PROBLEMI E...DINTORNI

A.S.2024-2025

Per insegnanti di scuola Primaria e Secondaria di I° grado

ROZZANO AIRM ASSOCIAZIONE ITALIANA RALLY MATEMATICO

12/12 2024

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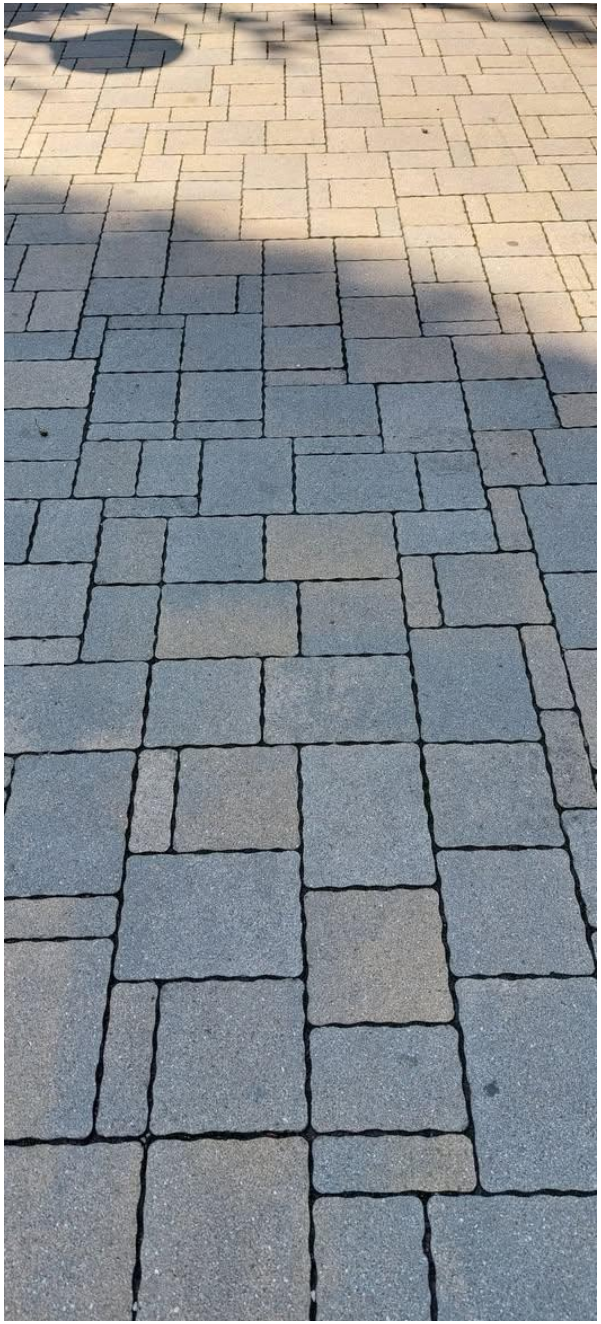
docente Primaria
responsabile del progetto Schoolmate

"Tassellazioni tra arte e problem solving"

Cosa sono le tassellazioni?

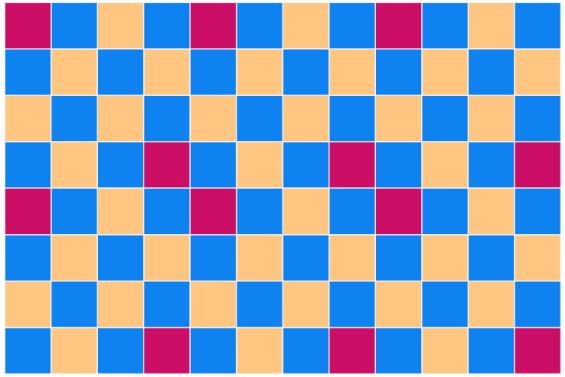
- Le **tassellazioni** sono ricoprimenti completi di un piano realizzati con una o più figure che si ripetono.
- Le figure che compongono una tassellazione prendono il nome di **tasselli**.

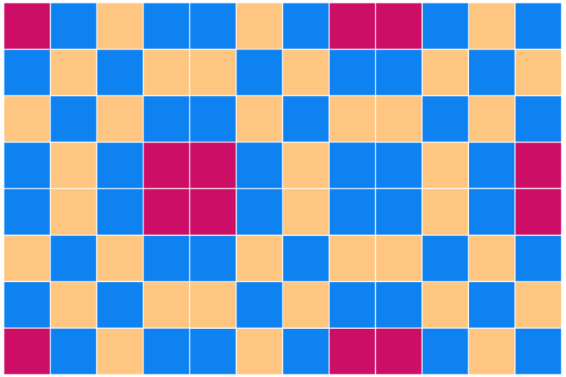
- Applicazioni pratiche riconoscere ed apprezzare elementi geometrici nel mondo reale
- Sviluppo della consapevolezza spaziale
- Sviluppo delle abilità motorie l percezioni visiva
- Sviluppo del pensiero geometrico e del metodo scientifico
- Miglioramento delle abilità di problemsolving
- Sviluppo del pensiero critico e delle capacità di analisi
- Esplorazioni di simmetrie e trasformazioni geometriche
- Promozioni di competenze matematiche
  (osservazioni,ricerca sistematiche, argomentazione classificazione rigorosa
- Approccio alla geometria basato sulle trasformazioni del piano
- Avvicinamento al concetto di infinito
- Promuove la creatività
- Collegamenti interdisciplinari (arte e matematica)
- Incorporamento di elementi digitali e tecnologici
- Valorizzazioni del lavoro di gruppo
- Piacere e bellezza di fare matematica

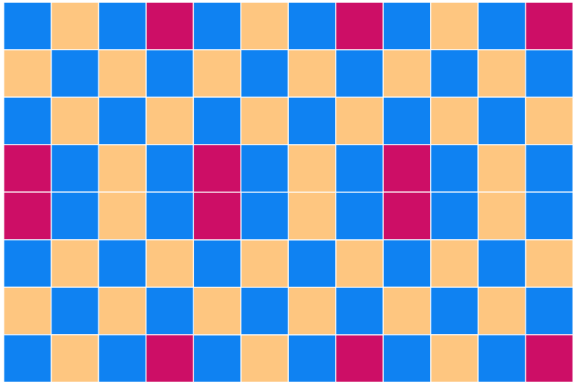


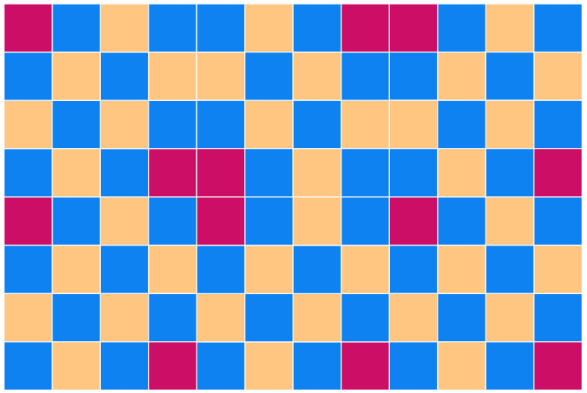
Applicazioni pratiche riconoscere ed apprezzare elementi geometrici nel mondo reale

Primo tassello quadrato









l’abate Sebastien Truchet

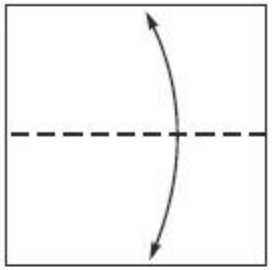
METHODE 132207
POUR FAIRE UNE INFINITÉ
DE
DESSEINS DIFFERENS,
AVEC
DES CARREAUX MI-PARTIS DE DEUX COULEURS
par une ligne diagonale:

Truchet Pattern Explorer

Tessera 1/2

Pezzo n. 1

1



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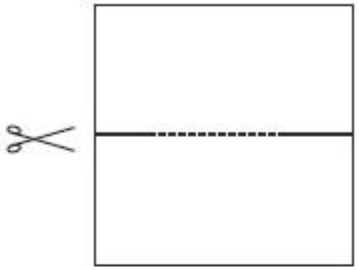

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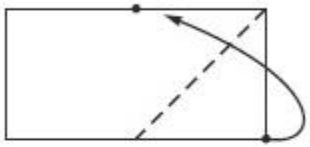

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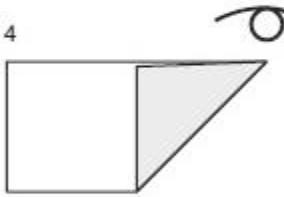

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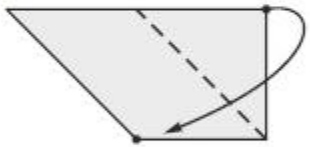

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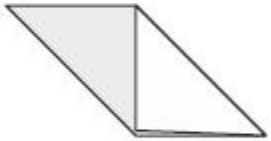

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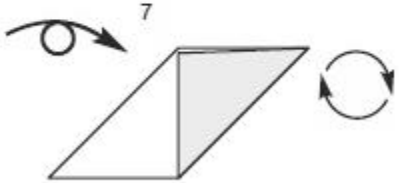

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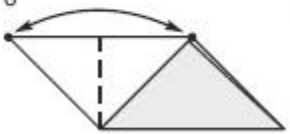

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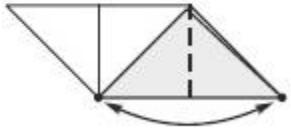

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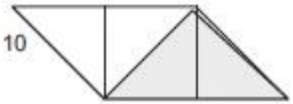
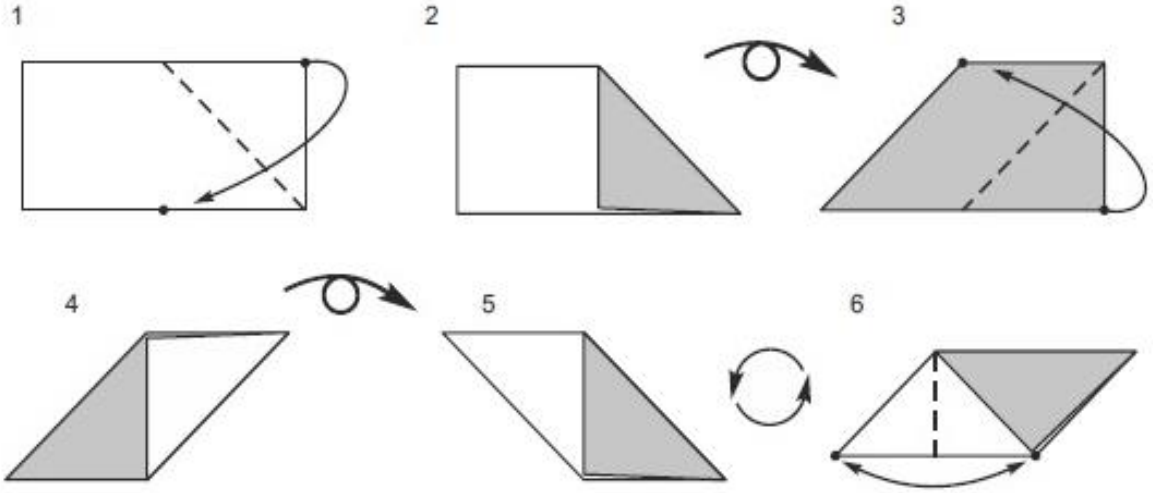
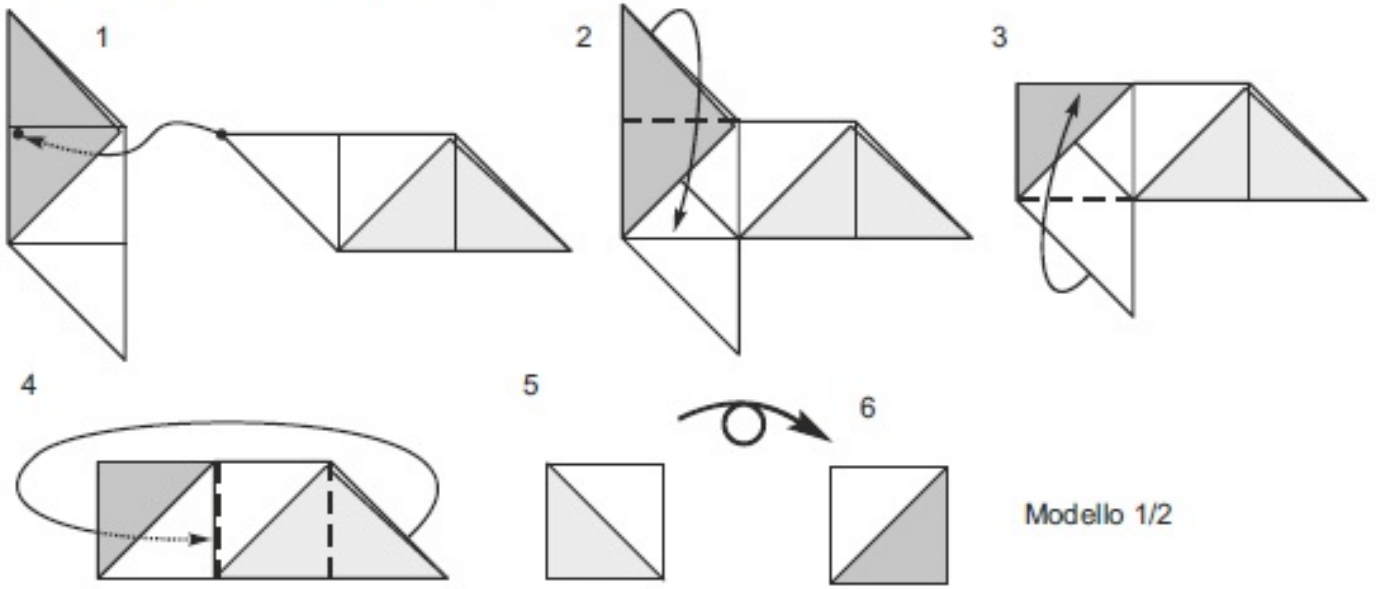


Pezzo n. 1 terminato

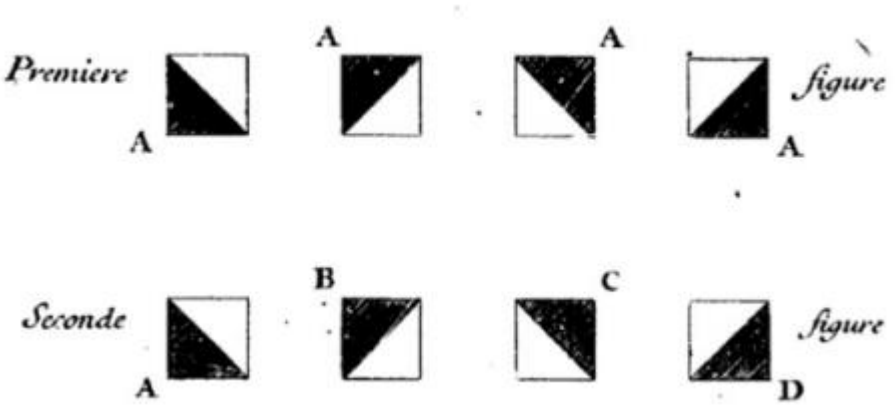
Pezzo n. 2

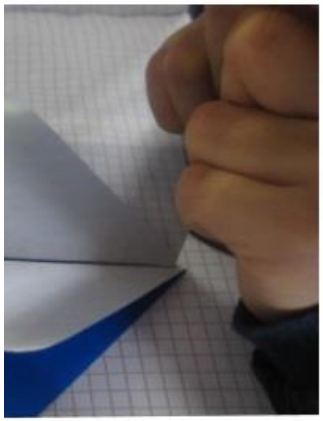


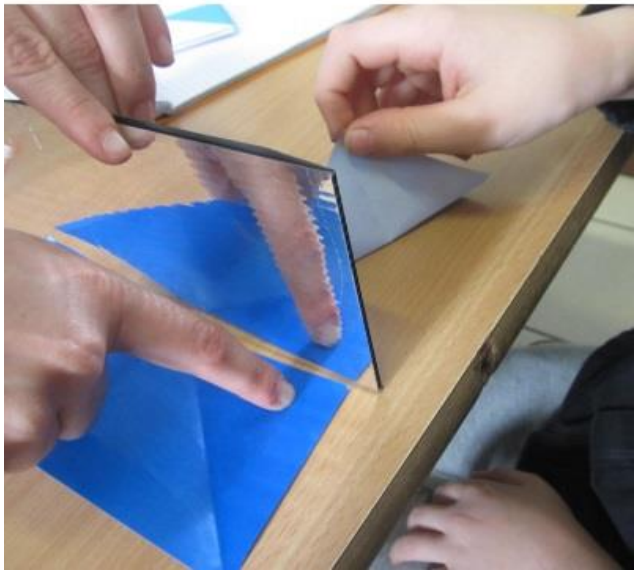
Unione del pezzo n. 1 con il pezzo n. 2

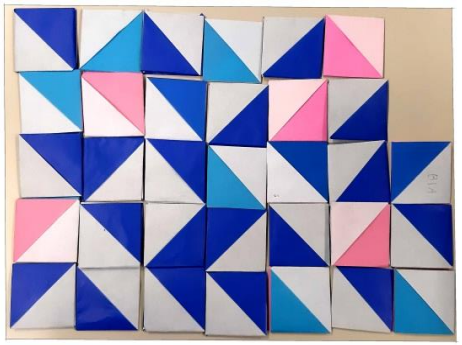


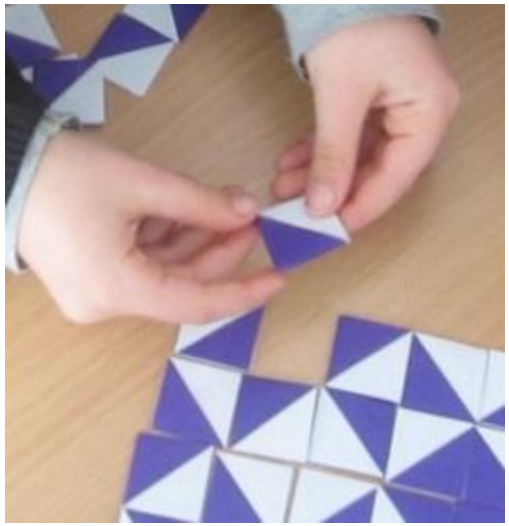
Modello 1/2

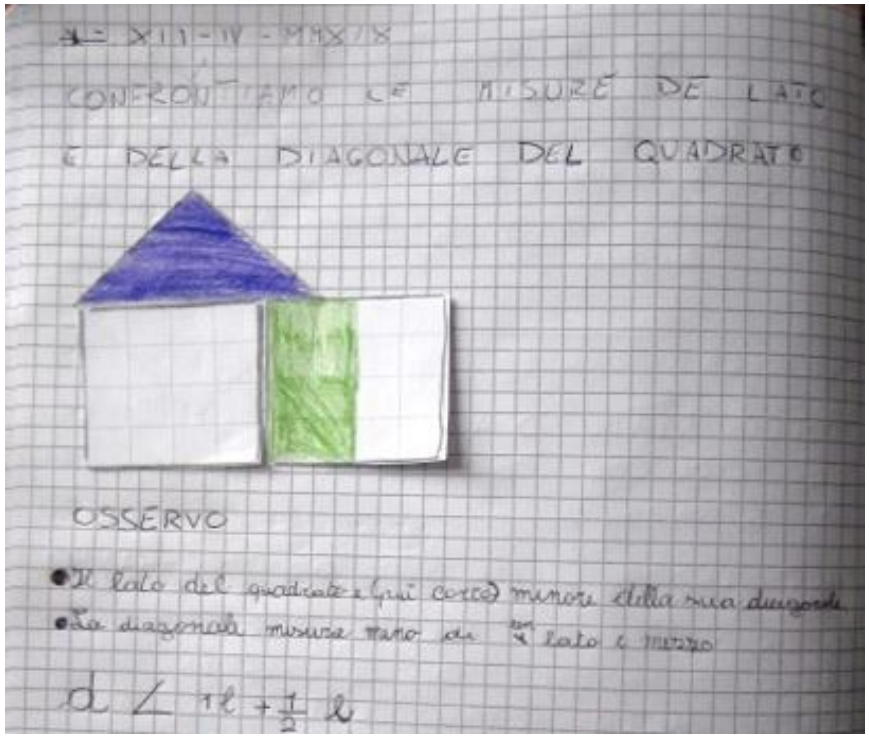

Premiere figure
A
A
A
A
Seconde figure
A
B
C
D










CONFRONTIAMO LE MISURE DEL LATO
E DELLA DIAGONALE DEL QUADRATO
OSSERVO
Il lato del quadrato è (più corto) minore della sua diagonale
La diagonale misura meno di 3/2 lato e mezzo
d < 1l + 1/2 l

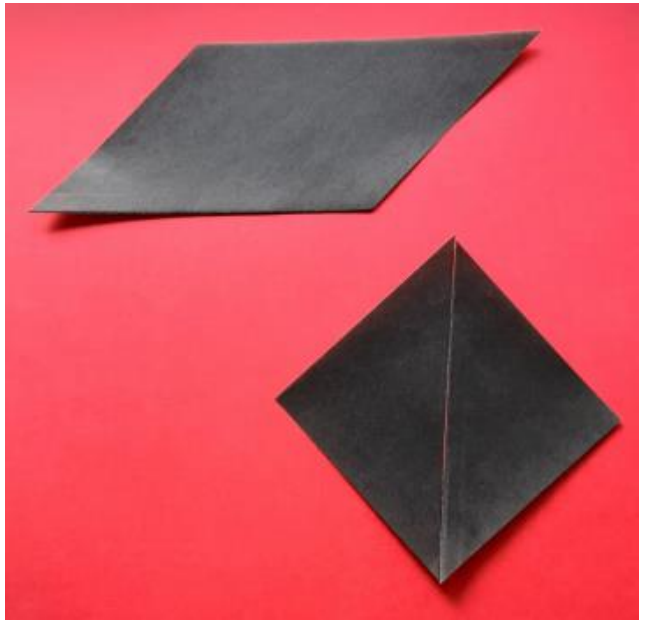
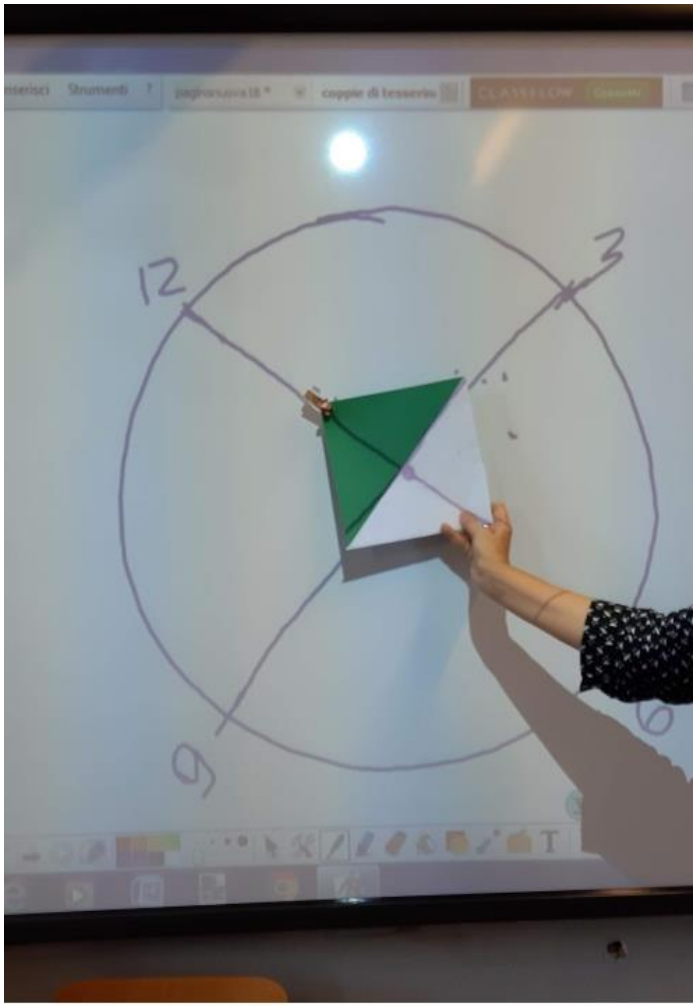
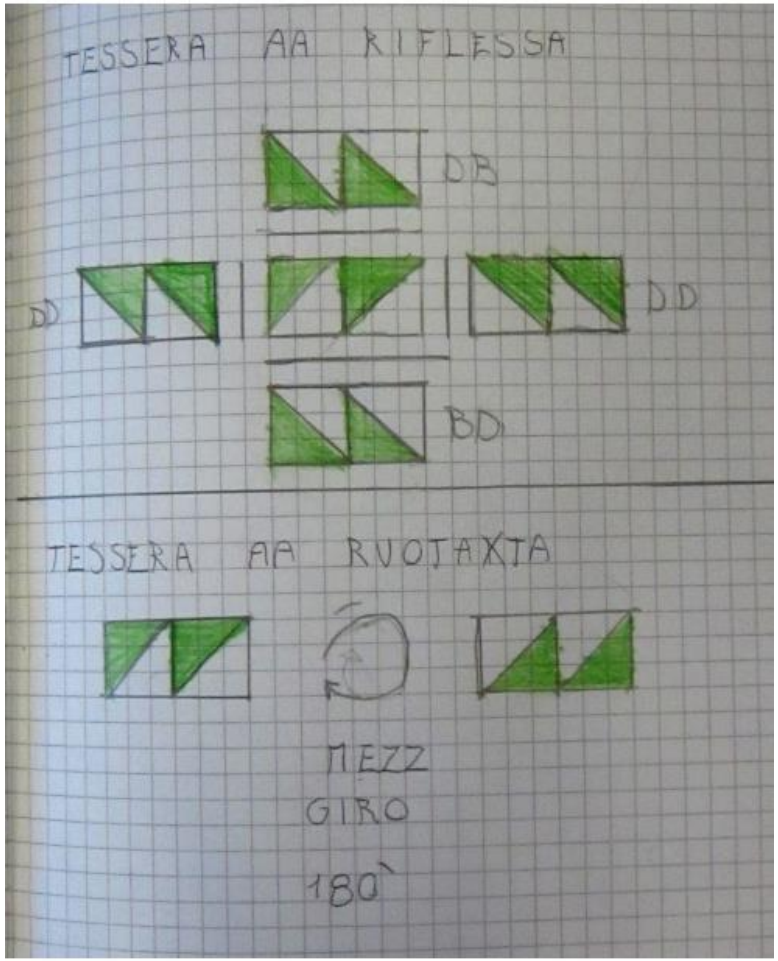
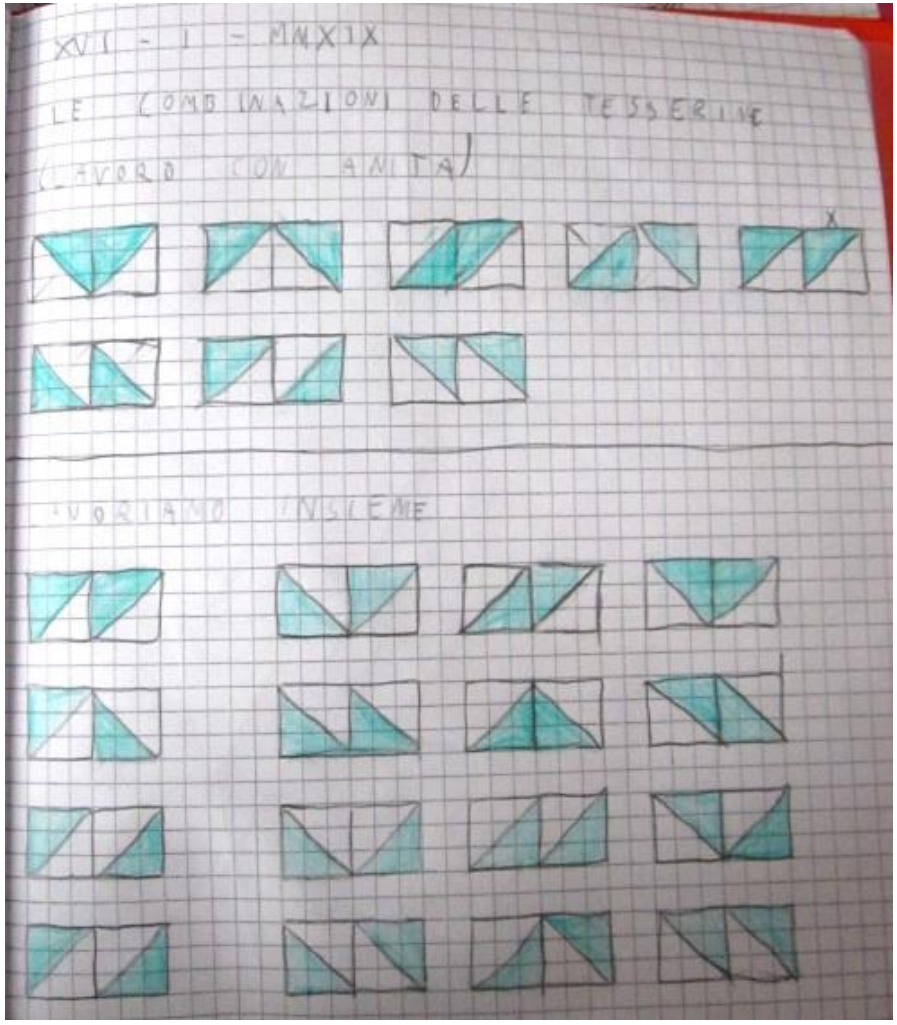


