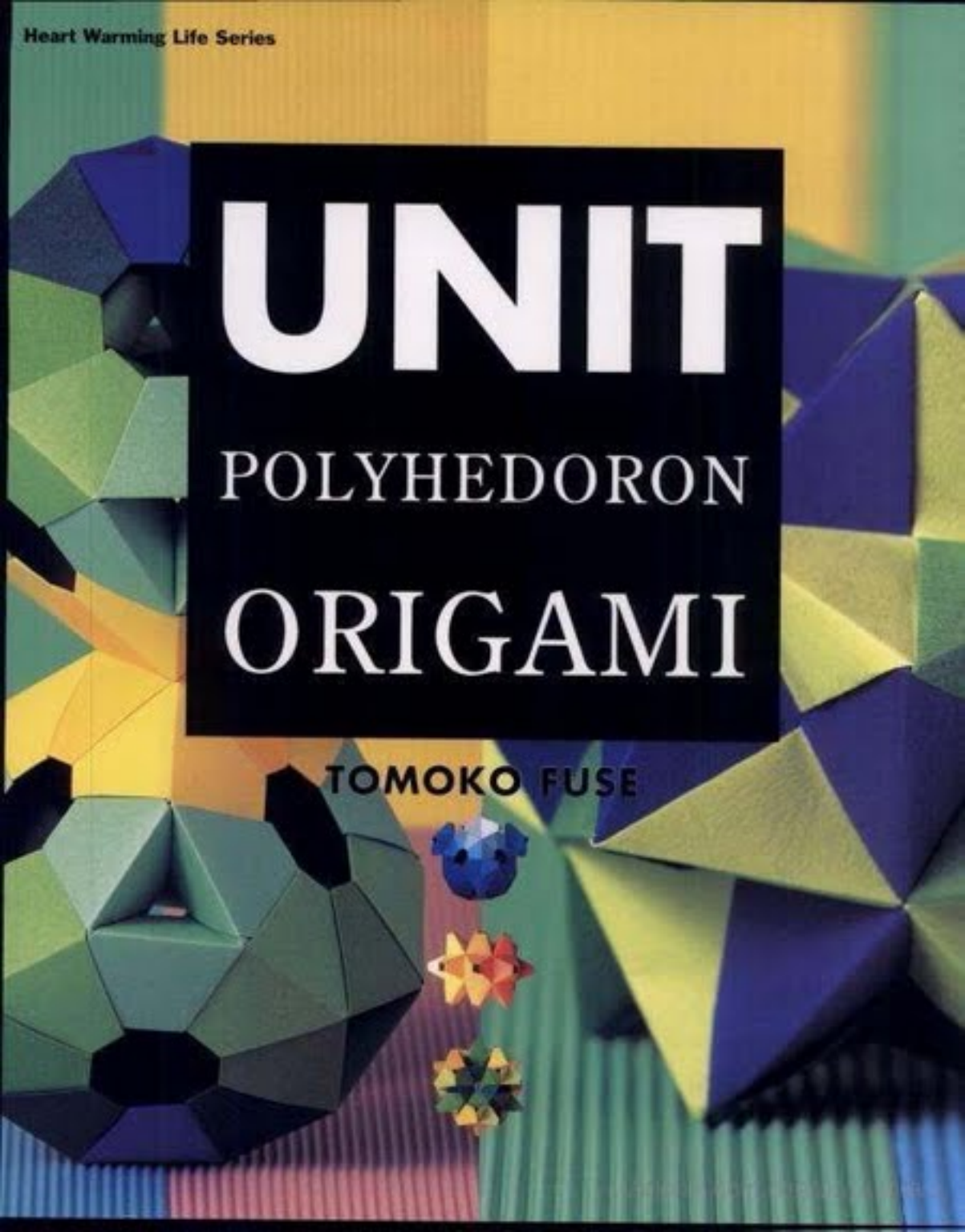
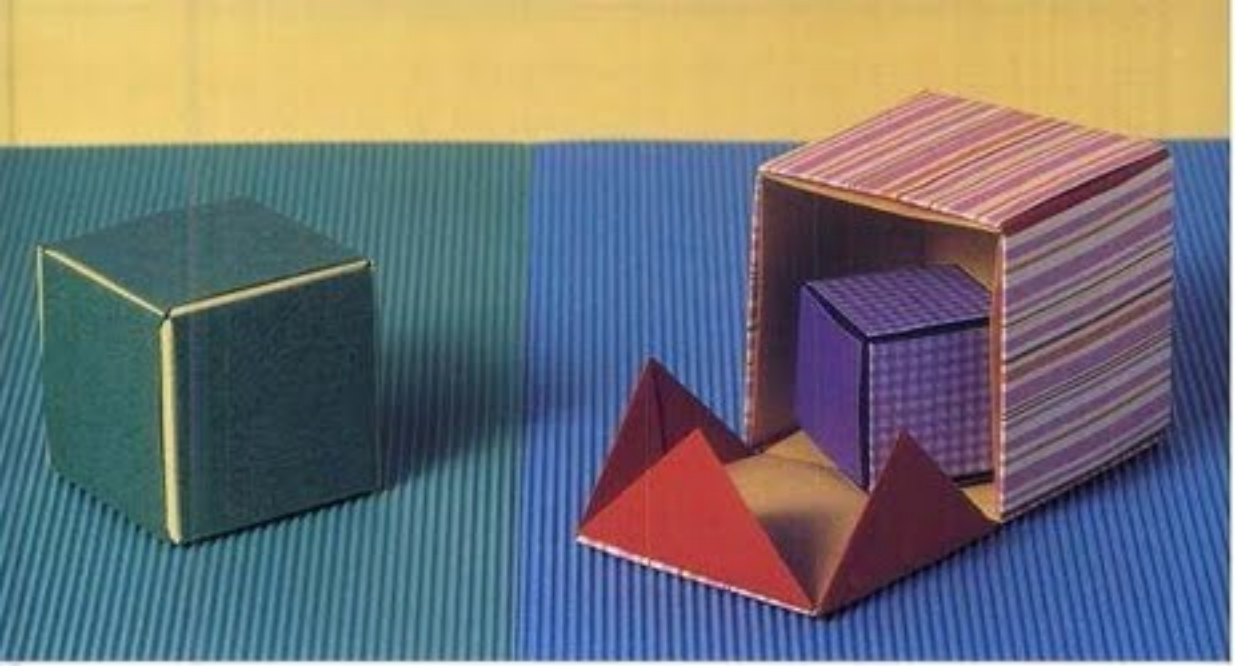
Heart Warming Life Series

UNIT POLYHEDORON ORIGAMI

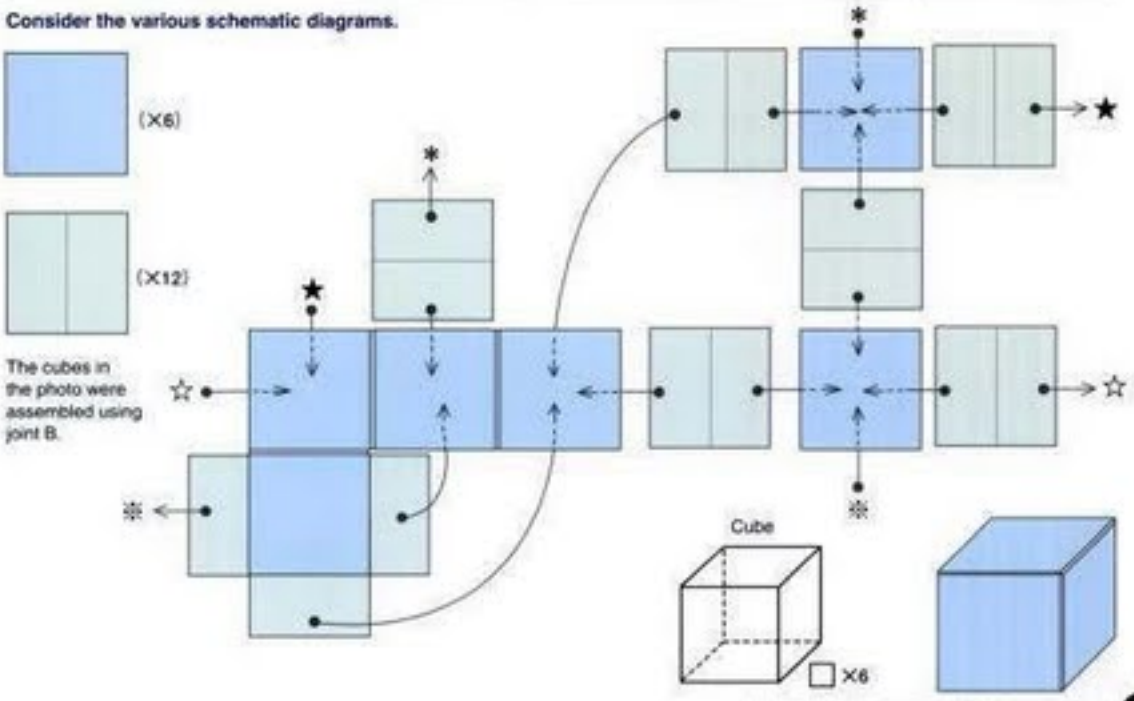
TOMOKO FUSE





CUBE | level ★ | 15cm×15cm

Consider the various schematic diagrams.

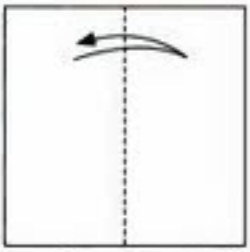


EQUILATERAL TRIANGULAR FLAT UNITS

level ★★ 15cm × 15cm

The unit has pockets on three sides, and it is assembled by inserting joints into them.

1



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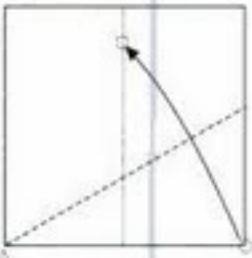
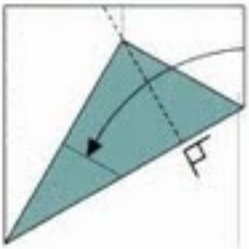


Fold so as to join the two circles ○, using △ as the pivot.

3



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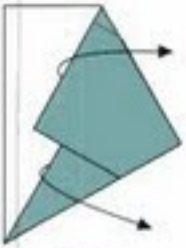
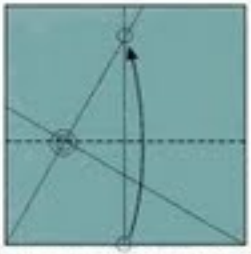


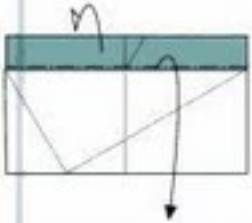
Unfold.

5



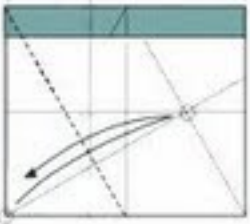
Fold so as to join the two circles ○ at node ○.

6

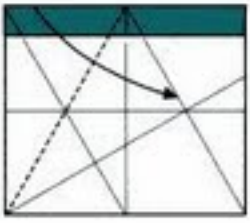


Fold the edge away from yourself and then unfold the upper layer.

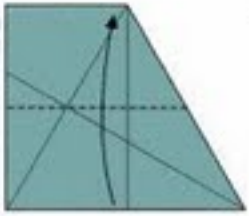
7



8



9



10

11

12

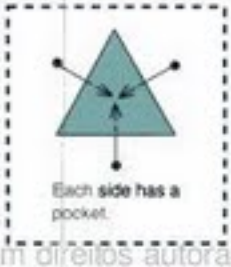
Tuck inside.

13

(Back)

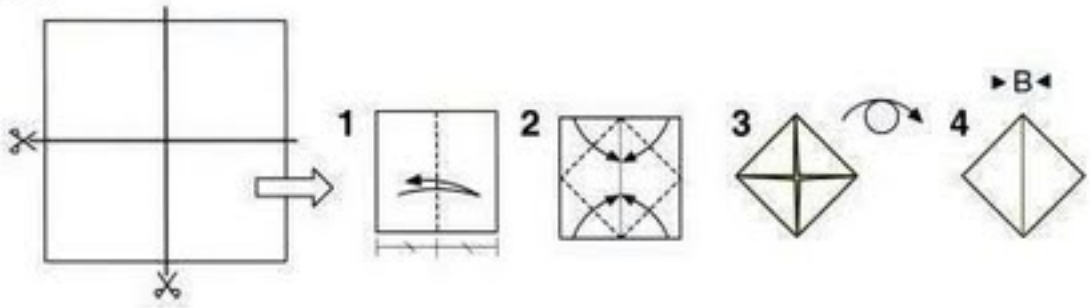
14

(Front)



Each side has a pocket.

Joint B

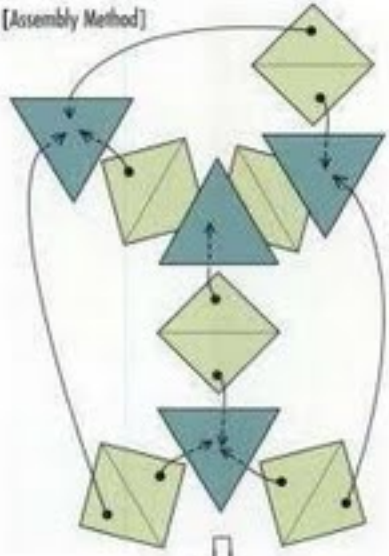


REGULAR TETRAHEDRON | level ★ | 15cm×15cm

Equilateral Triangular Flat Unit (×4)

Joint B (×6)

[Assembly Method]



△×4

REGULAR OCTAHEDRON AND ICOSAHEDRON

level ★

15cm×15cm

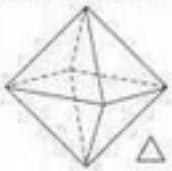
Equilateral Triangular
Flat Unit (p.10)

(×8)

Joint B (p.11)

(×12)

Regular Octahedron



△×8

Equilateral Triangular
Flat Unit (p.10)

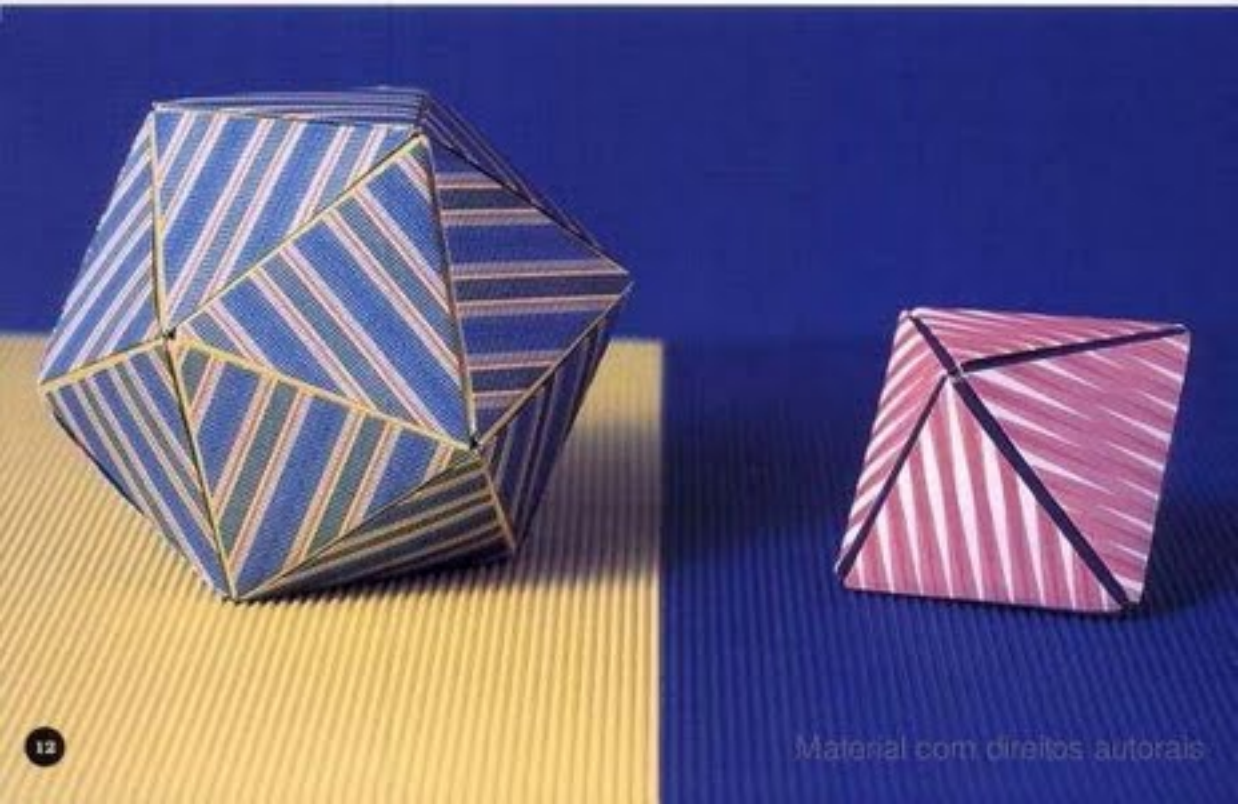
(×20)

Joint B (p.11)

(×30)

Regular Icosahedron

△×20



TRUNCATED REGULAR TETRAHEDRON

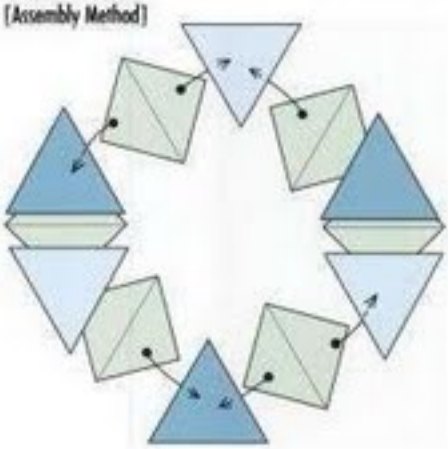
Using equilateral triangular flat units.

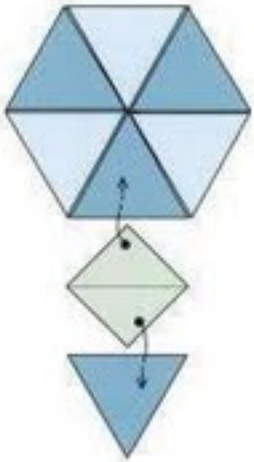
level ★★

12cm×12cm

You can make a regular hexagon by joining 6 equilateral triangular flat units.
It is possible to combine this hexagon with equilateral triangular units.

[Assembly Method]





Equilateral Triangular Flat Unit (p.10)

(×28)

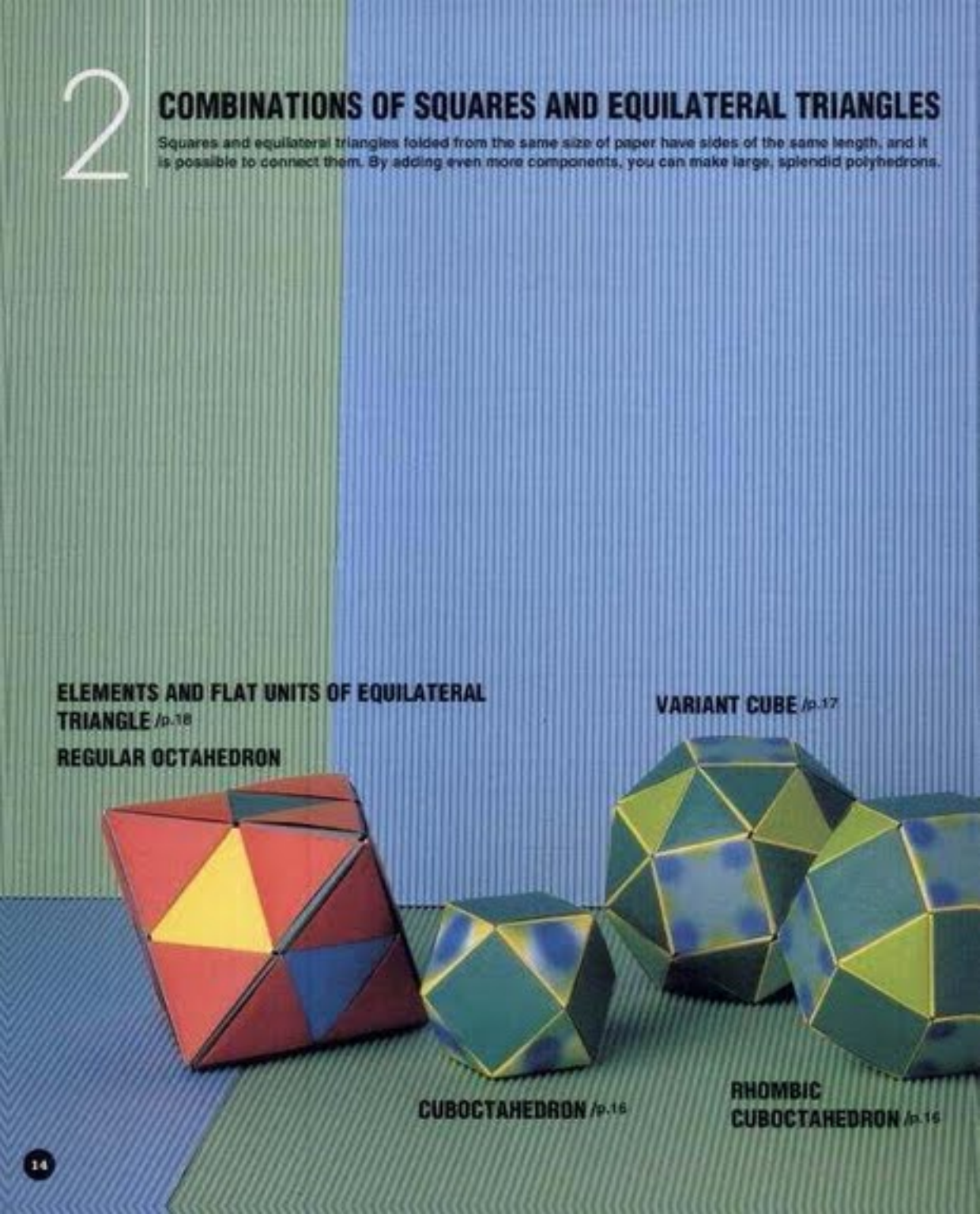
Joint B (p.11)

(×42)

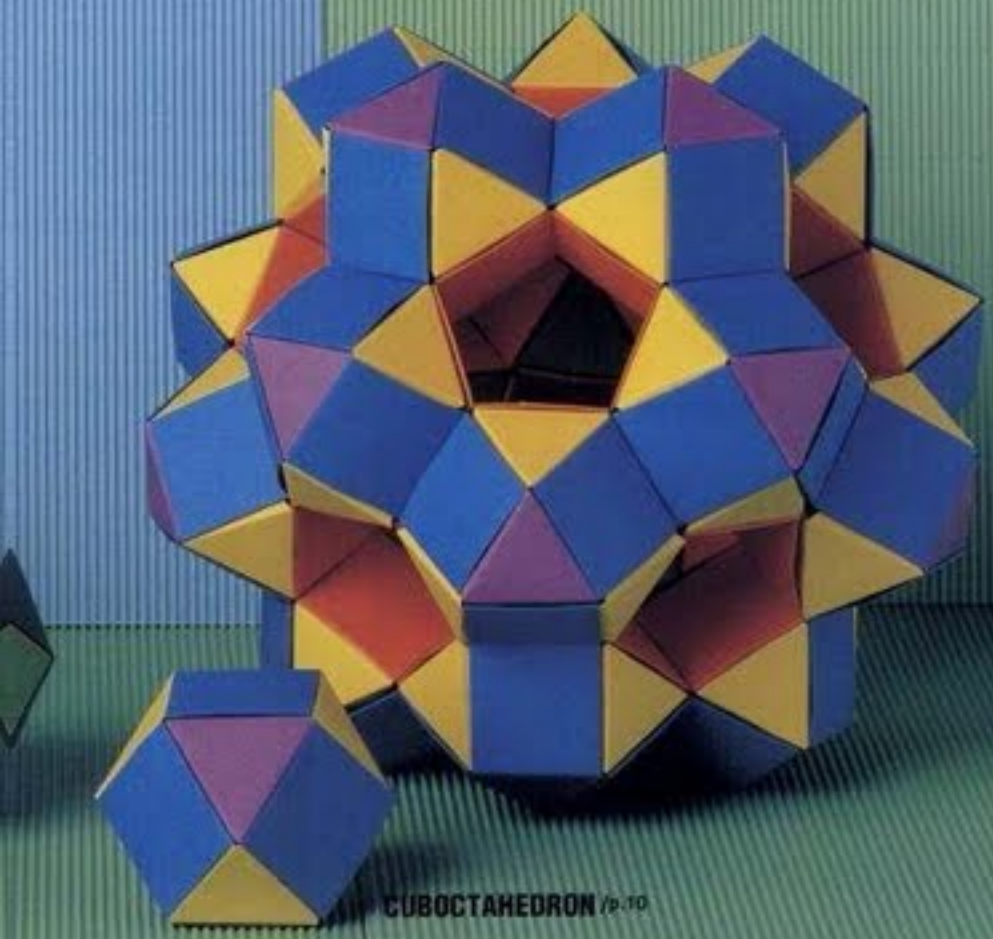
△×4
⬡×4

2 COMBINATIONS OF SQUARES AND EQUILATERAL TRIANGLES

Squares and equilateral triangles folded from the same size of paper have sides of the same length, and it is possible to connect them. By adding even more components, you can make large, splendid polyhedrons.



