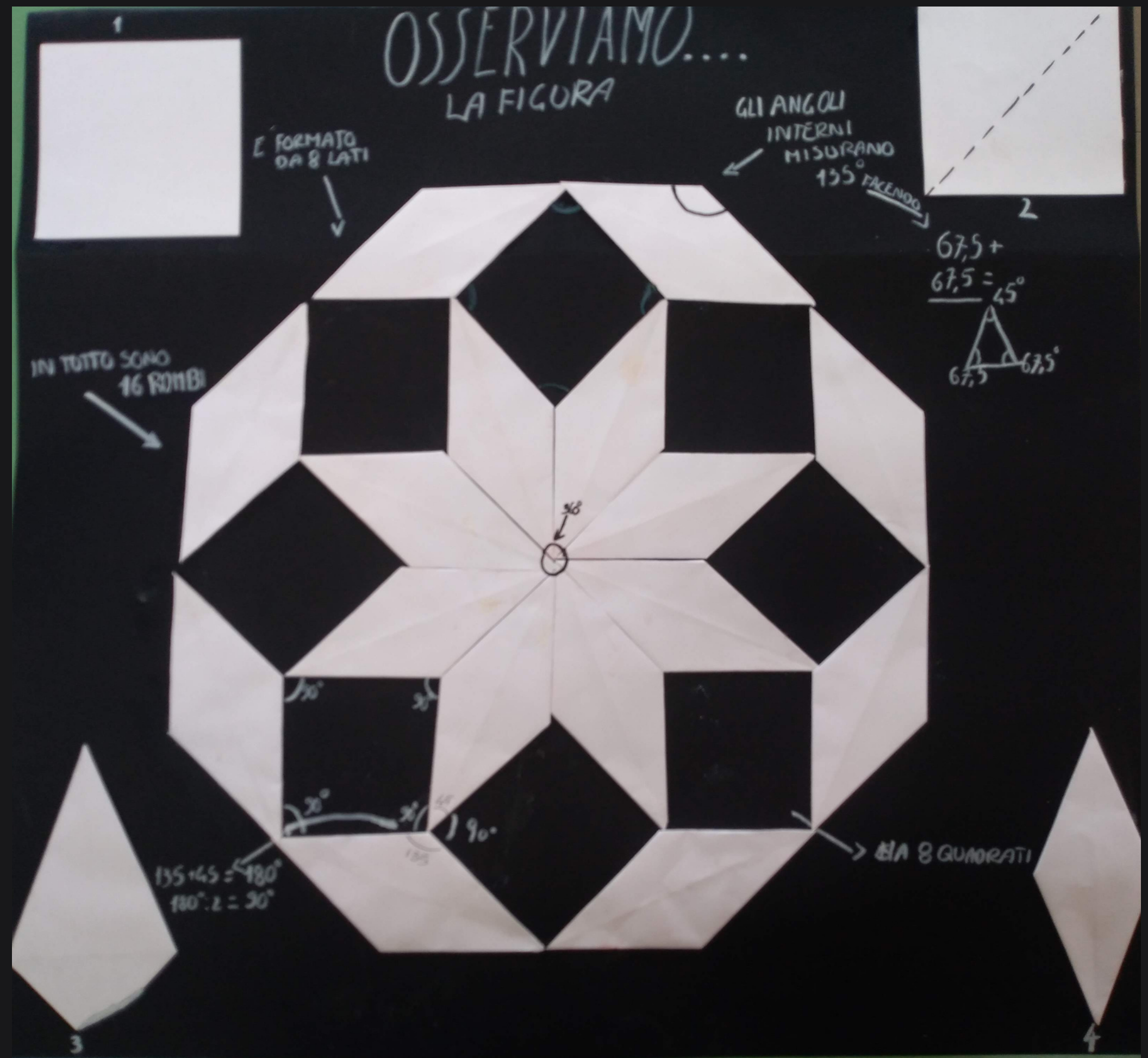
quindi: $DH = \frac{AD}{\sqrt{2}}$



poniamo $AD = \ell$

$$\text{AREA QUADRATO} = \ell^2 \quad \text{AREA ROMBO} = \frac{\ell^2}{\sqrt{2}}$$