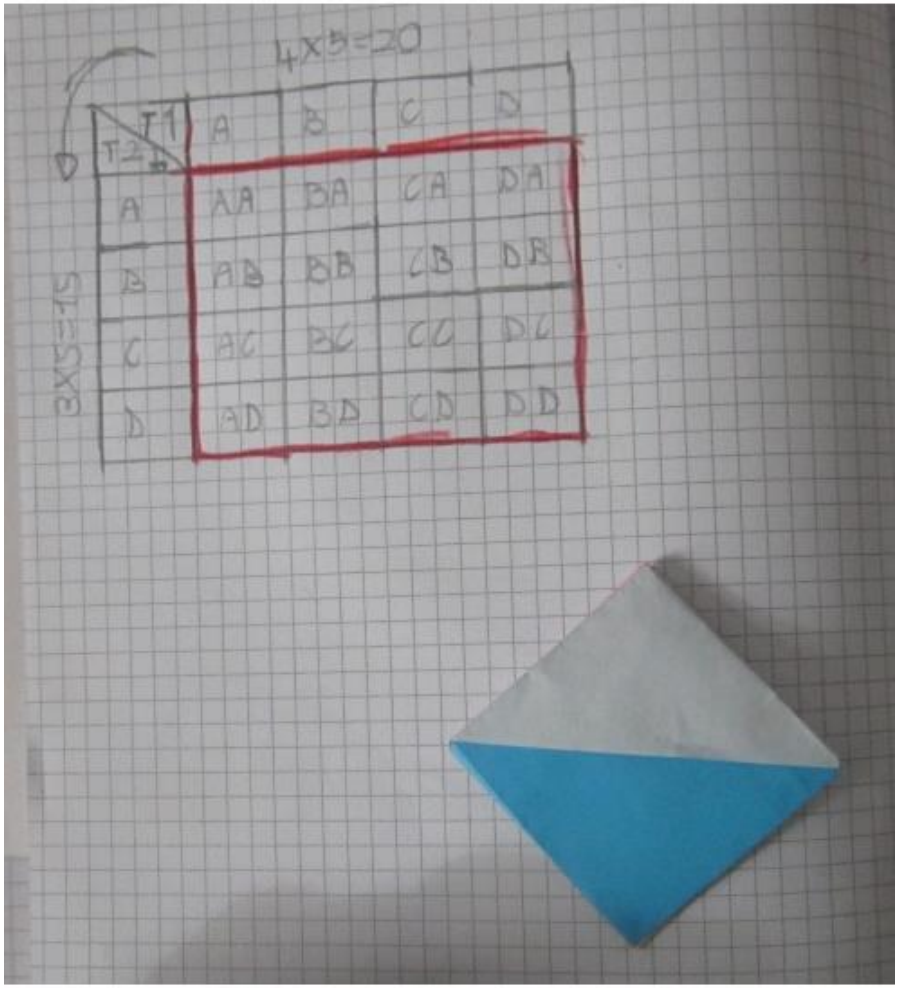
Fig. 1

Fig. 2


12
3
9
6

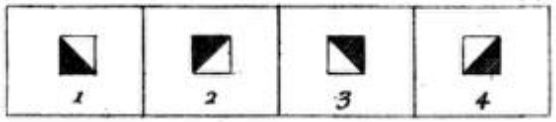

TESSERA AA RIFLESSA
DB
DD
DD
BD
TESSERA AA RUOTAXTA
MEZZ
GIRO
180°


XVI - I - MMXIX
LE COMBINAZIONI DELLE TESSERINE
(LAVORO CON ANITA)
LAVORANDO INSIEME


4X5=20
T1
T2
A
B
C
D
AA
BA
CA
DA
AB
BB
CB
DB
AC
BC
CC
DC
AD
BD
CD
DD
5X5=25

Premiere Table

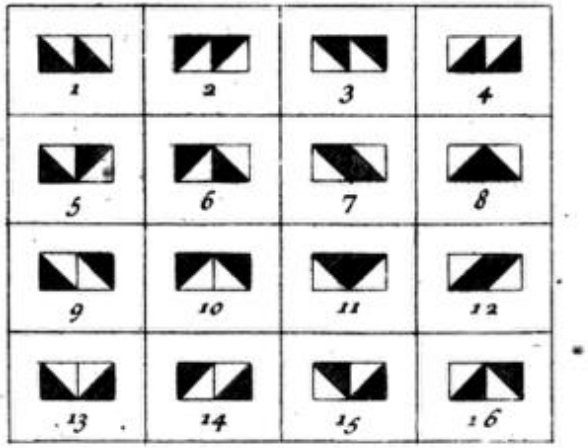
Contenant quatre Permutations



A B C D

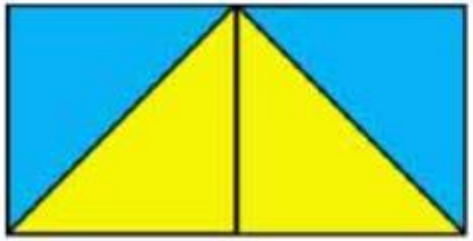
Seconde Table

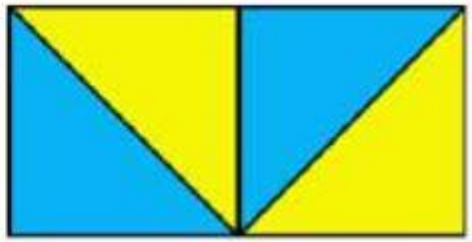
Contenant Seize Permutations.



Se consideriamo equivalenti le configurazioni che differiscono solo per l'ordine dei due tasselli, quante figure potremo ottenere?

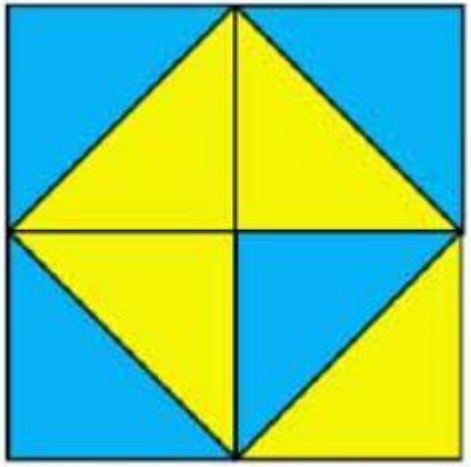
AA	BB	CC	DD
AB	BA	CA	DA
AC	BC	CB	DB
AD	BD	CD	DC

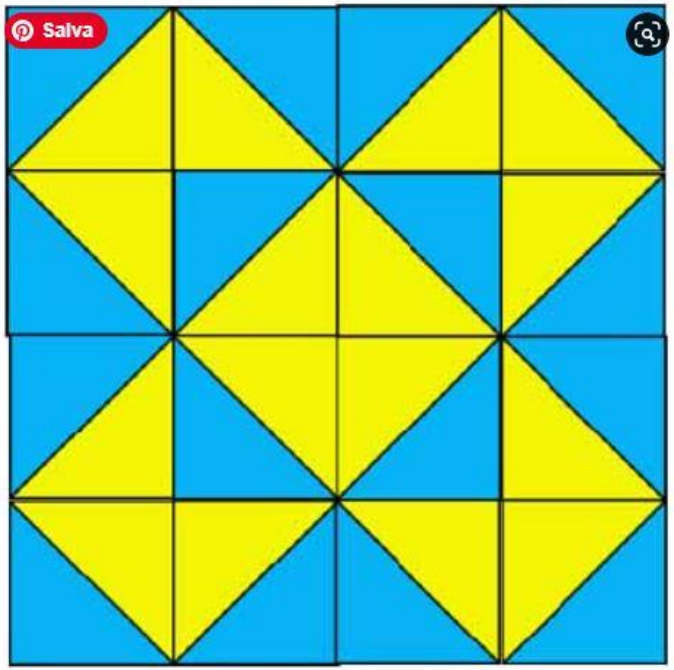




B **C** **A** **B**

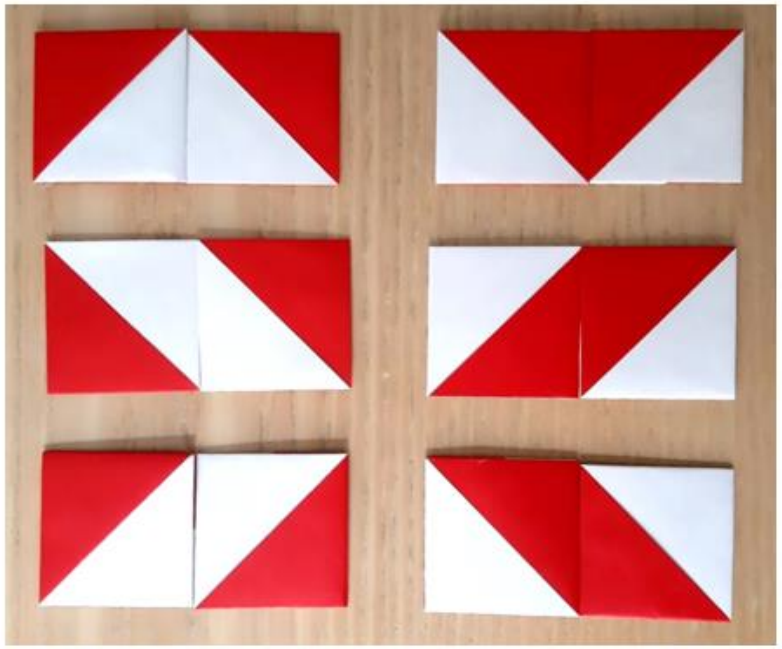
quadrato composto dai due moduli **BC** + **AB**



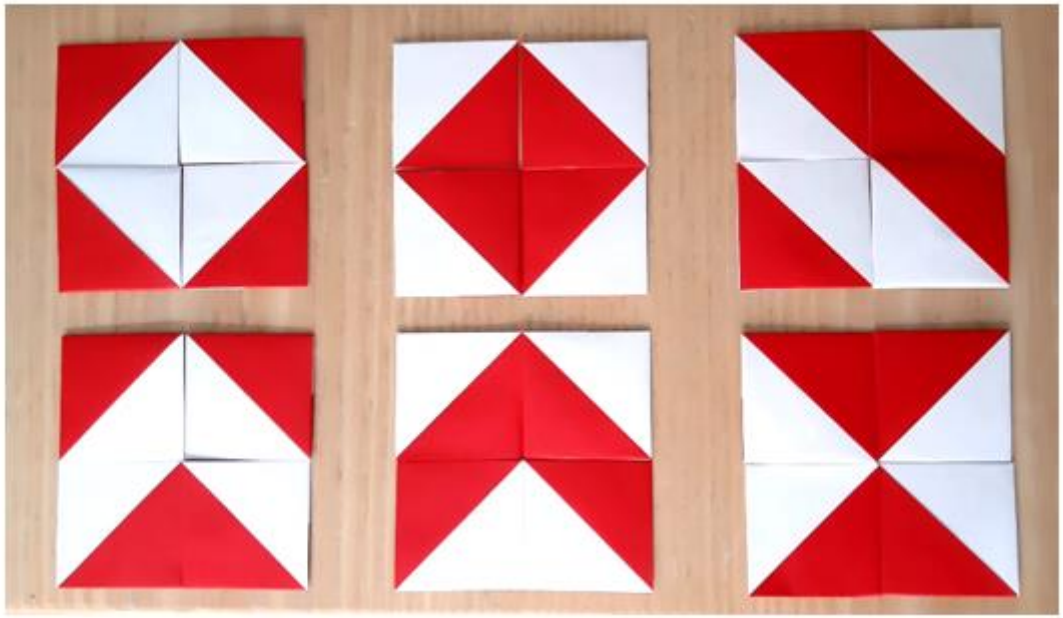


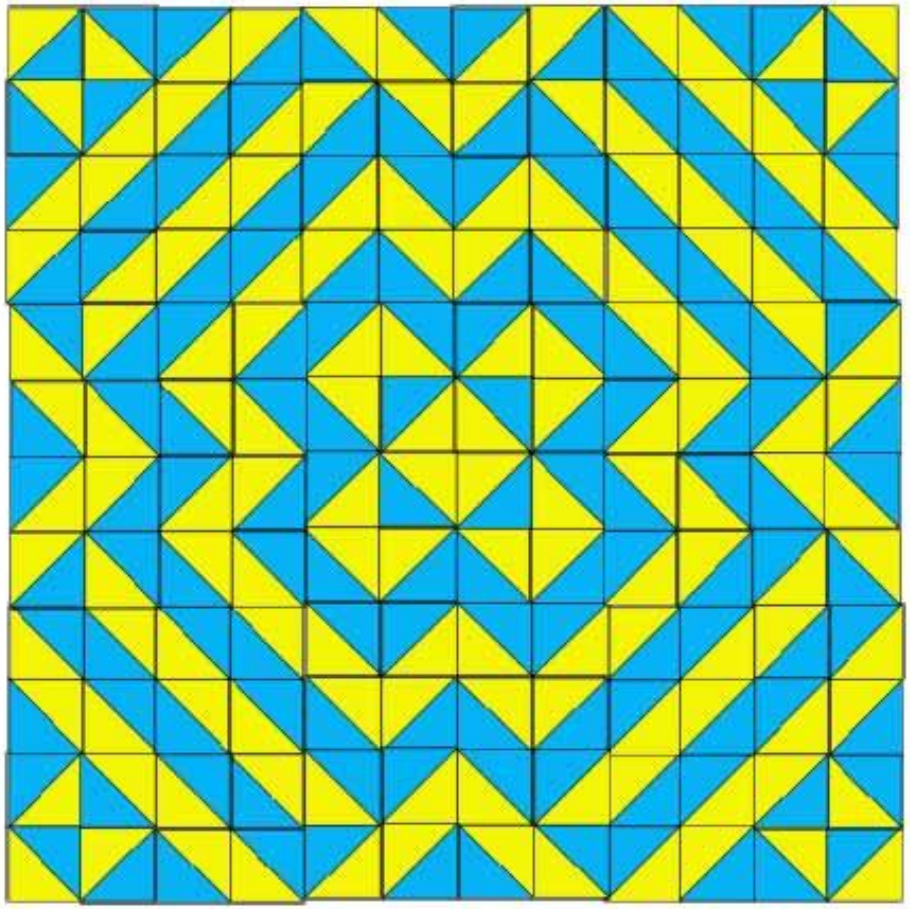
Immagini tratte da: http://jean-luc.bregeon.pagesperso-orange.fr/Page%200-27.htm

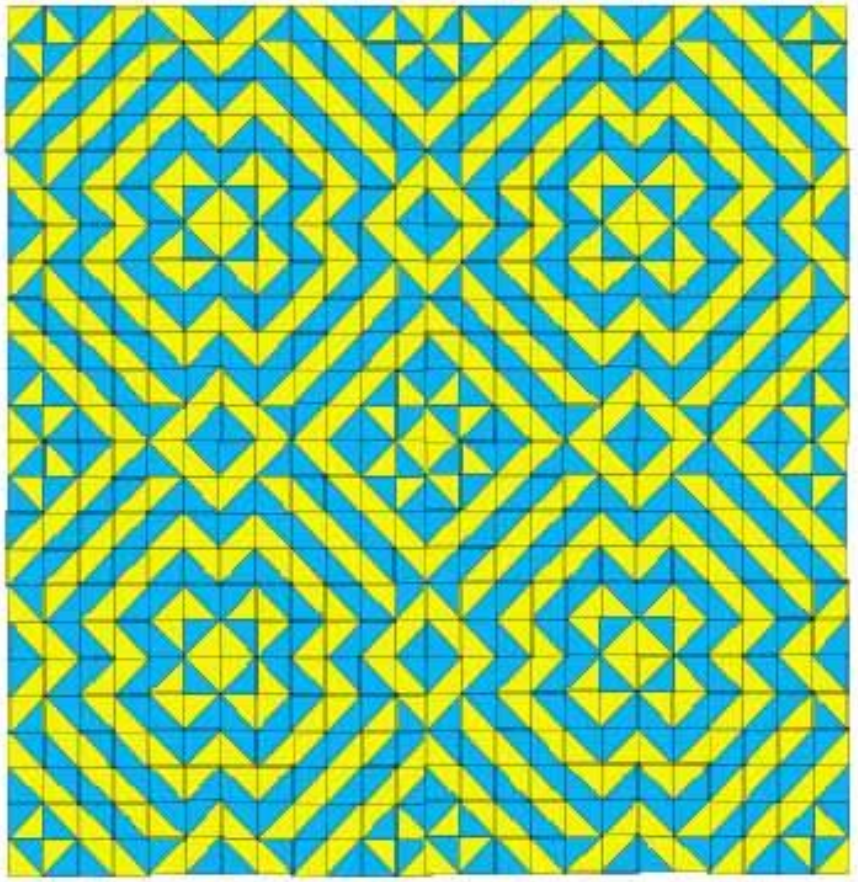
Due quadrati si possono accostare solo se le aree adiacenti sono dello stesso colore:



Stessa regola per quattro tasselli disposti a quadrato.

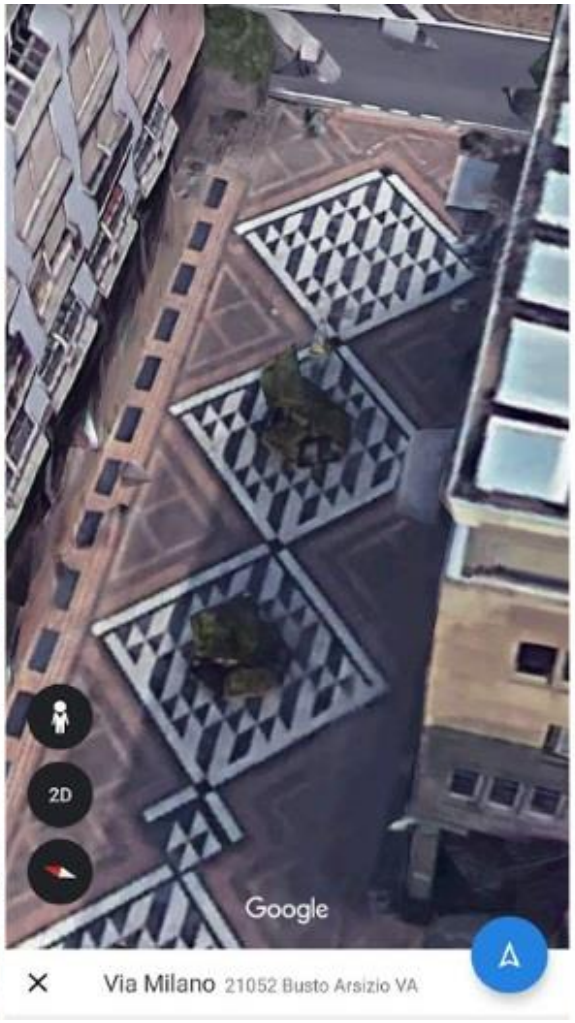


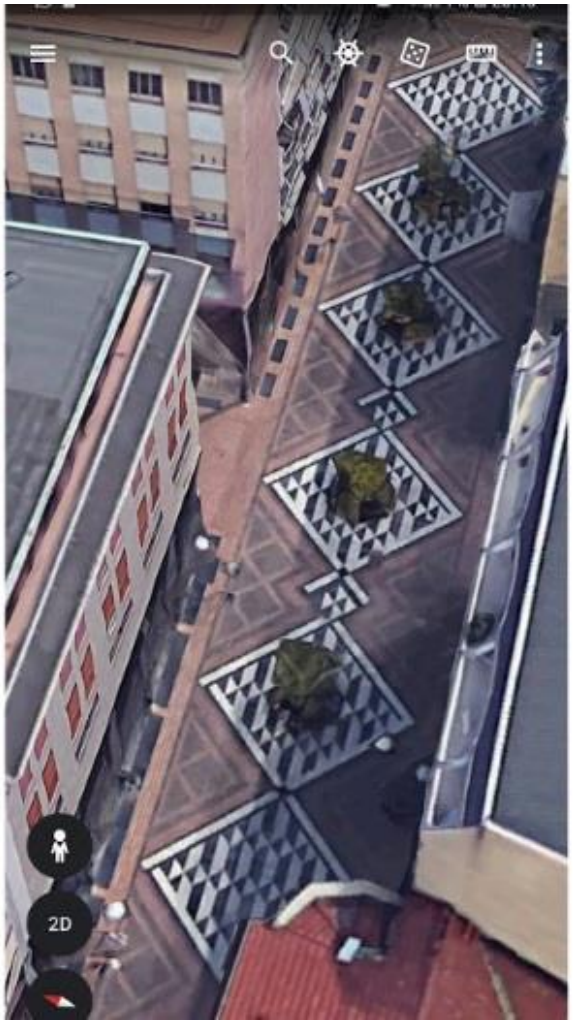




Immagini tratte da: http://jean-luc.bregeon.pagesperso-orange.fr/Page%200-27.htm


2D
Google


2D
Google
Via Milano 21052 Busto Arsizio VA


2D

MODO DI MAILA

25 5x5	3x5 15
3x5 15	3x3 9

25+15+15+9=64

5x5+3x5+3x5+3x3=25+15+15+9=64

MODO DI RICCARDO

		2x5 20
2x3 6	2x5=10	

100-20-10-6

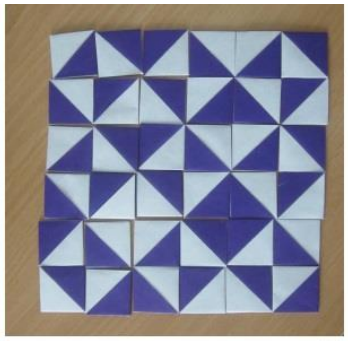
10x10-2x10-2x5-2x3=100-20-10-6=64

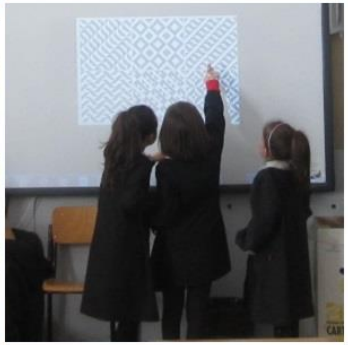
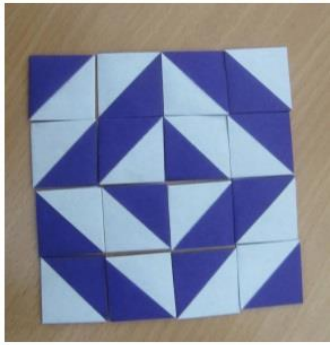
MODO DI LUCA

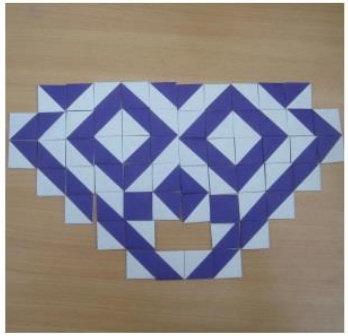
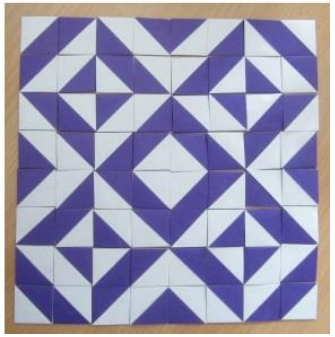
8+8=16

16x4=10x4+6+6+6+6=40+12+12=64

12 12

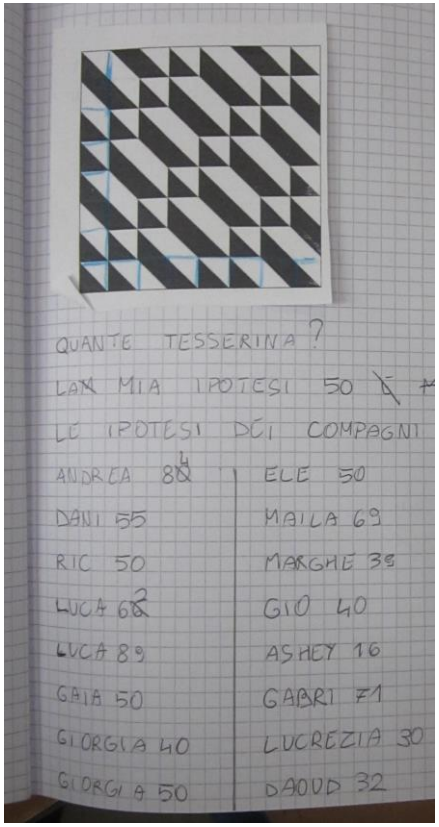




2D


8
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8
QUANTE TESSERINE?