A STRUCTURE MADE OF 20 CUBOCTAHEDRONS /p.21



CUBOCTAHEDRON /p.10

Combinations of Squares and Equilateral Triangles

CUBOCTAHEDRON AND RHOMBIC CUBOCTAHEDRON

level ★★ | 7.5cm×7.5cm

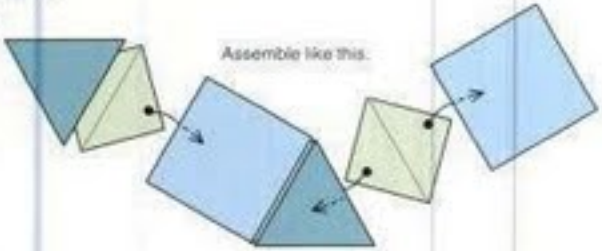
Square and equilateral triangular flat units folded from the same size of paper have sides of the same length, and it is possible to join them to make various solids.

Square flat joint (p.8)

Equilateral triangular flat joint (p.10)

Joint (p.10)

[Assembly Method]



Cuboctahedron

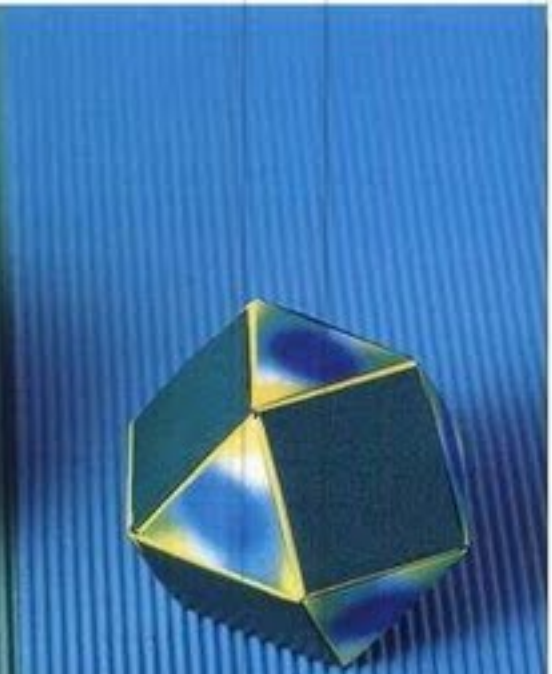
△×8 □×6

Joint ×24

Rhombic cuboctahedron

△×8 □×18

Joint ×48



Combinations of Squares and Equilateral Triangles

VARIANT CUBE | level ★★★

7.5cm×7.5cm

Variant cube

△×32 □×6

Square flat joint (p.8)

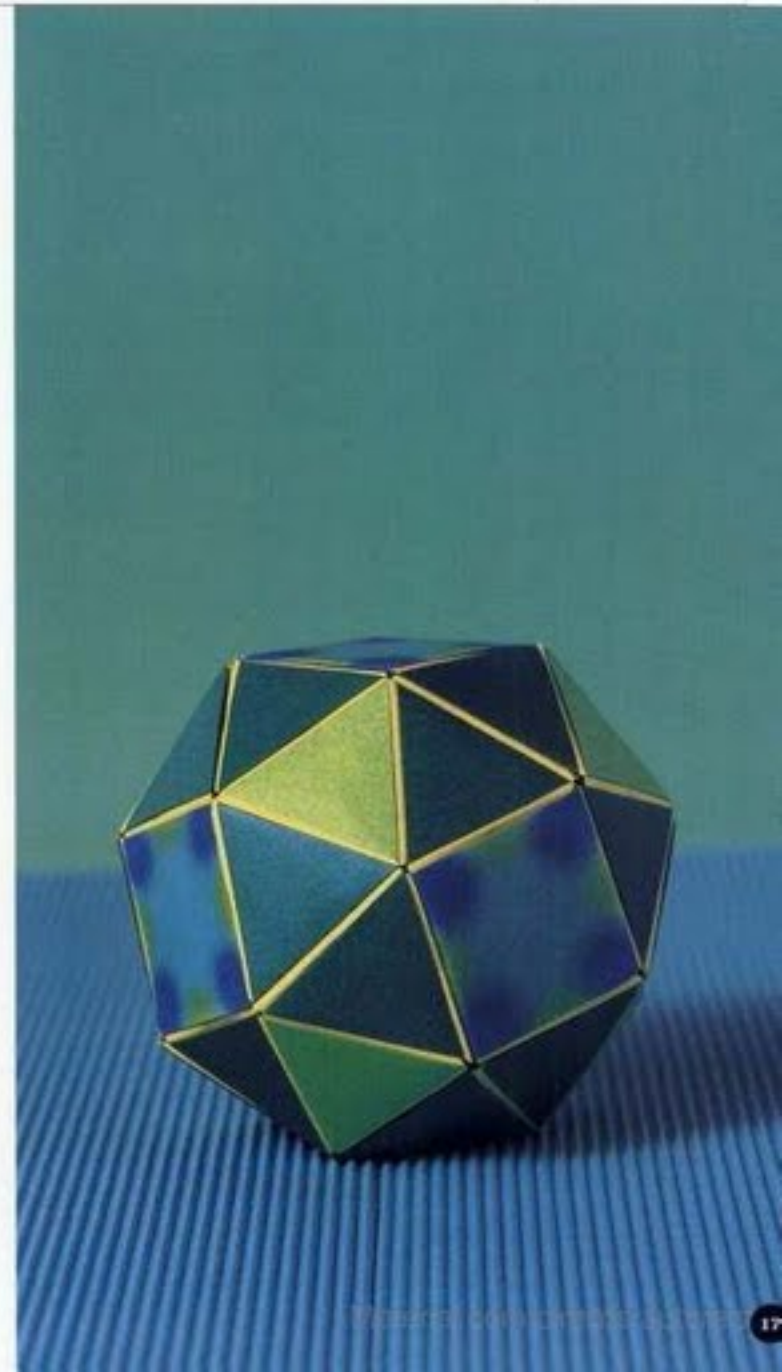
(×6)

Equilateral triangular flat joint (p.10)

(×32)

Joint B (p.11)

(×60)



EQUILATERAL TRIANGULAR ELEMENTS AND FLAT UNITS

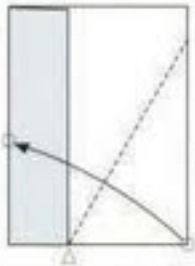
EQUILATERAL TRIANGULAR ELEMENTS

1

Make a short crease on the lower side.

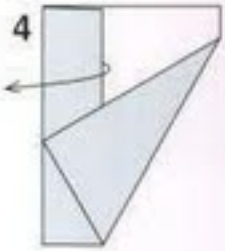
2

3



Fold on the crease △ to join the spots marked by the two circles.

4



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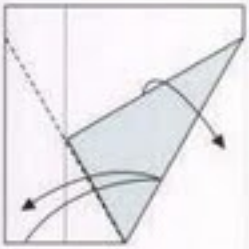

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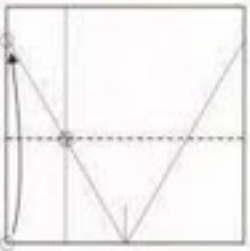

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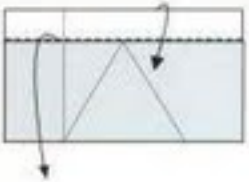

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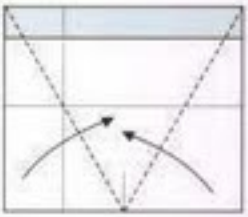
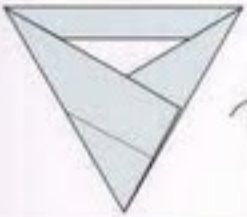
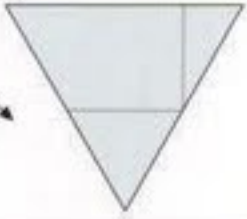


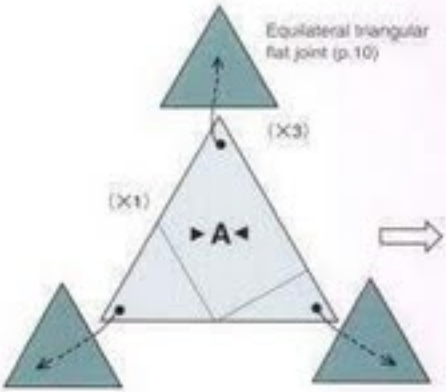
9 ▶A◀



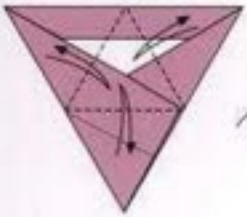
10



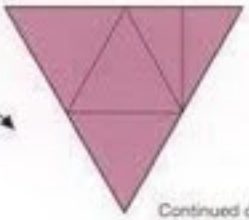
[Assembly Method]



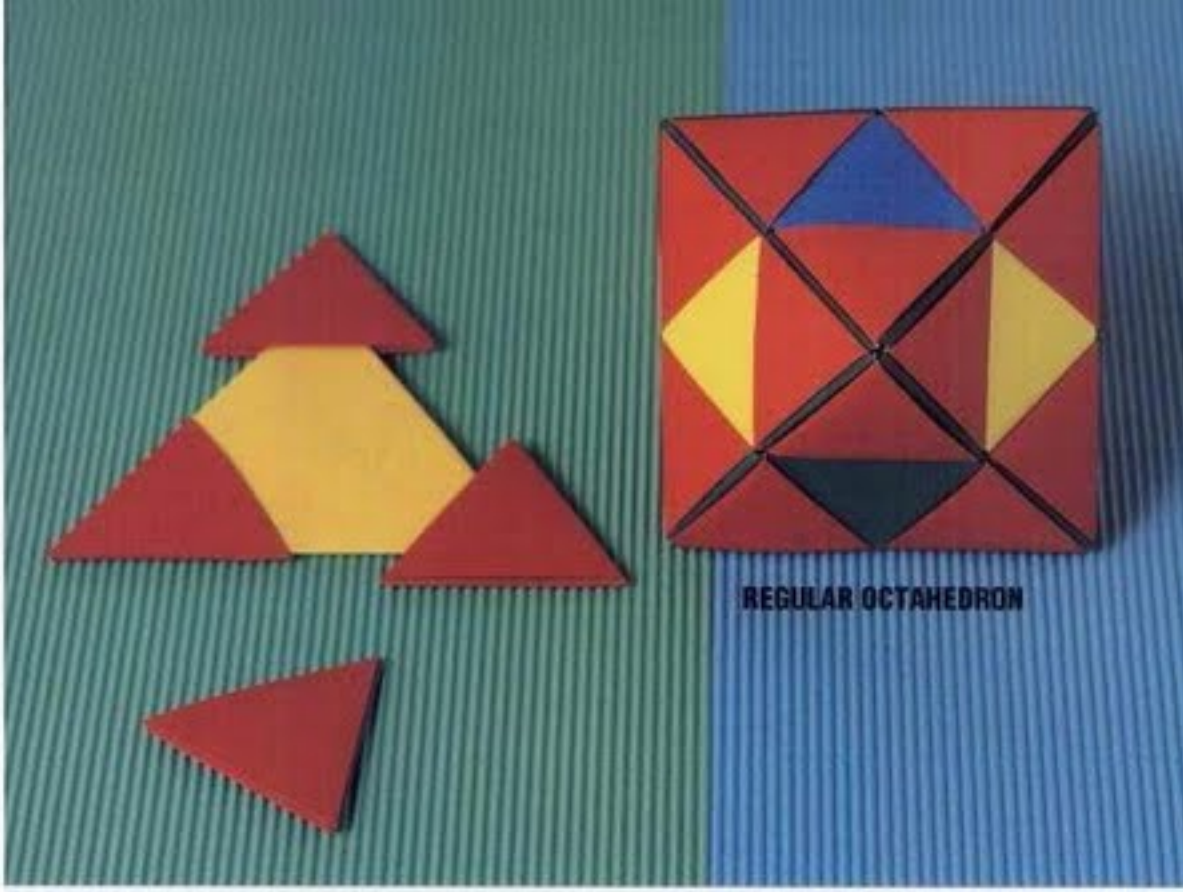
9 ▶B◀



10

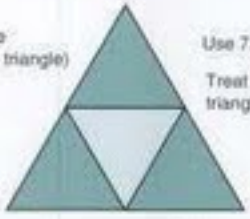


Continued on p.20 and p.21.



A quadruple equilateral triangle is made by combining 1 equilateral triangular element and 3 equilateral triangular flat units.

(Quadruple equilateral triangle)



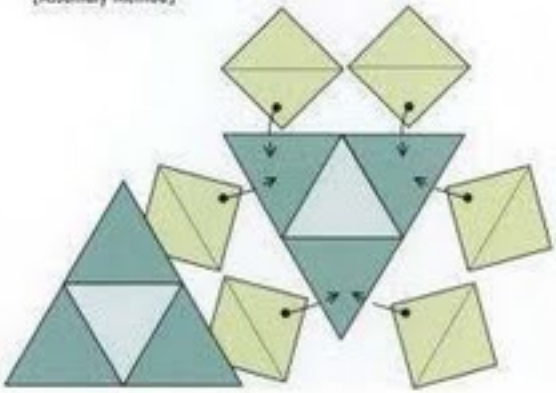
Use 7.5 cm x 7.5 cm paper.

Treat this as 1 triangle.

	Quadruple equilateral triangle	Joint B
		
Regular tetrahedron	(×4)	(×12)
Regular octahedron	**(×8)**	**(×24)**
Regular icosahedron	**(×20)**	**(×60)**

[Assembly Method]

Joint B (p.11)

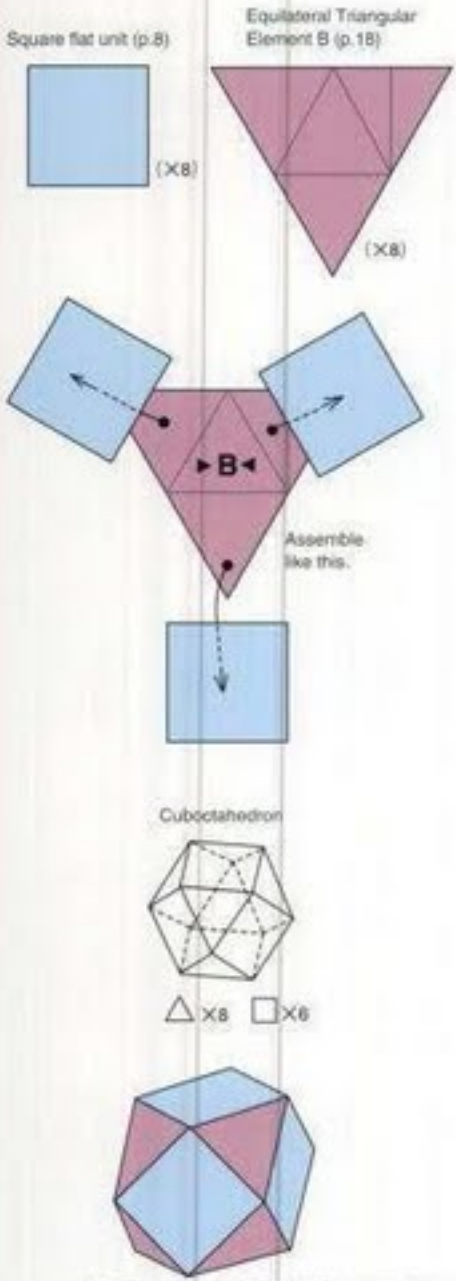


Equilateral Triangular Elements and Square Flat Units

CUBOCTAHEDRON

level ★

15cm×15cm



STRUCTURES MADE OF 20 CUBOCTAHEDRONS

level ★★★

8cm×8cm

Square flat unit (p.8)

(×120 : 240 sheets of paper)

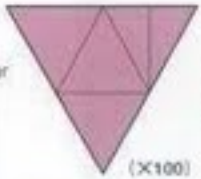
5 inside rings of square flat units (orange) 5×12=60
2 outside square flat units (blue) 2×30=60

Joint B (p.11)

(×90)

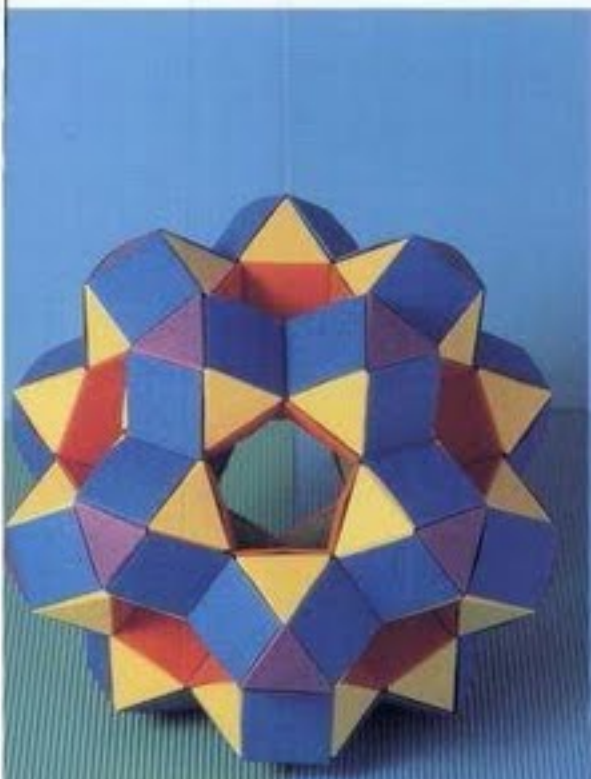
5 inside square flat units 5×12=60
2 outside square flat units 30

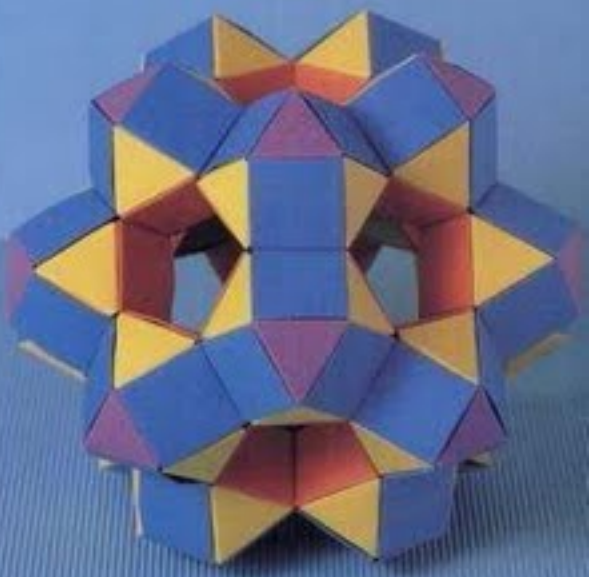
Equilateral triangular element B (p.18)



(×100)

Inside triangles (yellowish green) 20
Outside star-shaped triangles (yellow) 5×12=60
Exterior triangles (purple) 20





3 A VARIETY OF REGULAR DODECAHEDRONS

Surface patterns depend on the number of dodecahedrons used. It is possible to assemble them with 60 or 120 rhomboid units.

VARIANT KUSUDAMA DODECAHEDRON /p.30

RHOMBIC CUBOCTAHEDRON, DODECAHEDRON AND: MADE WITH 120 RHOMBOID UNITS /p.29

KUSUDAMA DODECAHEDRON /p.30

REGULAR ICOSAHEDRON:
MADE WITH 30 RHOMBOID UNITS /p.26

12 REGULAR
DODECAHEDRONS /p.24

ICOSAHEDRON, DODECAHEDRON:
MADE WITH 60 RHOMBOID UNITS /p.28

Regular Dodecahedron MADE WITH 12 UNITS | level ★★ | 15cm×15cm

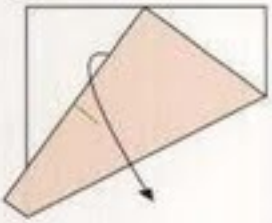
1

Make short creases on the upper and lower sides.

2

Fold along the line marked by the two circles to make a crease.

3

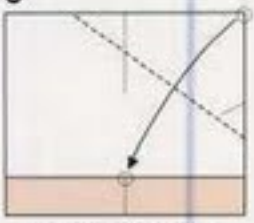


4

Make a short crease on the right side.

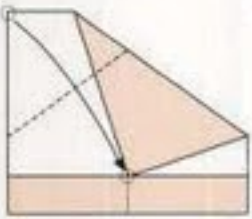
5

6

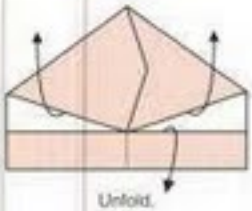


Fold so as to join the two circles ○.

7

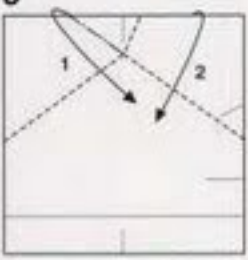


8



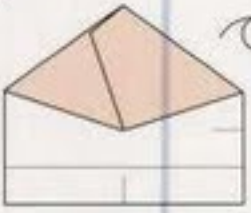
Unfold.

9

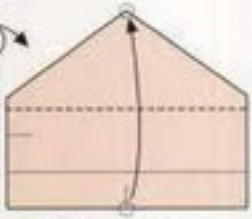


Fold in numerical order.

10



11

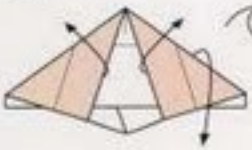


Fold so as to join the two circles ○.

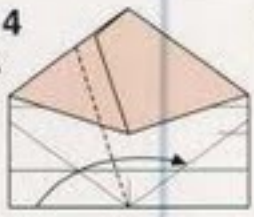
12

Fold the upper corners down.

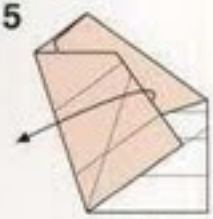
13



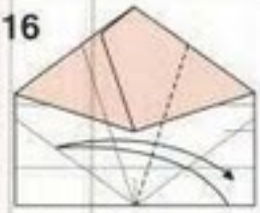
14



15

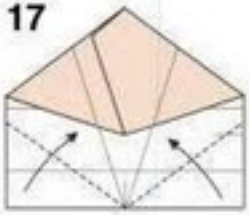


16

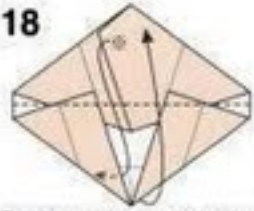


Fold the other side in the same way.

17



18

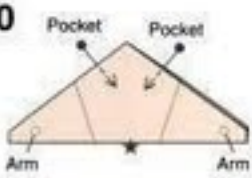


Fold by inserting the part marked with a star ✲ into the pocket.

19

Make creases by aligning edges with the line.