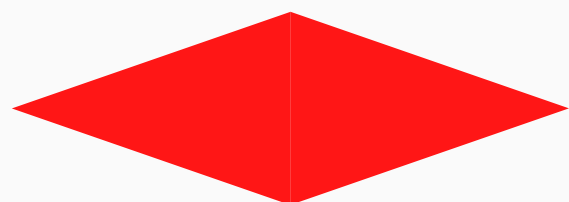
Anche per questo rosone la sola disposizione dei rombi con un sfondo a contrasto mette in evidenza i quadrati senza la necessità di piegarli



PER LA REALIZZAZIONE DEI ROMBI PER IL DECAGONO

Abbiamo preso spunto dai lavori di Mitchell

rombo $36^{\circ}-144^{\circ}$



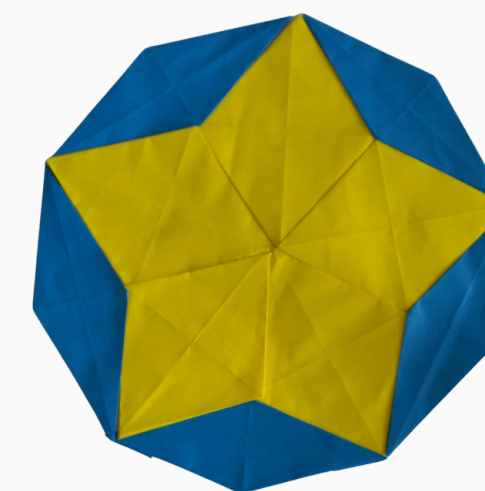