QUANTE TESSERINE?
LA MIA IPOTESI 50
LE IPOTESI DEI COMPAGNI
ANDREA 80
DANI 55
RIC 50
LUCA 68
LUCA 89
GAIA 50
GIORGIA 40
GIORGIA 50
ELE 50
MAILA 69
MARGHE 35
GIO 40
ASHEY 16
GABRI 71
LUCREZIA 30
DAOUD 32

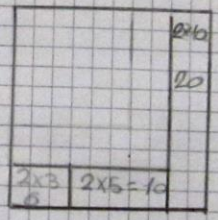
MODO DI MAILA

25 5X5	3X5 15
3X5 15	3X3 9

25+15+15+9=64

5X5+3X5+3X5+3X3=25+15+15+9=64

MODO DI RICCARDO



100-20-10-6

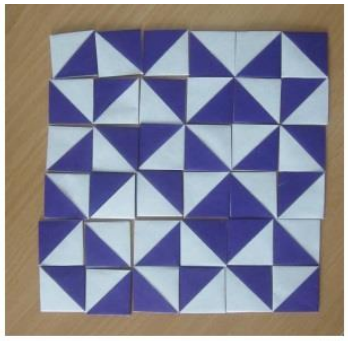
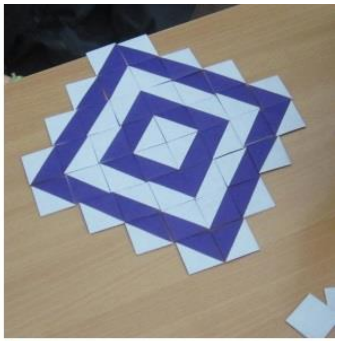
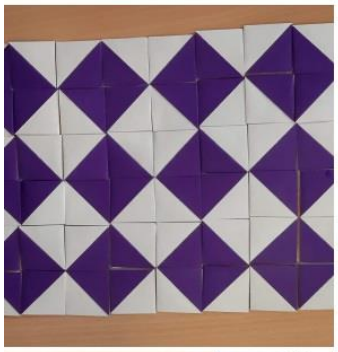
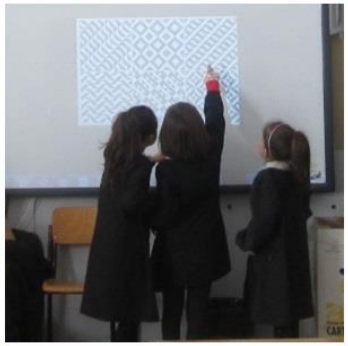
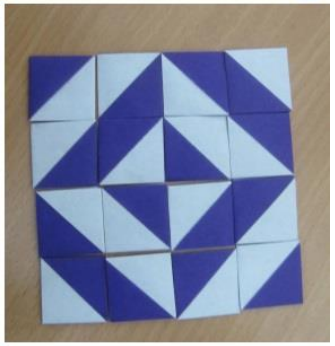
10x10-2x10-2x5-2x3=100-20-10-6=64

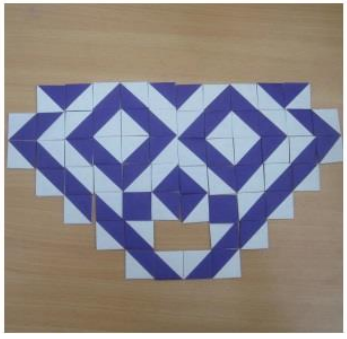
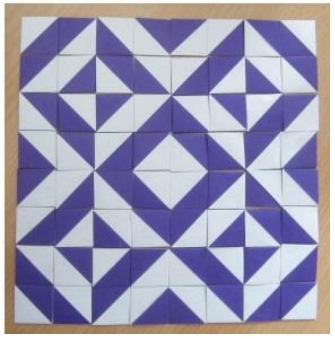
MODO DI LUCA

8+8=16

16X4=10X4+6+6+6+6=40+12+12=64

12 12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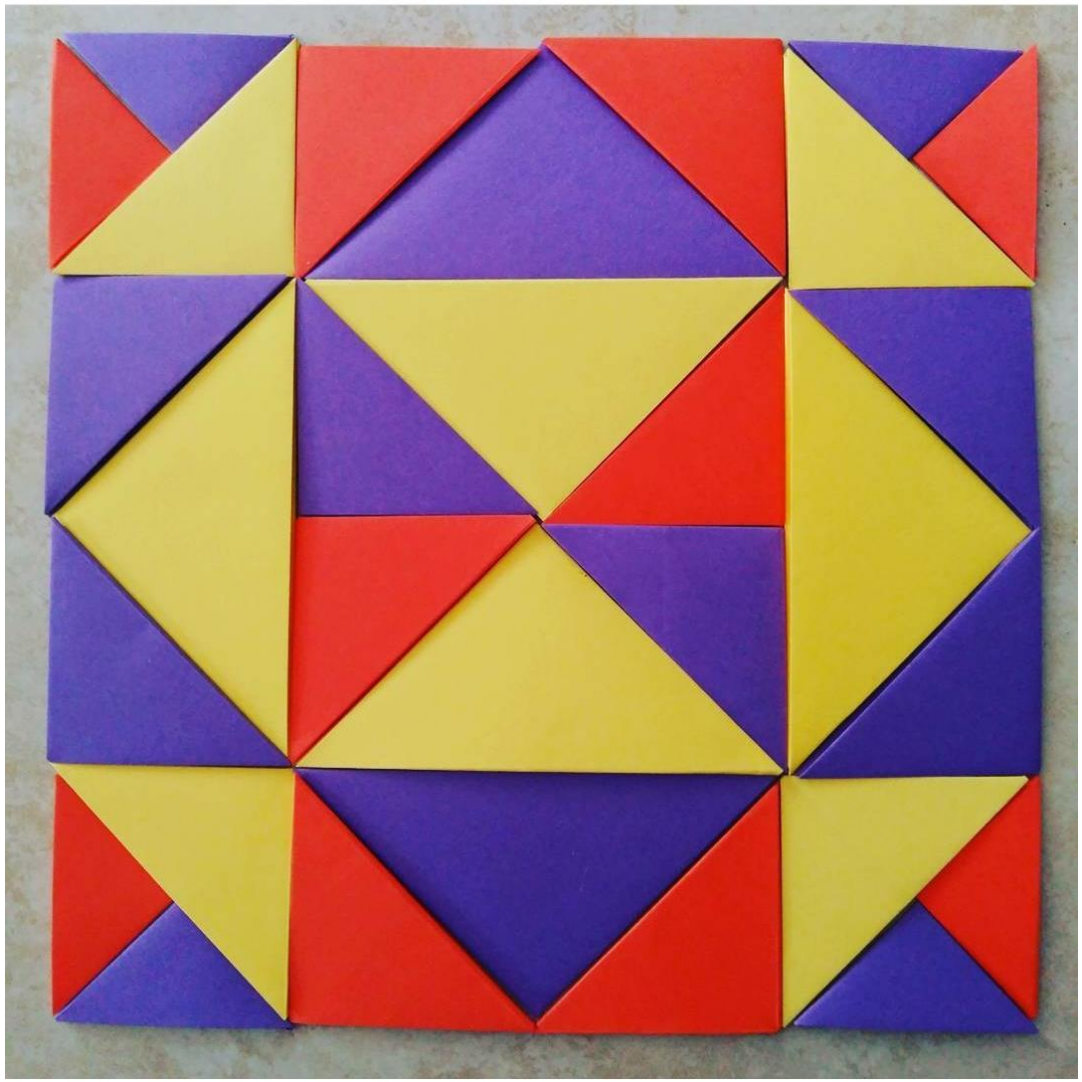

Nel link un’altra proposta

https://www.schoolmate.it/index.php?option=com_content&view=article&id=1267:poliaboli-sempre-una-bella-proposta&catid=61&Itemid=81

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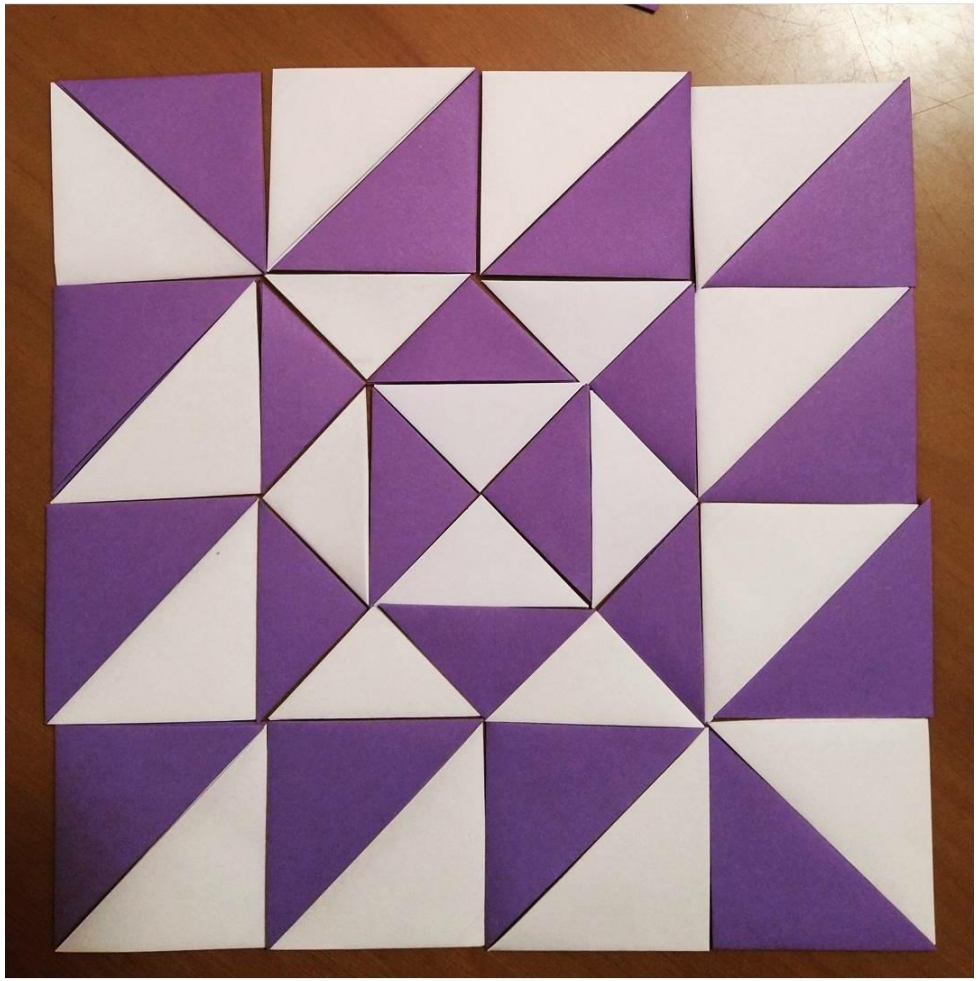

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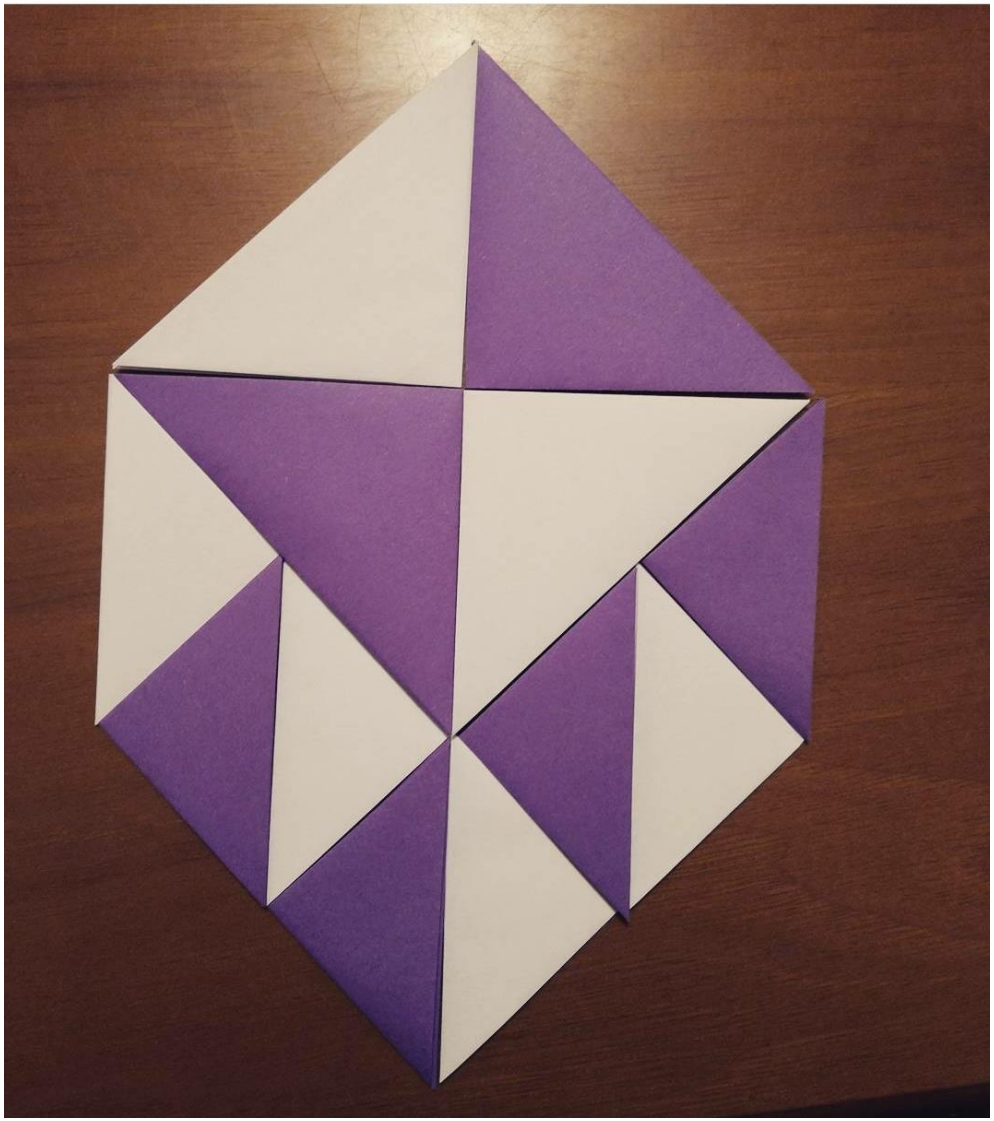

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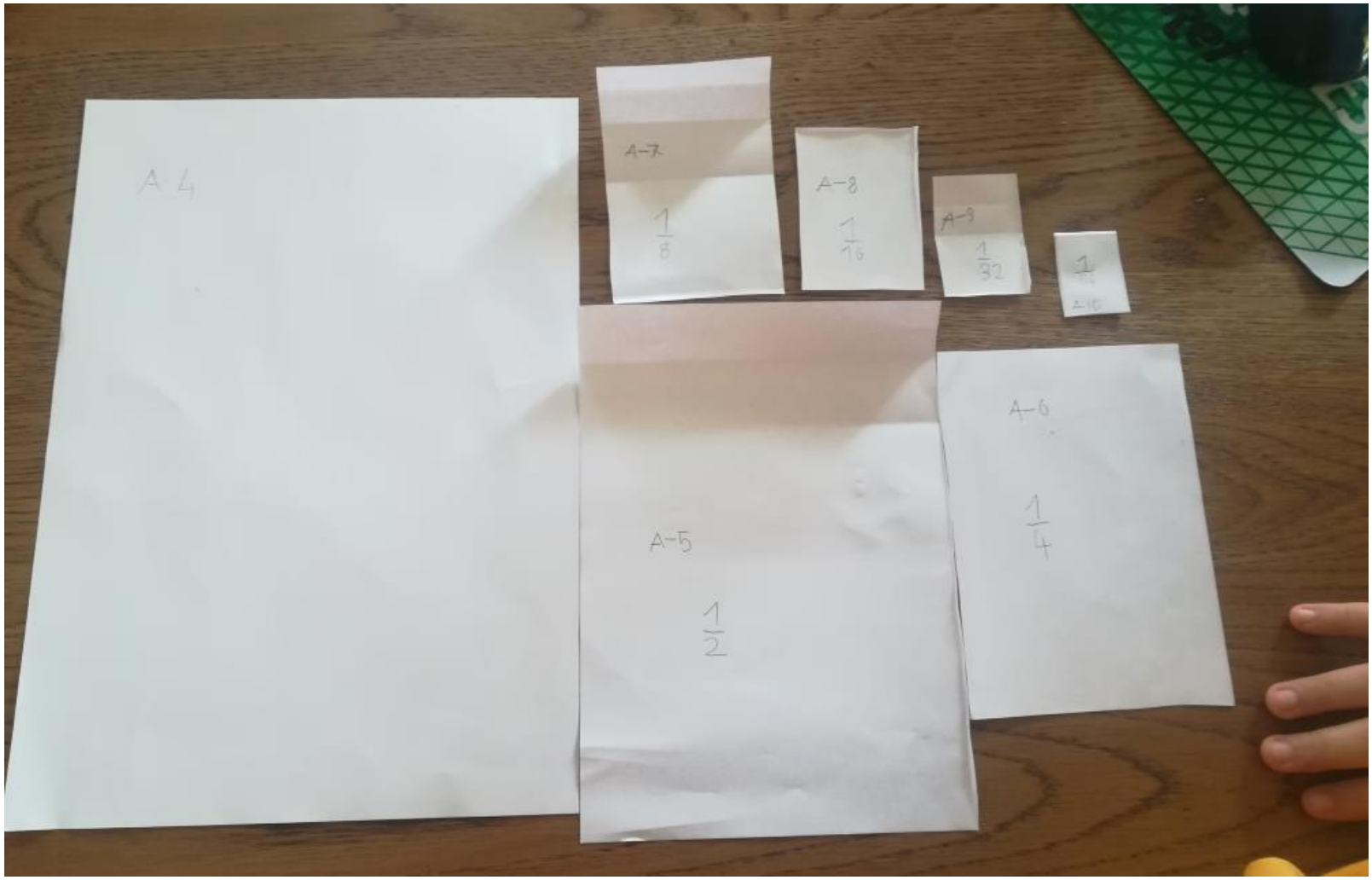
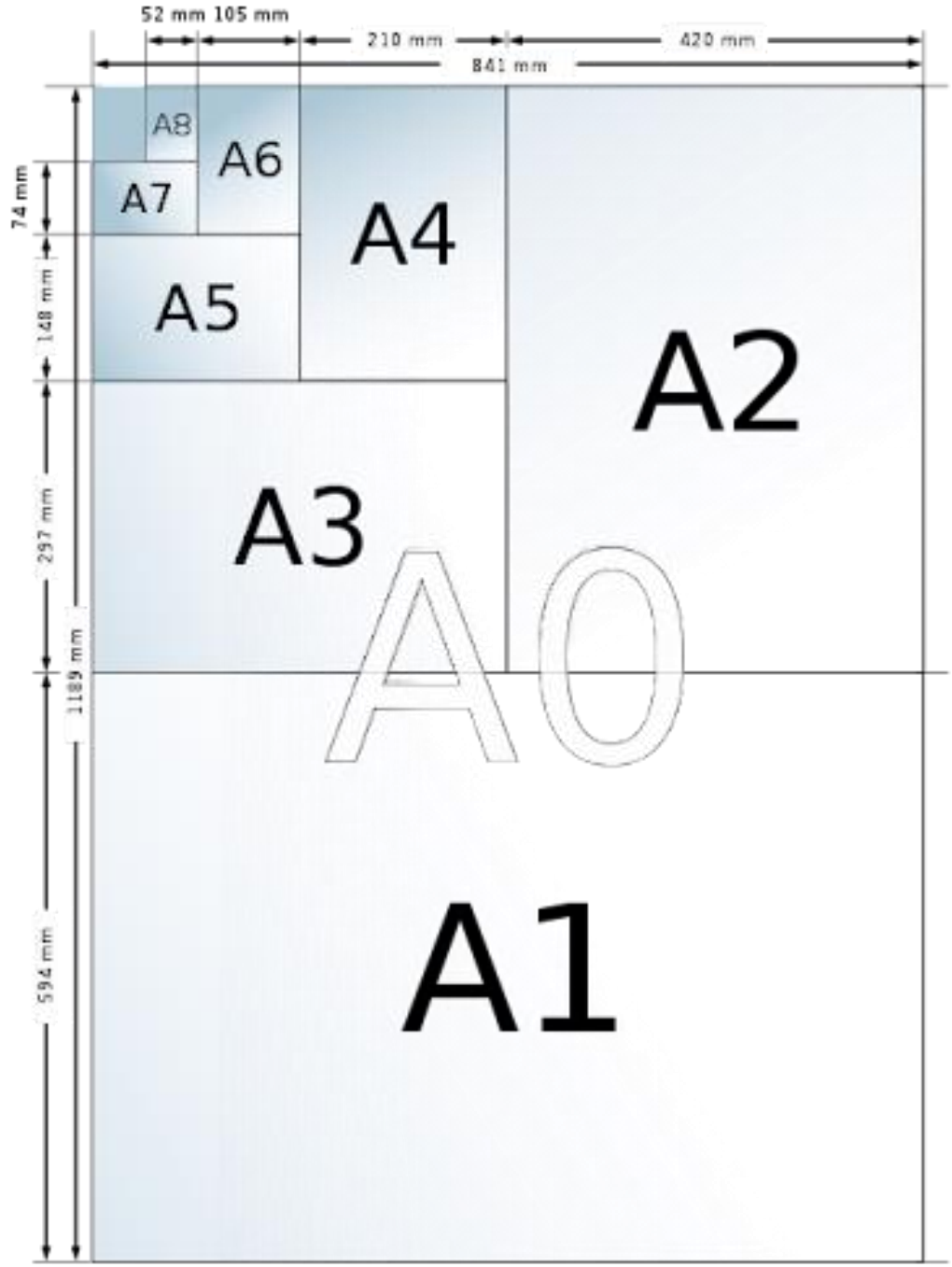

A 4
A-7
1/8
A-8
1/16
A-9
1/32
A-10
A-5
1/2
A-6
1/4

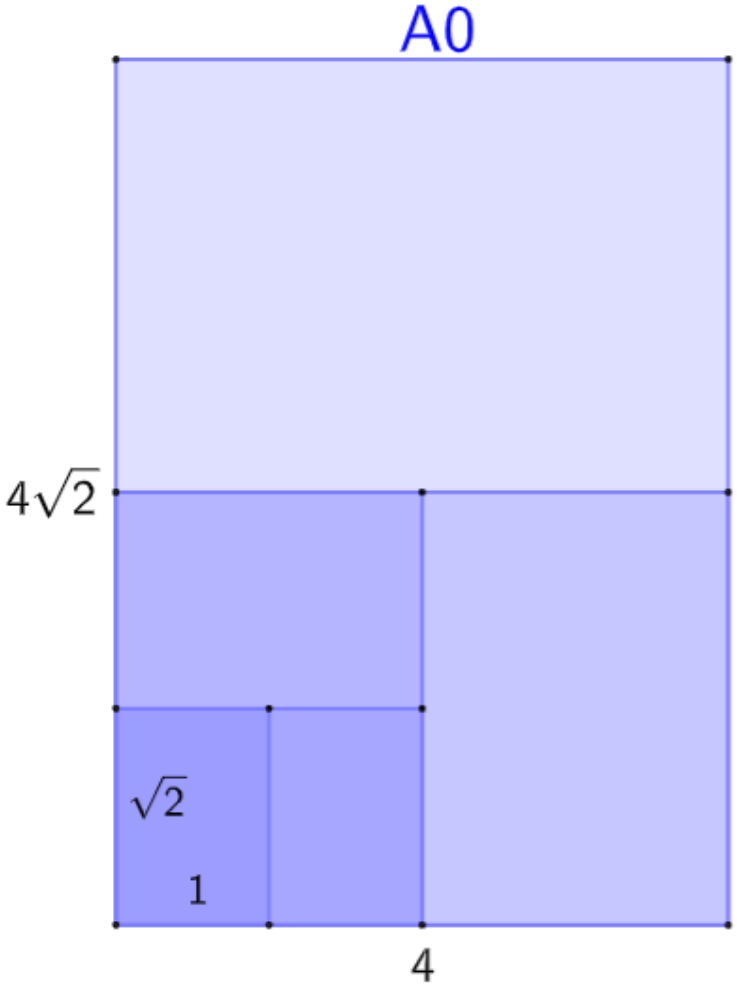
formato A	frazione rispetto all'A4
A4	1
A5	$\frac{1}{2}$
A6	$\frac{1}{4}$
A7	$\frac{1}{8}$
A8	$\frac{1}{16}$
A9	$\frac{1}{32}$
A10	$\frac{1}{64}$
A11	$\frac{1}{128}$