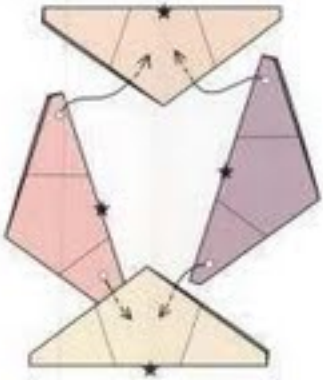
20



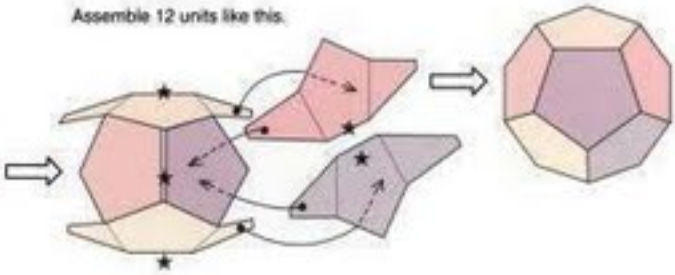
★ is closed.

(×12)

[Assembly Method] Connect by joining the spots marked with stars ★.



Assemble 12 units like this.



Regular Dodecahedron STRUCTURES MADE FROM 30 RHOMBOID UNITS

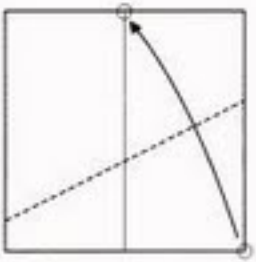
level ★★ | 15cm × 15cm

Make a rectangular pattern paper.

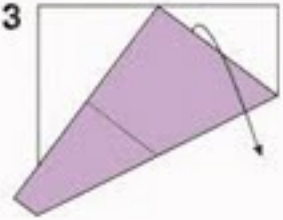
Methods 1-3 were worked out by Kazuo Haga.

1

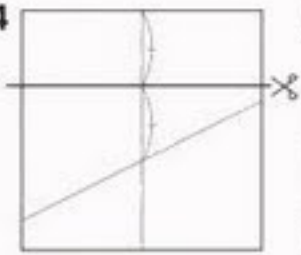
2



3

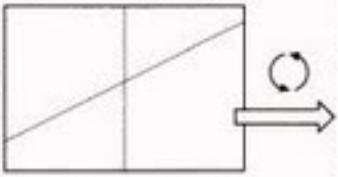


4



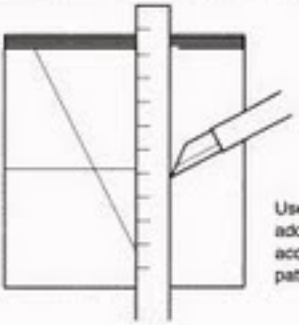
5

[Pattern paper]



Put sheets of paper on top.

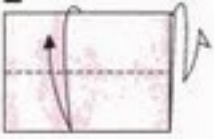
6



Use a cutter to cut additional sheets according to the pattern.

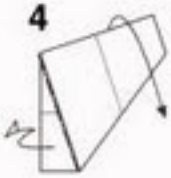
1

2



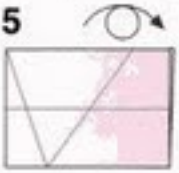
3

4

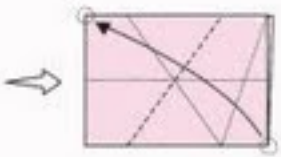


Make creases and unfold.

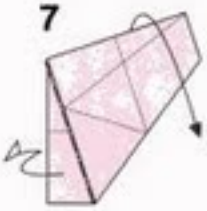
5



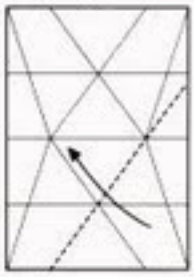
6



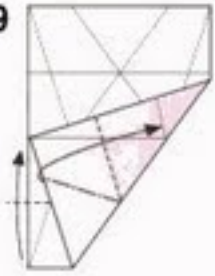
7



8



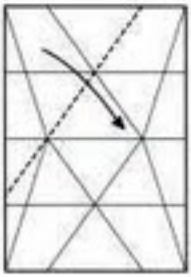
9



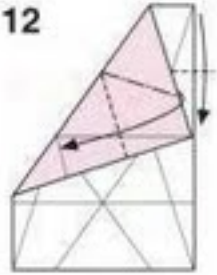
10

Unfold.

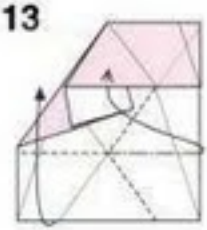
11



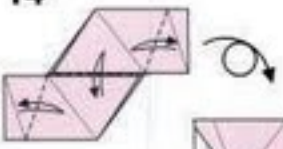
12



13

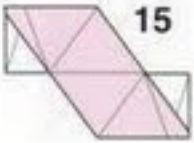


14



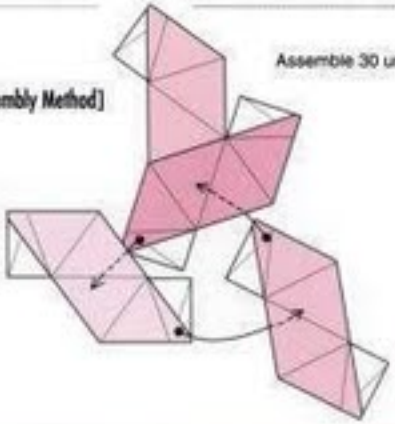
Make creases by folding both edges along the edges as shown below.

15

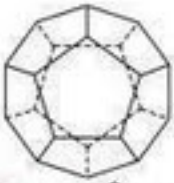


(×30)

[Assembly Method]



Assemble 30 units like this.

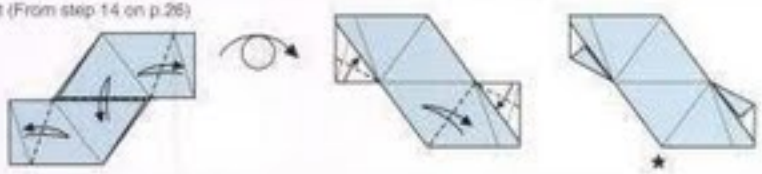


×12

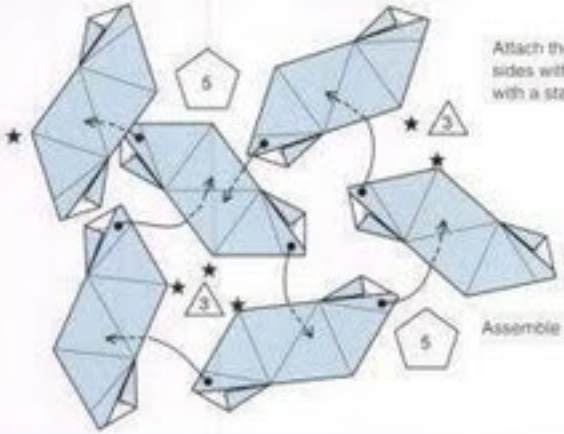
Icosahedron/dodecahedron STRUCTURE OF 60 RHOMBOID UNITS

level ★★★ | 15cm×15cm

Rhomboid unit (From step 14 on p.26)



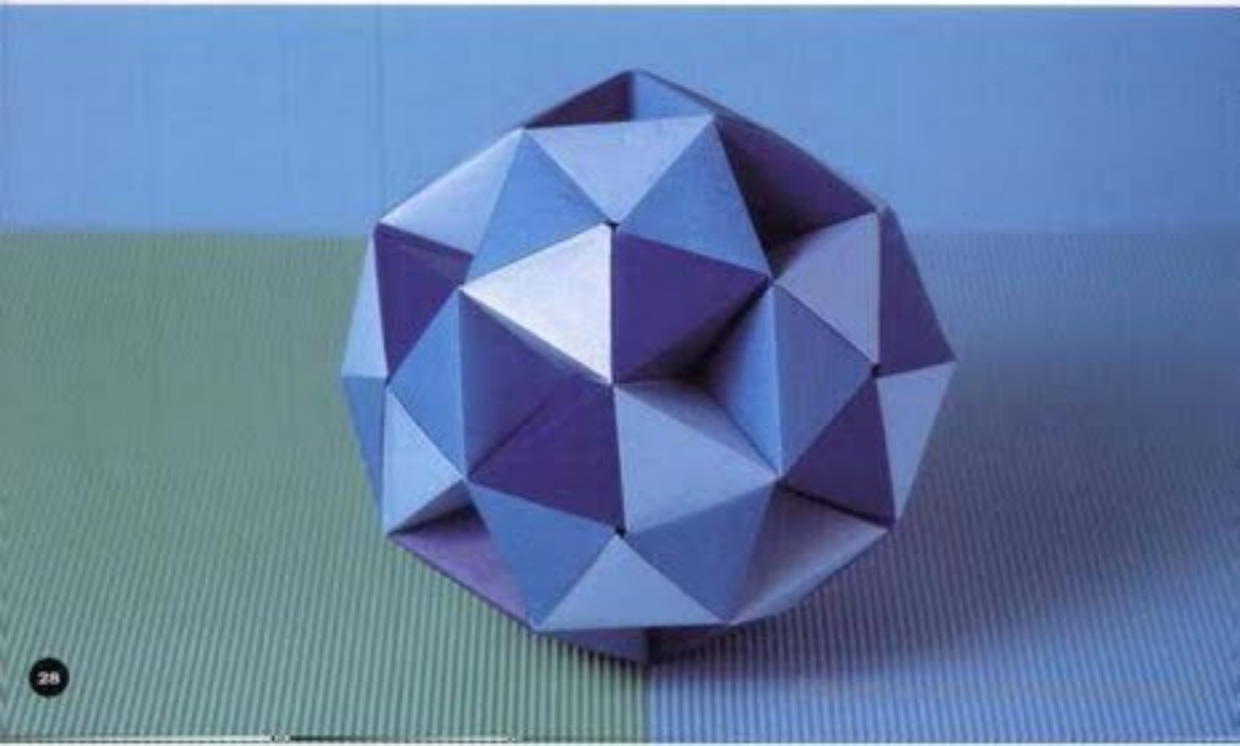
(×60)



Attach the triangles on the sides with creases marked with a star ★.

Assemble 30 units like this.

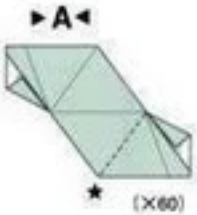
△×20 ⬠×12

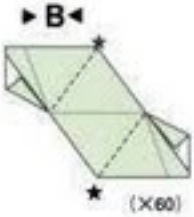


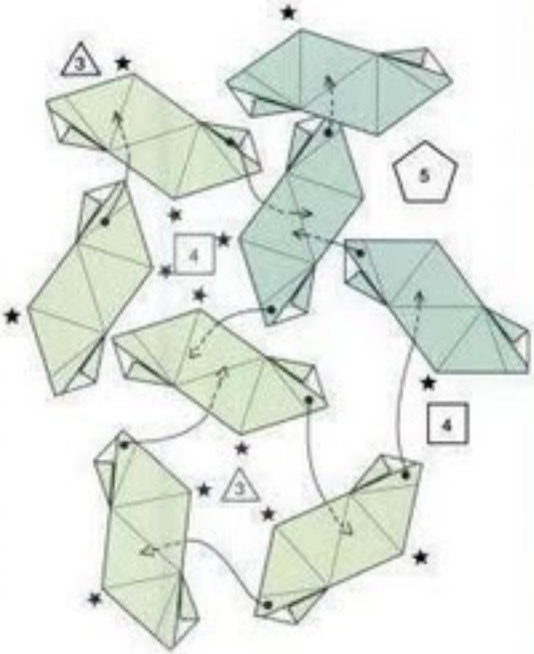
Rhombic Icosa-dodecahedron STRUCTURE WITH 120 RHOMBOID UNITS

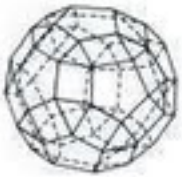
level ★★★ | 12cm×12cm

(A) has 1 crease and (B) has 2 creases. Assemble each of 60 units on the sides with the creases marked ★.

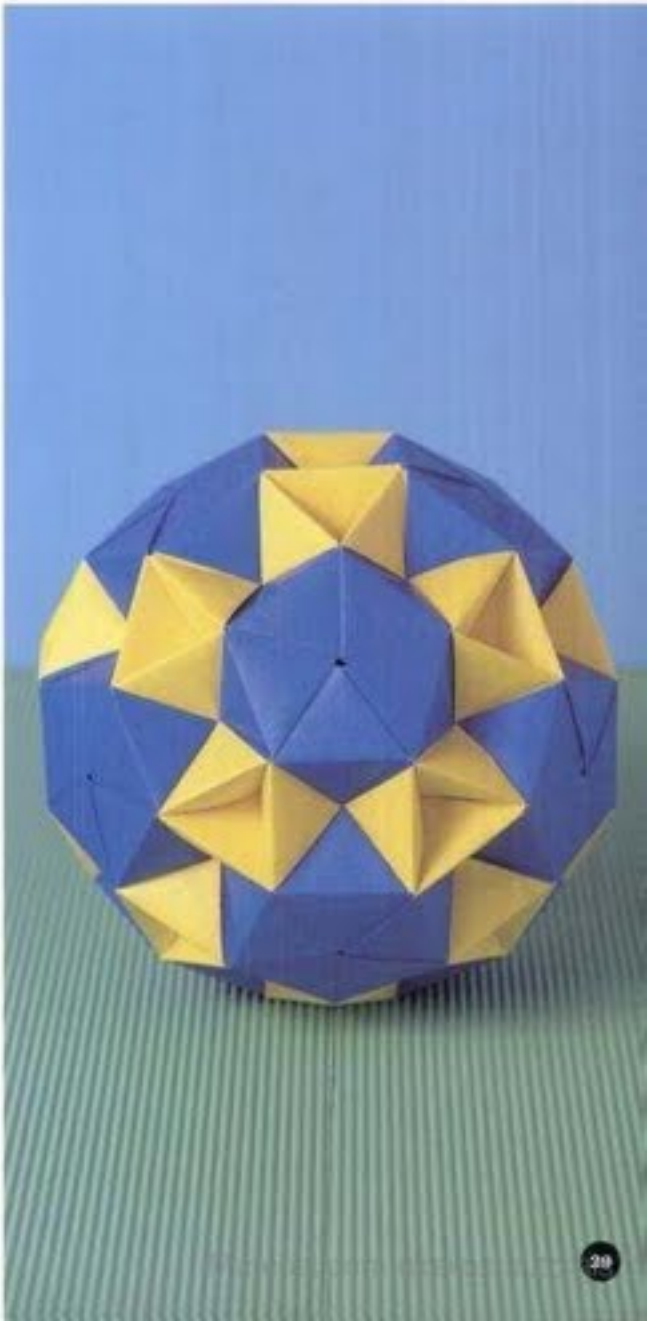








△×20 □×30 ⬠×12



KUSUDAMA DODECAHEDRON

level ★★

15cm×15cm

Cut a square into three equal parts and make a rectangle with sides in a 1:3 ratio.

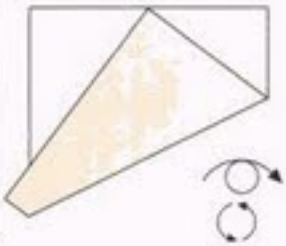
1

Make a short crease on the upper side.

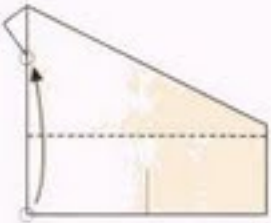
2

Fold so as to join the circles ○.

3

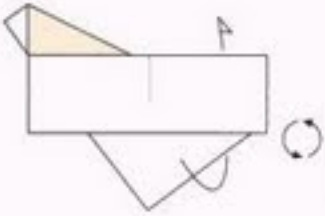


4



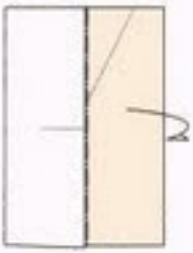
Fold so as to join the circles ○.

5



Unfold the back.

6



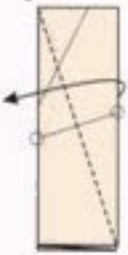
7

[Use your own judgment about where to fold the paper]

You may fold the paper into three layers, estimating the right place to fold it, and then flatten it.

8

9

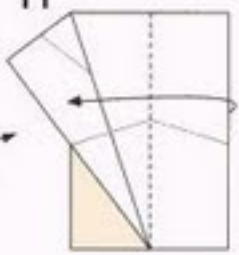


Fold only the upper layer.

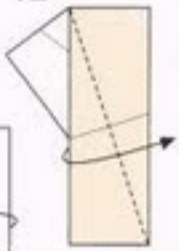
10

Unfold the back.

11



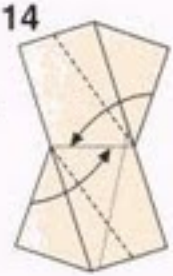
12

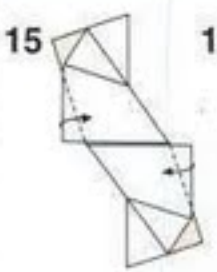


Fold only the upper layer.

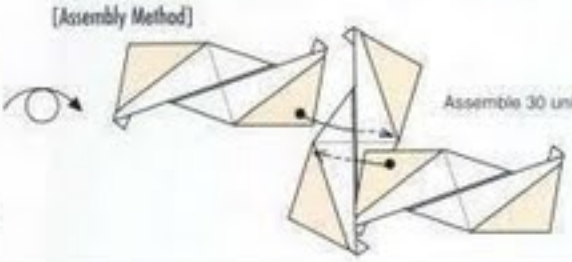
13

14





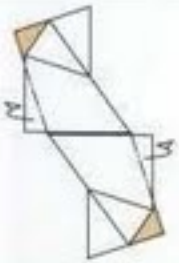
Fold at the white corner so as to align with edge (a). (This doesn't have to be exact.)



Assemble 30 units like this.

CHANGE PATTERNS

Starting with step **15**, fold in the same way as in step **16**.



4 REGULAR HEXAGONAL FLAT UNITS

There are two kinds of hexagonal flat units: one has 3 pockets on its 6 sides and the other has 6 pockets. Join the units with other elements, and create larger, more complex figures.

TRUNCATED TETRAHEDRON /p.36

USING REGULAR HEXAGONAL FLAT UNITS WITH 3 POCKETS (1) /p.38

TRUNCATED OCTAHEDRON /p.36

REGULAR HEXAGONAL FLAT UNIT • 3 POCKETS

level ★★

12cm×12cm

1

Make a short crease on the lower side.

2

3

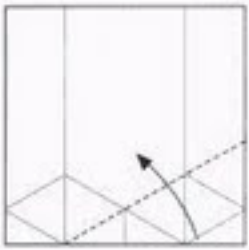
Fold so as to join the two circles ○, using the corner △ as the pivot.

4

5

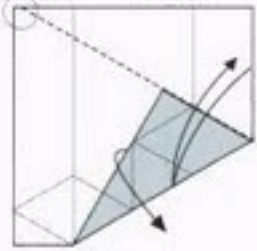
Make a crease and unfold.

6



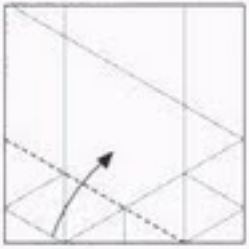
7

Leave a bit of a space between the fold and the corner.

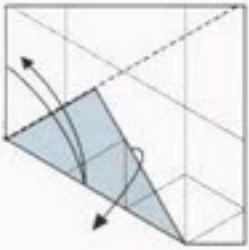


Make a crease and unfold.

8

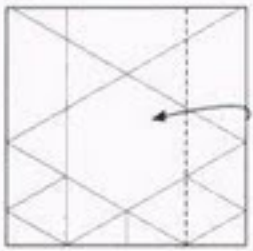


9

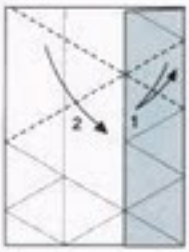


Make a crease and unfold.

10

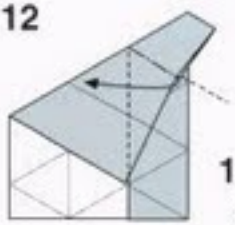


11

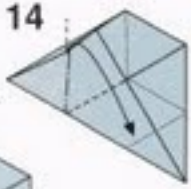


Fold in numerical order.

12

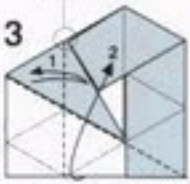


14



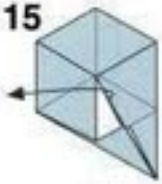
Leave a bit of a space here.

13



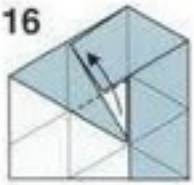
Fold in numerical order.

15

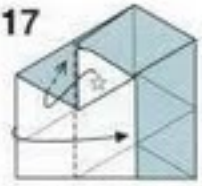


Unfold.

16



17



Insert flap marked with the star ☆ into the slit and fold the left side.

18

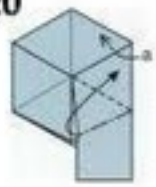
Inside reverse fold

Be sure that the part marked with the triangle is securely tucked in.

19

Pull out the flap.

20

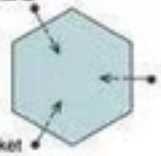


21

Insert the flap ★ into slit (a) of step 20.

22

23



Hexagonal flat unit

Simple Form

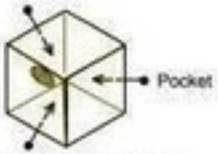
15'

Pull out the flap.

16'

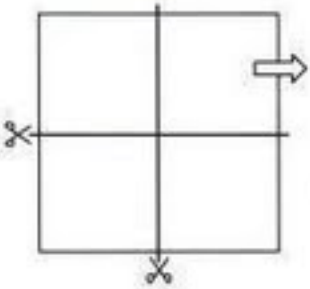
17'

18'



Glue the inside of the shaded part so that it stays in place.

Joint C



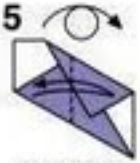
1

2

3

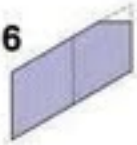
1

5



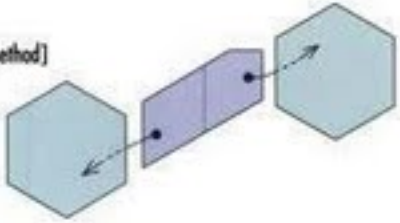
Fold in half on the crease.

6



The corner is missing from the joint, but this is not a problem. Insert it in any direction you like.