rombo $72^{\circ}-108^{\circ}$



per il rosone completo
servono 20 rombi di
ciascun tipo

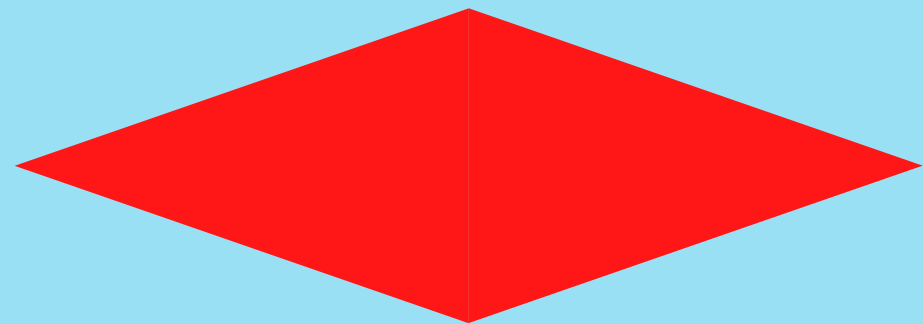


per il bocciolo servono
5 rombi di ciascun tipo

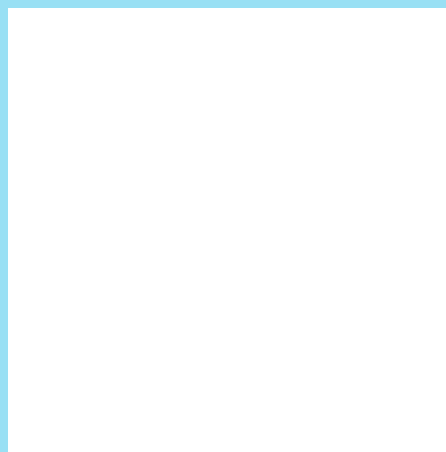


altra possibile
scomposizione

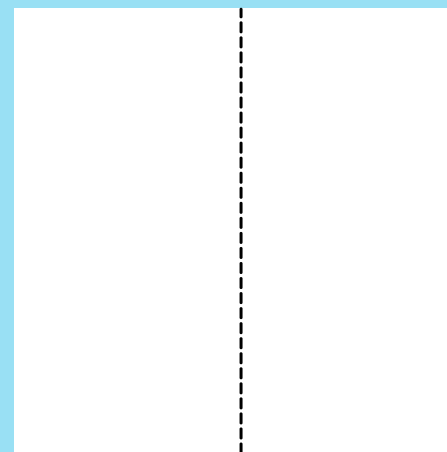
rombo 36°-144°



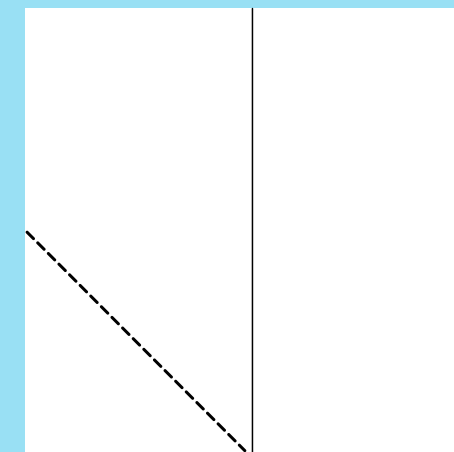
1



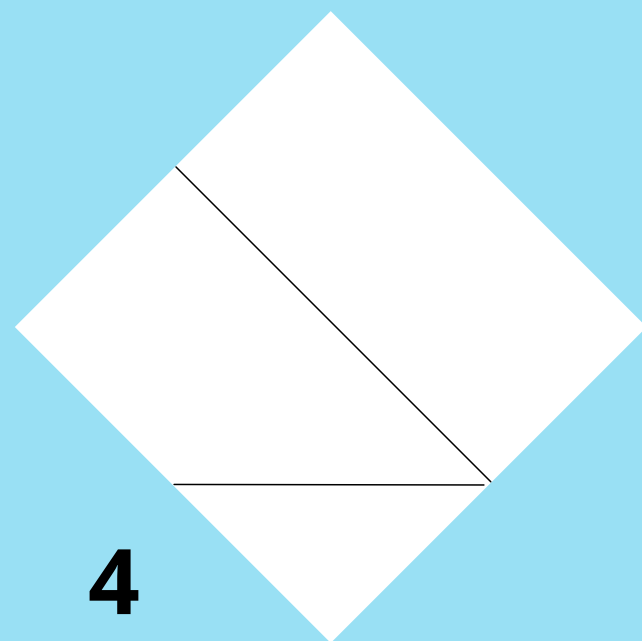