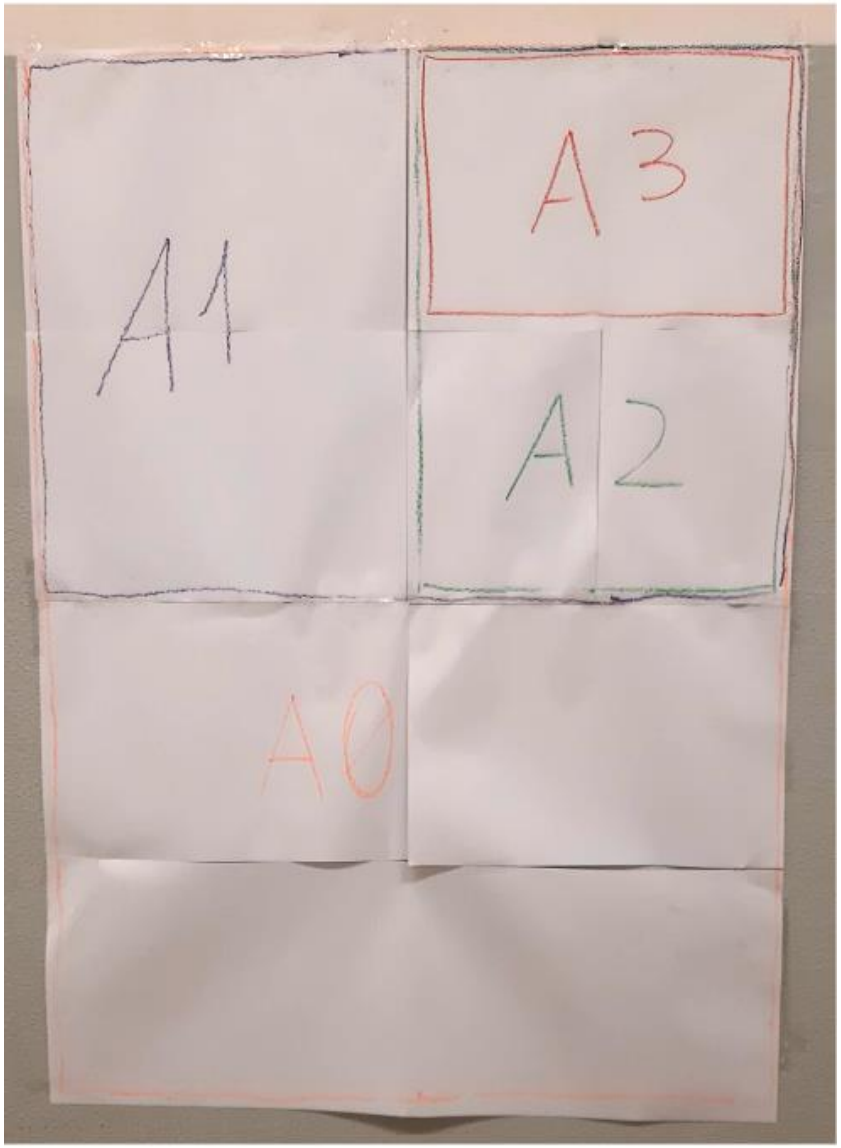
FOAIA	mm	cm	SUPERFICIE
0	840 x 1188	84 x 118,8	9979,2 cm^2
1	594 x 840 :2	59,4 x 84	4989,6 cm^2
2	420 ~~594~~ x 594	42 x 59,4	2494,8 cm^2
3	297 x 420 :2	29,7 x 42	124,7 cm^2
4	210 x 297 :2	21 x 29,7	21 x 29,7 = 623,7 cm^2
5	148,5 x 210 :2	14,85 x 21	14,85 x 21 = 311,85 cm^2
6	105 x 148,5 :2	10,5 x 14,85	10,5 x 14,85 = 155,925 cm^2
7	74,25 x 105 :2	7,425 x 10,5	7,425 x 10,5 = 77,9625 cm^2
8	52,5 x 74,25 :2	5,25 x 7,425	5,25 x 7,425 = 38,98125 cm^2
9	37,125 x 52,5	3,7125 x 5,25	3,7125 x 5,25 = 19,490625 cm^2


52 mm
105 mm
210 mm
420 mm
841 mm
74 mm
148 mm
297 mm
1189 mm
594 mm
A8
A6
A7
A4
A5
A2
A3
A0
A1

Area A4 = bxh
Area A3 = 2bxh = 2 Area A4
<u>Area A2</u>= 2bx 2h = 4 Area A4
Area A1= 4bx2h = 8 Area A4
Area A0 = 4bx4h = 16 Area A4

Area A0 = 10000cm^2



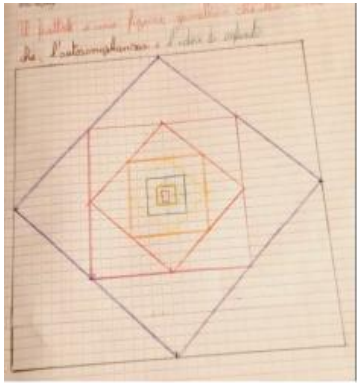


$10\ 000\ cm^2 = 1m^2$

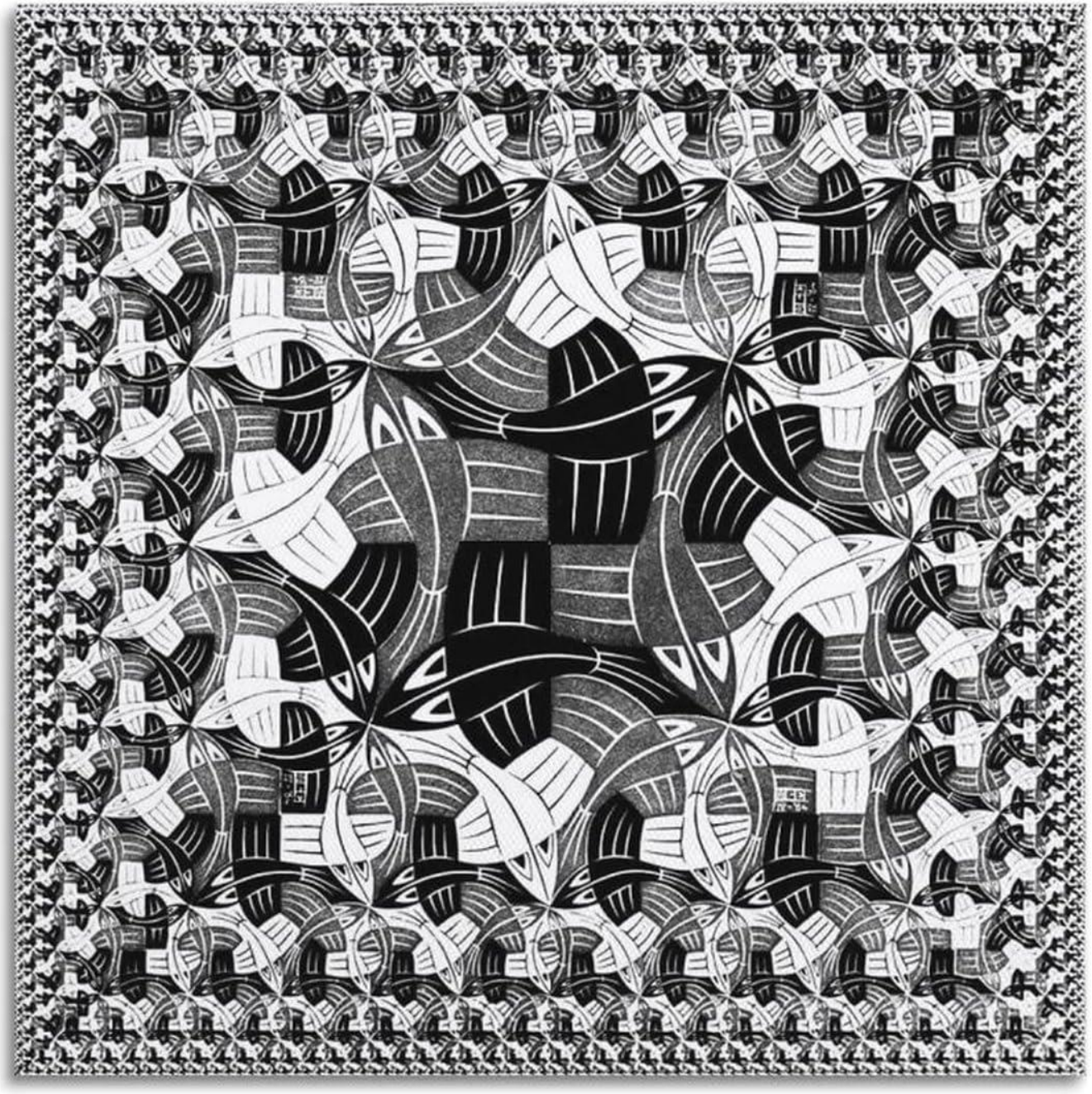
Quando il metro quadrato
non è quadrato

Ragionando sul foglio a 1 partendo da a 4

FORMATO	LL	LC	LL:LC
A4	29,7	21	29,7cm : 21cm = 1,41
A5	21	14,85	21 : 14,85 = 1,41
A6	14,85	10,5	14,85 : 10,5 = 1,41
A7	10,5	7,42	10,5 : 7,42 = 1,41
A8	7,42	5,25	7,42 : 5,25 = 1,41
A9	5,25	3,71	5,25 : 3,71 = 1,41
A10	3,71	2,62	3,71 : 2,62 = 1,41
A11	2,62	1,85	2,62 : 1,85 = 1,41



Escher
il limite
del
quadrato



Escher

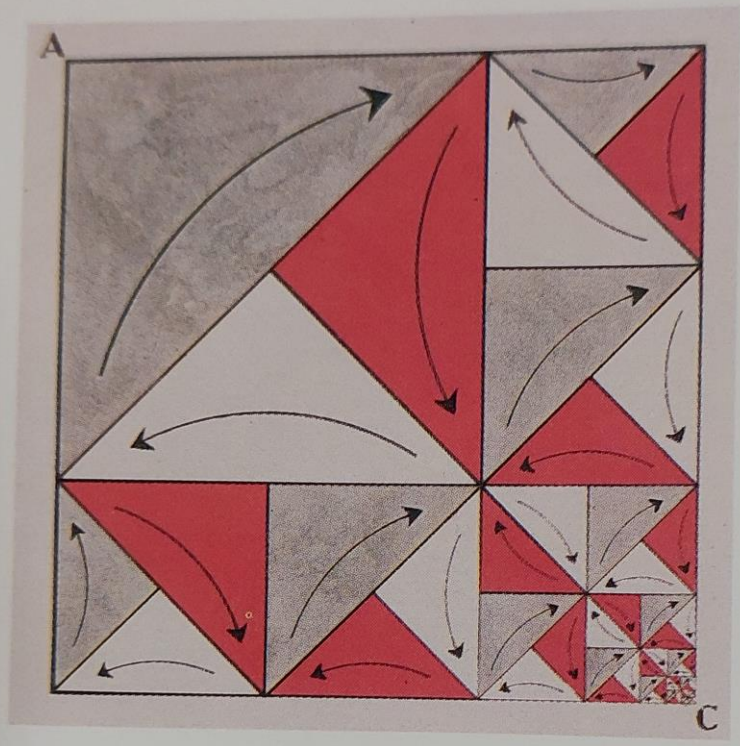
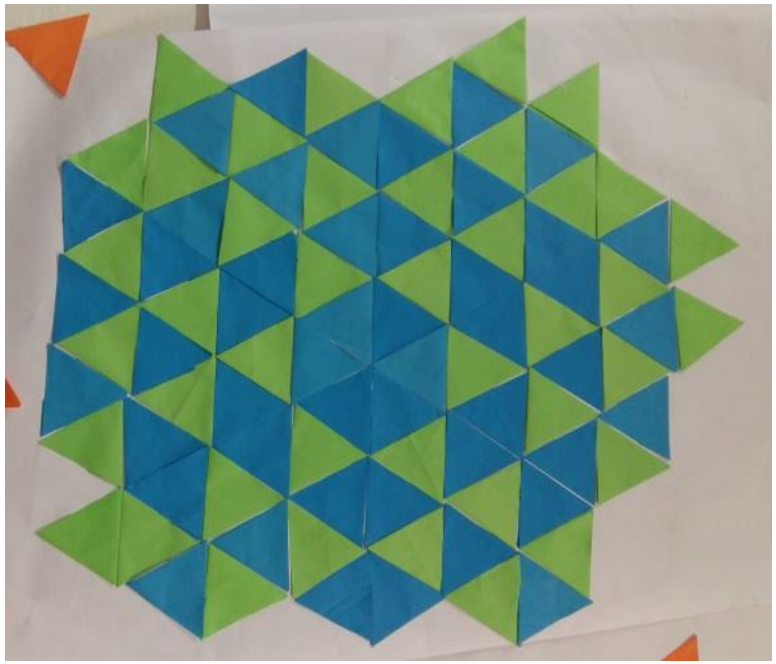
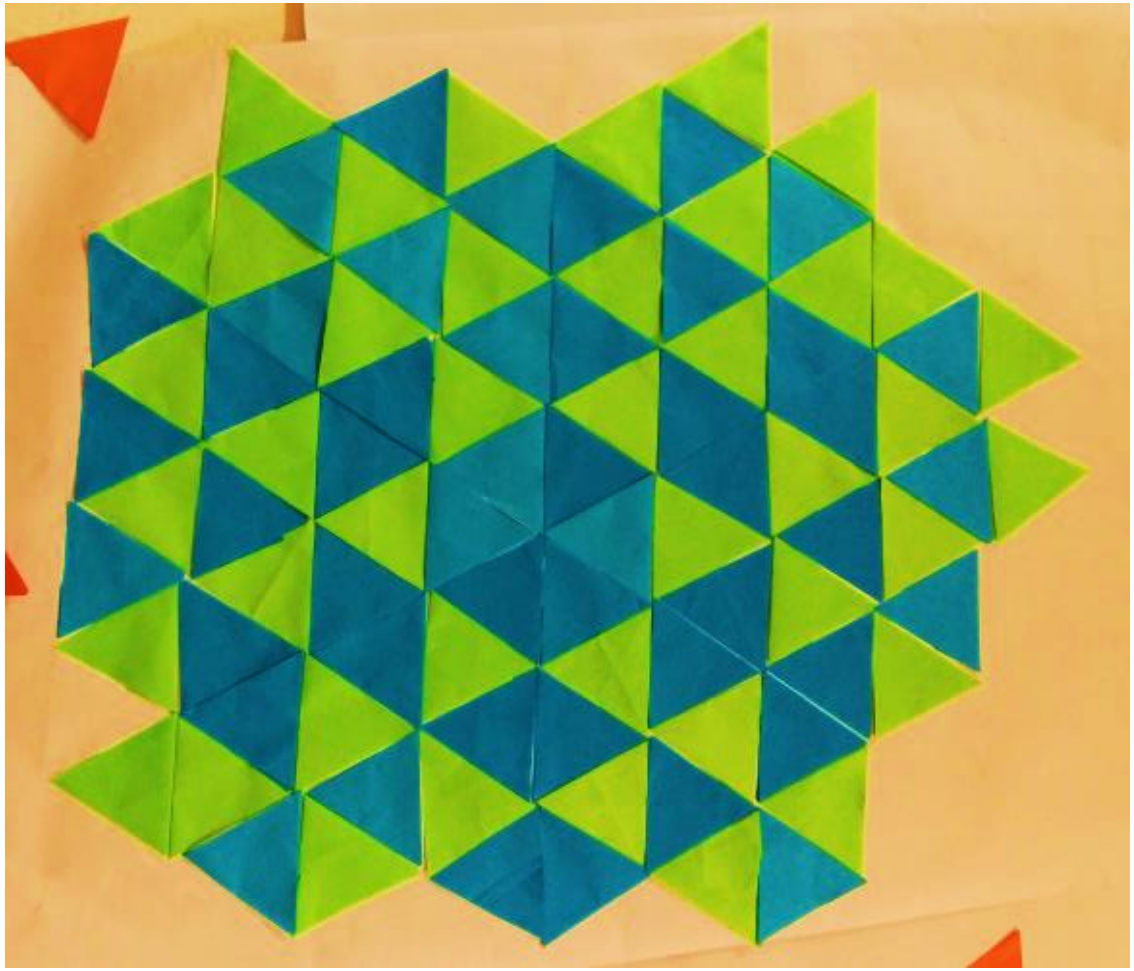


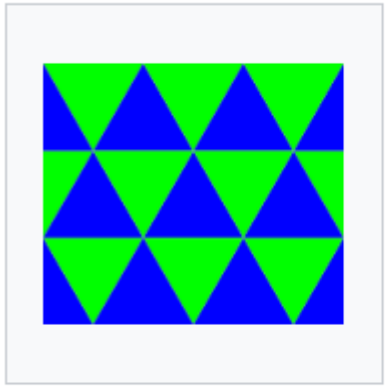
Illustrazione usata da Escher durante le sue conferenze per esemplificare la struttura geometrica di *Sempre più piccolo*. Corrisponde a un quarto della stampa quadrata, con C al centro.

Tutti i triangoli tassellano?

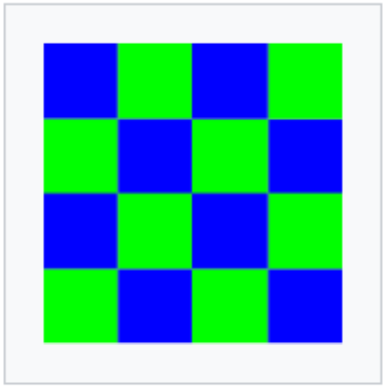
Tutti i triangoli tassellano?



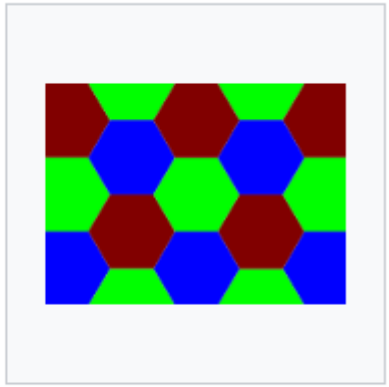




Tasselli triangolari

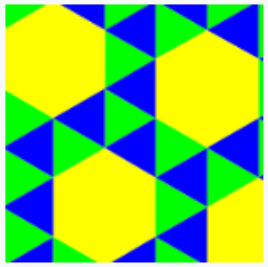


Tasselli quadrati

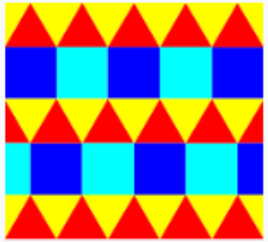


Tasselli esagonali

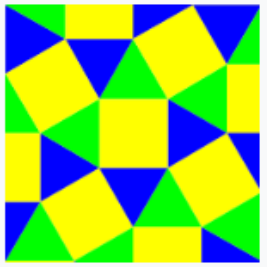
Con due o più poligoni regolari abbiamo invece le seguenti configurazioni (sotto ogni immagine sta la *descrizione dei vertici*, che - ricordiamo - sono tutti uguali: ogni numero indica il tipo di poligono adiacente, girando in senso orario):



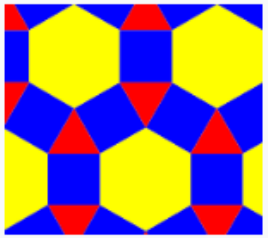
(3,3,3,3,6)



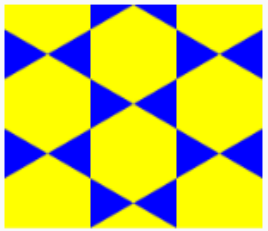
(3,3,3,4,4)



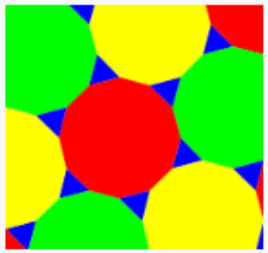
(3,3,4,3,4)



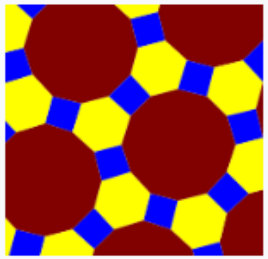
(3,4,6,4)



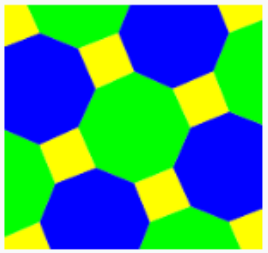
(3,6,3,6)



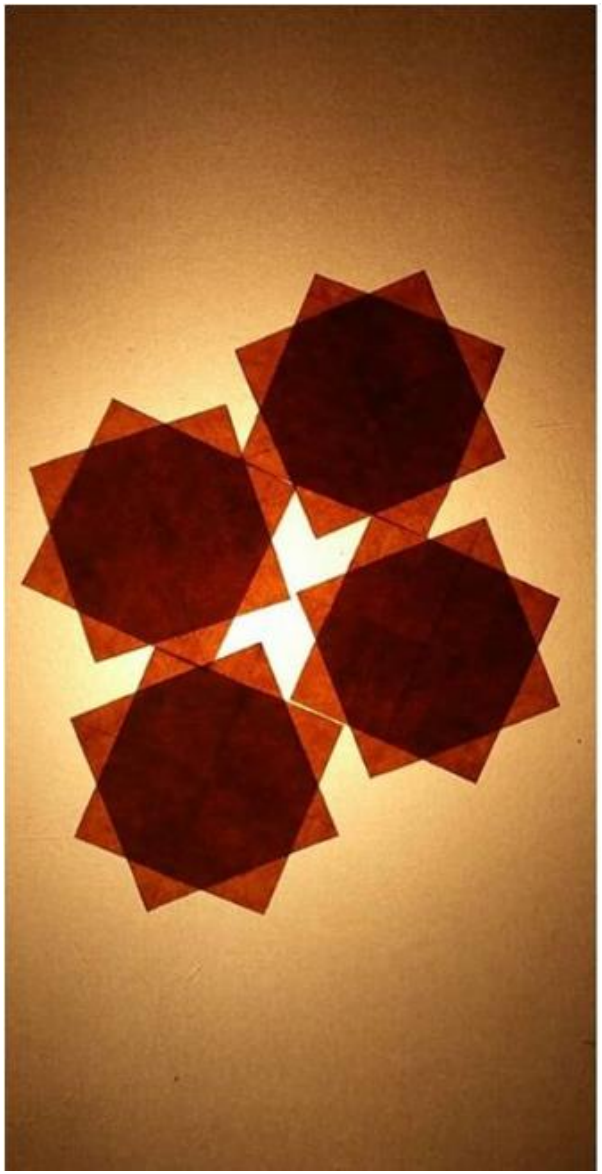
(3,12,12)

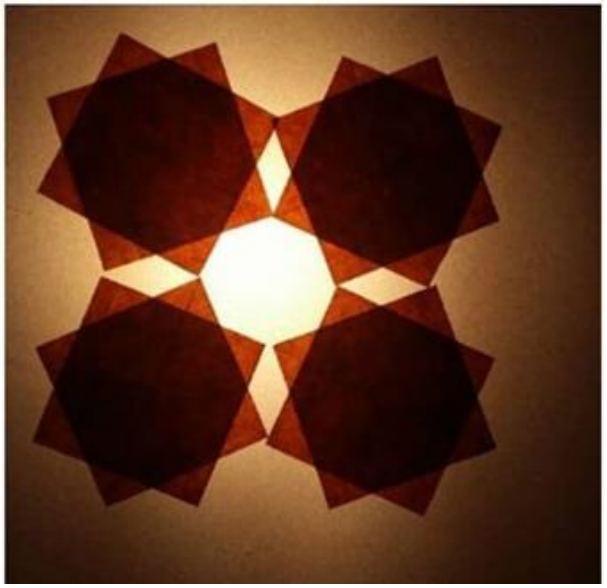


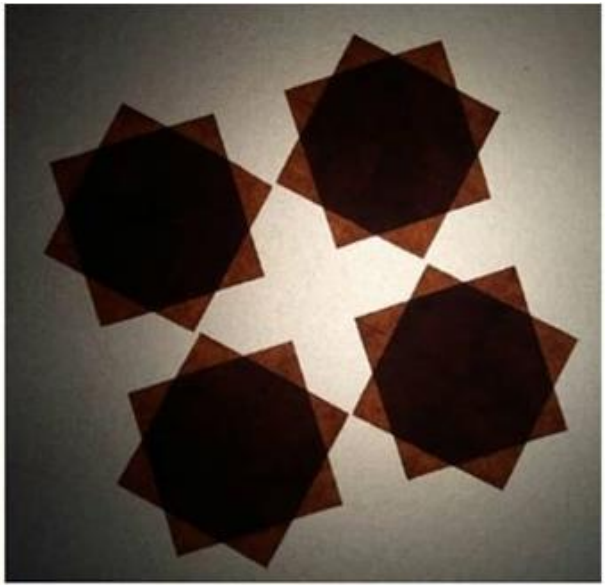
(4,6,12)

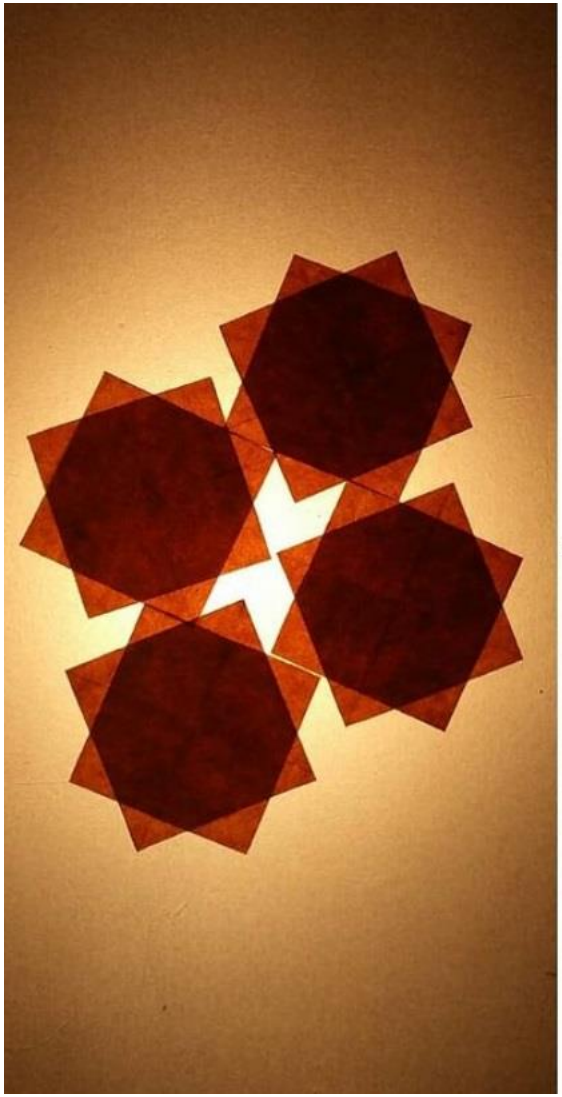


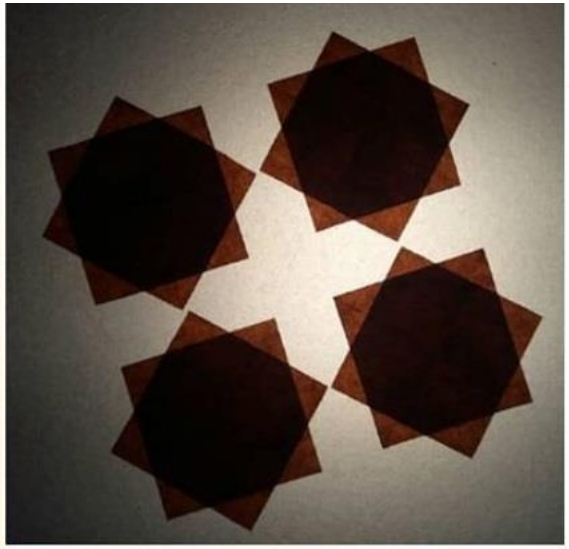
(4,8,8)