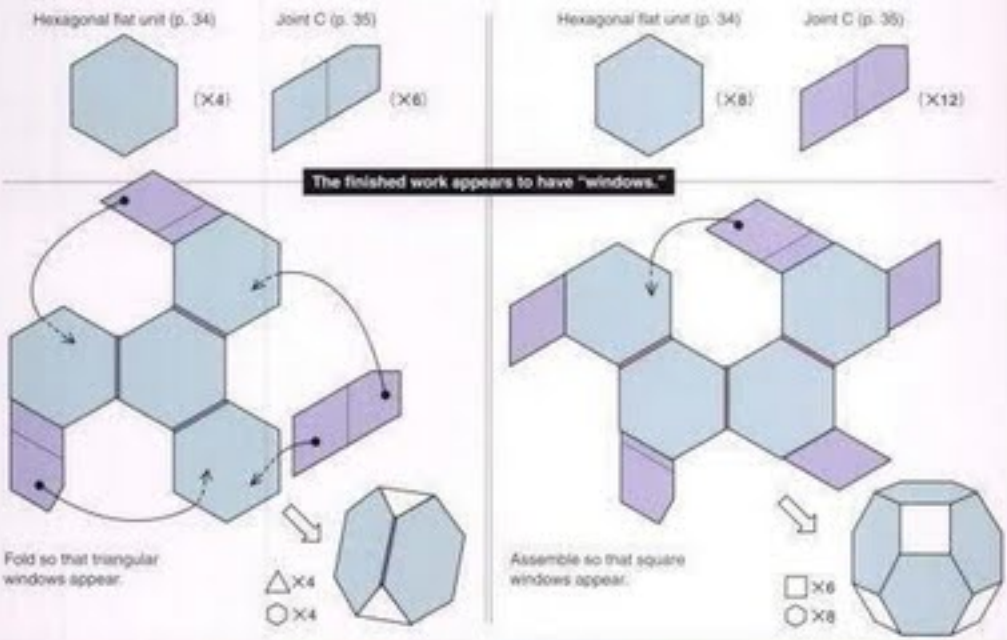
[Assembly Method]

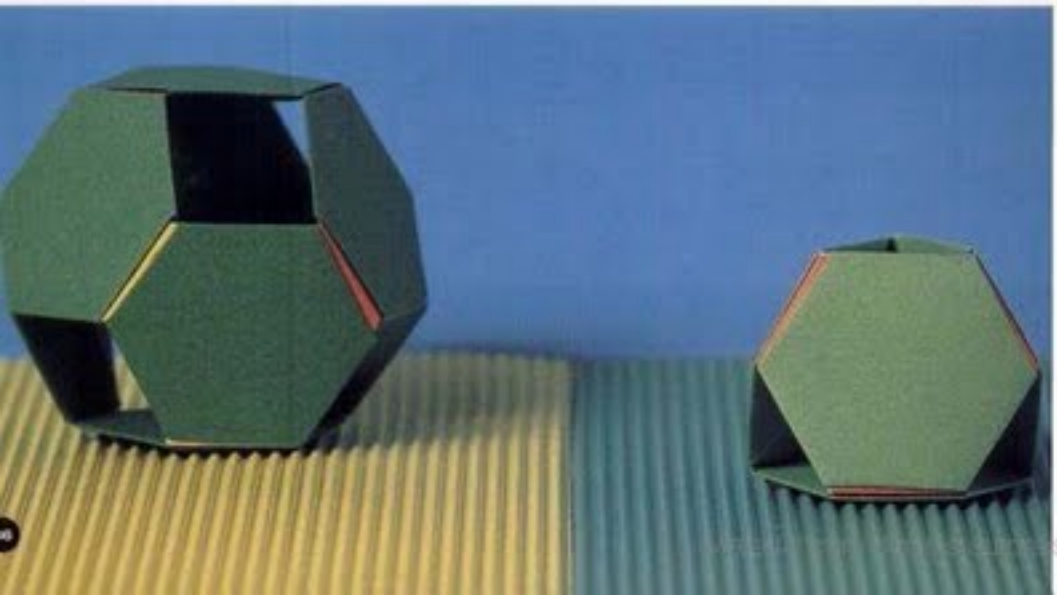


TRUNCATED TETRAHEDRON AND OCTAHEDRON

level ★

12cm×12cm



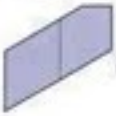


TRUNCATED ICOSAHEDRON | level ★ | 10cm×10cm

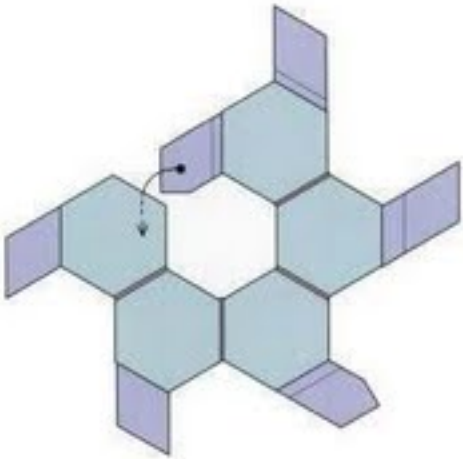
Hexagonal flat unit (p. 34)

(×20)

Joint C (p. 35)

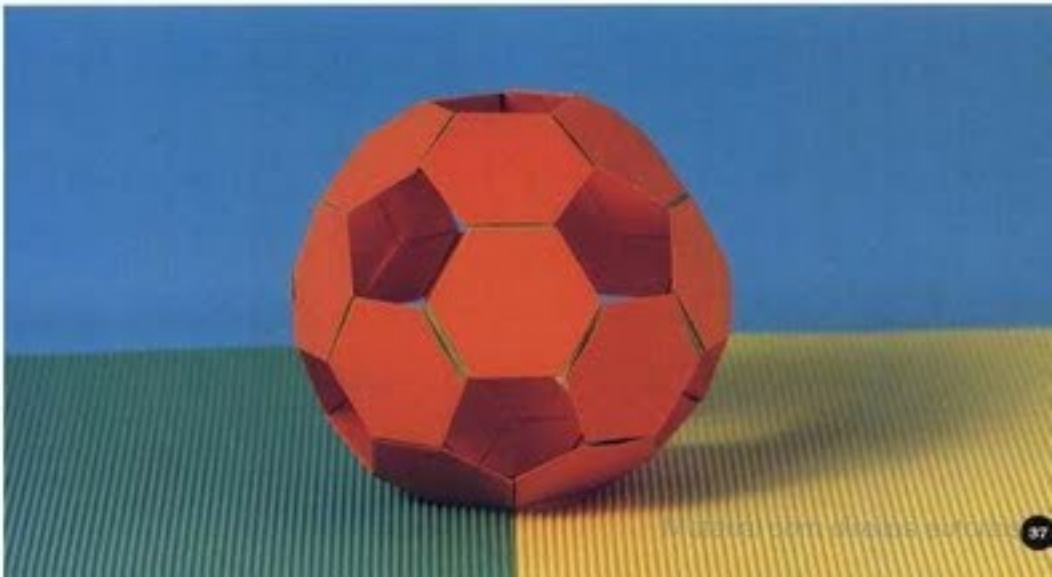


(×30)



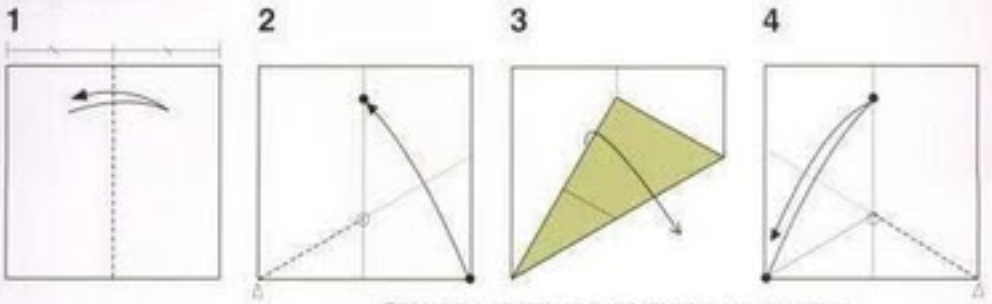
Assemble so that pentagonal windows appear.

⬠×12 ⬡×20

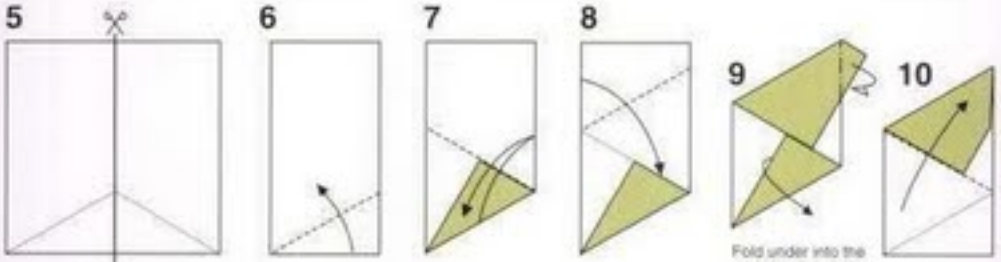


Regular Hexagonal Flat Unit USING 3 POCKETS (1) | level ★ | 12cm×12cm

Triangle Element A



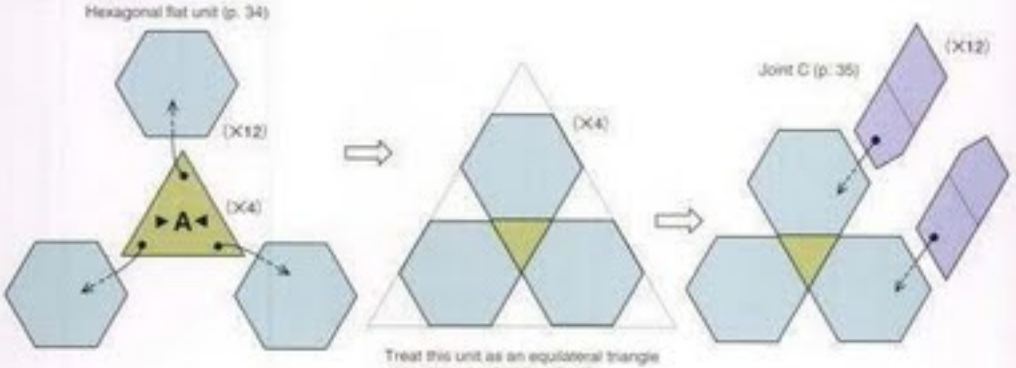
Fold the corner marked with the black dot up to the other black dot, using the corner marked with a triangle as the pivot.



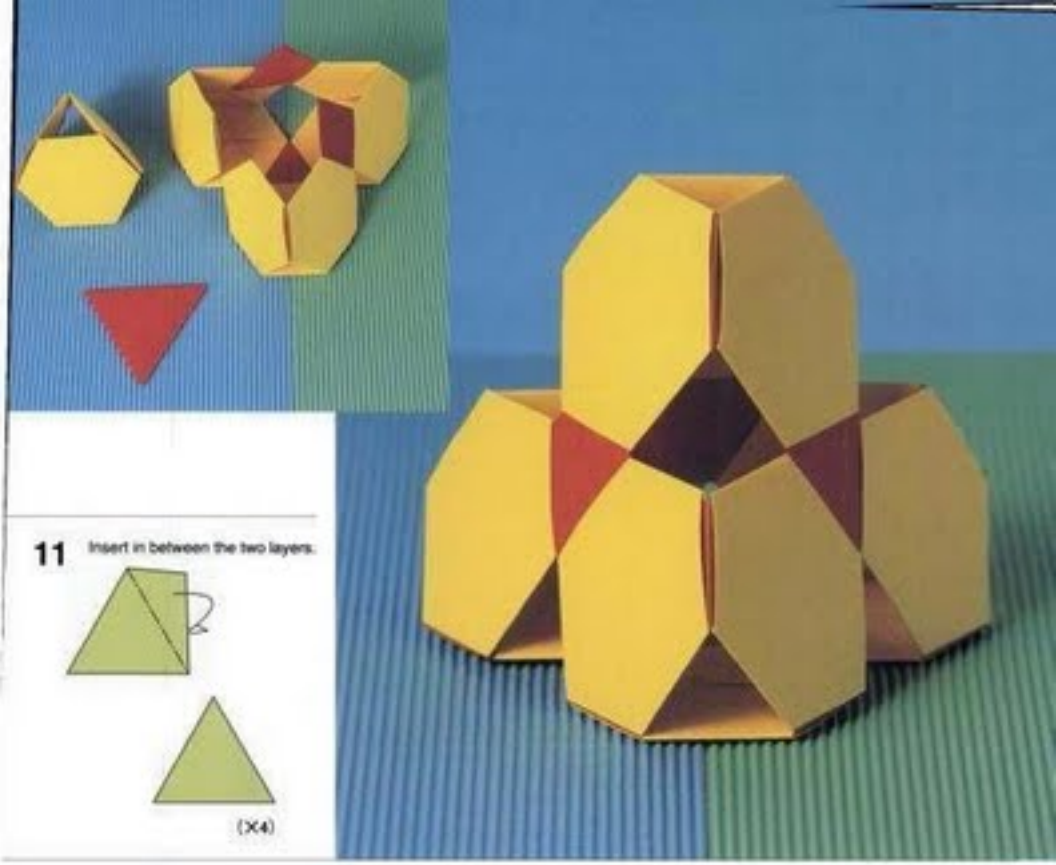
Cut in half.

Fold under into the space between the two layers.

[Assembly Method]

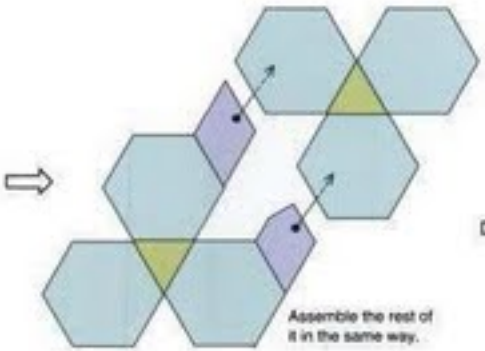


Treat this unit as an equilateral triangle when you assemble the figure.

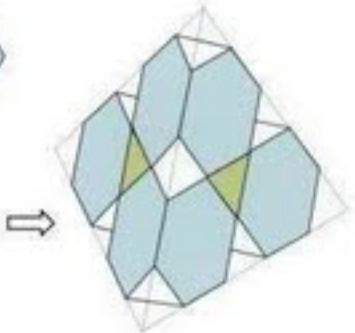


11 Insert in between the two layers.

(×4)



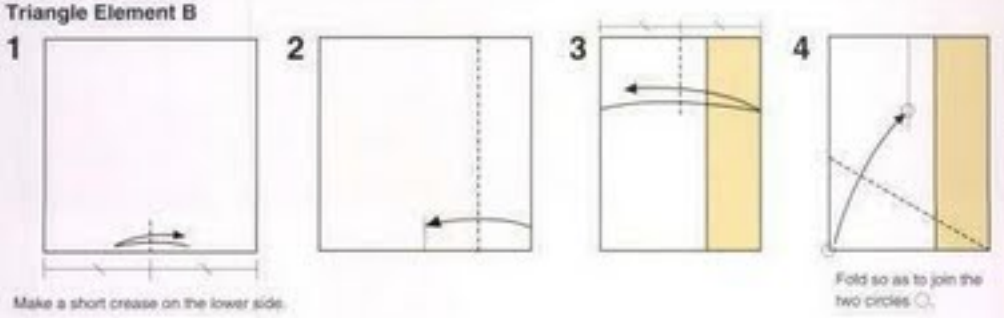
Assemble the rest of it in the same way.

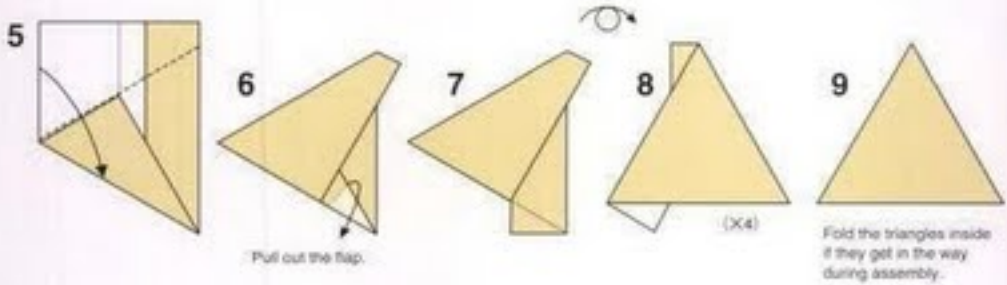


△×4

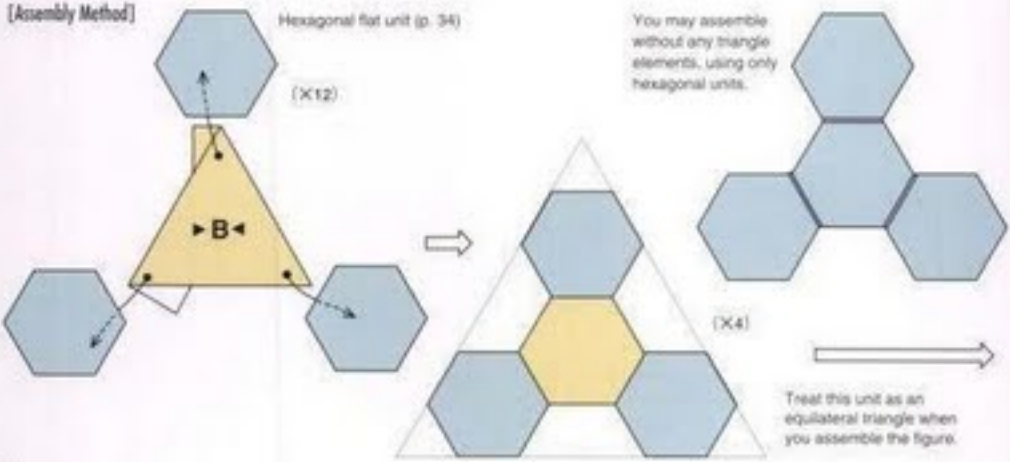
Regular Hexagonal Flat Unit USING 3 POCKETS (2) | level ★ | 12cm×12cm

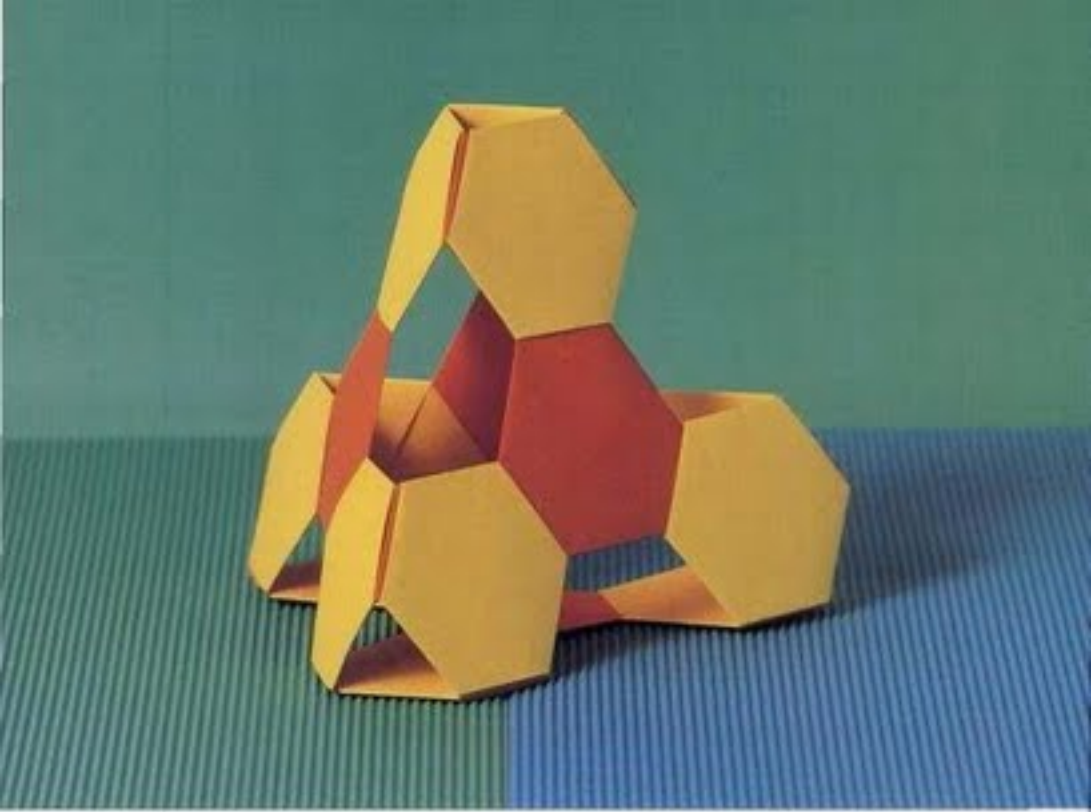
Triangle Element B

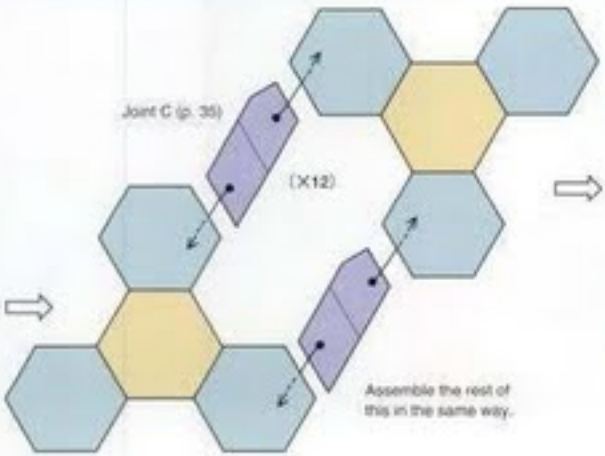


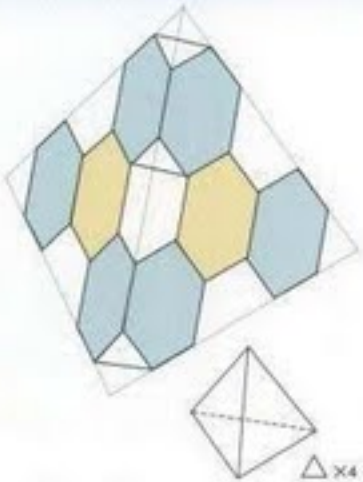


[Assembly Method]





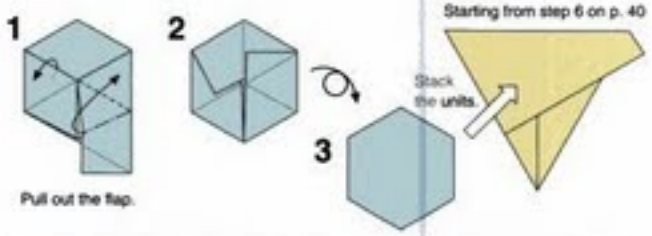


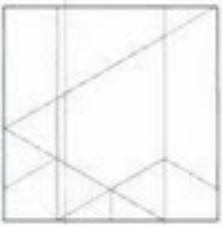


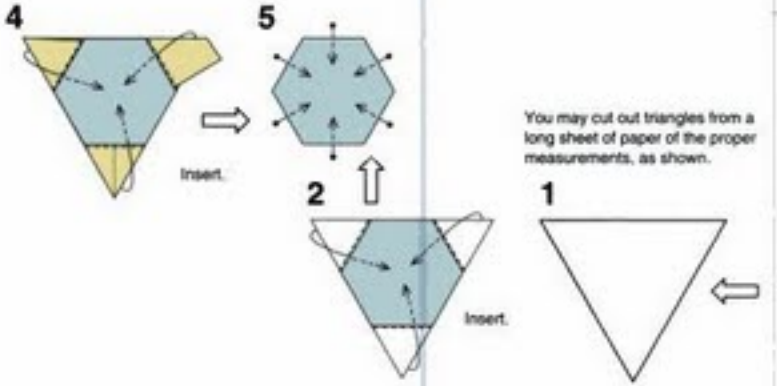
Regular Hexagonal Flat Unit USING 6 POCKETS | level ★★ | 12cm × 12cm

Now you will learn to make structures with two units stacked on top of each other.
Using this unit, you can make the solids shown on pp. 38-41 without windows. You can also use it on p. 36.

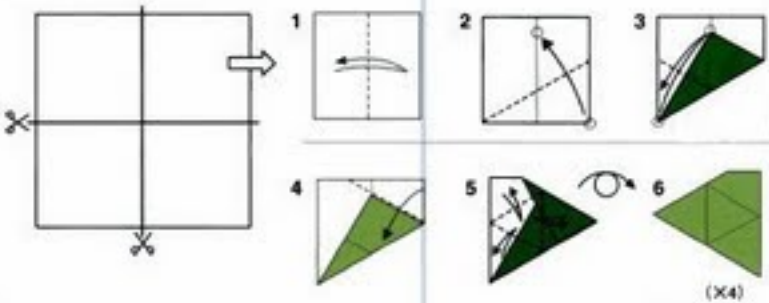
Hexagonal Flat Unit (Simple Form) (Starting from step 16 on p. 35)







Triangle Element C

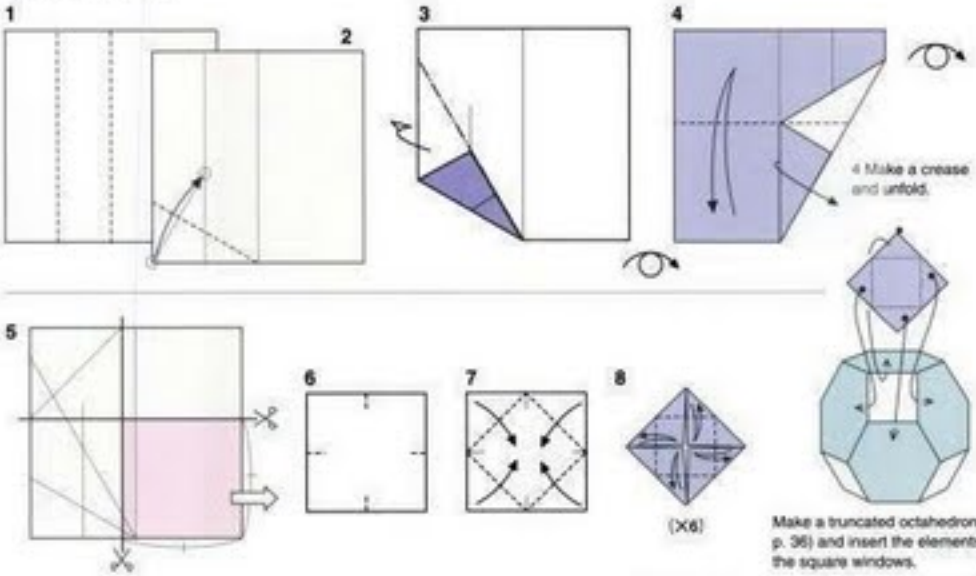


Make a truncated tetrahedron (see p.36) and insert the elements into the triangle windows.