2



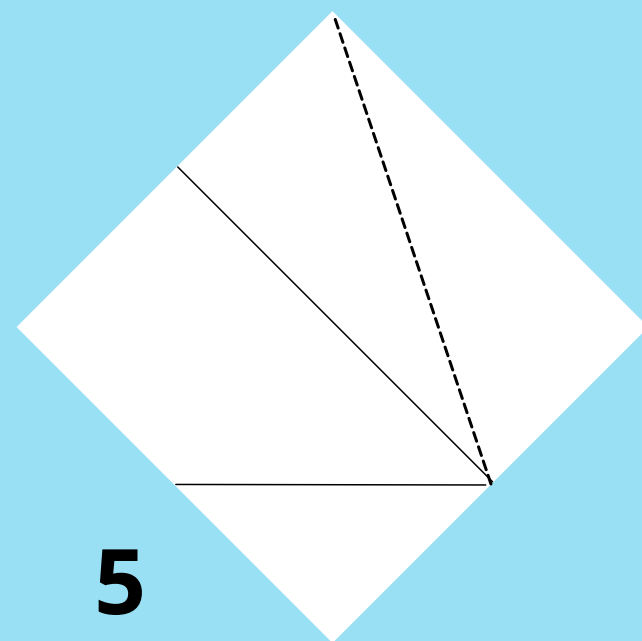
3



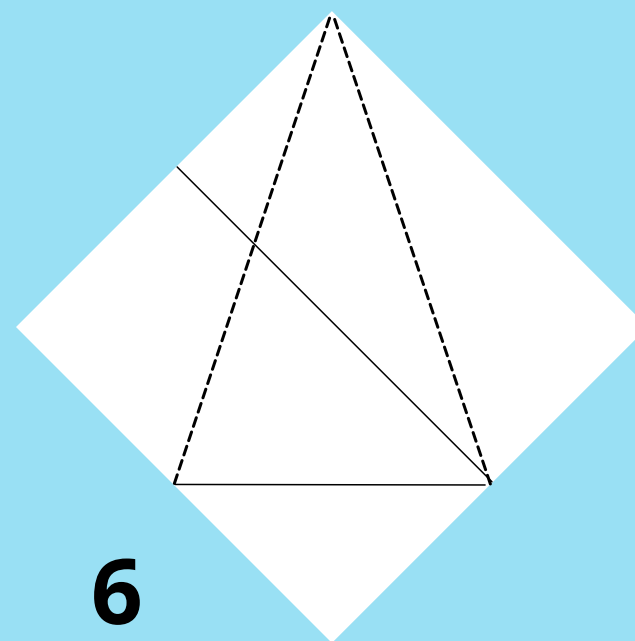
4



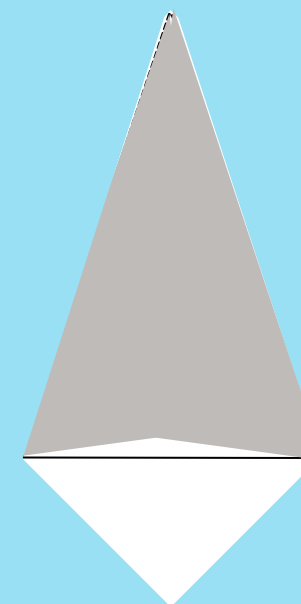
5



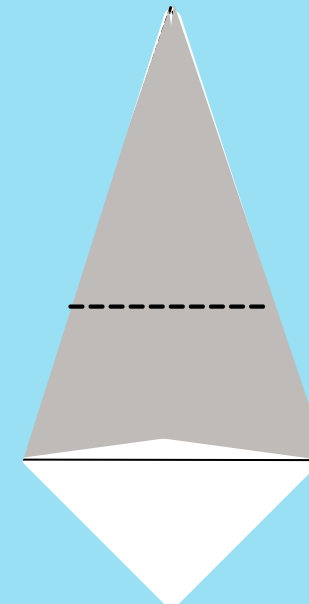
6



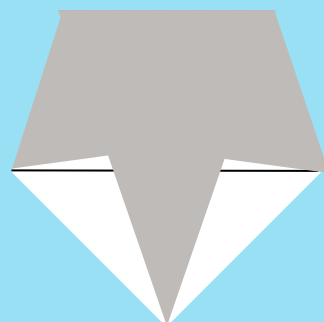
7



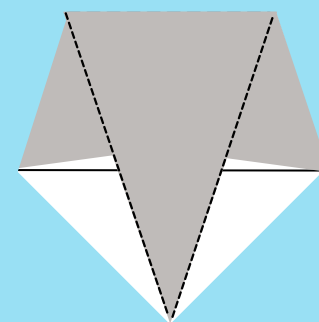
8



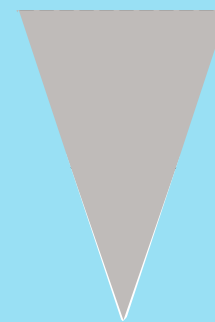
9



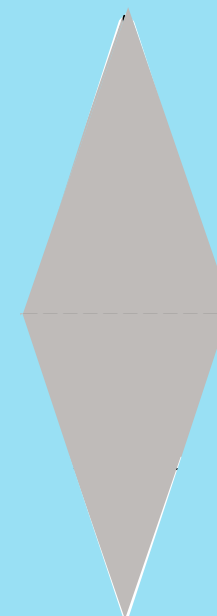