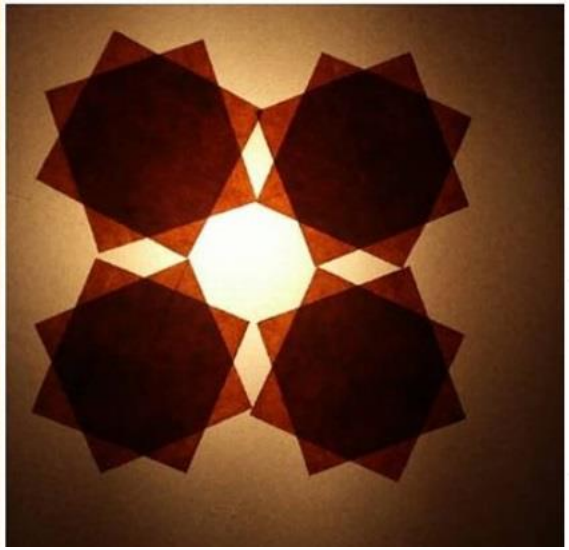


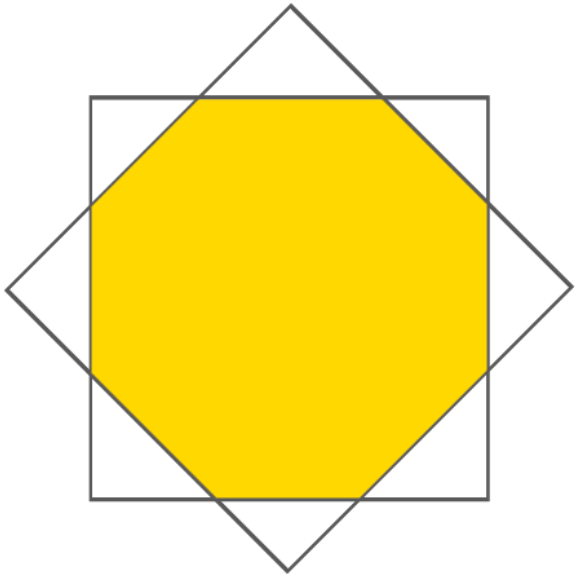




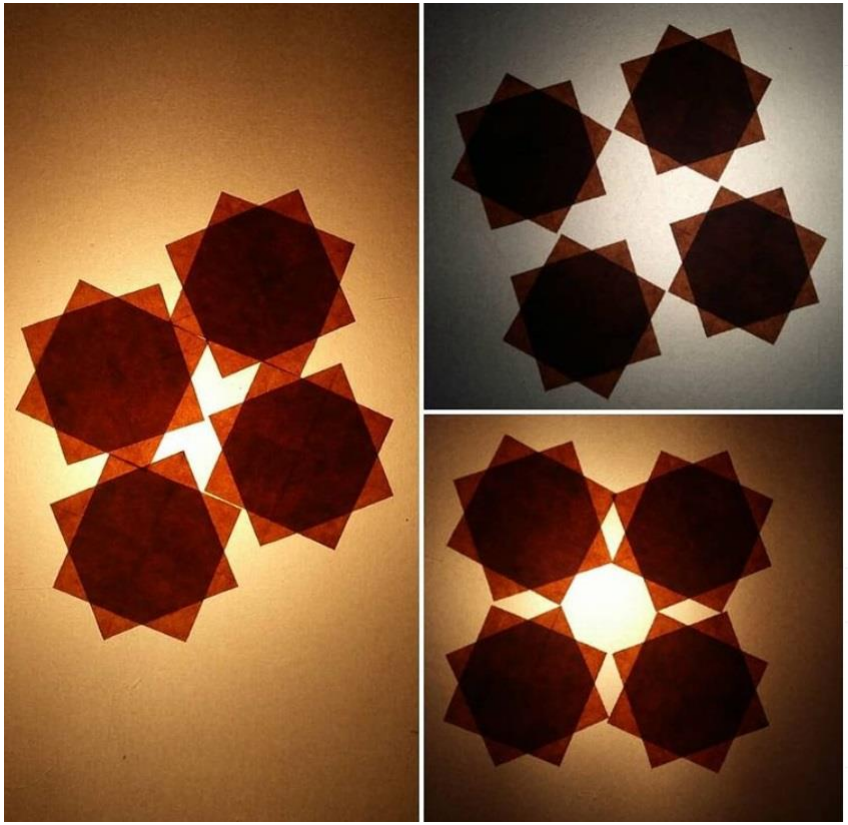


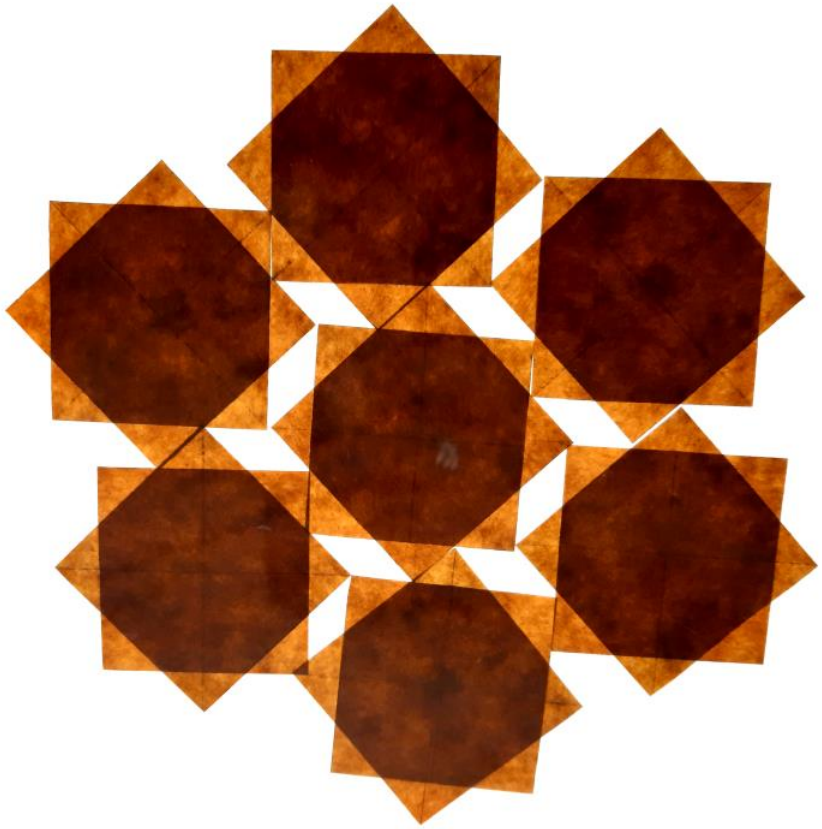


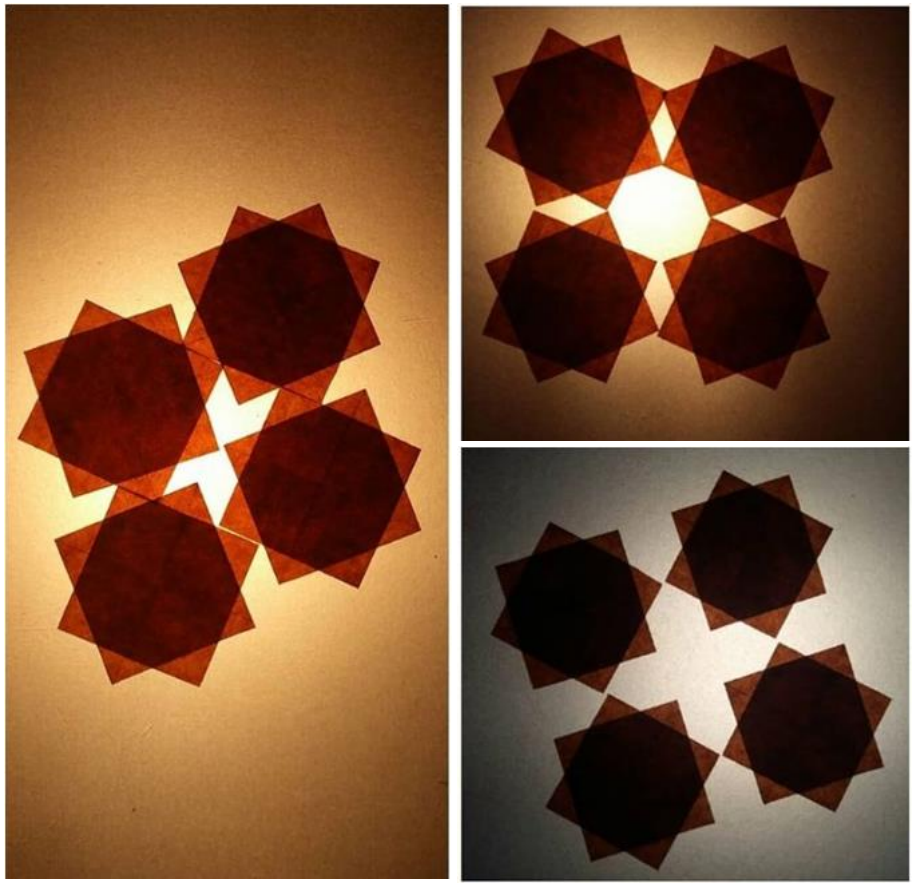




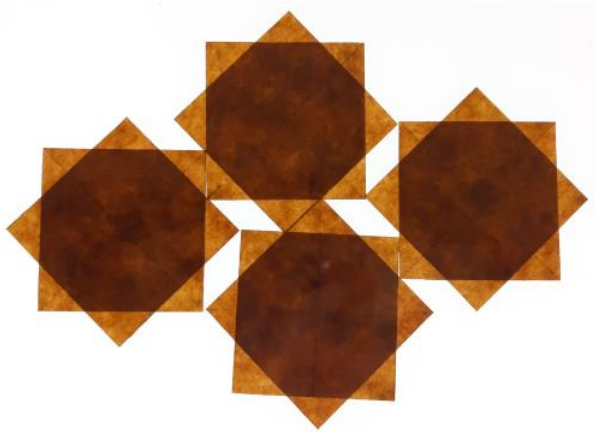
Osserviamo i “vuoti”

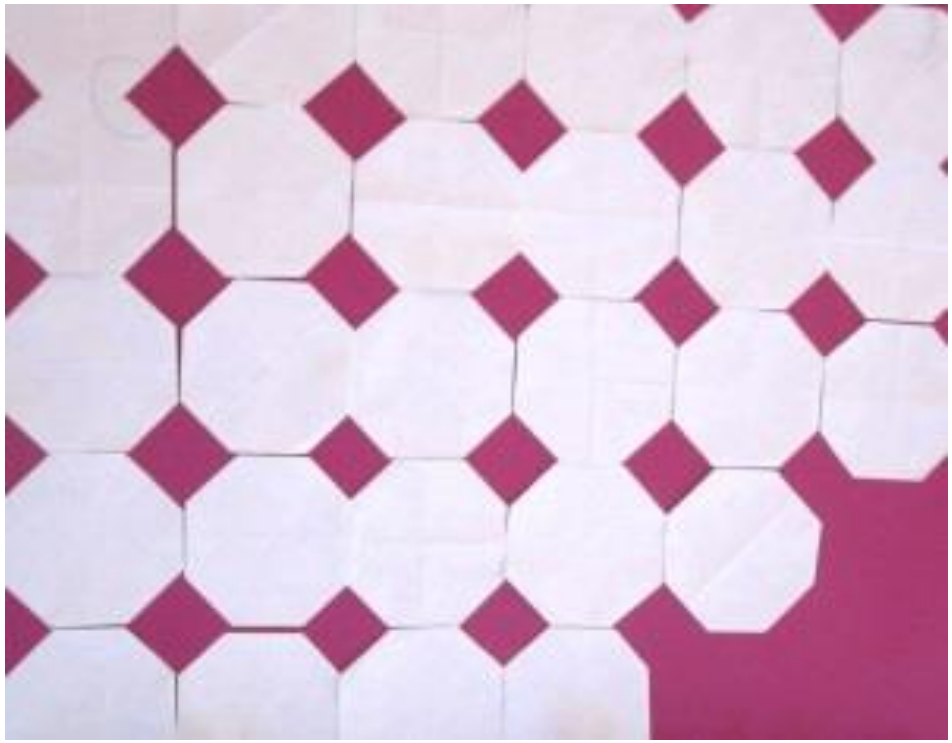






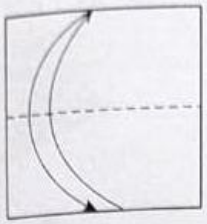
Osserviamo i poligoni “vuoti” che si formano al centro. Sono tutti equilateri ma non equiangoli



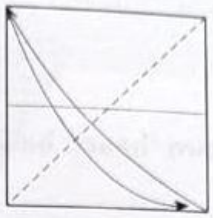


Tutti i quadrilateri tassellano?

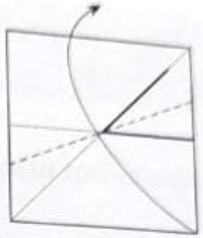
inside.



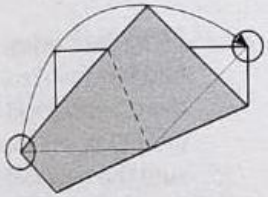
Precrease the median. Unfold.



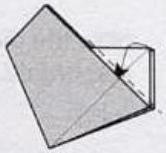
Now the diagonal, and unfold.



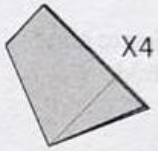
Bring the median fold line (marked) to the diagonal fold line (marked), and make sure the new fold line goes through the center.



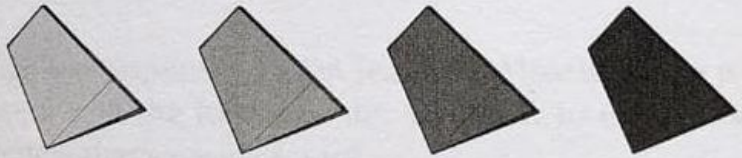
Now bring the left marked corner to the top marked corner.



Tuck the two white flaps under the top gray layer.

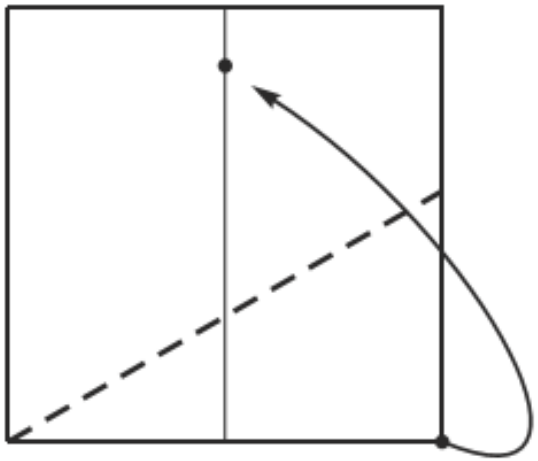


This is a single module. Make four.

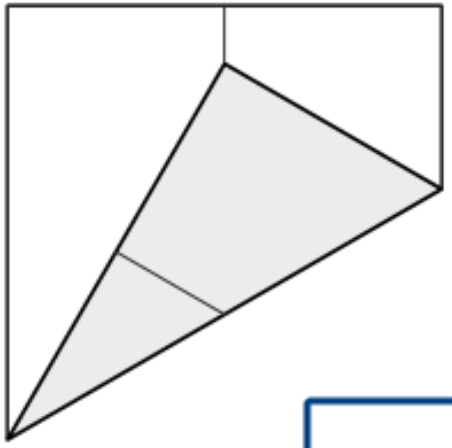


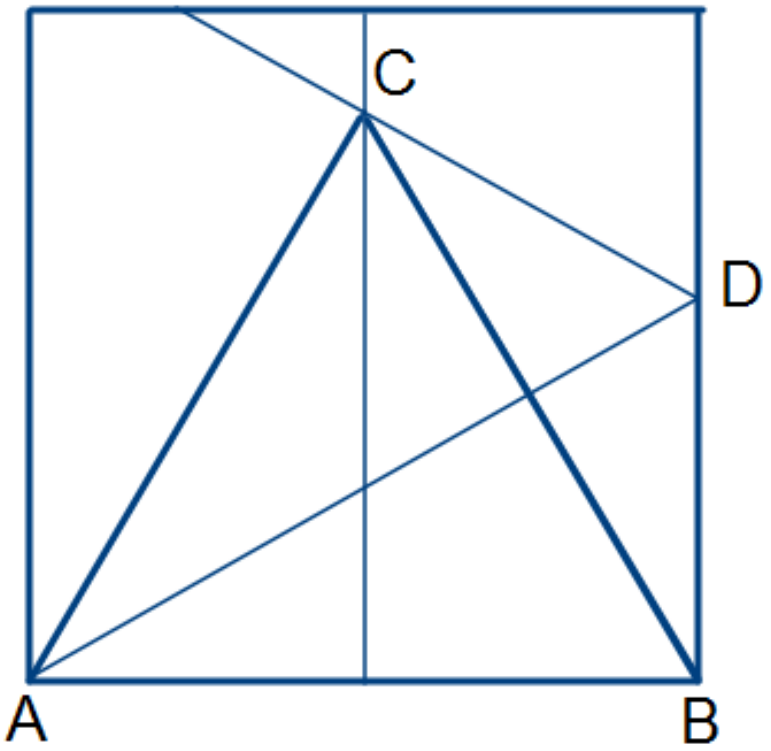
Using the four modules, create a square; and a square with a square hole inside.