TETRAHEDRON

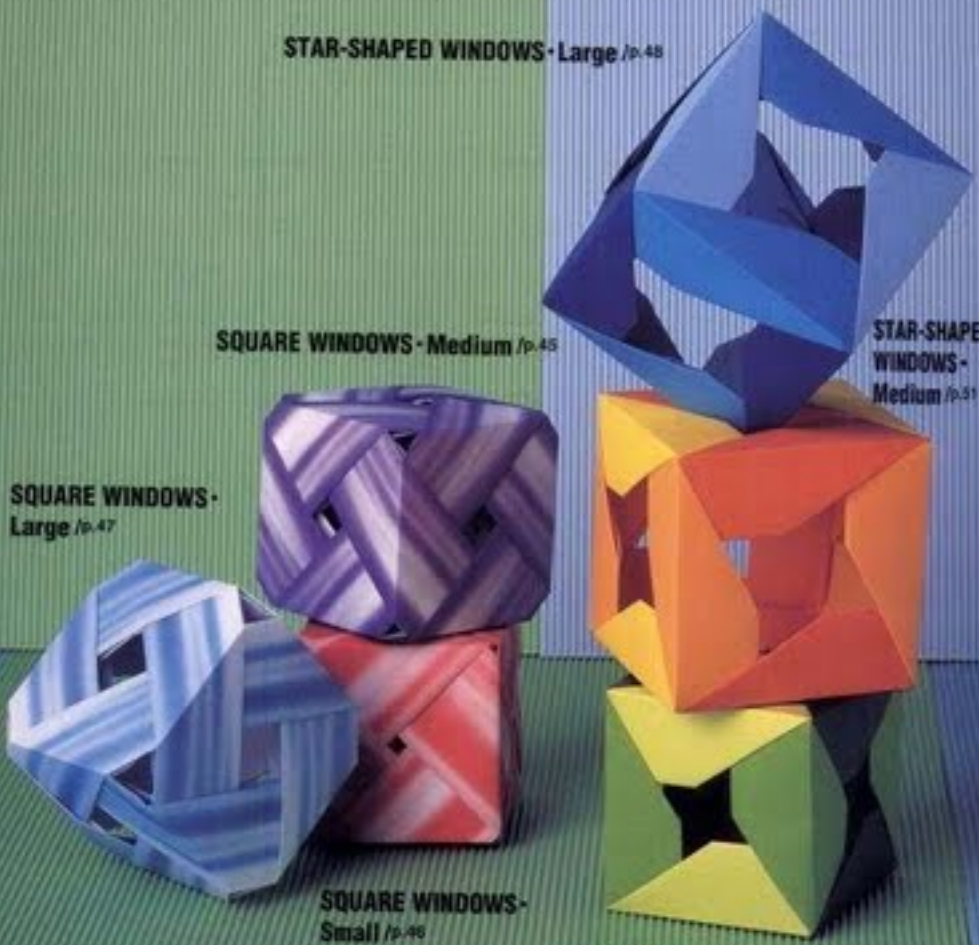
OCTAHEDRON

Square Element



5 EDGE CUBES

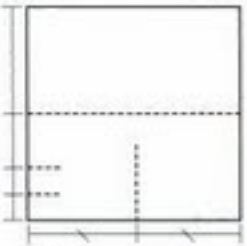
These cubes are assembled by connecting them at twelve places. There are square or star-shaped windows in the middle of each surface. Modifying the folds and measurements changes the cubes and the size of the windows.



Edge Cube SQUARE WINDOWS • Medium | level ★★ | 15cm × 15cm

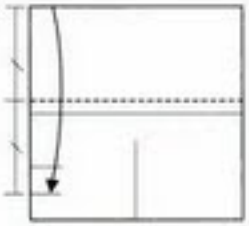
This cube is assembled by joining the sides. Changing the folds and the measurements changes the size of the windows.

1



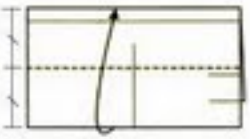
Make creases as shown.

2



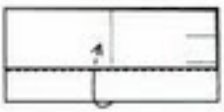
3

4



Align the edges and fold.

5

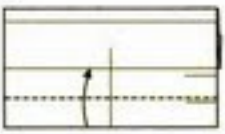


Fold the edge under the flap.

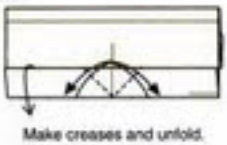
6

Unfold the upper layer.

7

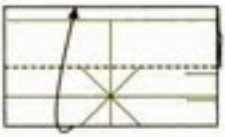


8



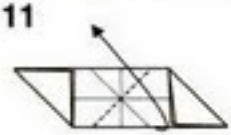
Make creases and unfold.

9



10

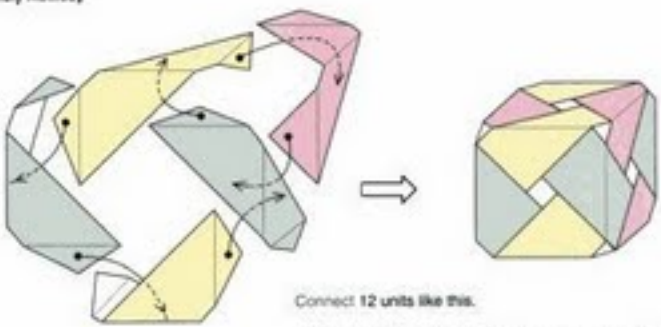
11



12

(×12)

[Assembly Method]



Connect **12 units like this.**

Edge Cube SQUARE WINDOWS・Small

level ★★

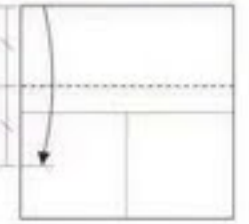
15cm × 15cm

A cube assembled by connecting sides. Changing the folds and the measurements changes the size of the windows.

1

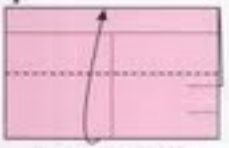
Make creases as shown.

2



3

4



Align edges and fold.

5

Fold under the flap.

6

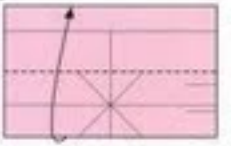
Unfold the upper layer.

7

8

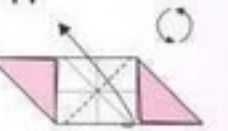
Make creases and unfold.

9



10

11



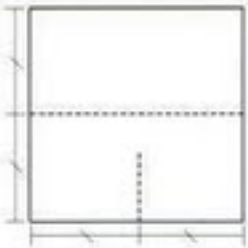
12

(×12)

Assemble in the same way as the medium cube. (p. 45)

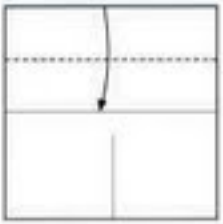
Edge Cube SQUARE WINDOWS · Large | level ★★ | 15cm×15cm

1

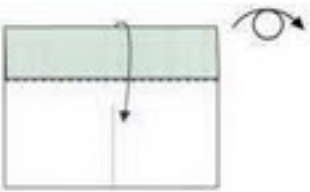


Make creases as shown.

2



3



4

Align the edges and fold.

5

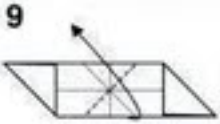
6

Make creases and unfold.

7

8

9



10

(×12)

Assemble in the same way as the medium cube. (p. 45)

Edge Cube STAR-SHAPED WINDOWS • Large

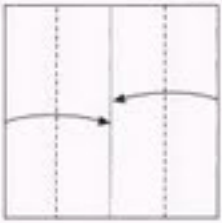
level ★★

12cm × 12cm

A cube with star-shaped windows. Changing the folds and the measurements changes the size of the windows.

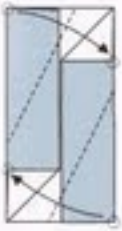
1

2



3

4

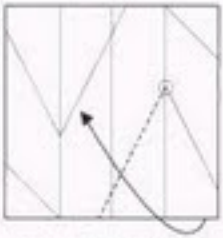


Fold so as to join the two circles ○.

5

Unfold.

6

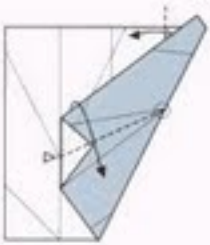


Fold to the place indicated by the circle ○.

7

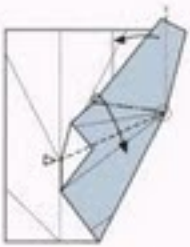
Fold on line (a).

8



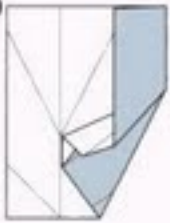
Fold on line between the triangle △ and the circle ○.

9

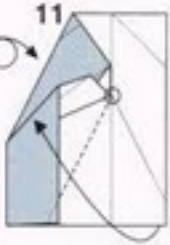


Intermediate form.

10

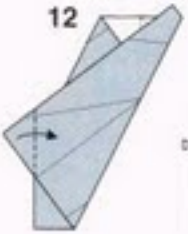


11



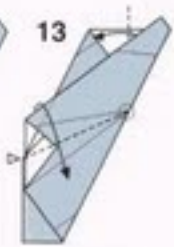
Fold to the place indicated by the circle ○.

12

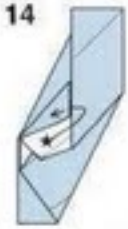


Fold the triangle along the side.

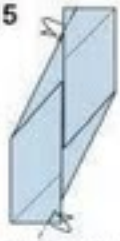
13



Fold a crease between the triangle △ and the circle ○.

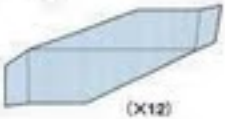


Tuck the tab marked with a star ★ inside the folds.



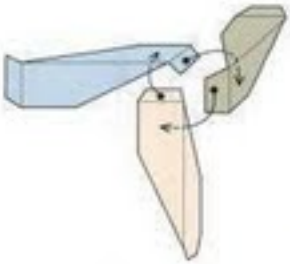
Fold the corner inward.

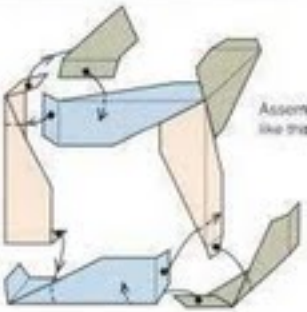
Unfold.



(×12)

[Assembly Method]





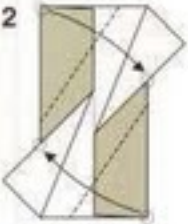
Assemble 12 units like this.

Edge Cube STAR-SHAPED WINDOWS • Small | level ★★ | 12cm × 12cm

From step 4 on p. 48

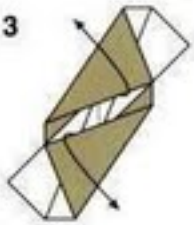
1

2



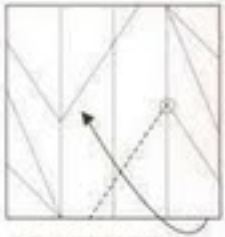
Fold so as to join the two circles ○.

3



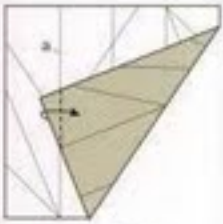
Unfold.

4



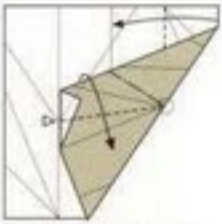
Fold to the place indicated by the circle ○.

5



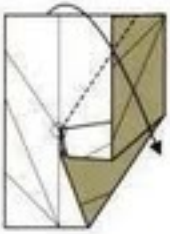
Fold on line (a).

6

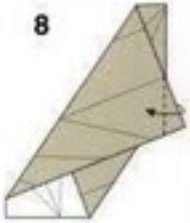


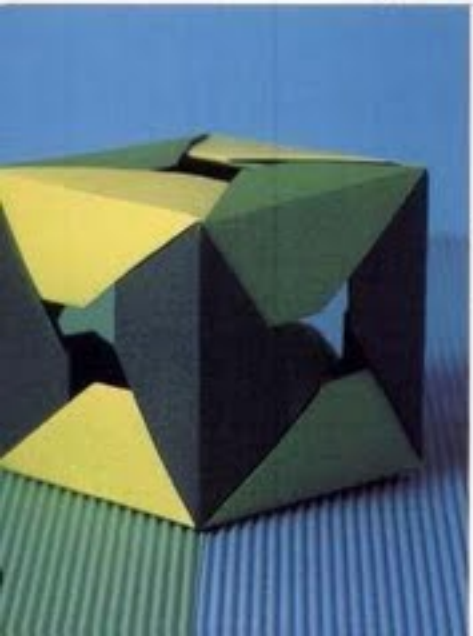
Fold on line between the triangle △ and the circle ○.

7

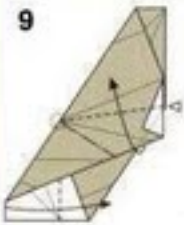


8





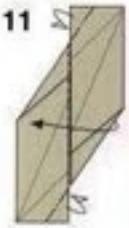
9



10

Tuck the tab marked with a star ★ inside the folds.

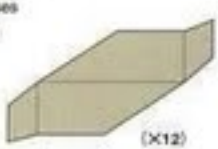
11



12

Make creases and unfold.

13



(×12)

Assemble in the same way as the large cube (p. 49)

Edge Cube STAR-SHAPED WINDOWS • Medium | level ★★ | 12cm × 12cm

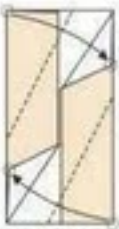
Starting from step 3 on p. 48.

1

2

3

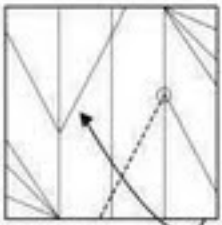
4



Fold so as to join the two circles ○.

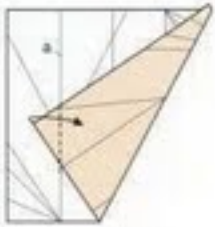
5

6



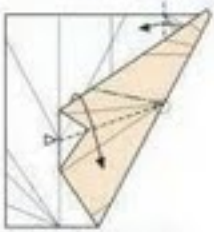
Fold to the place indicated by the circle ○.

7



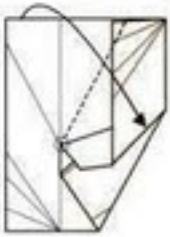
Fold on line (a).

8

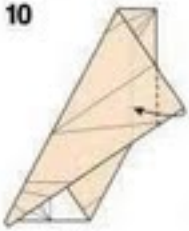


Fold on line between the triangle △ and the circle ○.

9

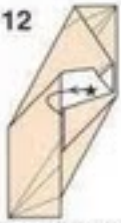


10



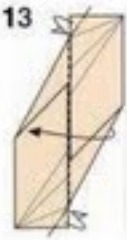
11

12



Tuck the tab marked with a star ★ inside the folds.

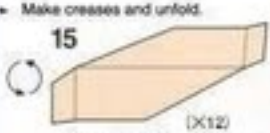
13



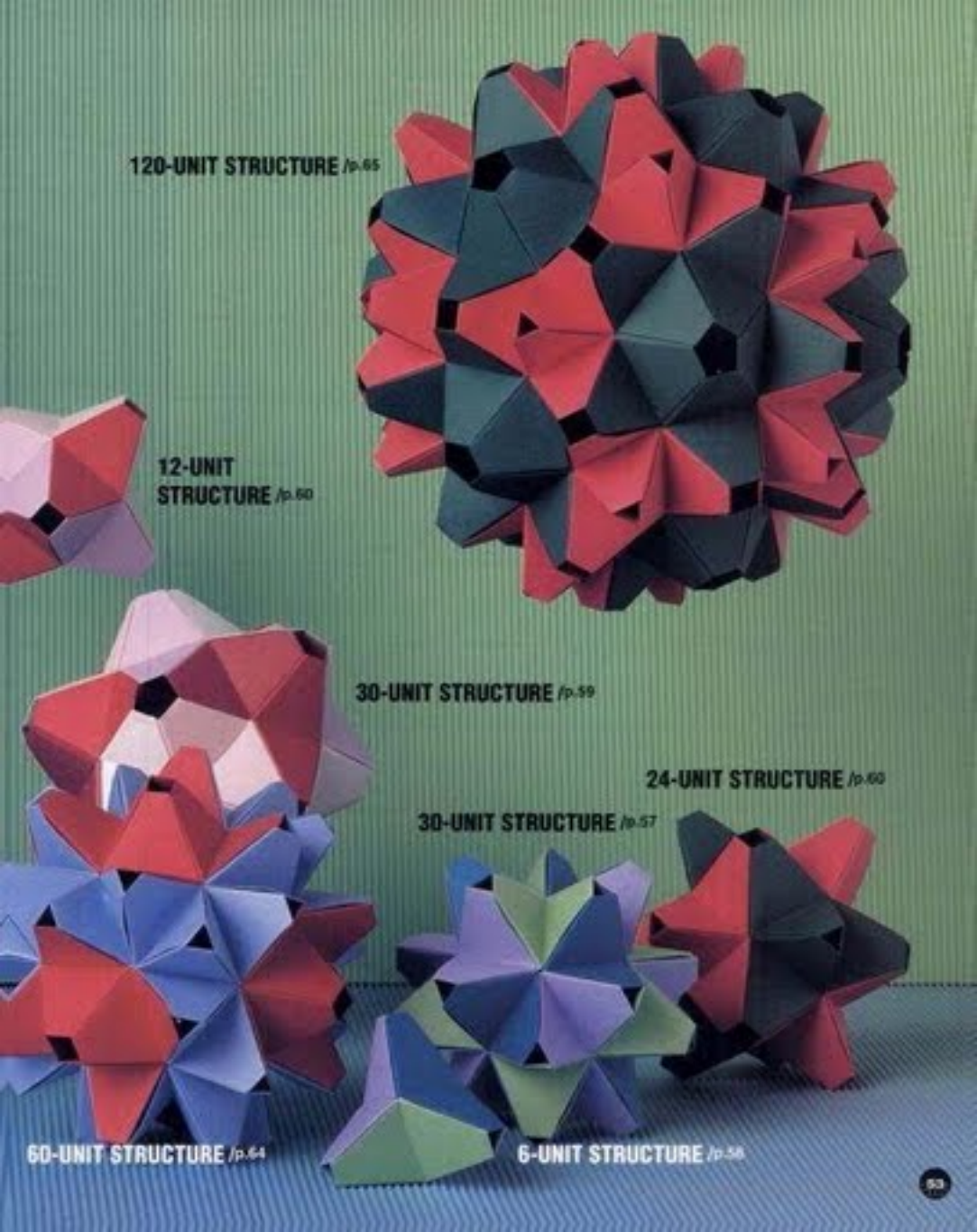
14

Make creases and unfold.

15



Assemble in the same way as the large cube (p. 49)


120-UNIT STRUCTURE /p.65
12-UNIT STRUCTURE /p.60
30-UNIT STRUCTURE /p.59
24-UNIT STRUCTURE /p.60
30-UNIT STRUCTURE /p.57
60-UNIT STRUCTURE /p.64
6-UNIT STRUCTURE /p.56

HINT ON ASSEMBLY 2

Regular Tetrahedron

△×4

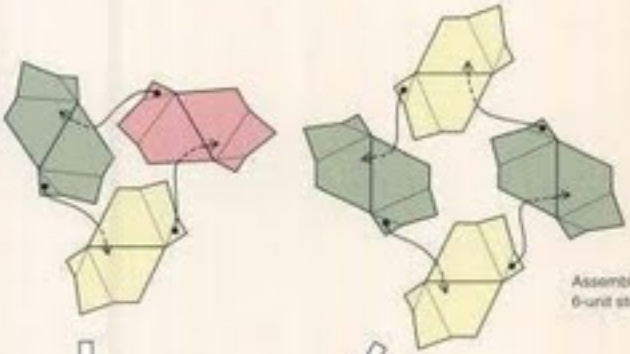
Cube

□×6

Cuboctahedron

△×8 □×6

The bottom of each pyramidal unit has a different shape as shown below. You can use them to assemble various kinds of solids. Let's look at a regular tetrahedron, for example. The regular tetrahedron consists of 4 equilateral triangles. So you need to make a 3-unit structure, and put it together so that it has 4 triangular pyramids.
The next example is a cube consisting of 6 squares. So make a 4-unit structure, and put it together so that it has 6 square pyramids.
When combining different shapes, begin with the smallest structure, although there may be cases in which you follow a different order. If you intend to make a cuboctahedron, begin with a 3-unit structure. Make it the core, and enlarge it by connecting the units one by one.

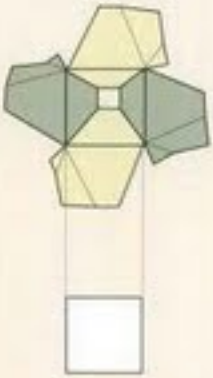


Assemble the 5-unit structure and the 6-unit structure in the same way.