10



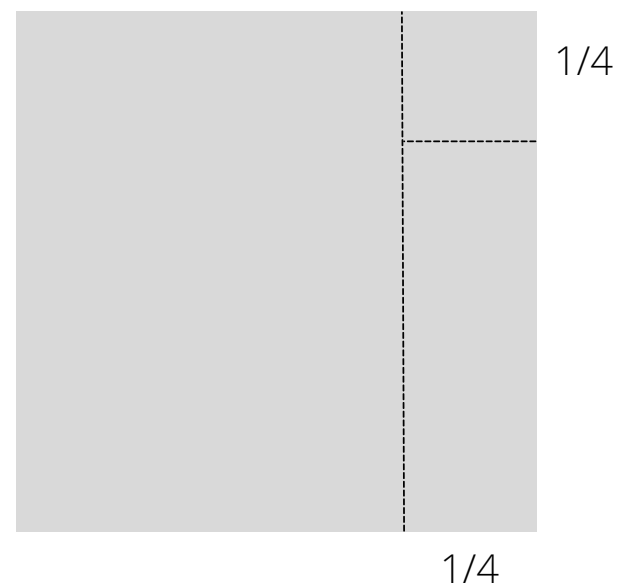
11



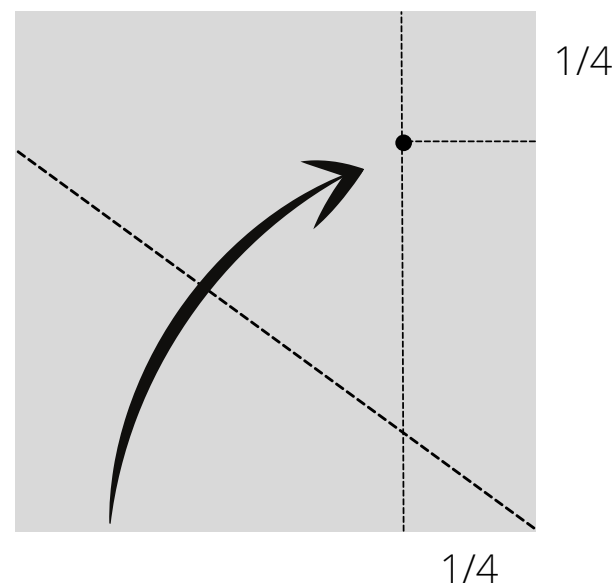
12



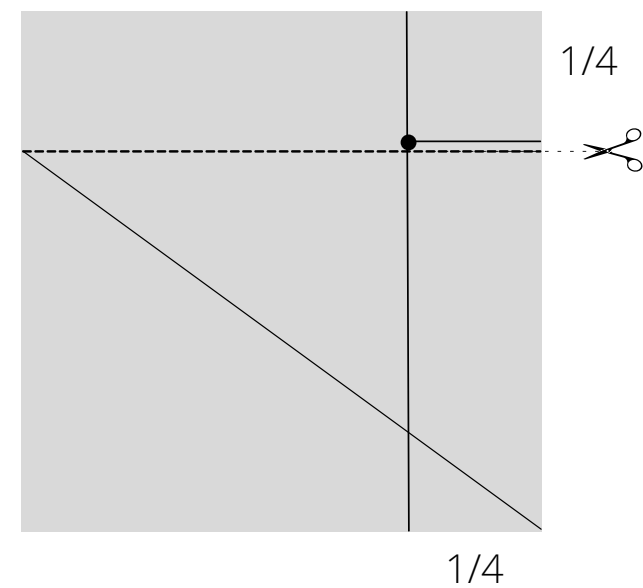
1



2



3



4

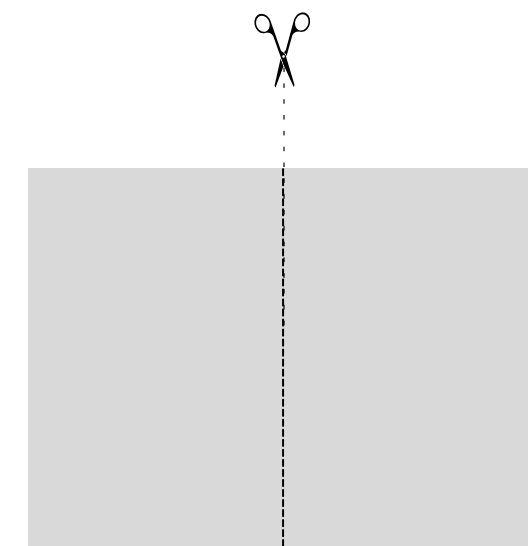
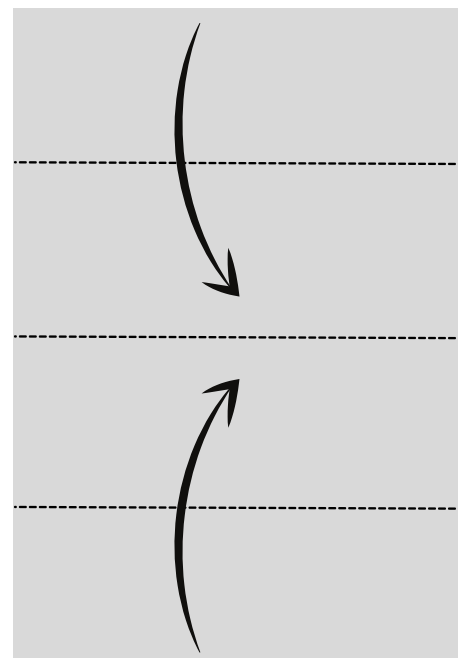


immagine ingrandita



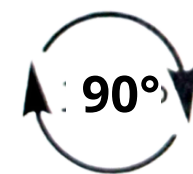
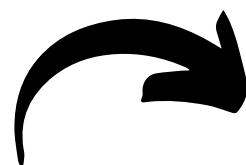
5