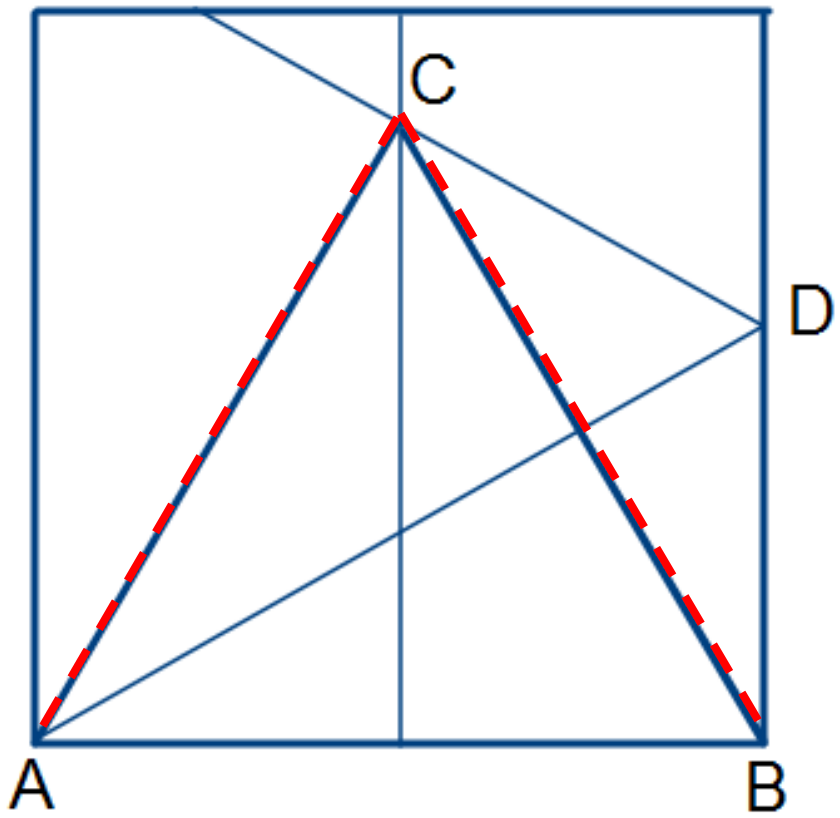
2



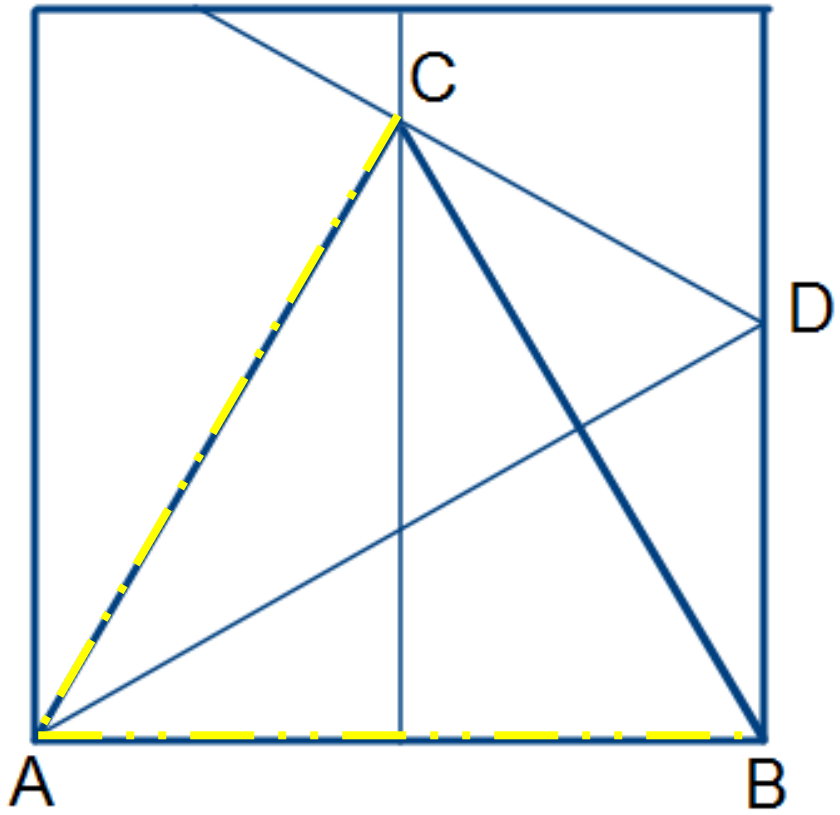
3







$\overline{AC} = \overline{CB}$

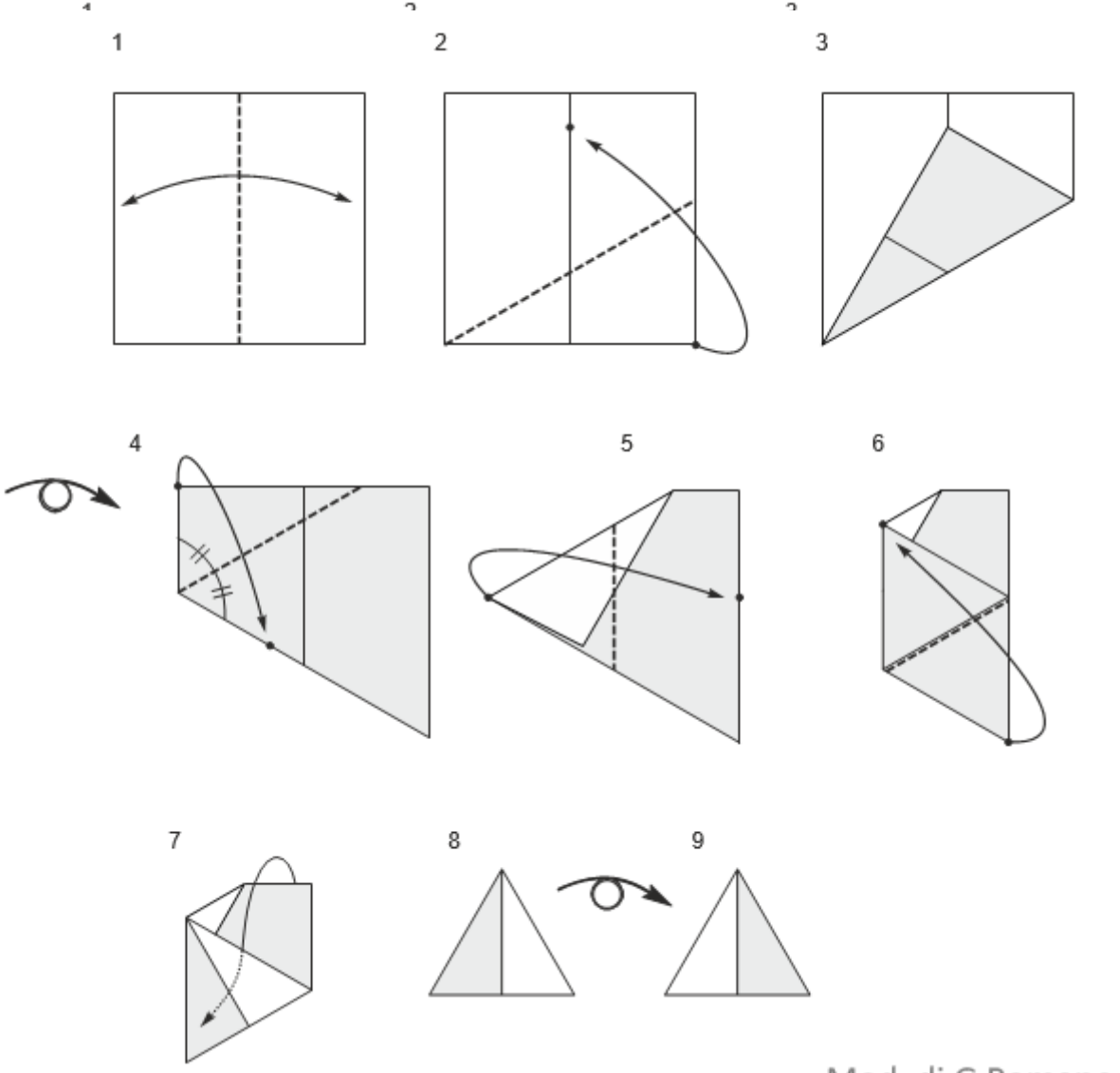


$\overline{AB} = \overline{AC}$

$\overline{AC} = \overline{BC}$

$\overline{BC} = \overline{AB}$

→ $\overline{AB} = \overline{AC} = \overline{CB}$ → $\hat{A} = \hat{B} = \hat{C} = 60°$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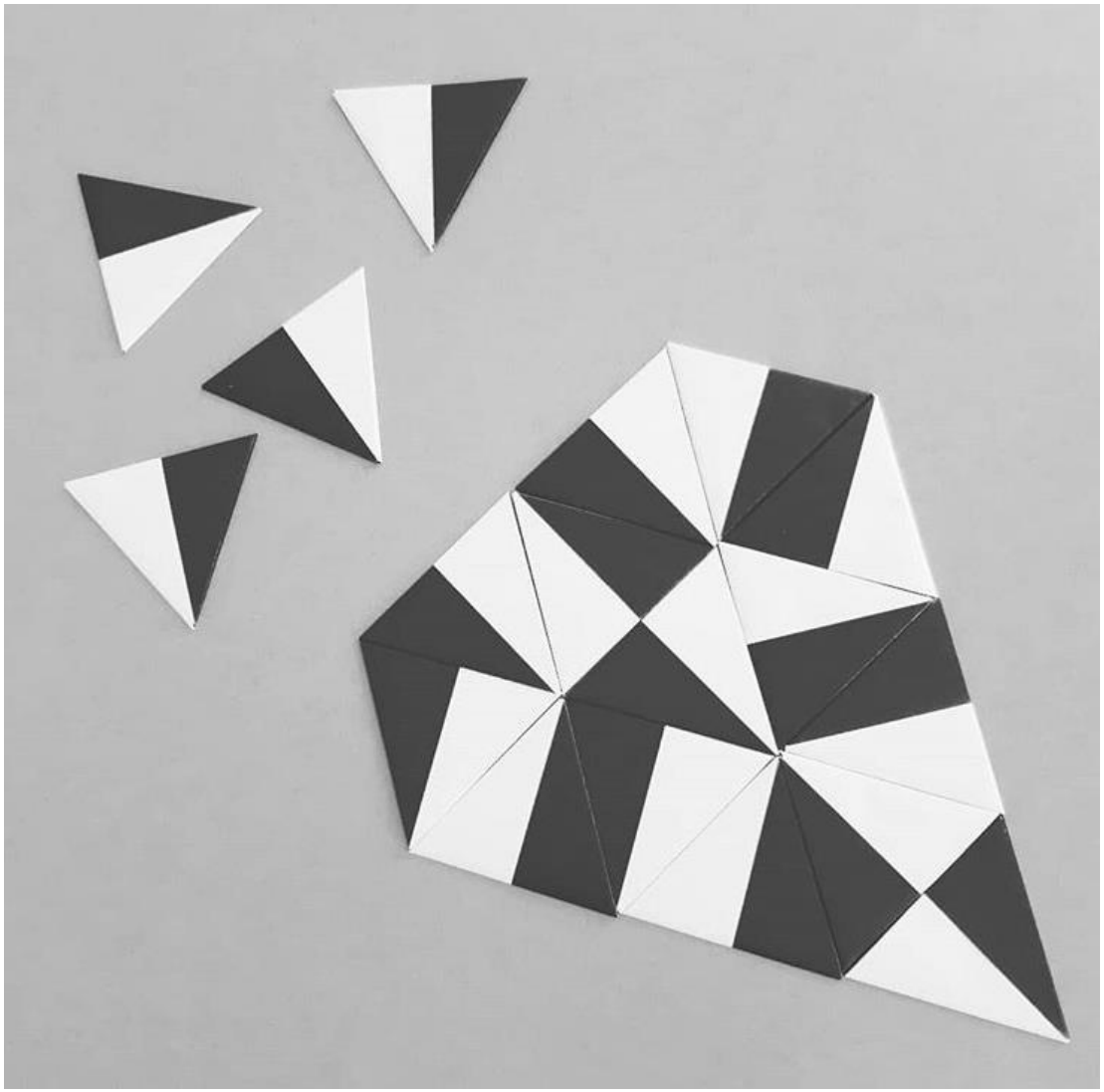
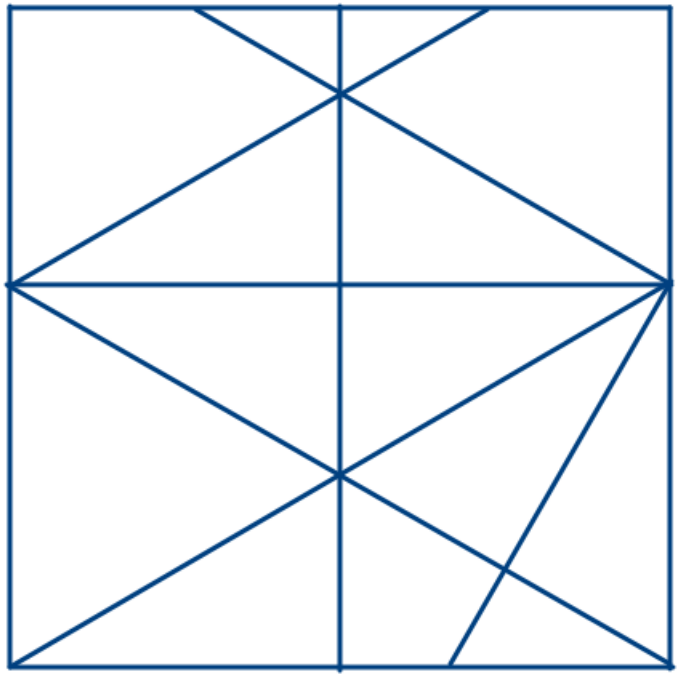
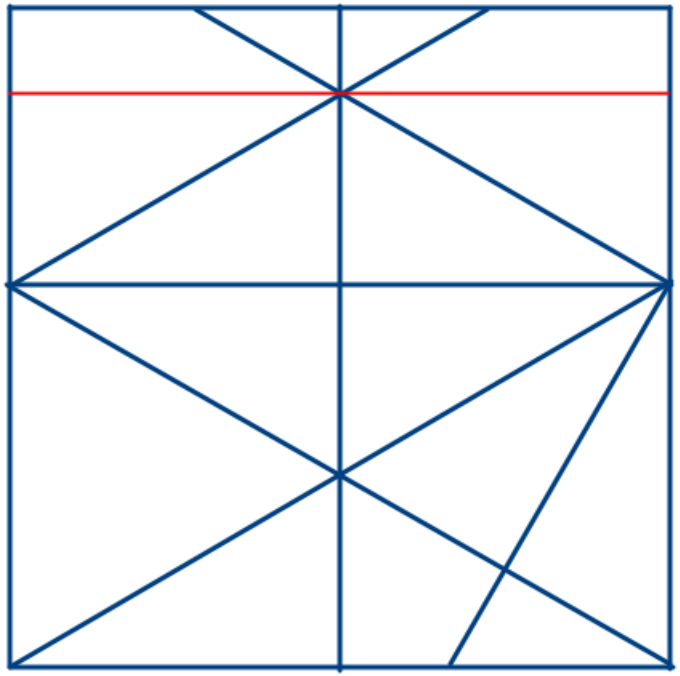
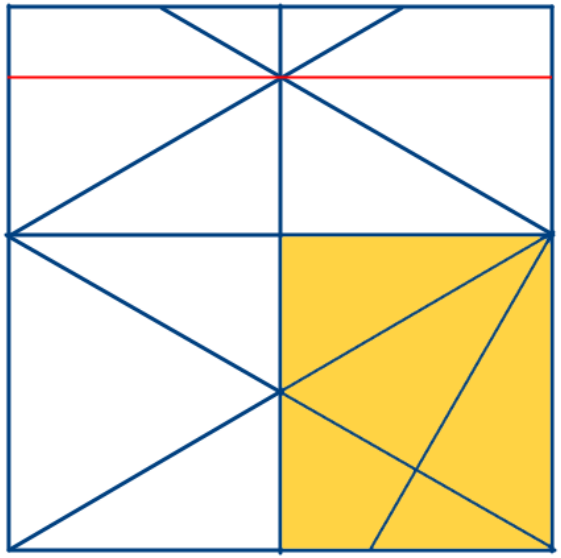
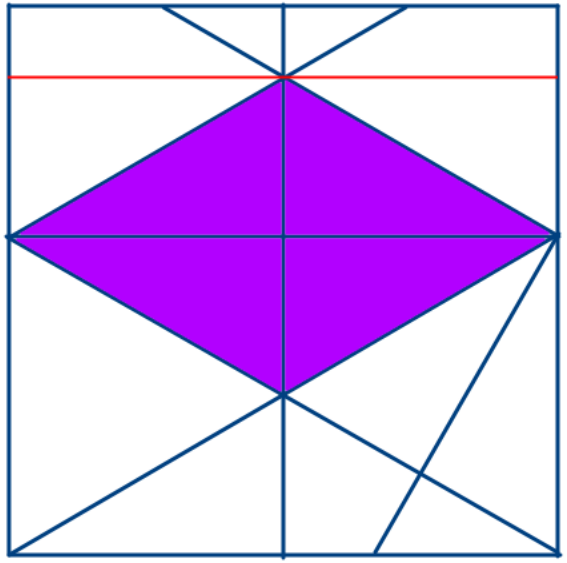
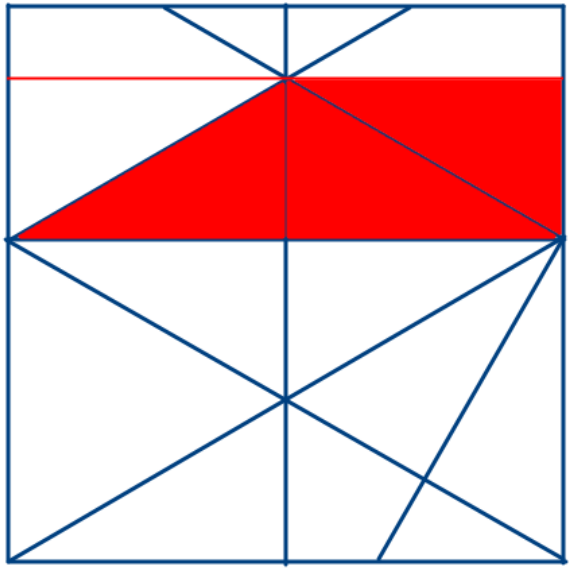
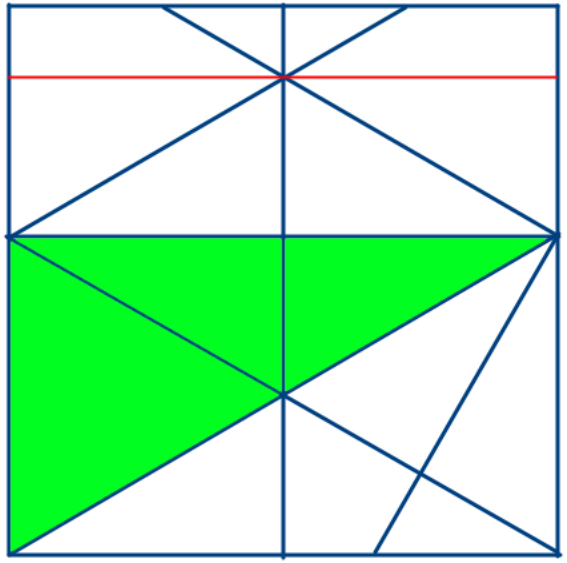
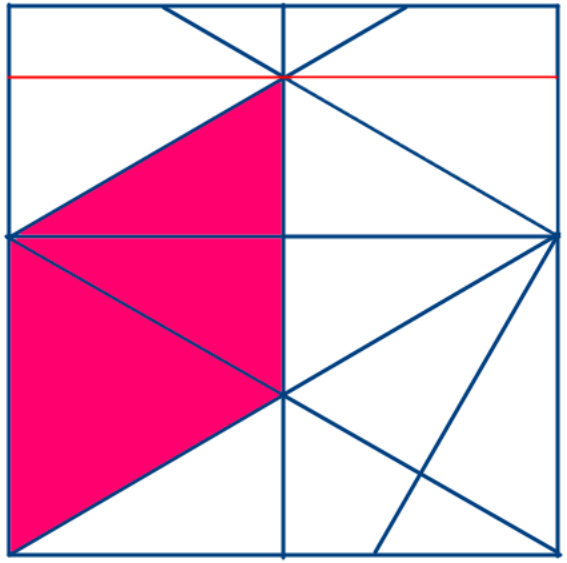
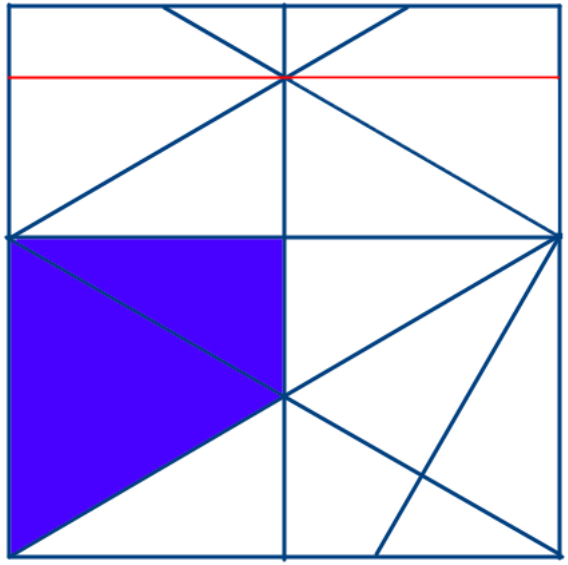
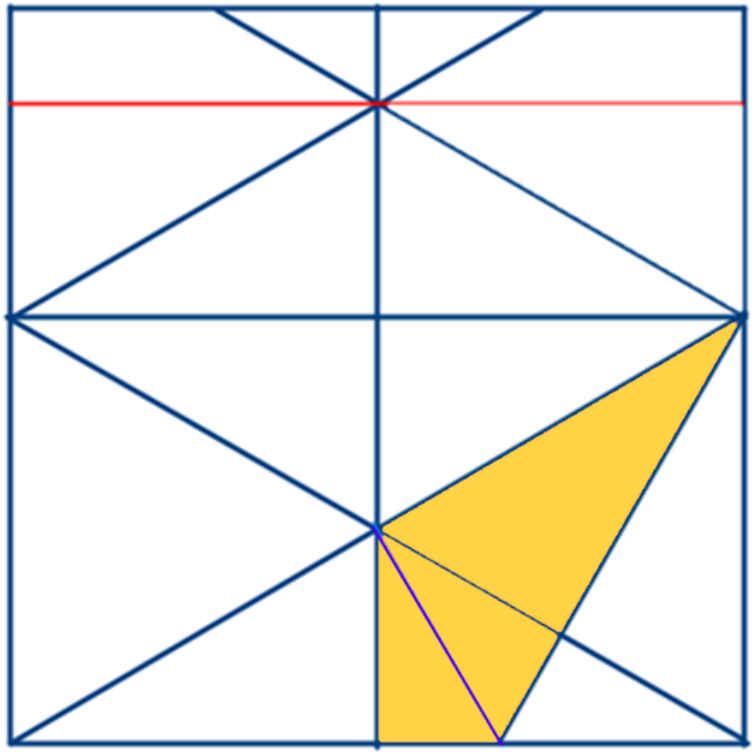
Mod. di G Romano

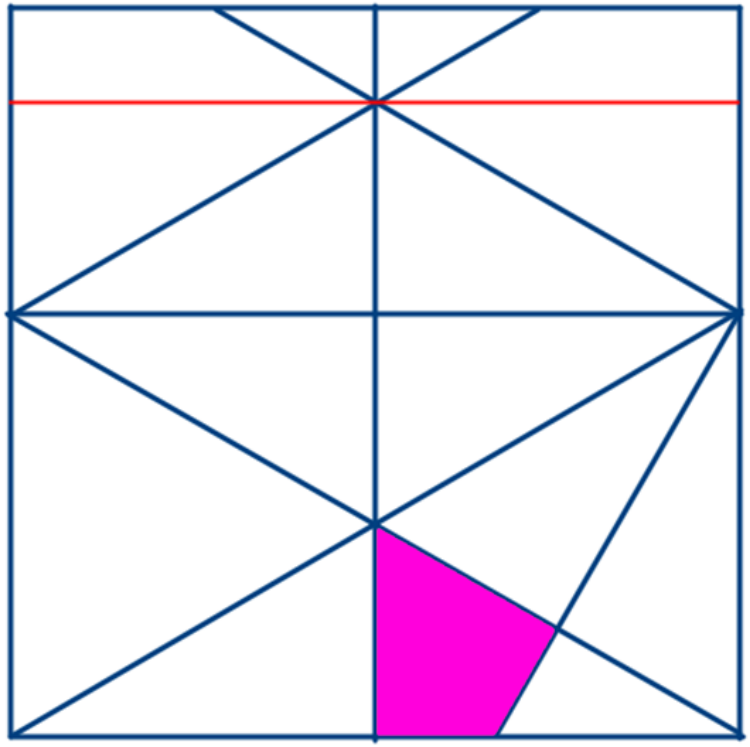






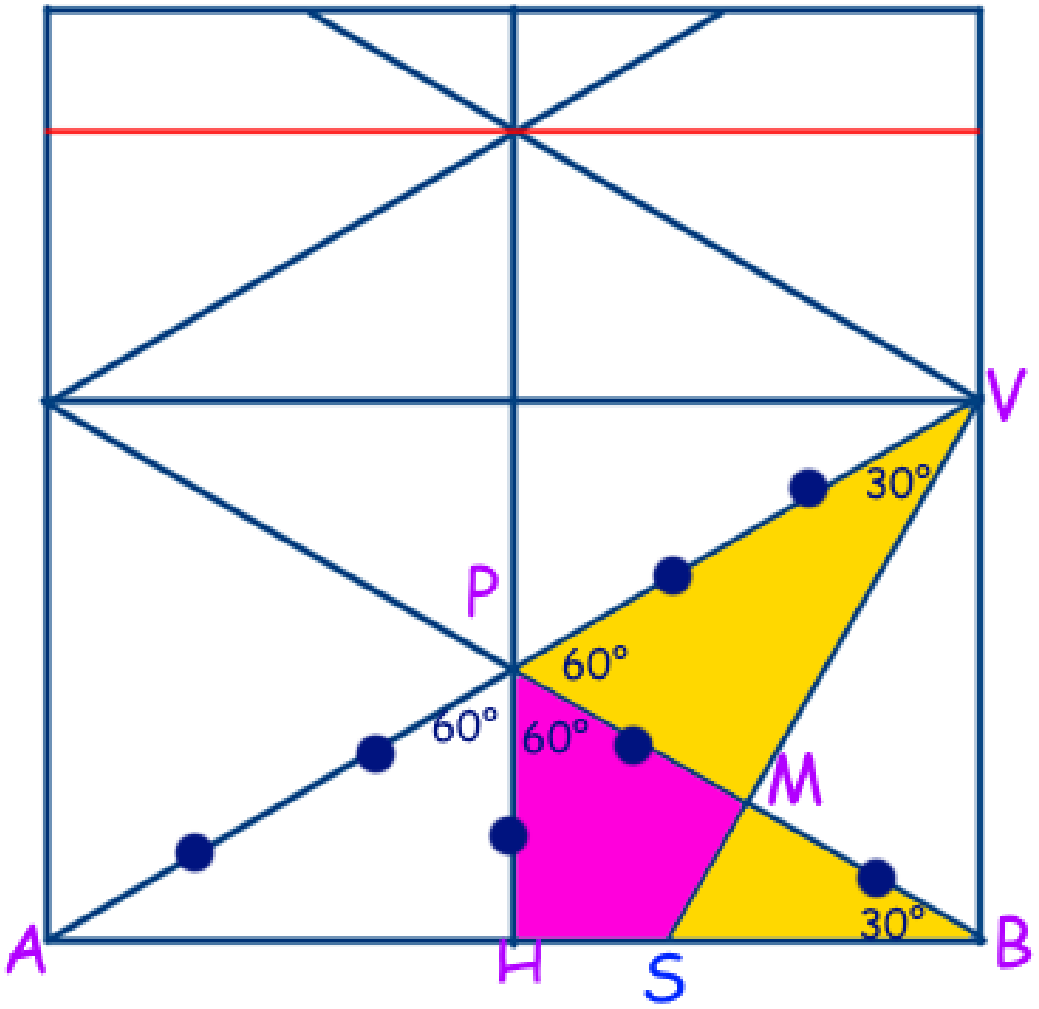


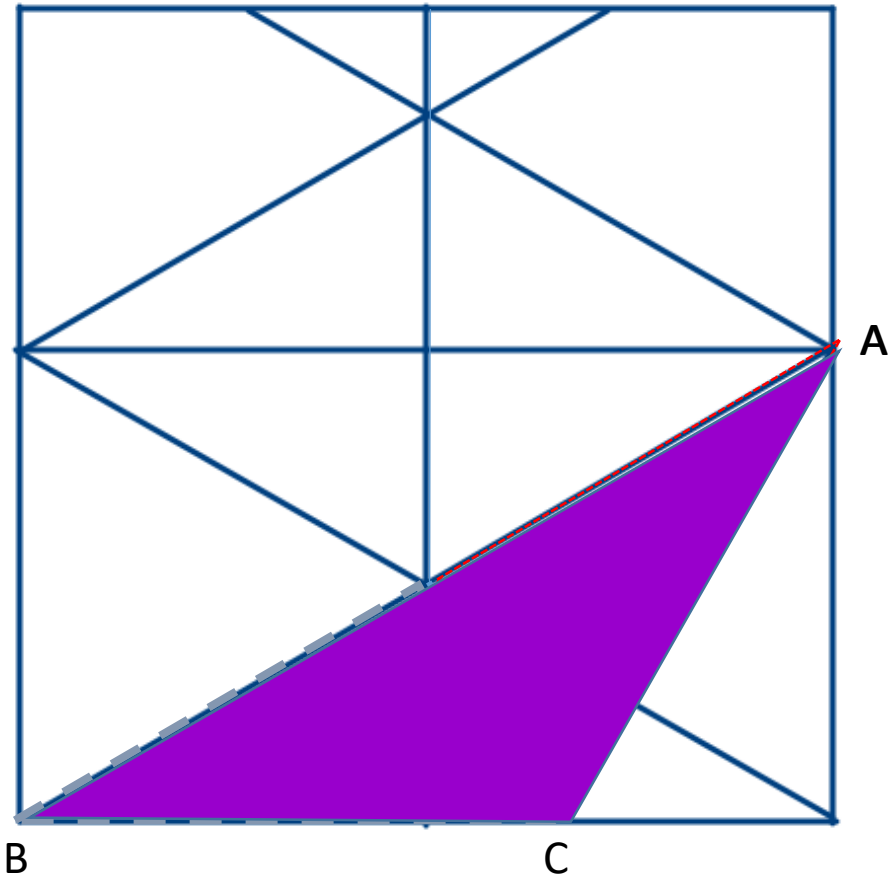


$$\overline{MP} = \frac{1}{2}\overline{PV} \rightarrow \overline{SM} = \frac{1}{2}\overline{SB}$$

I due triangoli gialli sono simili perché hanno un angolo retto ed un angolo di 30°

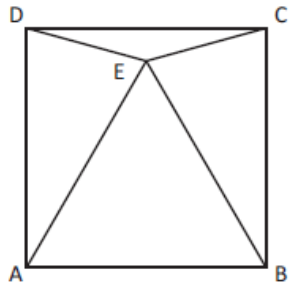
Il cateto minore nel triangolo grande è metà dell'ipotenusa quindi la stessa cosa accade per il triangolo piccolo





Il triangolo ABC è isoscele perché ha due angoli alla base di 30°

D31. **Osserva la seguente figura piana: *ABCD* è un quadrato e *ABE* è un triangolo equilatero.**



Quali segmenti hanno la stessa lunghezza del segmento *AB*?

Risposta: .....

D21. Queste sono le prime tre figure di una sequenza.

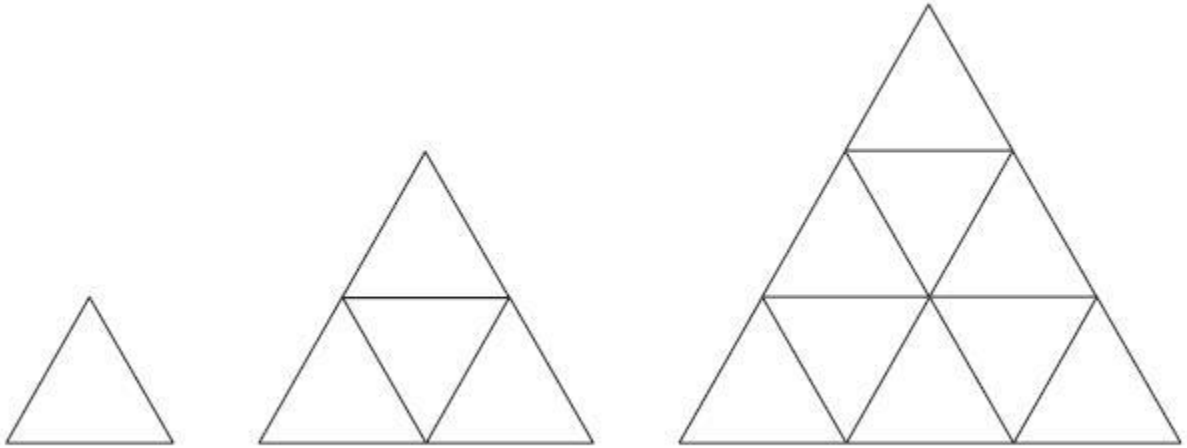


fig. 1 fig. 2 fig. 3 ...

Il lato del triangolo di figura 2 è il doppio di quello di figura 1 e la sua area è quattro volte più grande. Il lato del triangolo di figura 3 è il triplo di quello di figura 1 e l'area è nove volte più grande.

a) Un triangolo formato da 30 triangoli uguali a quello di figura 1 appartiene alla sequenza?

☐ Sì

☐ No

b) Giustifica la tua risposta:

.....

.....

.....

D21. Queste sono le prime tre figure di una sequenza.

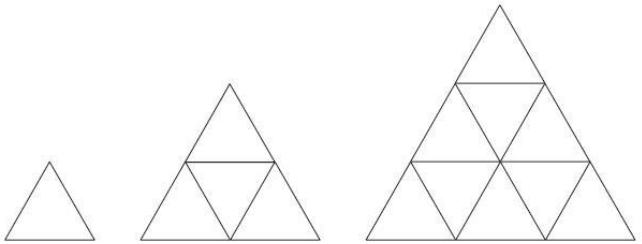


fig. 1 fig. 2 fig. 3 ...

Il lato del triangolo di figura 2 è il doppio di quello di figura 1 e la sua area è quattro volte più grande. Il lato del triangolo di figura 3 è il triplo di quello di figura 1 e l'area è nove volte più grande.

a) Un triangolo formato da 30 triangoli uguali a quello di figura 1 appartiene alla sequenza?