3-unit structure

Equilateral Triangle
(triangular pyramid)

4-unit structure

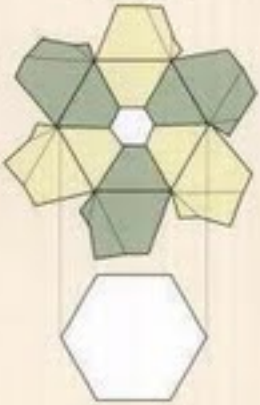


Square
(square pyramid)

5-unit structure

Regular Pentagon
(pentagonal pyramid)

6-unit structure

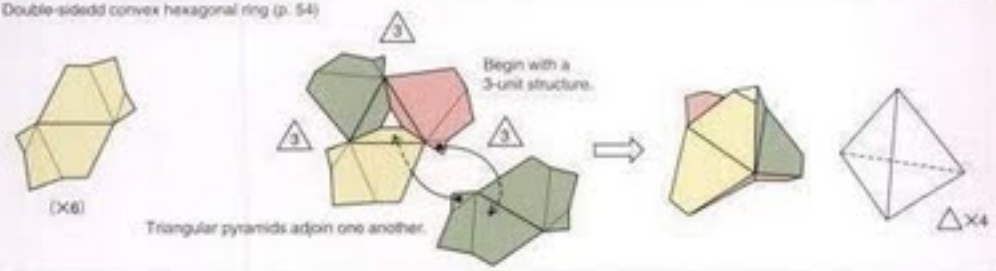


Regular Hexagon
(hexagonal pyramid)

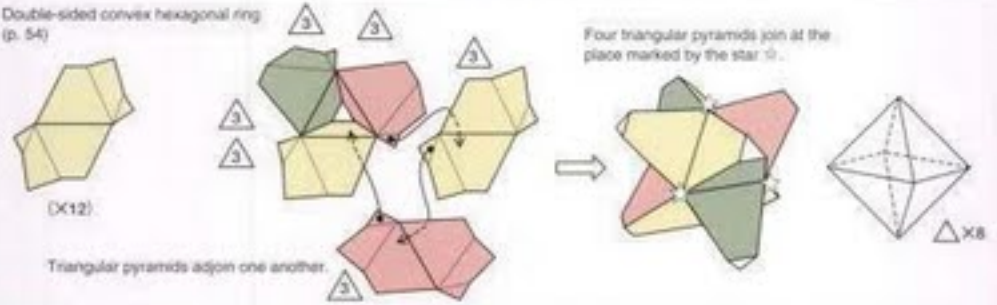
6-UNIT STRUCTURE Regular Tetrahedron, 12-UNIT STRUCTURE Octahedron

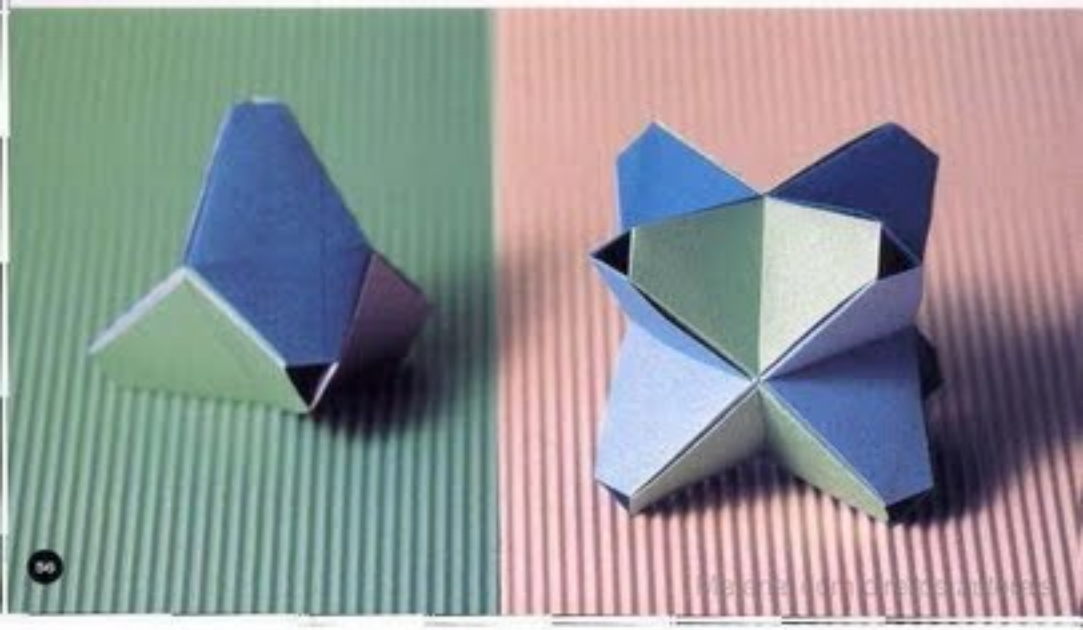
level ★ | 12cm×6cm

Double-sidedd convex hexagonal ring (p. 54)



Double-sided convex hexagonal ring (p. 54)



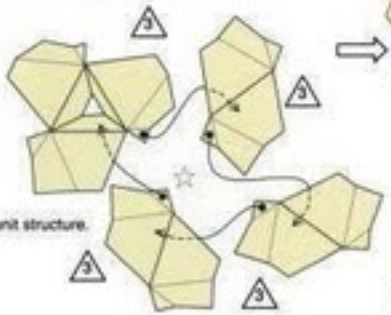


30-UNIT STRUCTURE Regular Icosahedron | level ★★ | 12cm×6cm

Double-sided convex hexagonal ring (p. 54)

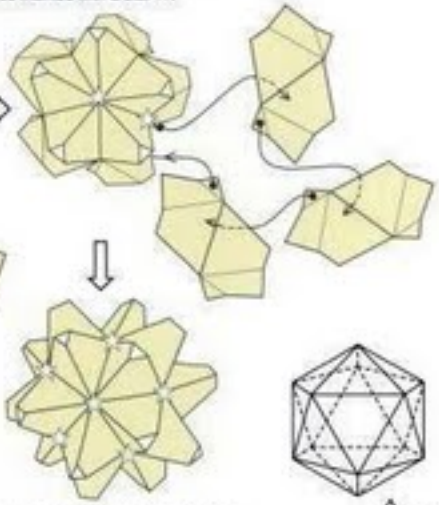
[×30]

Make 5 triangular pyramids centered around the place marked with a star ☆.



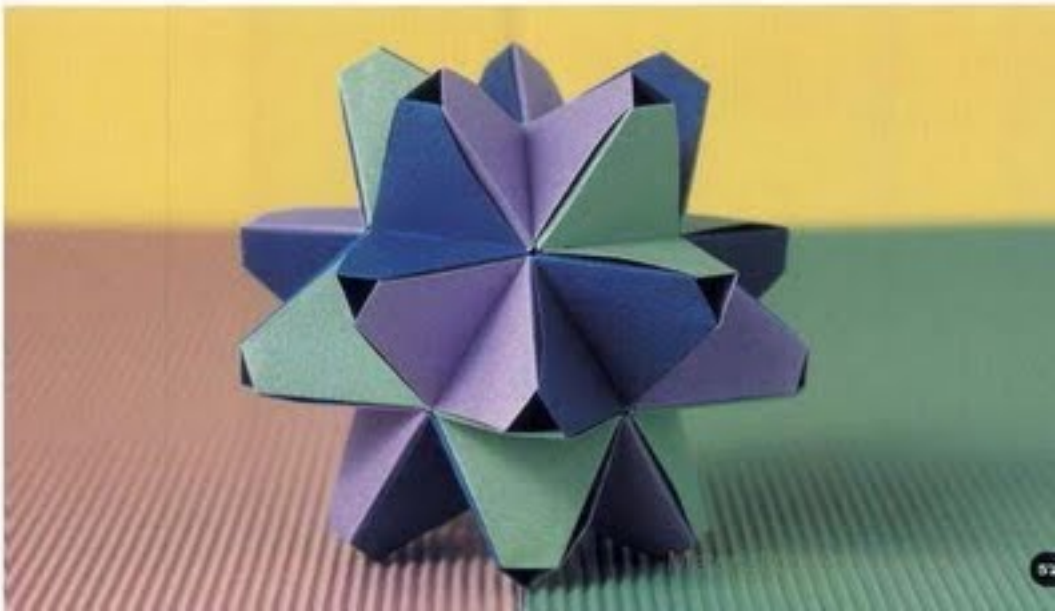
Begin with a 3-unit structure.

Five triangular pyramids join at the place marked with a star ☆.



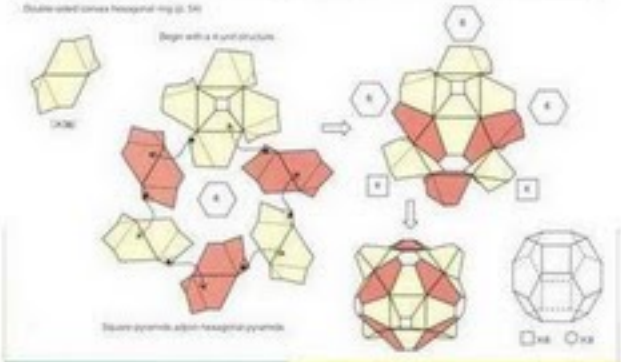
Five triangular pyramids join at the place marked with a star ☆.

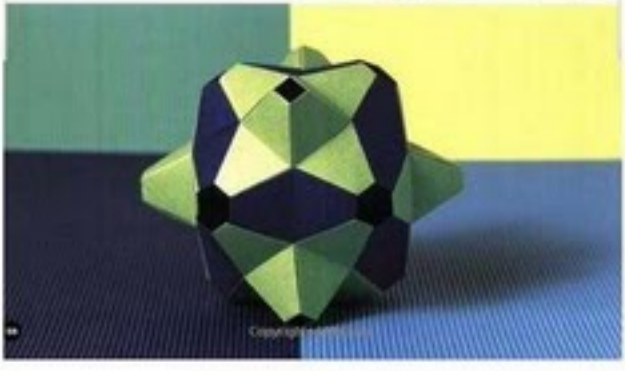
△×20



36-UNIT STRUCTURE Truncated Octahedron | level ★★

12cm × 6cm

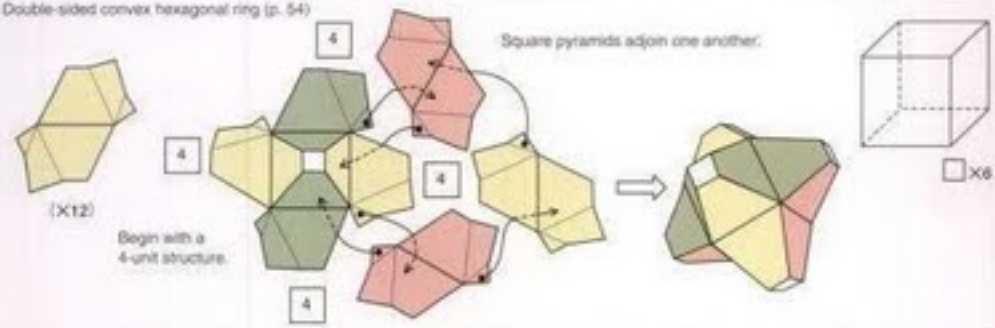




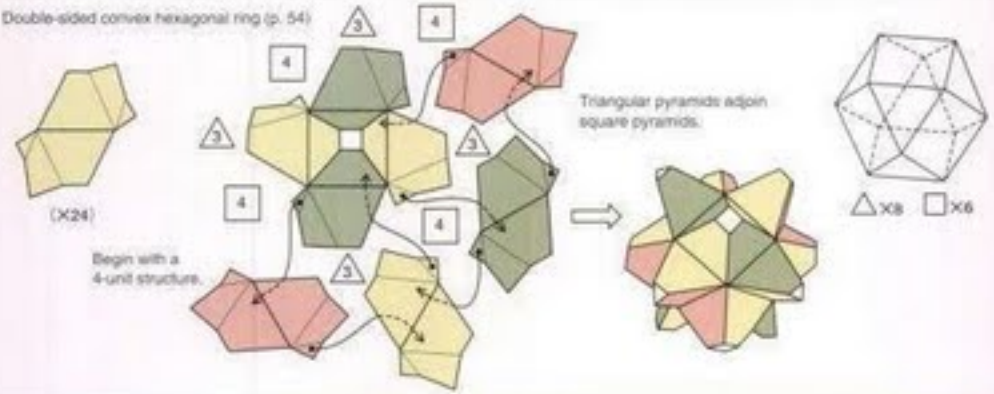
12-UNIT STRUCTURE Cube, 24-UNIT STRUCTURE Cuboctahedron

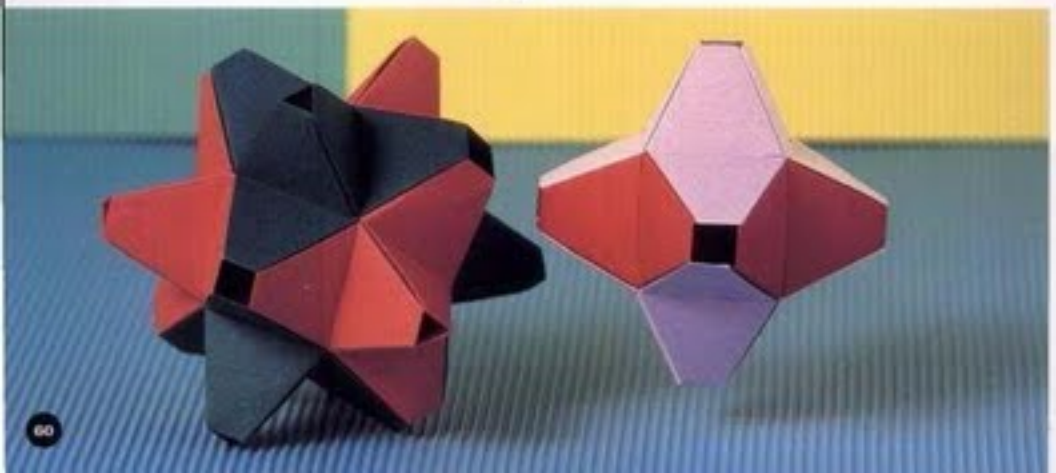
level ★ | 12cm×6cm

Double-sided convex hexagonal ring (p. 54)



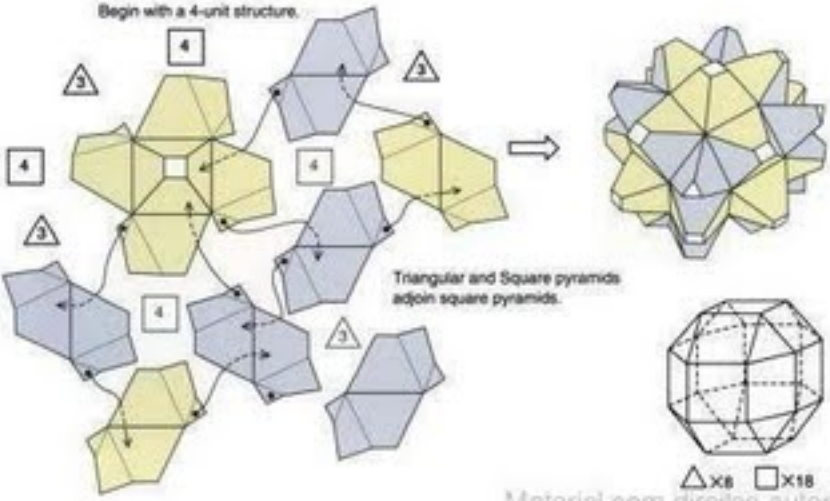
Double-sided convex hexagonal ring (p. 54)





48-UNIT STRUCTURE Rhombic Cuboctahedron | level ★★ | 12cm×6cm

Double-sided convex hexagonal ring (p. 54)

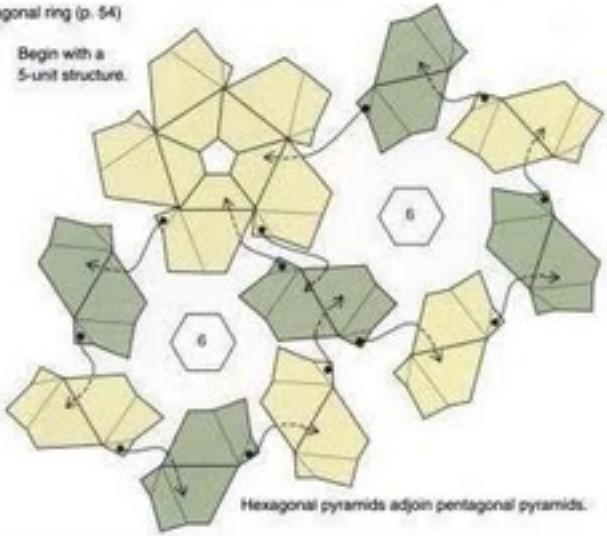


90-UNIT STRUCTURE Truncated Icosahedron | level ★★ | 12cm×6cm

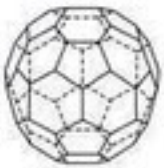
Double-sided convex hexagonal ring (p. 54)

(×90)

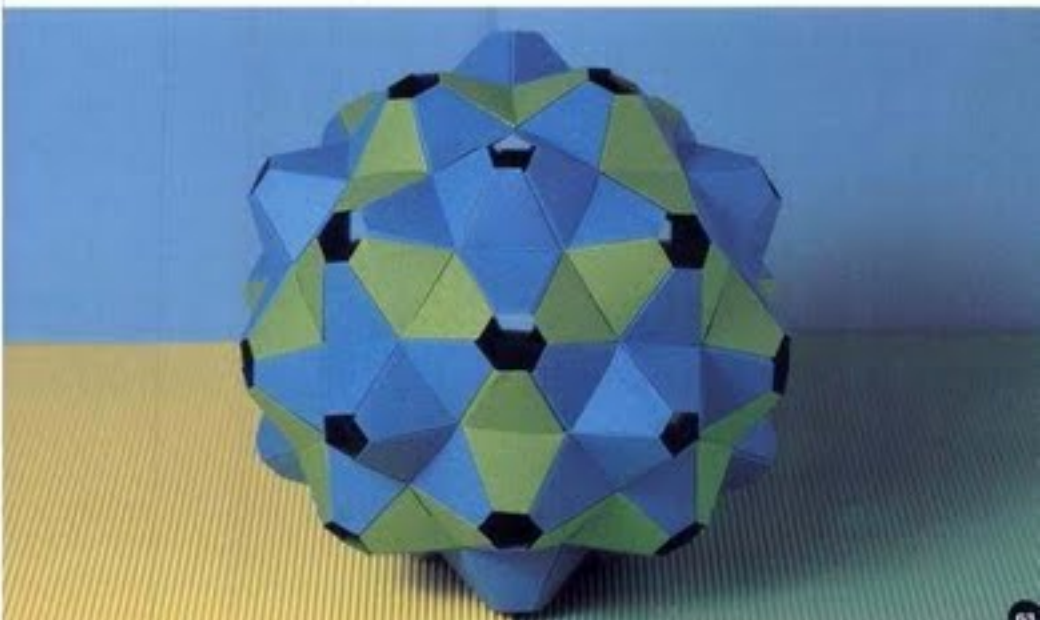
Begin with a 5-unit structure.



Hexagonal pyramids adjoin pentagonal pyramids.



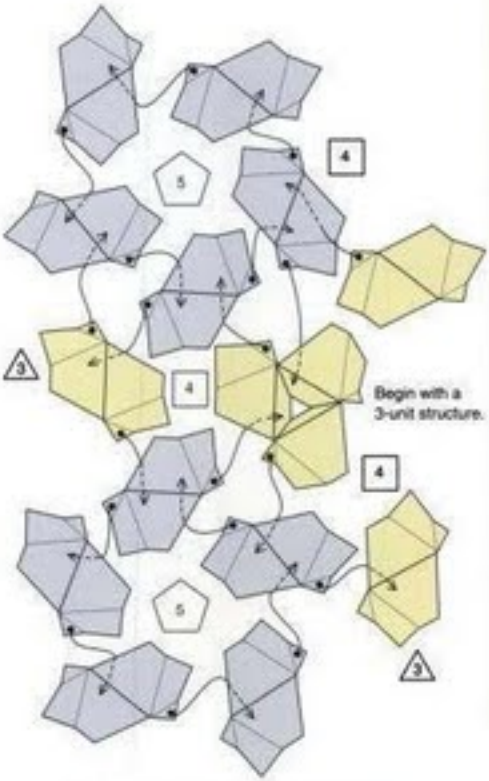
⬠×12 ⬡×20



120-UNIT STRUCTURE Rhombic Icosahedron/Dodecahedron | level ★★★ | 12cm×6cm

Double-sided convex hexagonal ring (p. 54)

(×120)

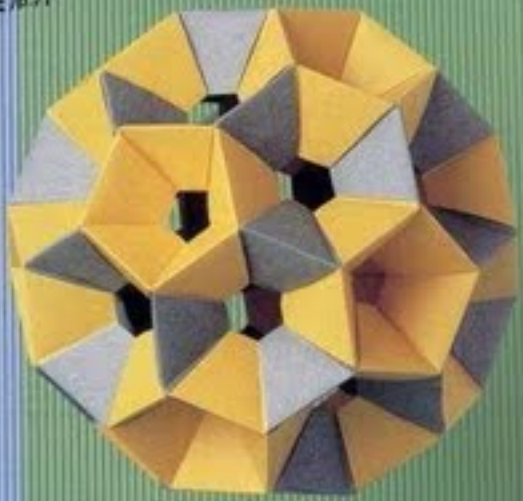


The sides that adjoin the pentagon are square.
The sides that adjoin the triangle are square.

△ ×20
□ ×30
⬠ ×12

90-UNIT STRUCTURE /p.75

30-UNIT STRUCTURE /p.71



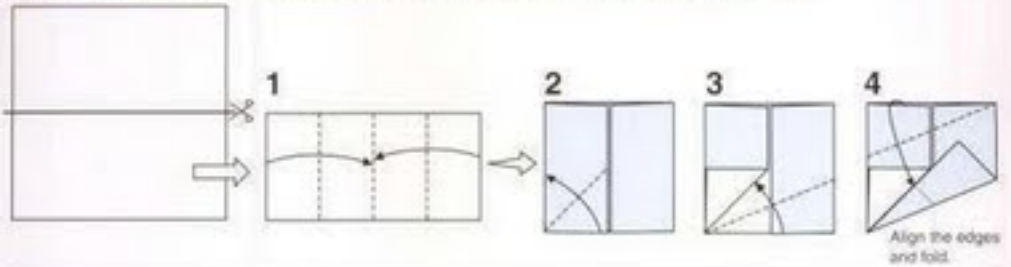
36-UNIT STRUCTURE /p.72

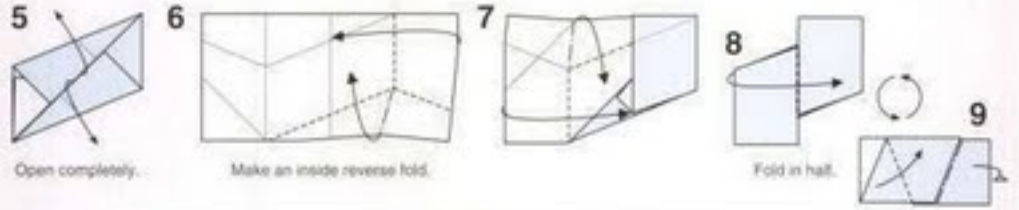
36-UNIT STRUCTURE /p.70

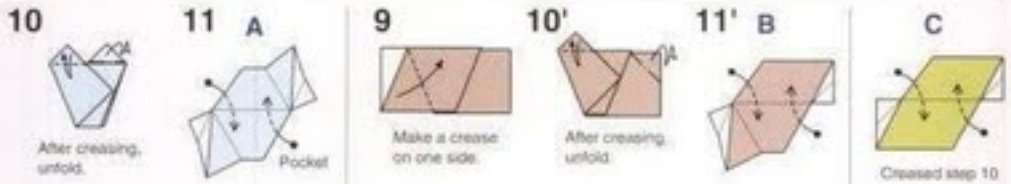
DOUBLE-SIDED CONCAVE HEXAGONAL RING SOLID

level ★ 12cm × 16cm

The structure is the same as that of the double-sided convex hexagonal ring solid. However, you use a different folding method when assembling it in order to hide the extra lines. The finished works are sturdy, so glue is not necessary. Unit B, which is used in some structures, has a crease only on one side.

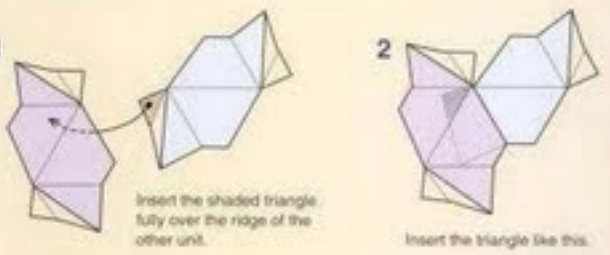






HINT ON ASSEMBLY 1

Take special note of the small triangle (shaded) in step 10. This triangle hooks firmly and makes the unit sturdy.

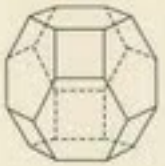


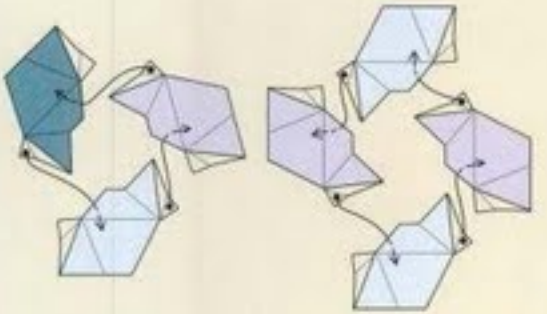
HINT ON ASSEMBLY 2

As is seen in the figures, the units are indented along the ridges. You can assemble various kinds of solids by making use of them.
One example is a truncated octahedron. It consists of squares and hexagons.

First, make 4-unit structures and put them together so that the hexagons are connected adjoin around the square indentation.
Begin with the smallest structure (a 4-unit structure in this case). Make it the core, and expand it by connecting additional units one by one.

Truncated Octahedron





Assemble 5-unit and 6-unit structures in the same fashion.