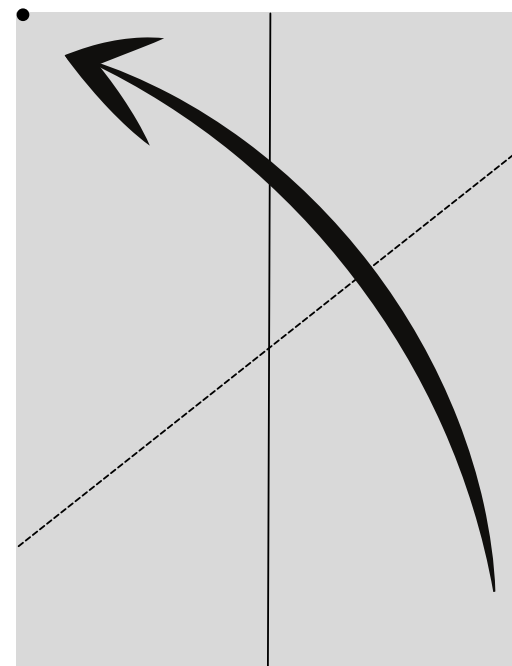
6



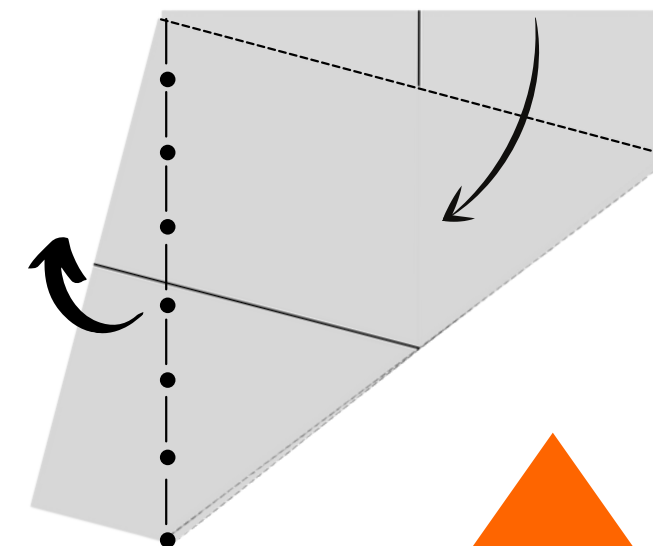
immagine ingrandita



7

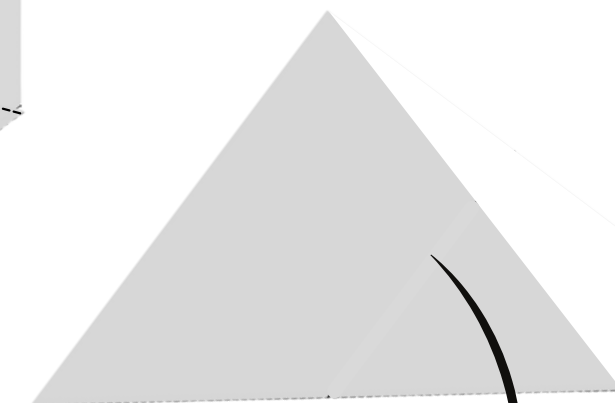


8



9

riaprire



rombo 72°-108°

10



Grazie per l'attenzione



Luciana & Barbara

**Per visualizzare il percorso intero
clicca qui**



**Per visualizzare il lavoro svolto in classe da
Luciana Piras
clicca qui**



**Per visualizzare il lavoro svolto in classe da
Barbara Sbrega
clicca qui**



**Per visualizzare i file di D. Mitchell
clicca
qui & qui**