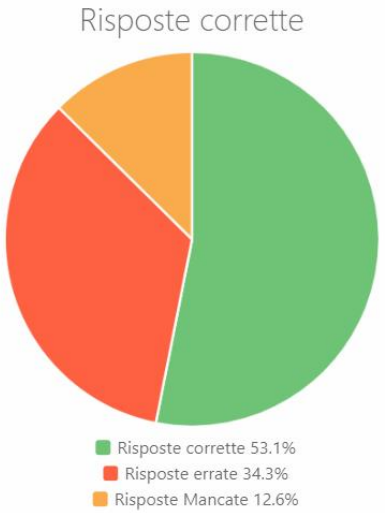
☐ Sì

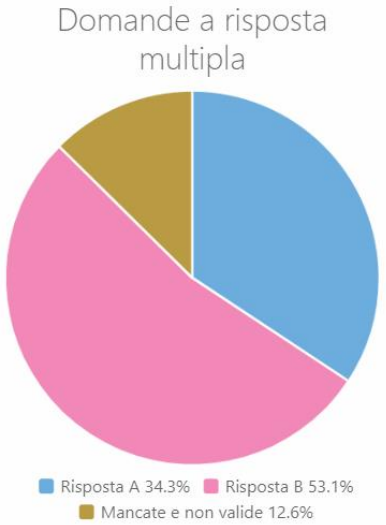
☐ No

b) Giustifica la tua risposta:

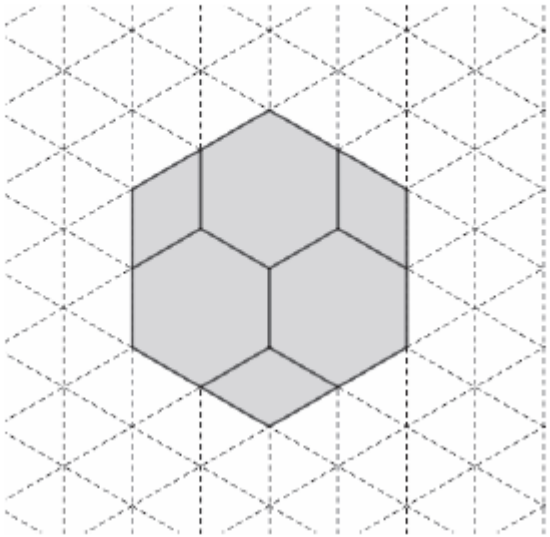
.....
.....
.....

item A

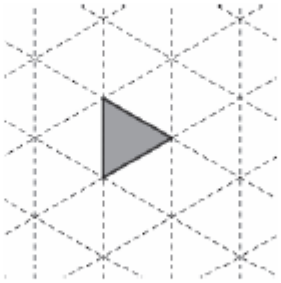




D20. **Filippo ha a disposizione delle tessere a forma di esagono regolare e di rombo. Con queste tessere compone la seguente figura.**



Poi Filippo ricopre completamente l'intera figura usando, senza sovrapporle, solo tessere a forma di triangolo equilatero come questa:

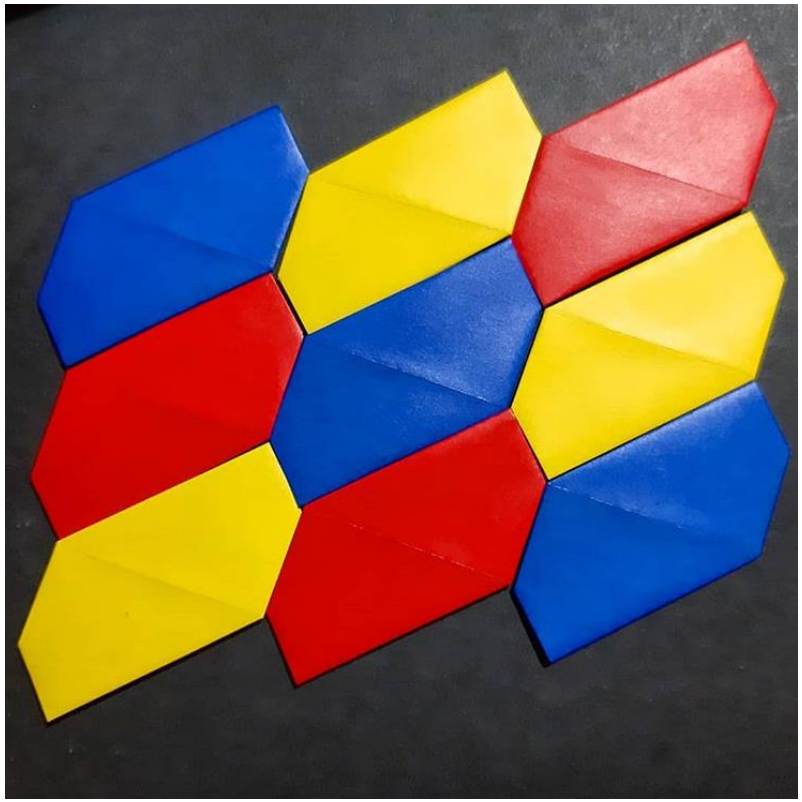


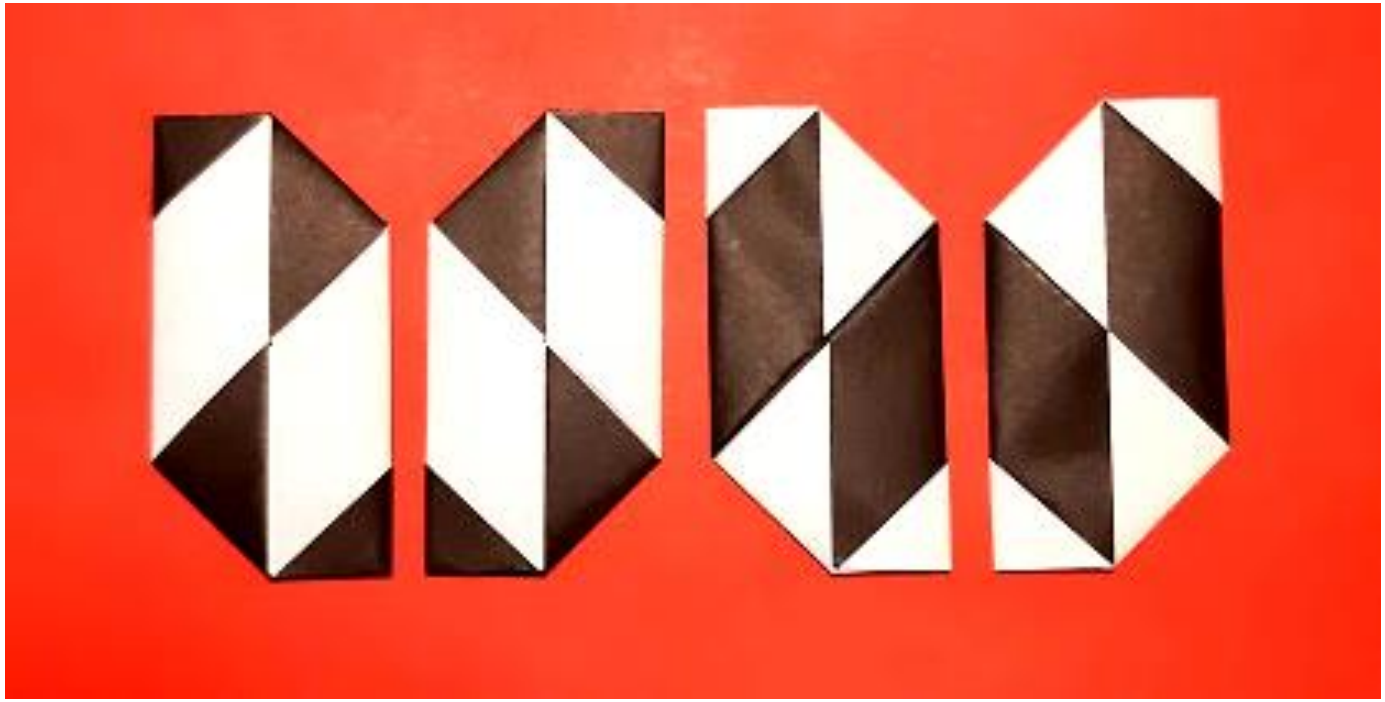
Quante tessere a forma di triangolo equilatero utilizza?

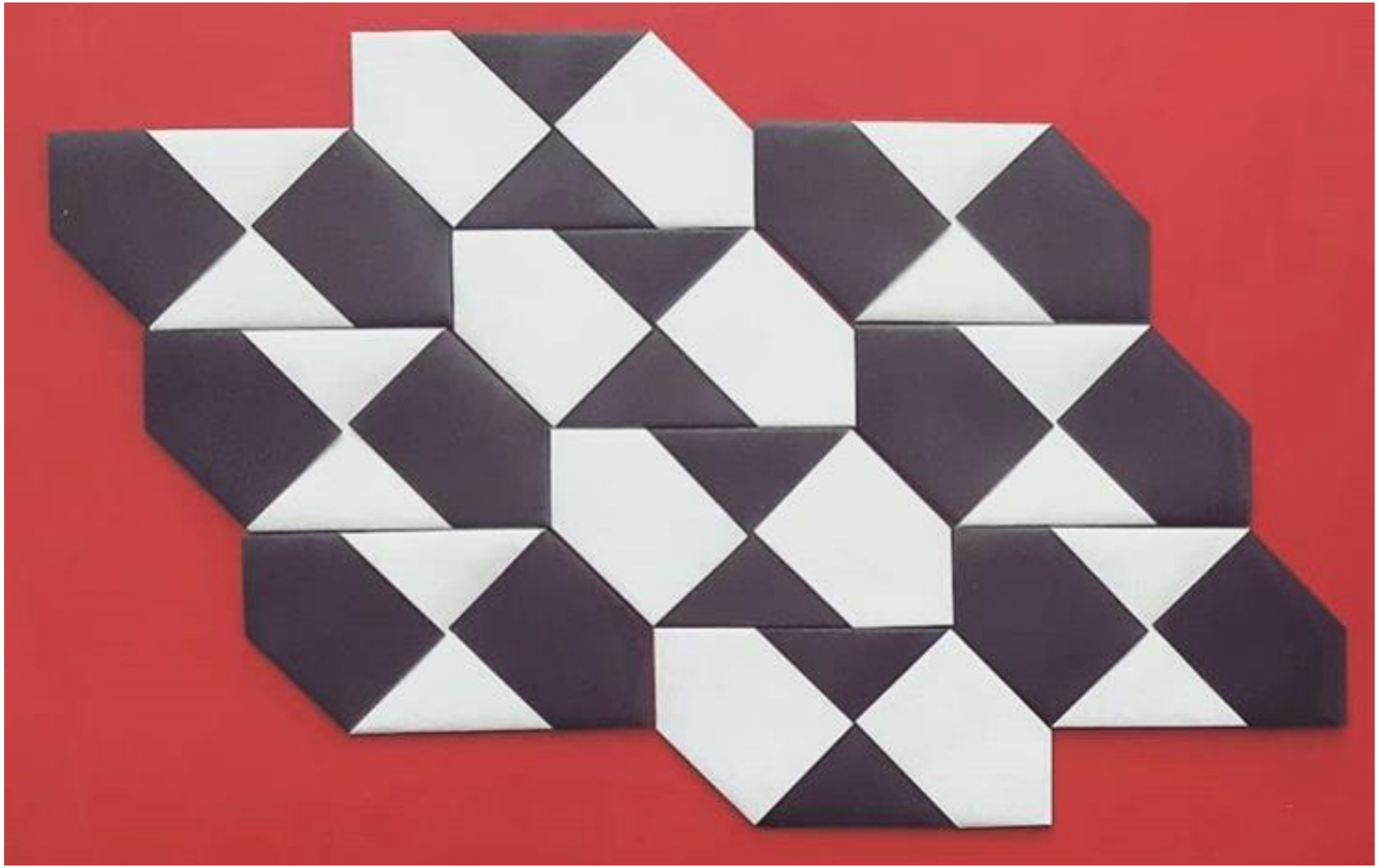
Risposta: .....