3-unit structure

Equilateral Triangle
(Triangular indentation)

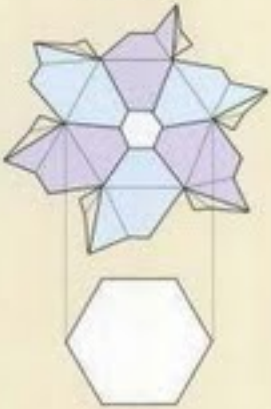
4-unit structure

Square
(Square indentation)

5-unit structure

Regular Pentagon
(Pentagonal indentation)

6-unit structure

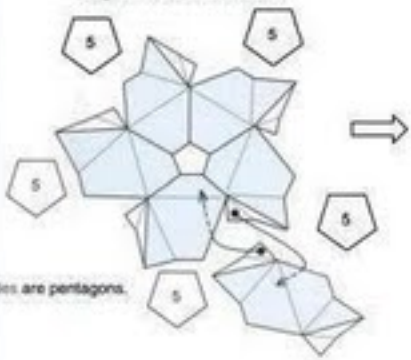


Regular Hexagon
(Hexagonal indentation)

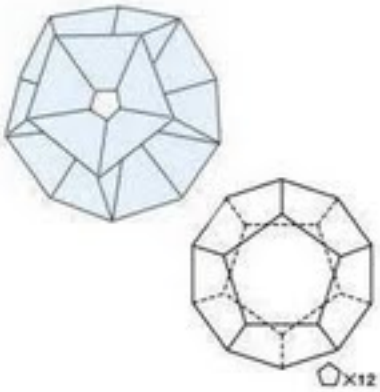
30-UNIT STRUCTURE Regular Dodecahedron | level ★★ | 12cm×6cm

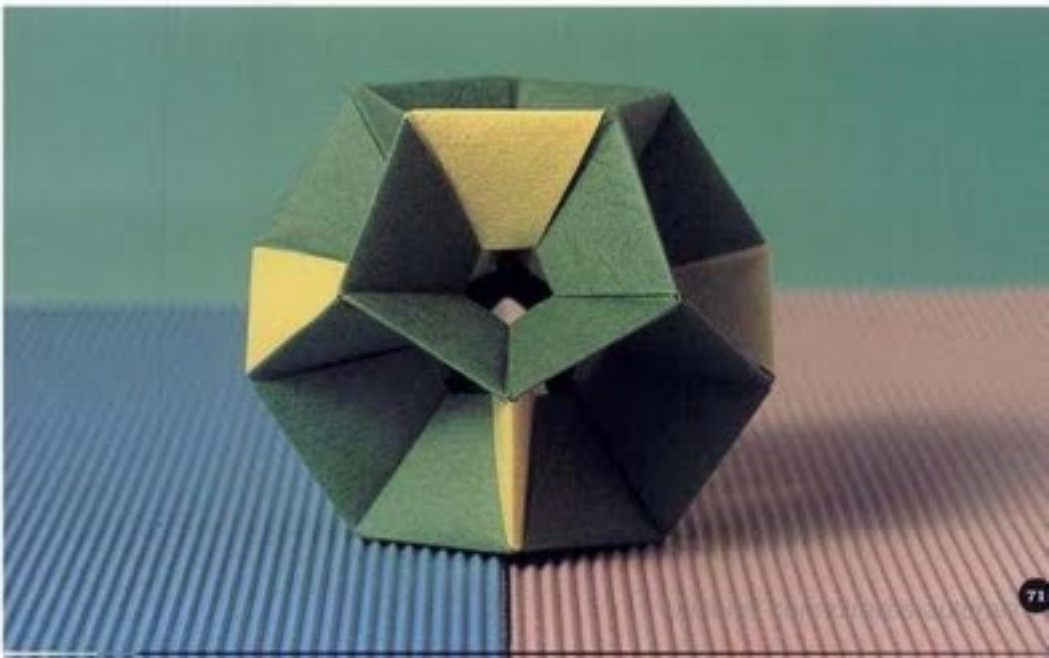
Double-sided concave hexagonal ring (p.68)

Begin with a 5-unit structure.



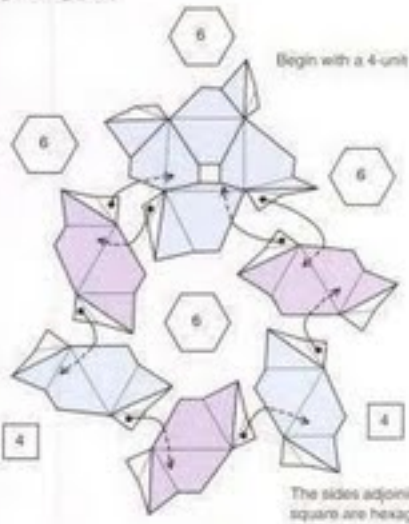
The adjoining sides **are pentagons.**

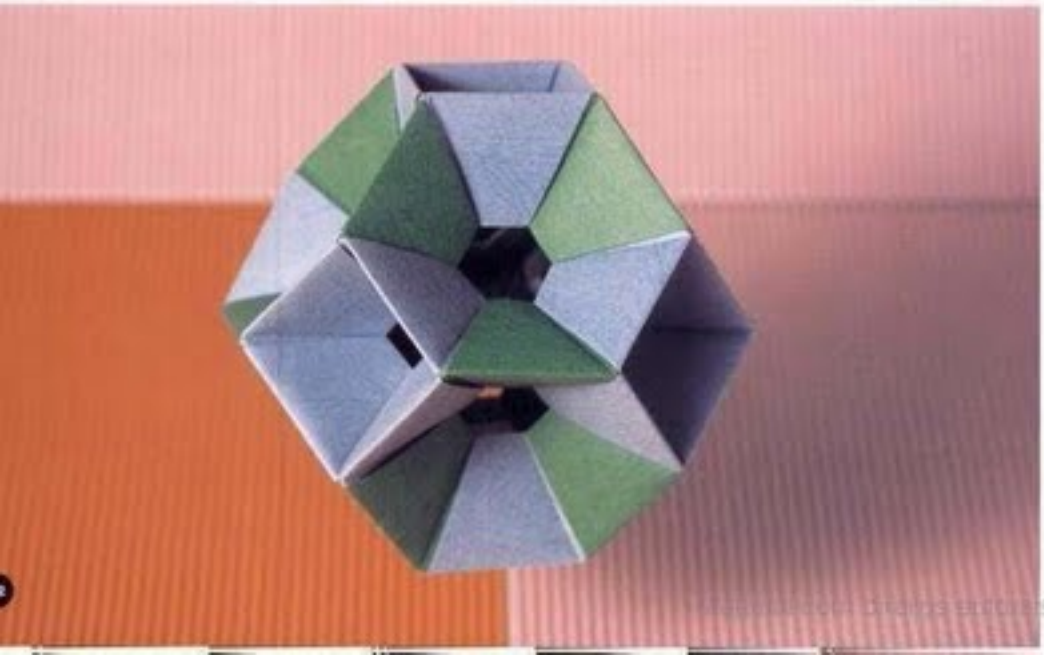




36-UNIT STRUCTURE Truncated Octahedron | level ★★ | 12cm×6cm

Double-sided concave hexagonal ring (p.66)



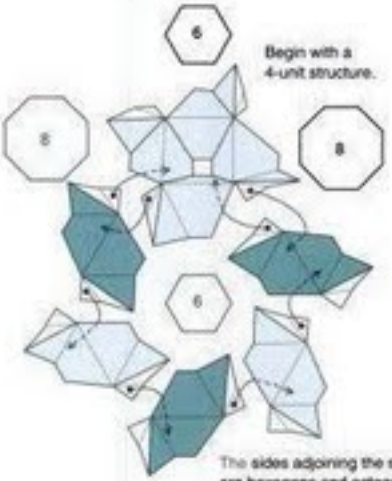


72-UNIT STRUCTURE Rhombic Truncated Octahedron

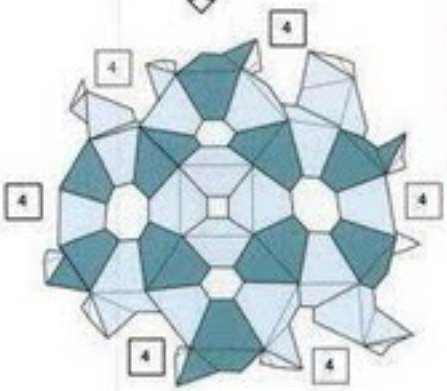
level ★★

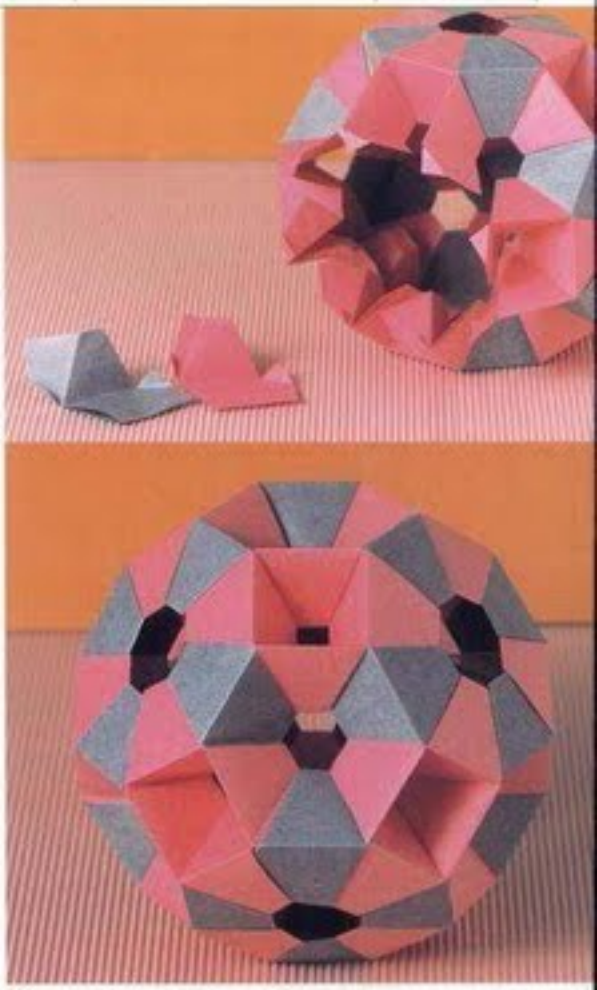
12cm×6cm

Double-sided concave hexagonal ring (p.68)



The sides adjoining the square are hexagons and octagons.





□ ×12
○ ×8
○ ×6

60-UNIT STRUCTURE Icosahedron/Dodecahedron

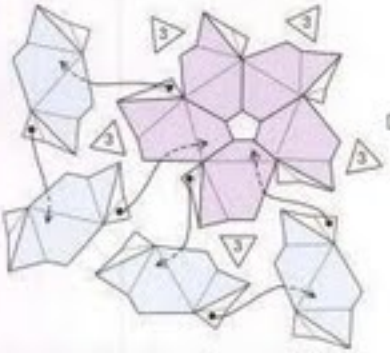
level ★★

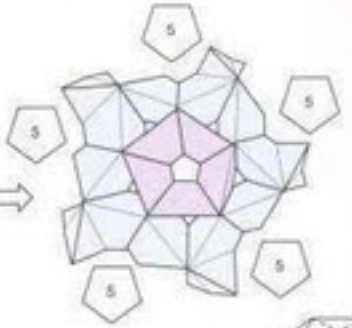
12cm×6cm

Double-sided concave hexagonal ring (p.68)

(×60)

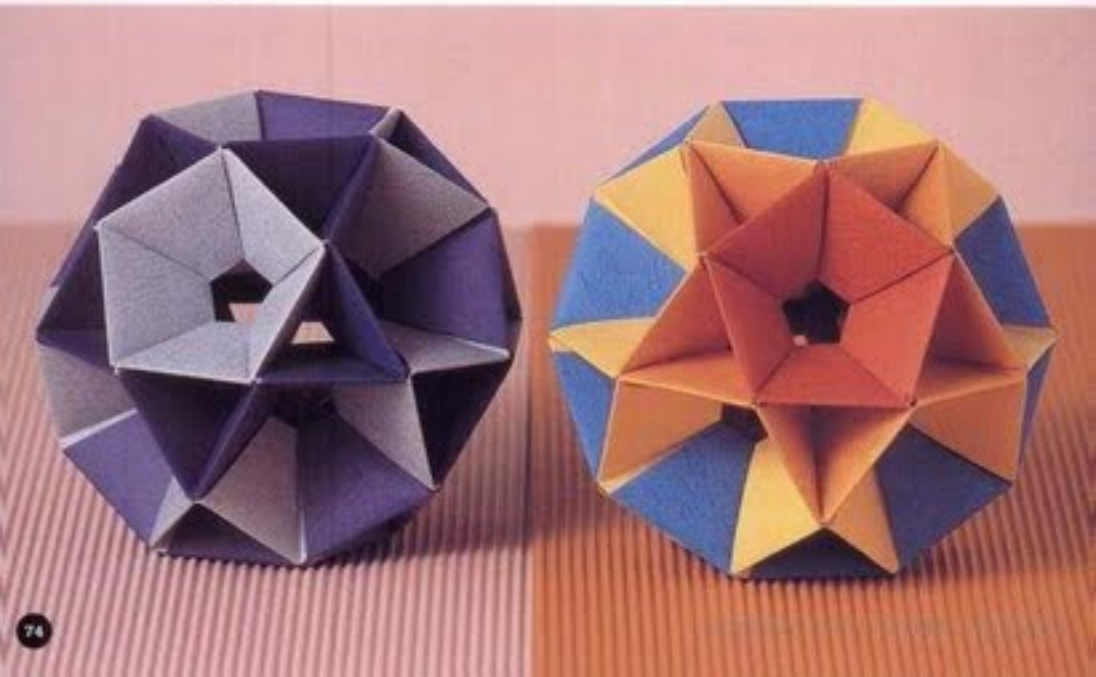
Begin with a 5-unit structure.





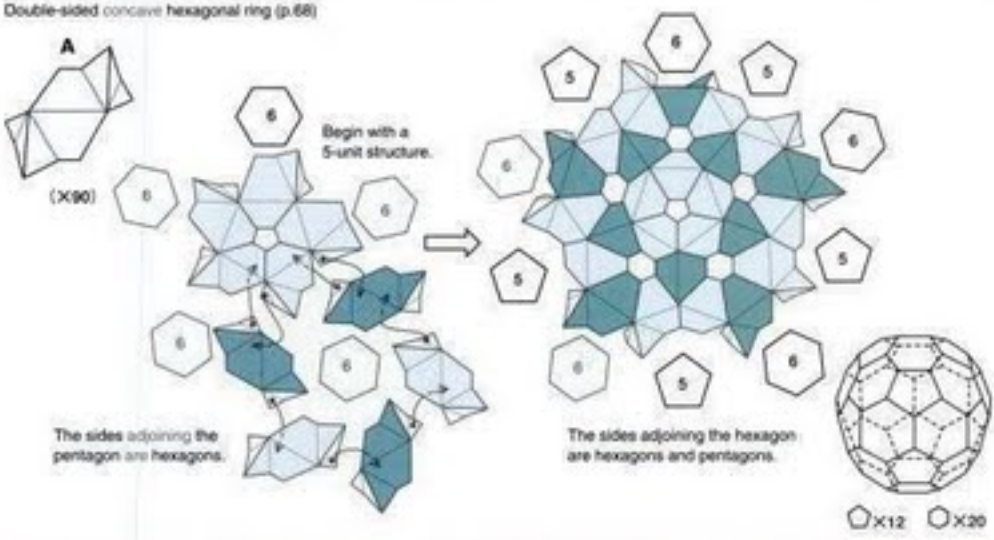
The sides adjoining the pentagon are triangles.

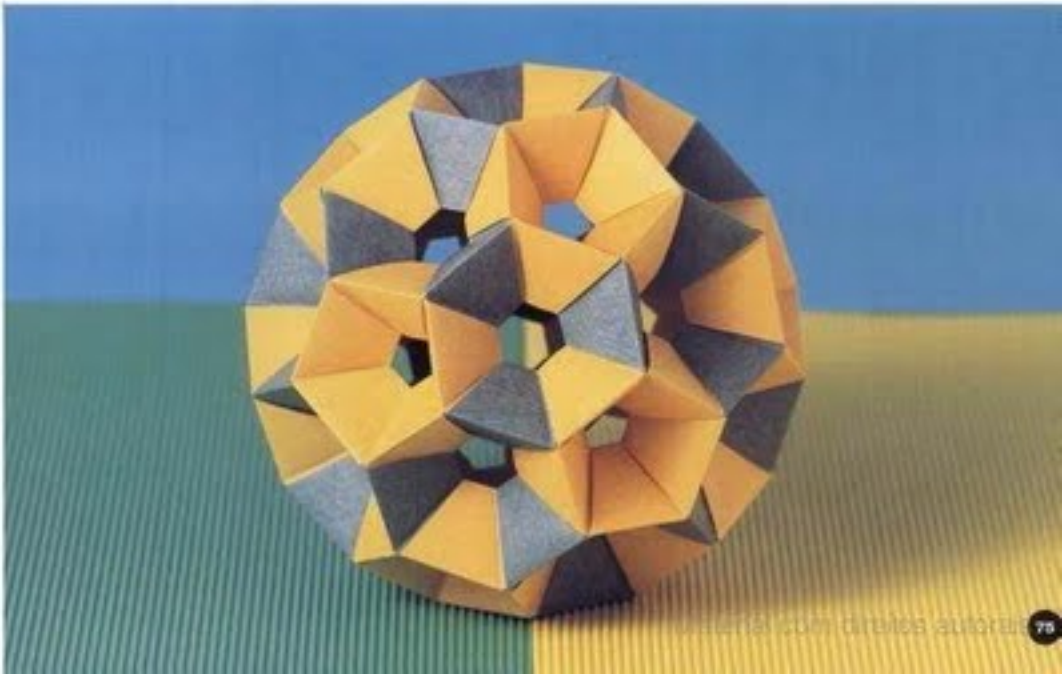
△×20 ⬠×12



90-UNIT STRUCTURE Truncated Icosahedron | level ★★ | 12cm×6cm

Double-sided concave hexagonal ring (p.68)

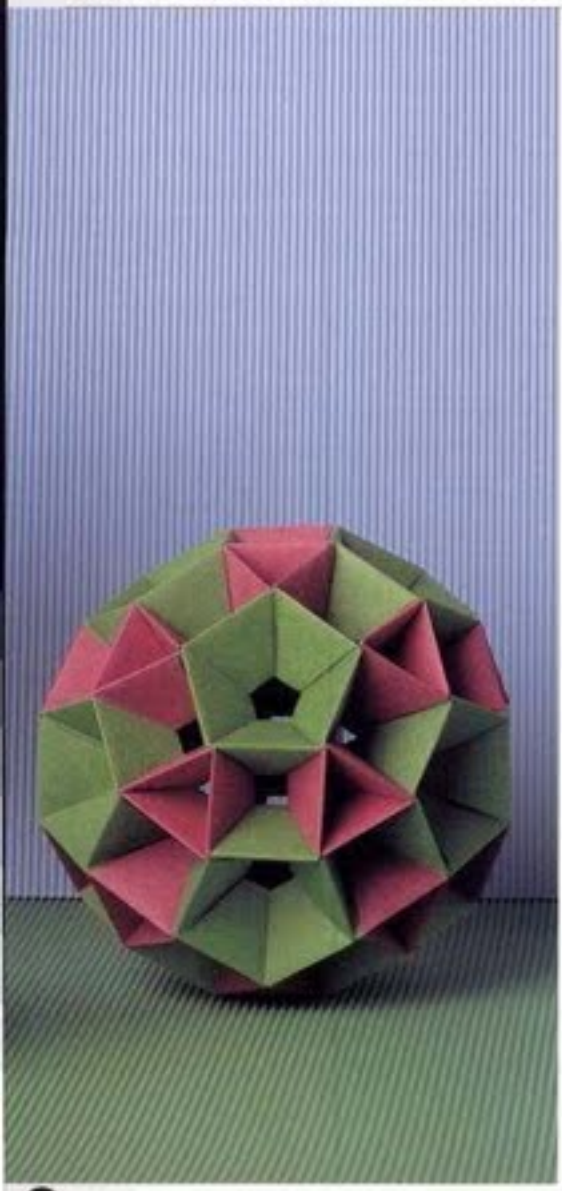




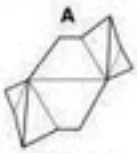
120-UNIT STRUCTURE Rhombic Icosahedron/Dodecahedron

level ★★★

12cm×6cm



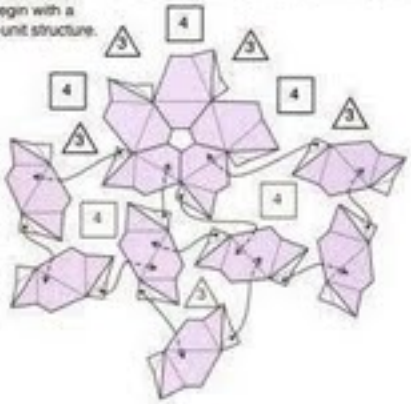
Double-sided concave hexagonal ring (p.68)



(×120)

The sides adjoining the pentagon are squares.
The sides adjoining the triangle are squares.

Begin with a 5-unit structure.