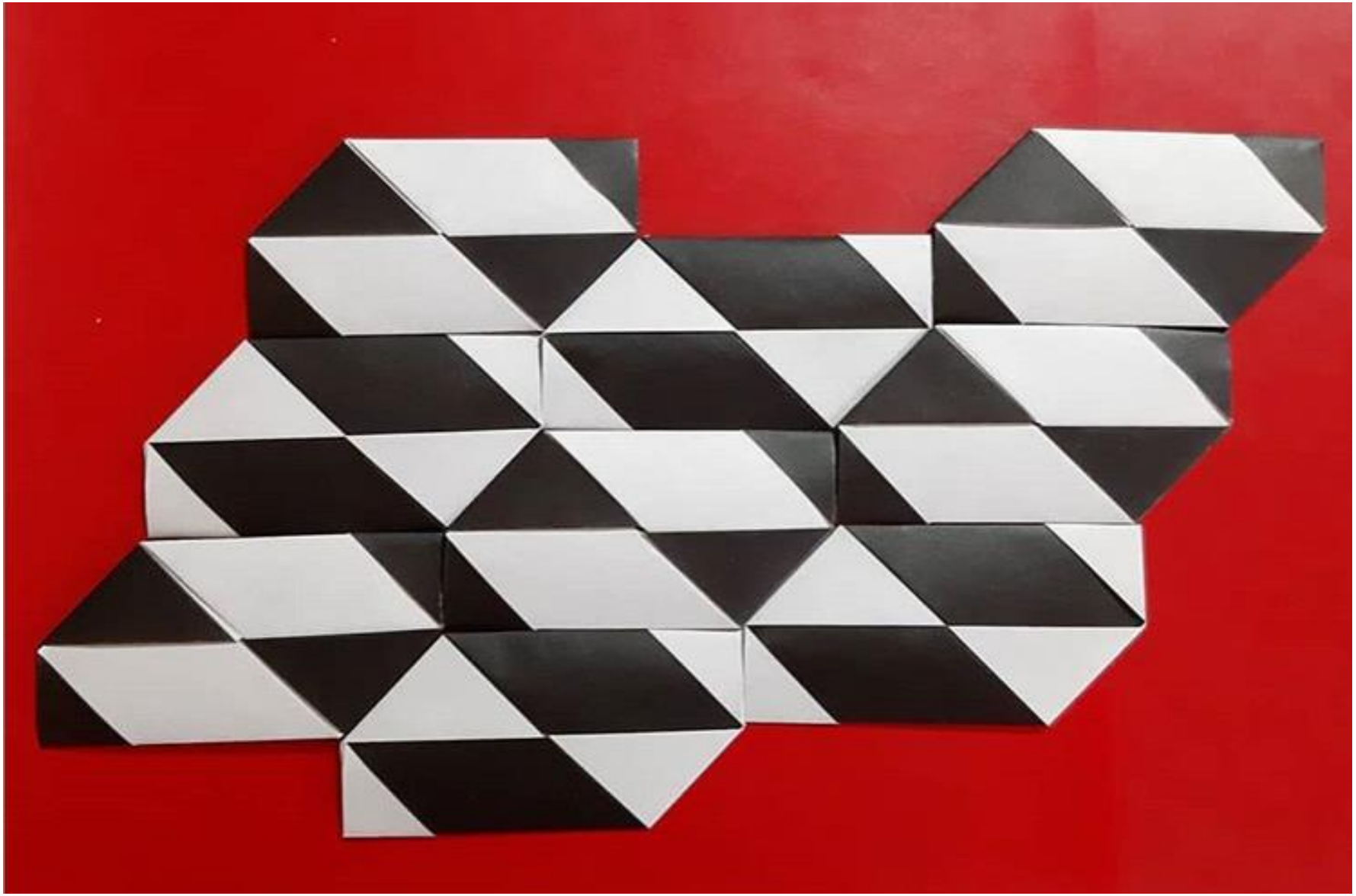
Invalsi grado 5 - 2018

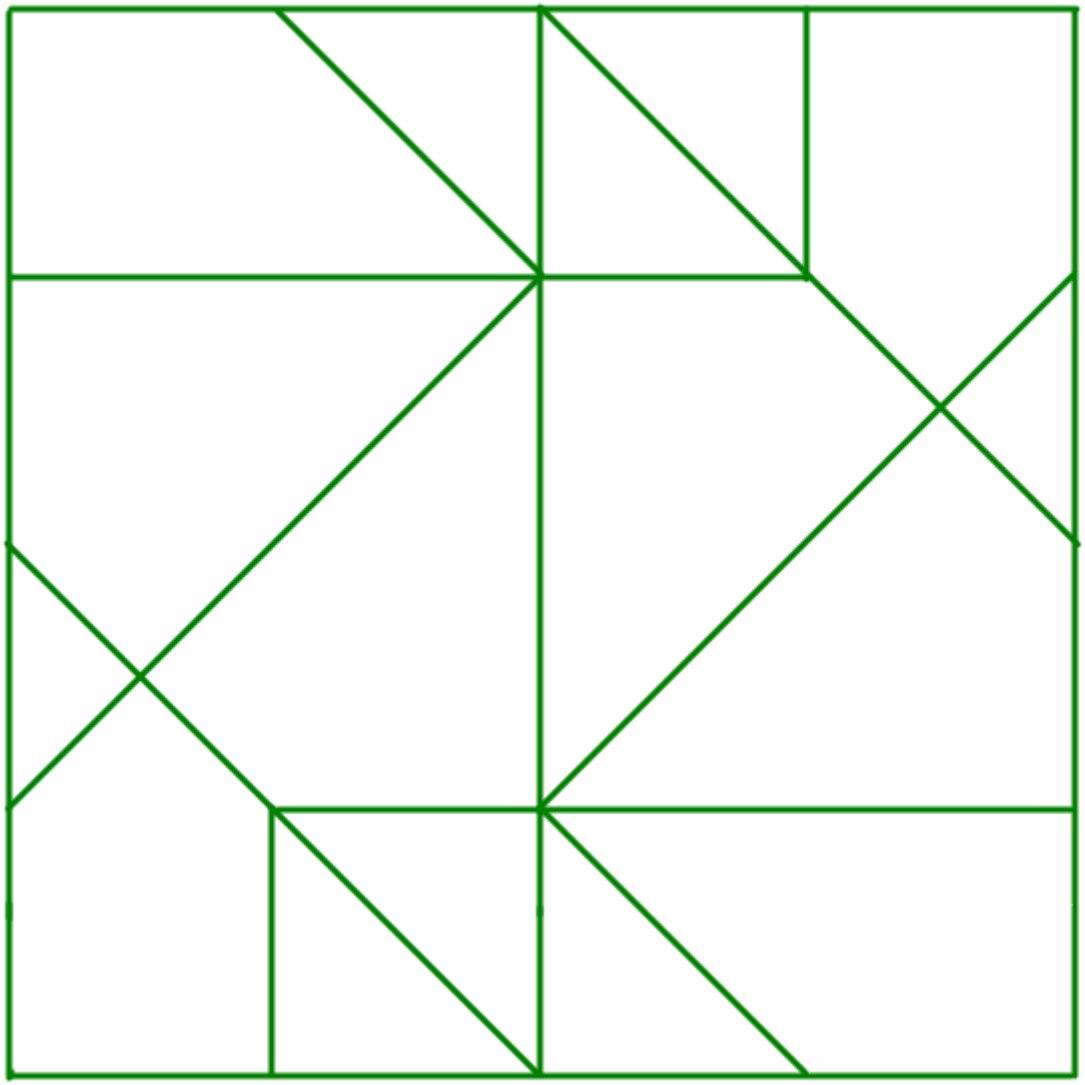
TESSERA ESAGONALE

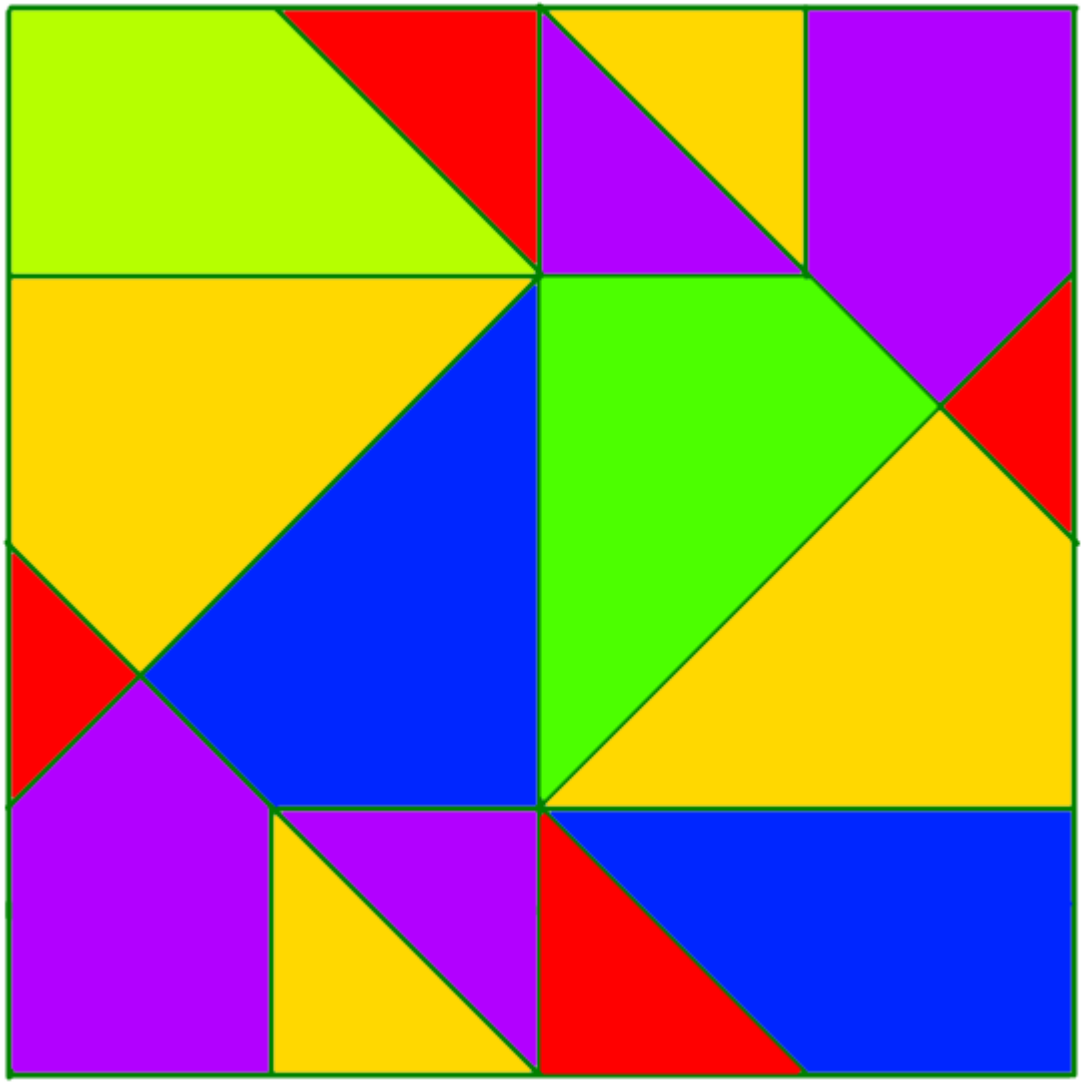


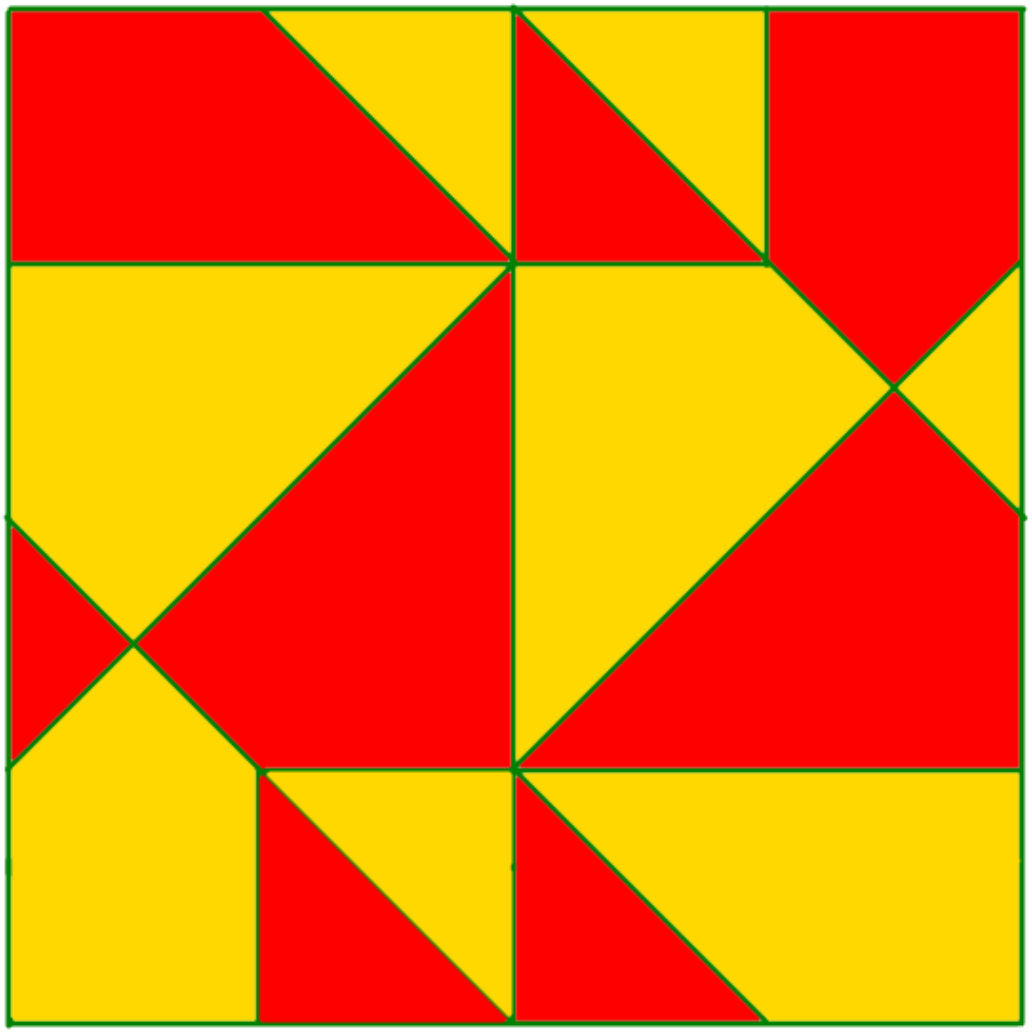




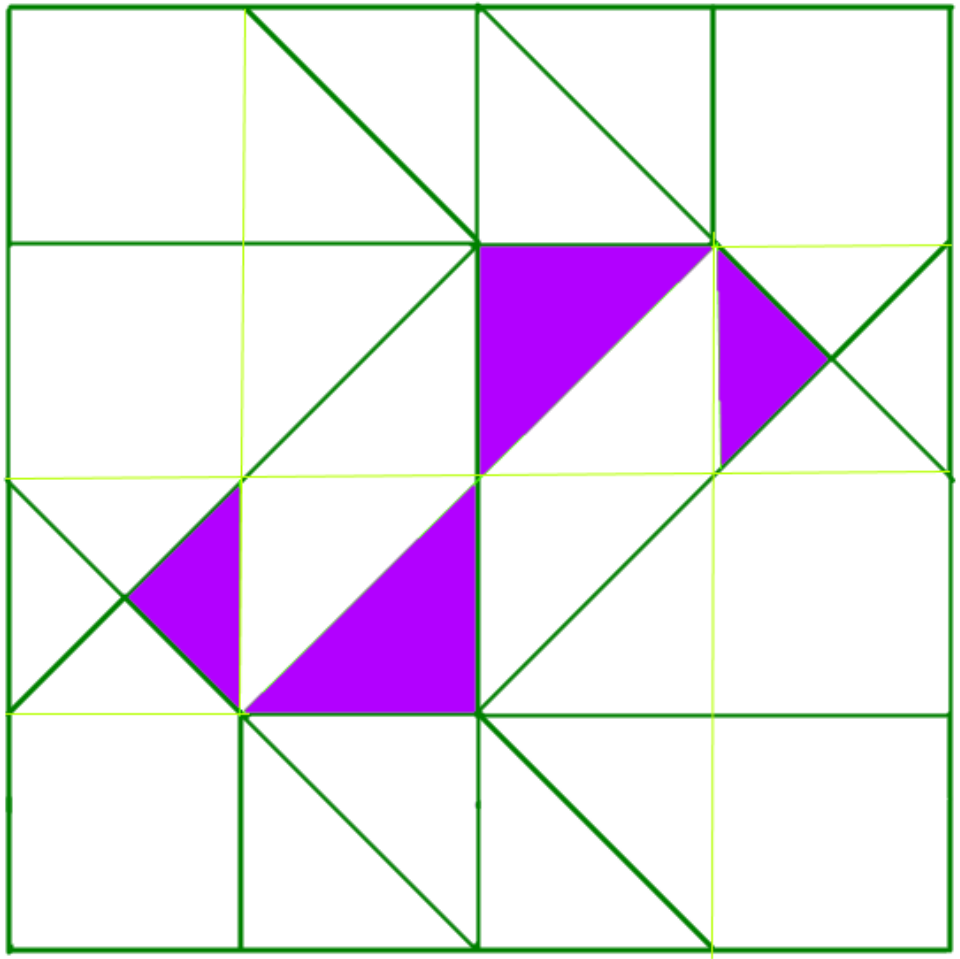


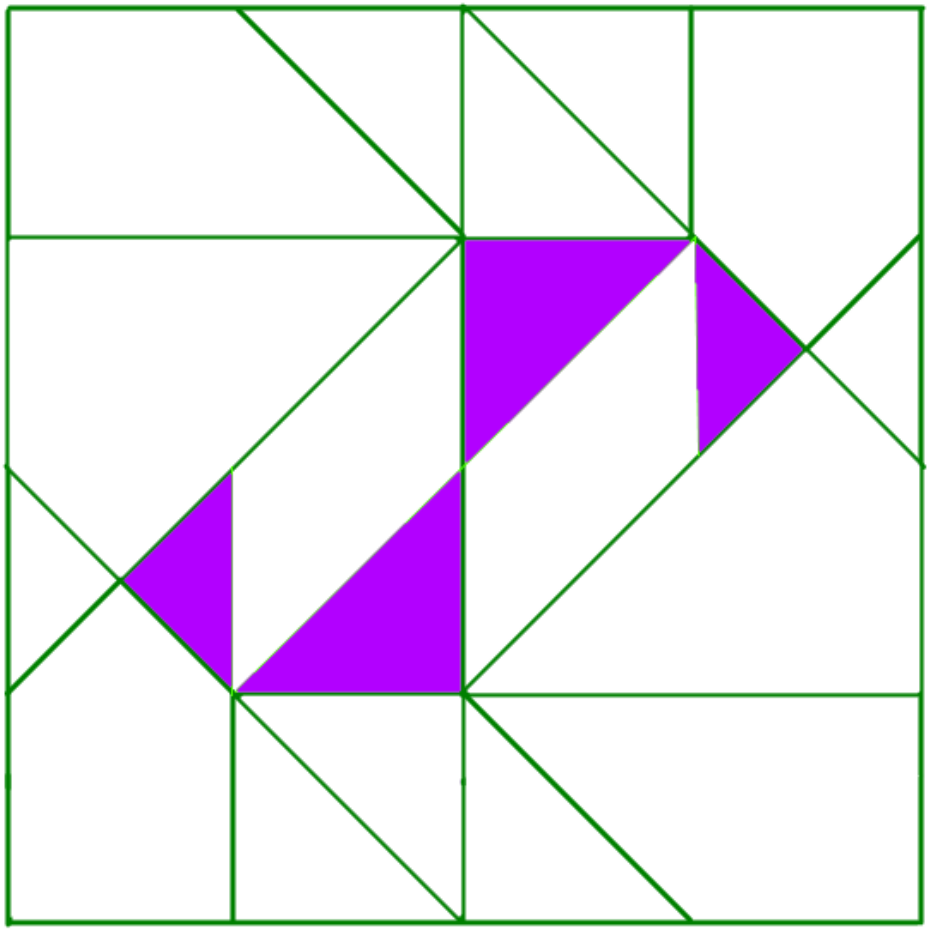






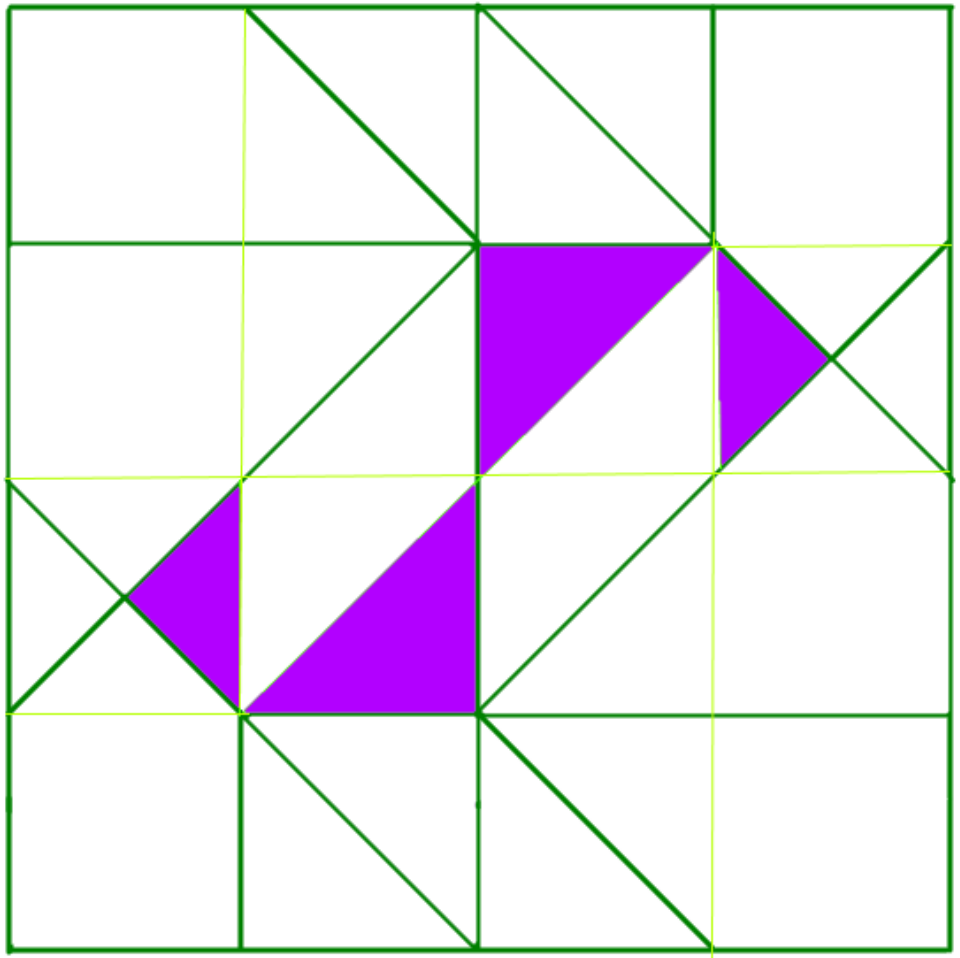
Quanto vale
la parte viola?



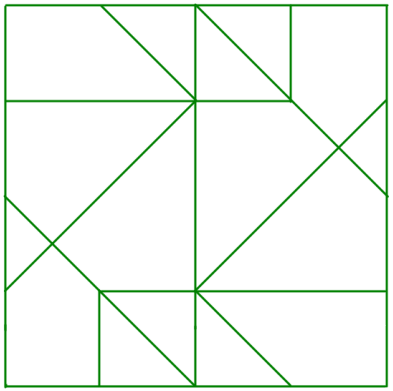


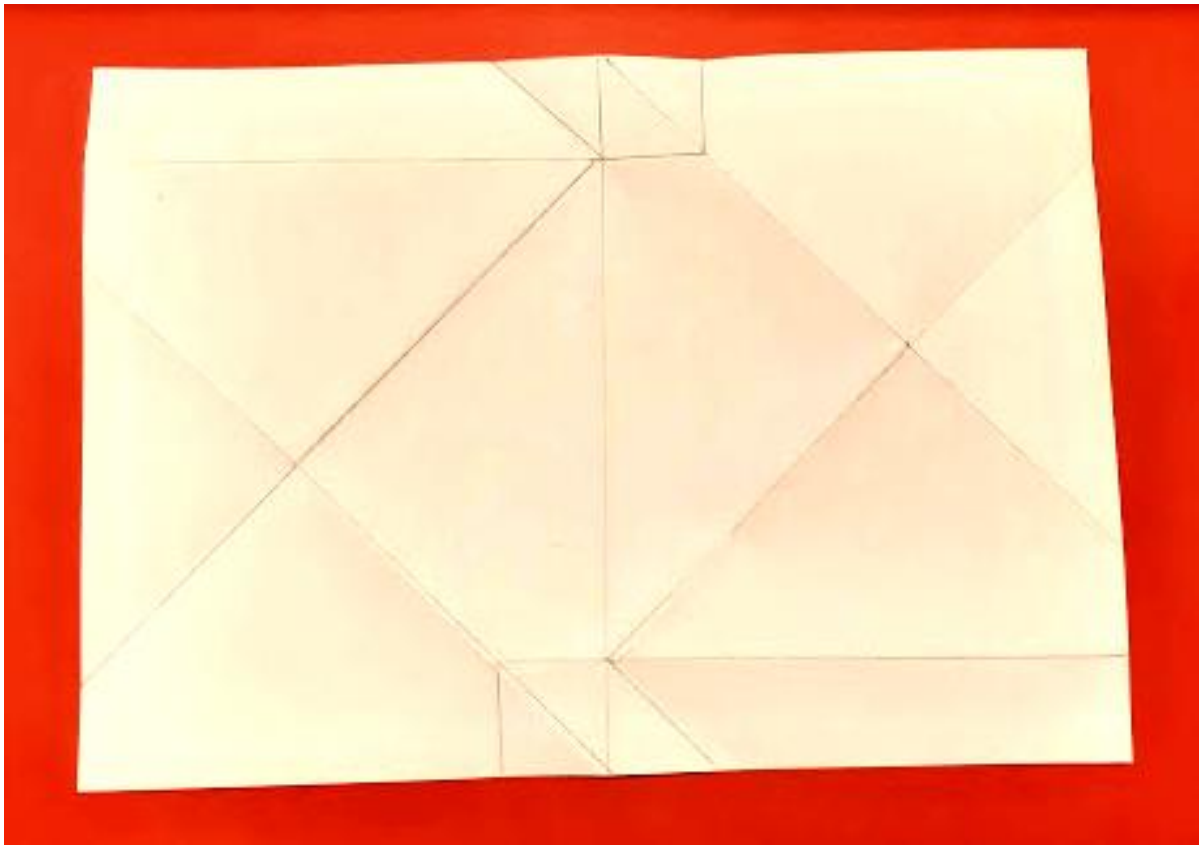
Viola
6/64

Bianco
8/64

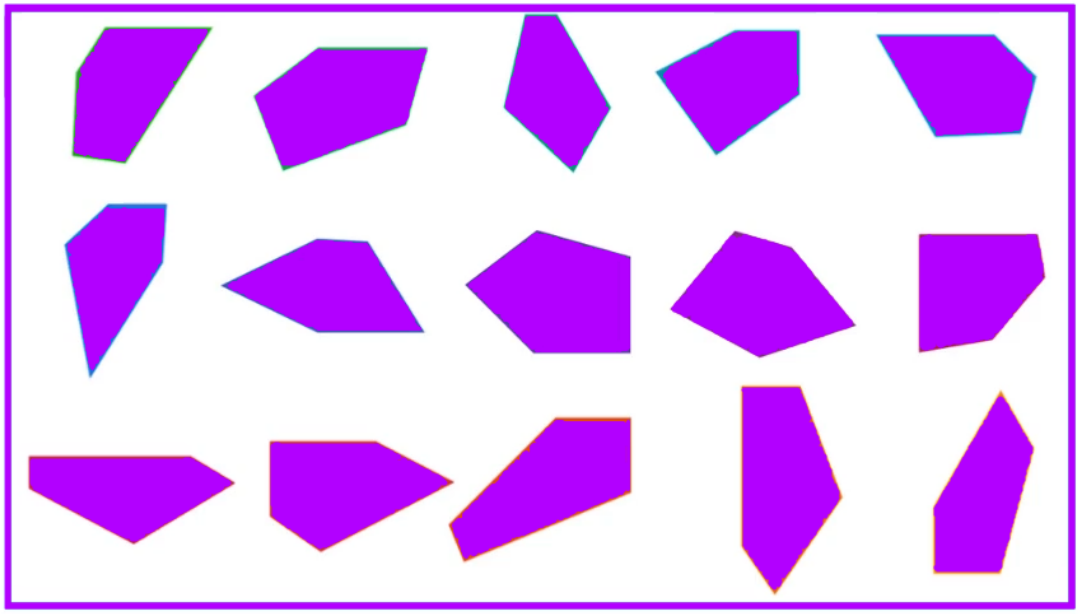


Nuovi sviluppi
Cosa succede se uso un foglio di formato A?





I pentagoni
Percorso storico



1918- matematico tedesco
REINHARDT: 5 tipi

1968- matematico tedesco
KERSHNER: 3 tipi

1975- Articolo di M. Gardner

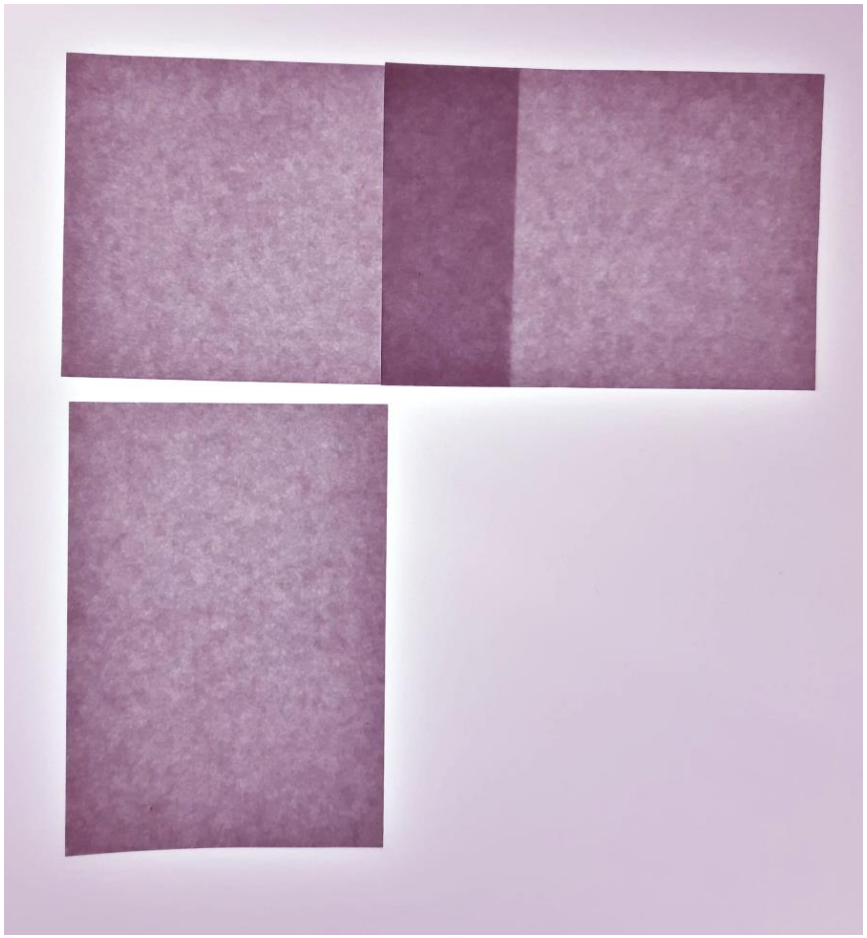
1975- JAMES:1 tipo

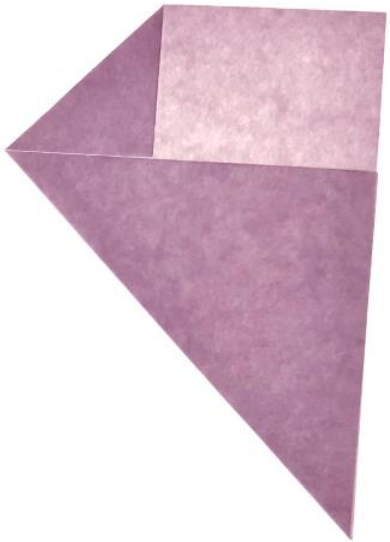
1977- casalinga RICE:4 tipI

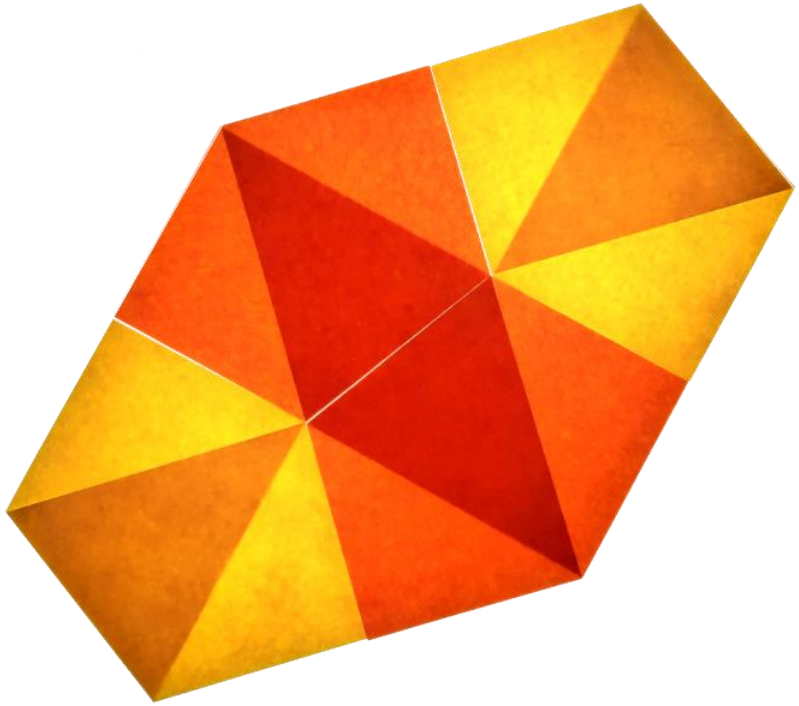
1985- StudenteSTEIN:1 tipo

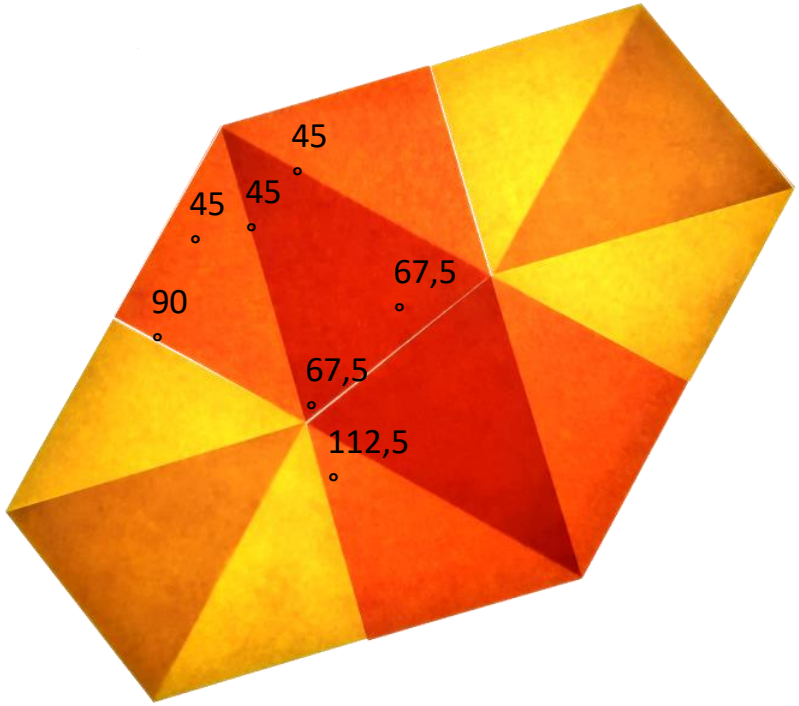
2015- Mann et all ultimo tipo tipo

2017- matematico RAO: Verifica con l'uso del computer che sono solo 15





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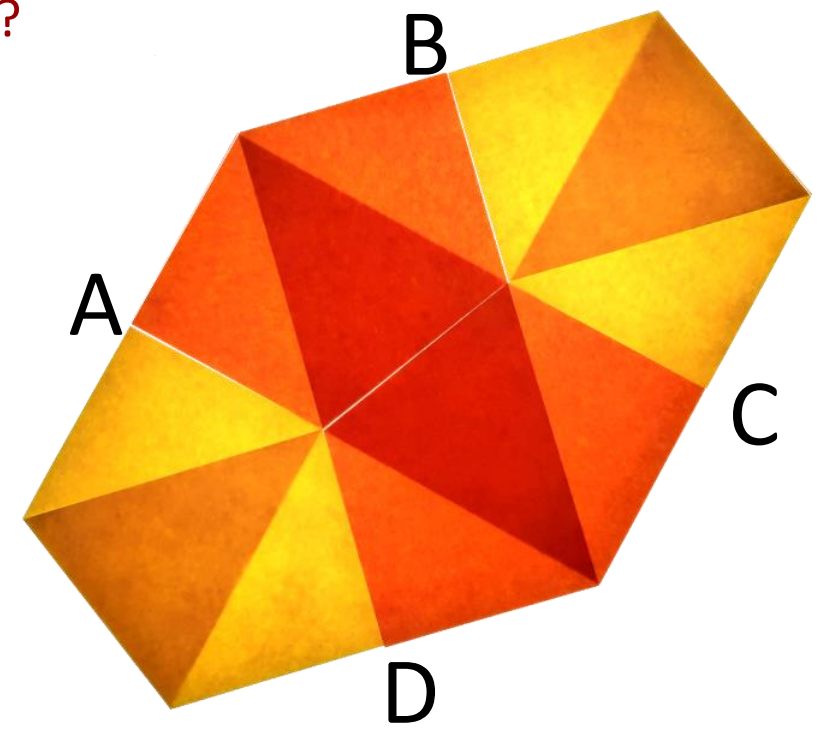
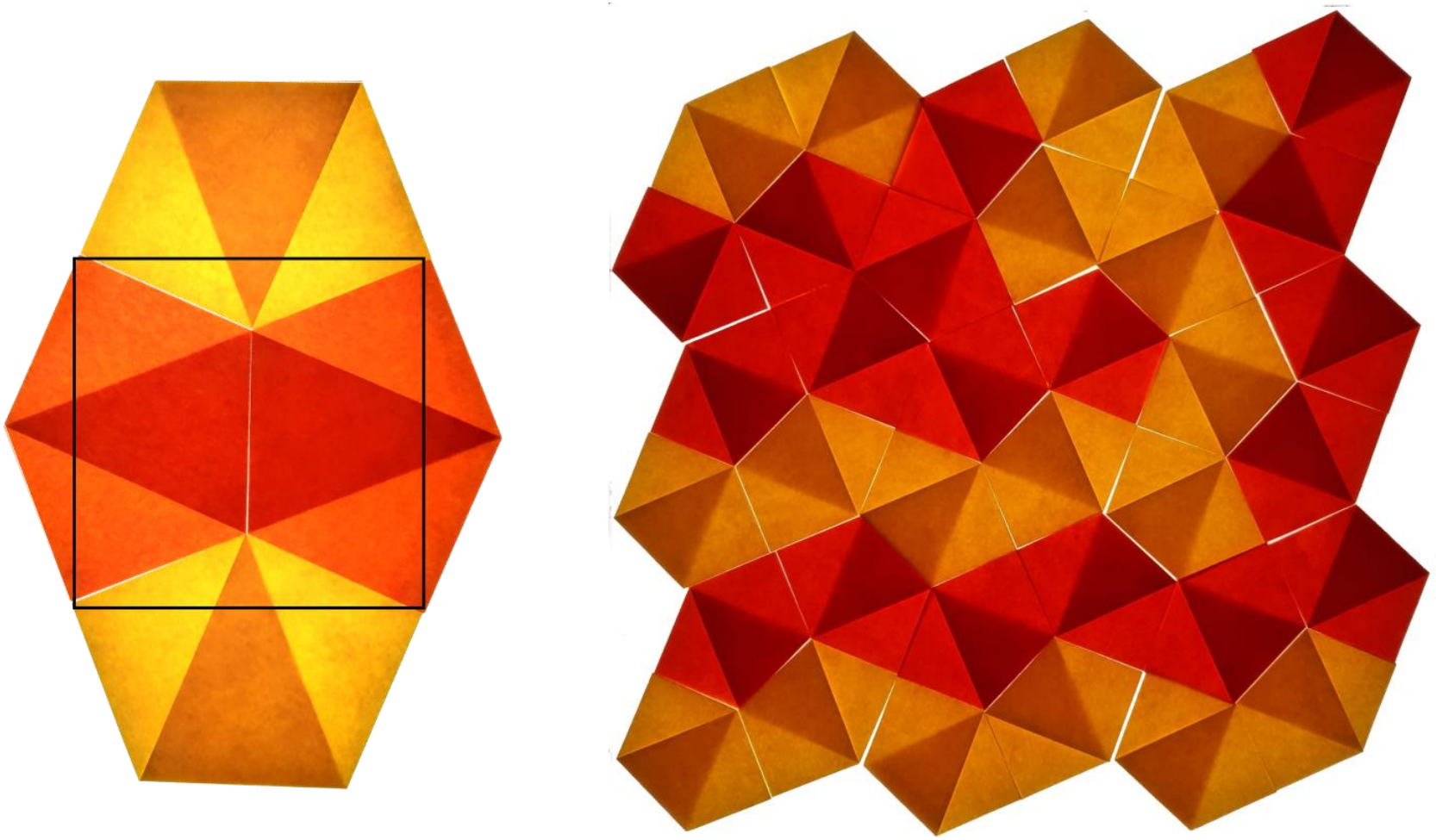
67,5°
112,5°

Che poligono ottengo unendo questi punti?





E saper vedere cose semplici e degnarsi di rifletterci sopra è la cosa più importante

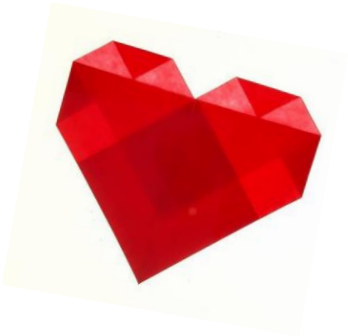
Bruno De Finetti

Grazie

Gabriella Romano (schoolmate)

Origami e didattica

Schoolmate.it



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