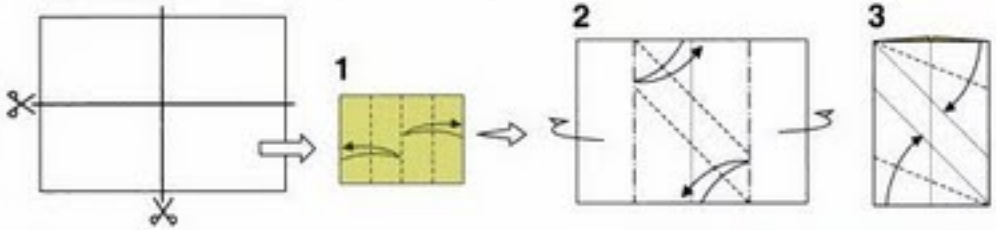
△×20 □×30 ⬠×12

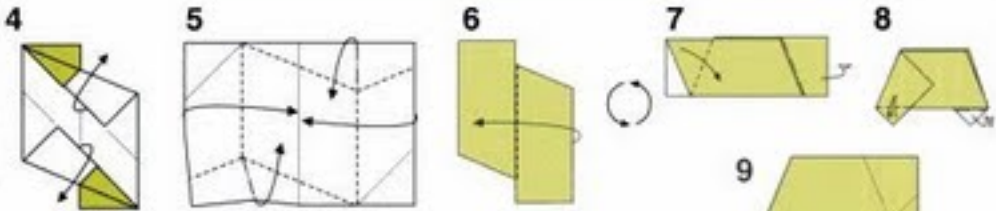
Double-sided Hexagonal Rings FROM DIFFERENT SIZES OF PAPER | level ★

**It is possible to fold double-sided convex and concave units from A4 (210 x 297 mm) or B5 (182 x 257 mm) paper.
In that case, you end up with larger windows.
If you fold using square paper, the windows end up being too large and make the unit fragile.**

A4 (210 x 297 mm) or
B5 (182 x 257 mm)

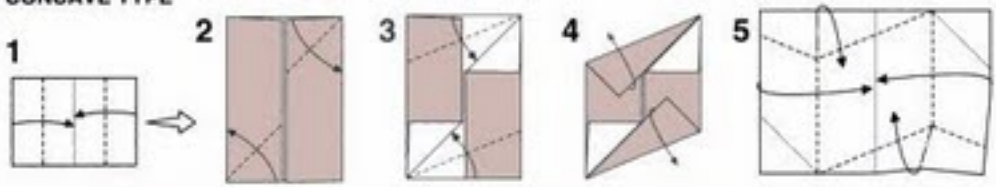
CONVEX TYPE

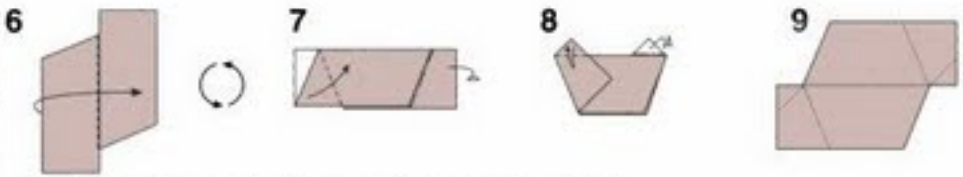




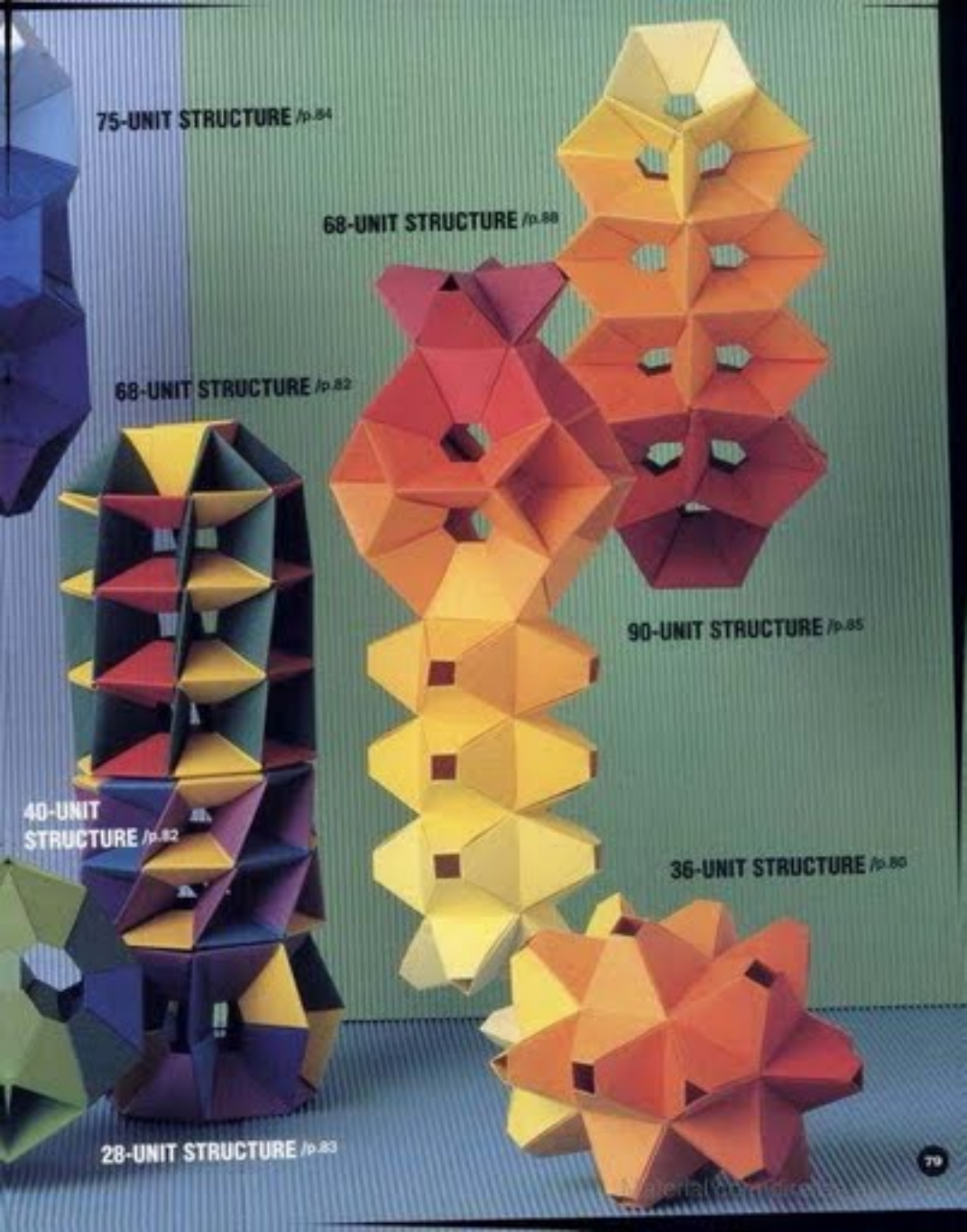
The assembly method is the same as that of the double-sided convex hexagonal ring (p. 56 – p. 65).

CONCAVE TYPE





The assembly method is the same as that of double-sided concave solids (p. 69 – p. 76).


75-UNIT STRUCTURE /p.84
68-UNIT STRUCTURE /p.88
68-UNIT STRUCTURE /p.82
90-UNIT STRUCTURE /p.85
40-UNIT STRUCTURE /p.82
36-UNIT STRUCTURE /p.80
28-UNIT STRUCTURE /p.83

Various Methods of Assembling Double-sided Convex Hexagonal Ring

36-UNIT STRUCTURE

level ★★

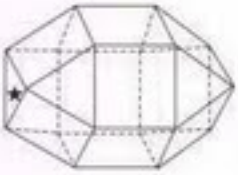
12cm×6cm

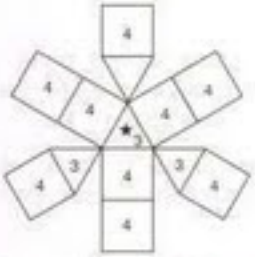
Double-sided convex hexagonal ring (p. 54)

(×36)

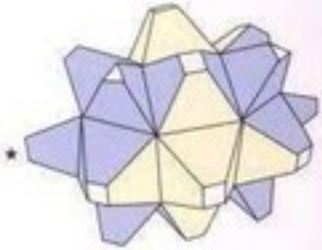
You can assemble the double-sided hexagonal ring in shapes other than a ball. See how many kinds of structures you can assemble using convex units.

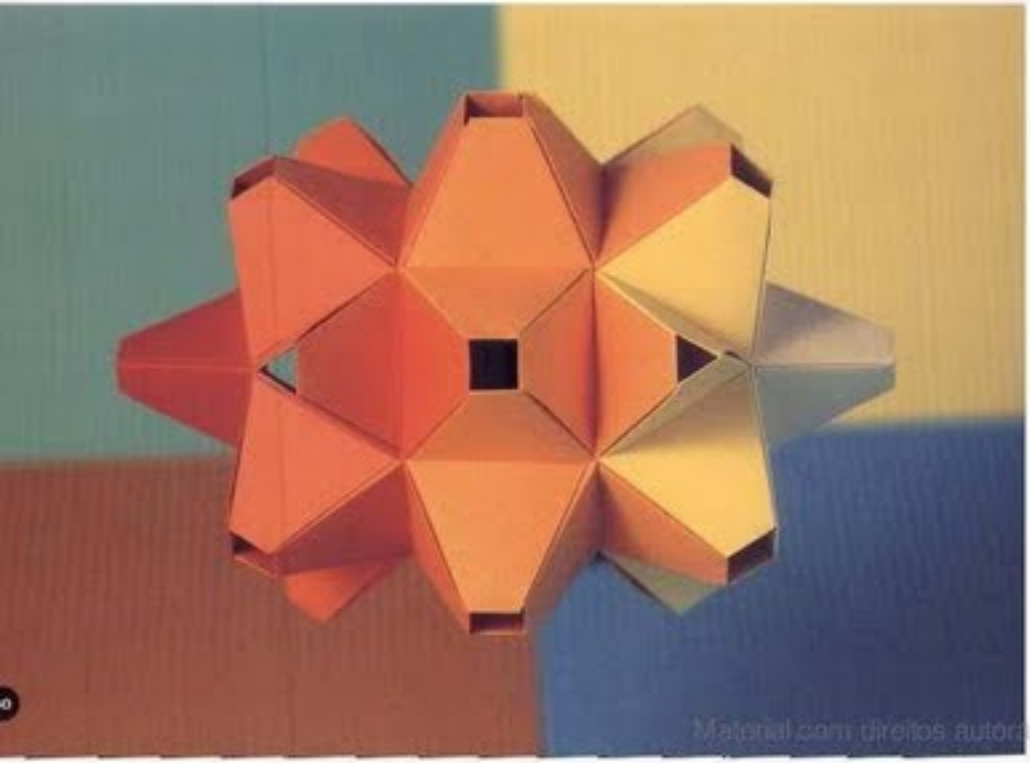
[Framework Shape]





The framework shape viewed lengthwise. (Intermediate stage)





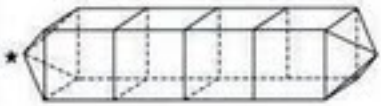
44-UNIT STRUCTURE

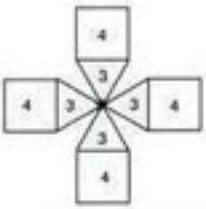
level ★★

12cm × 6cm

Double-sided convex hexagonal ring (p. 54)

[Framework Shape]



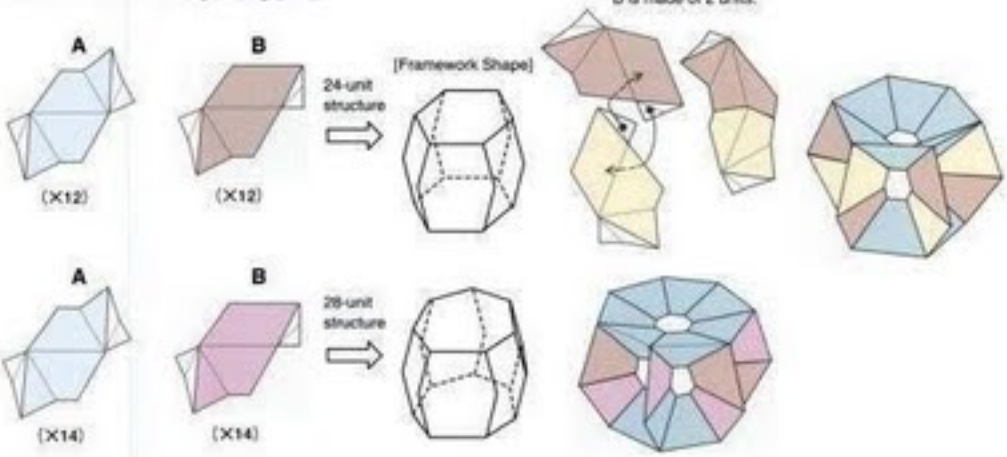


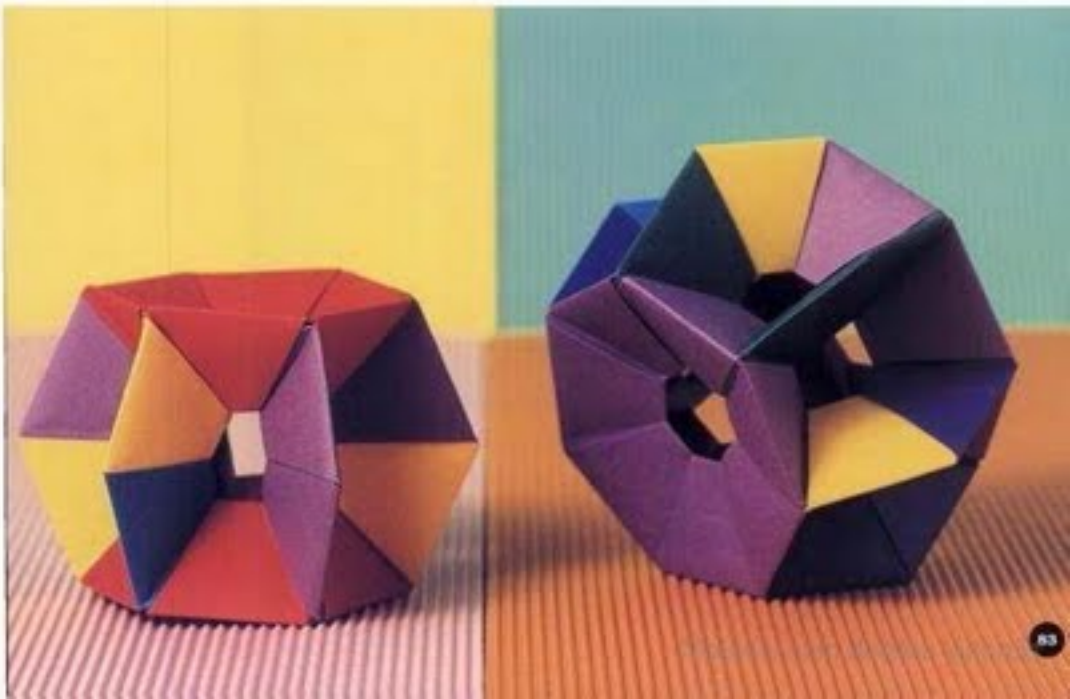
The framework shape viewed lengthwise. (Intermediate stage)

24-UNIT STRUCTURE, 28-UNIT STRUCTURE

level ★★ | 12cm×6cm

Double-sided concave hexagonal ring (p.68)

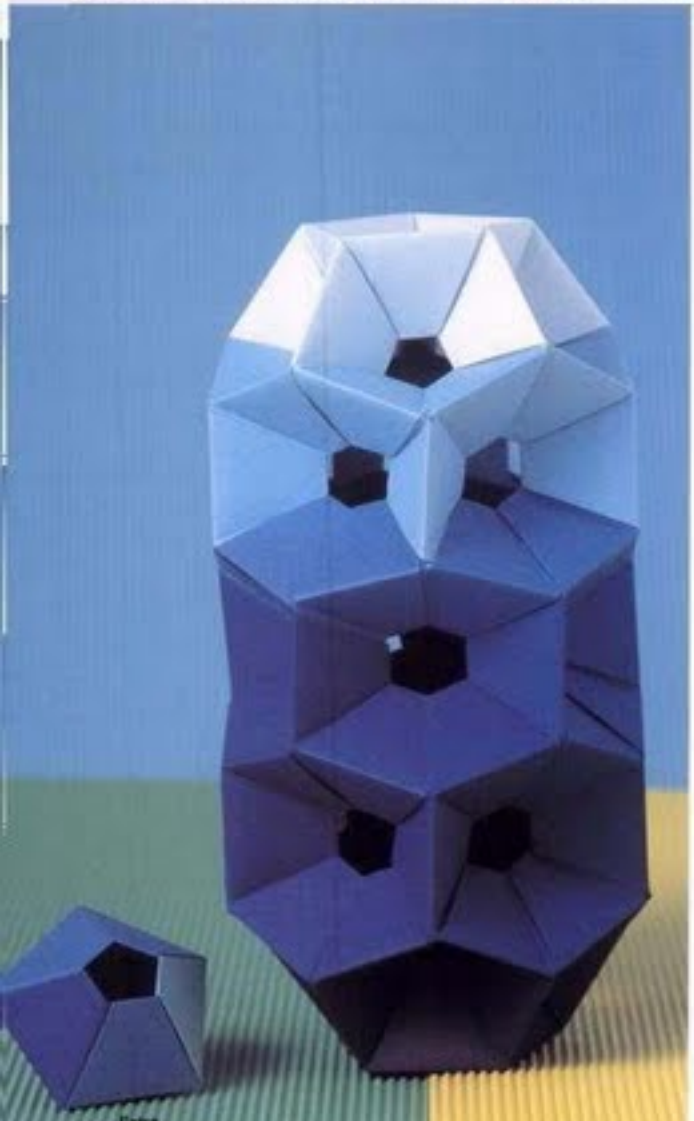




75-UNIT STRUCTURE

level ★★★

12cm×6cm



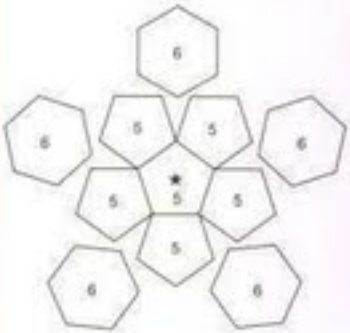
Extra

Double-sided concave hexagonal ring (p 68)

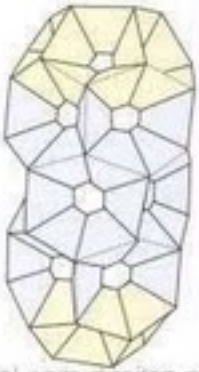
A

(×75)

[Framework Shape]



The framework shape viewed lengthwise. (Intermediate stage)



Mixed Structures of Double-sided Convex & Concave Hexagonal Rings Around Cores of Truncated Hexahedrons

69-UNIT STRUCTURE

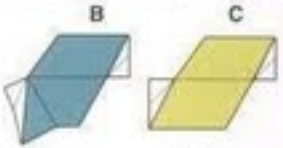
level ★★

12cm×6cm

Double-sided convex hexagonal ring (p.54)

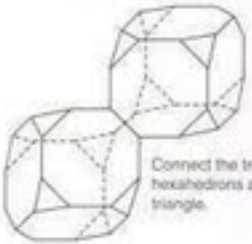
(×3)

Double-sided concave hexagonal ring (p.68)

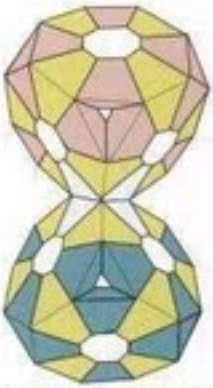


(×42) (×24)

[Core Solid]



Connect the truncated hexahedrons at the triangle.



48-UNIT STRUCTURE

level ★★

12cm×6cm

Double-sided convex hexagonal ring (p.54)

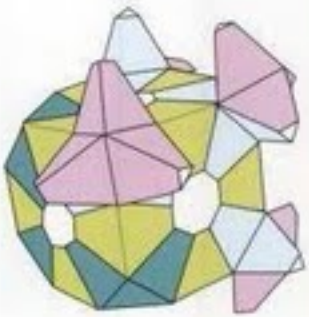
(×24)

Double-sided concave hexagonal ring (p.68)

(×12) (×12)

[Core Solid]

Connect the 3-unit assemblies at the triangle of truncated hexahedrons.



Mixed Structures of Double-sided Convex & Concave Hexagonal Rings Around Cores of Truncated Hexahedrons

68-UNIT STRUCTURE

level ★★

12cm×6cm

If you use convex units for jointing, you can connect solids made of concave units. Devise your own variations and try to construct different shapes. You can figure out how to make forms other than spherical shapes.

Double-sided convex hexagonal ring (p.54)

(×40)

Double-sided concave hexagonal ring (p.68)

B

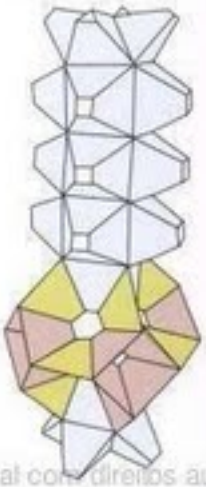
(×16)

C

(×12)

[Core Solid]

Connect the double-sided convex hexagonal rings to the square.



Mixed Structures of Double-sided Convex & Concave Hexagonal Rings Around Cores of Truncated Hexahedrons

60-UNIT STRUCTURE

level ★★

12cm×6cm

Double-sided convex hexagonal ring (p.54)

(×48)

Double-sided concave hexagonal ring (p.68)

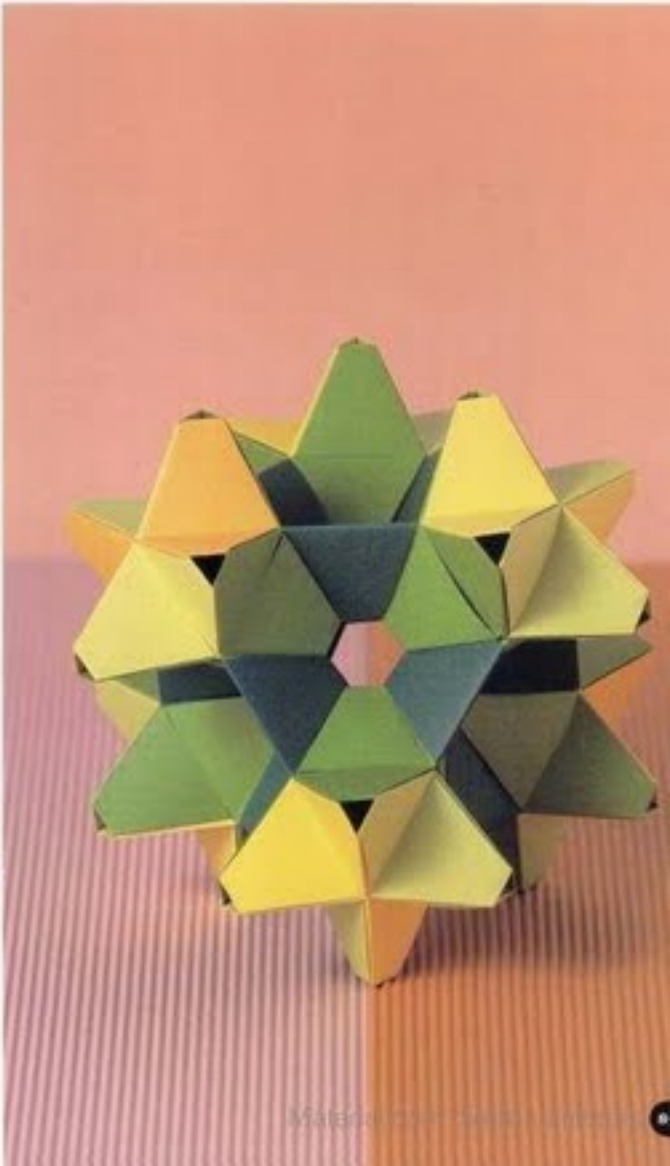
C

(×12)

Six-unit structure of double-sided convex hexagonal rings. The bottom is square.

[Core Solid]

Connect 8-unit assemblies of double-sided convex hexagonal rings at the square.



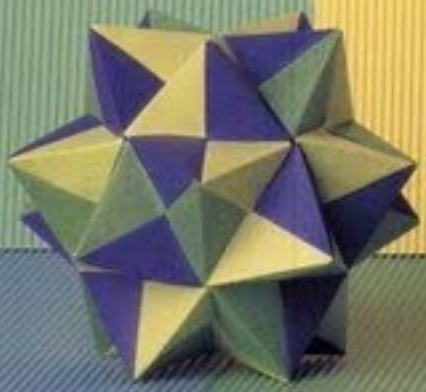
9 DIAGONALLY FOLDED TRIANGULAR-UNIT SOLIDS

This unit is made from rectangular paper, which is made from square paper cut in half, with a basic crease made diagonally. The finished solids are sturdy. Shown here are models with polyhedrons at their core.

6-UNIT STRUCTURE /p.94

30-UNIT STRUCTURE /p.95

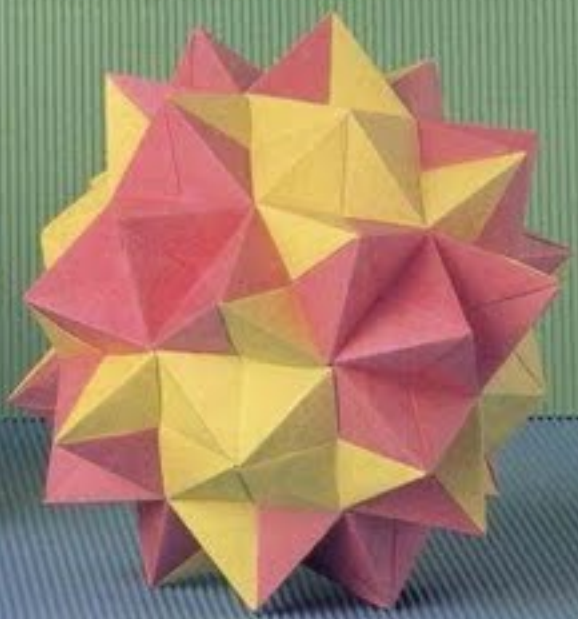
24-UNIT STRUCTURE /p.96



12-UNIT STRUCTURE /p.94

48-UNIT STRUCTURE /p.97

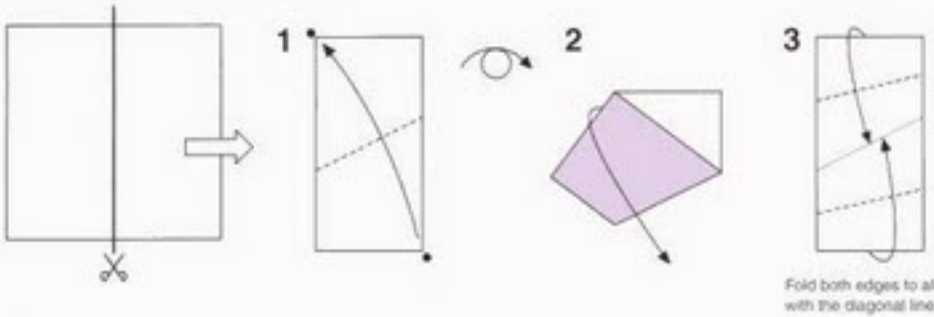
60-UNIT STRUCTURE /p.98

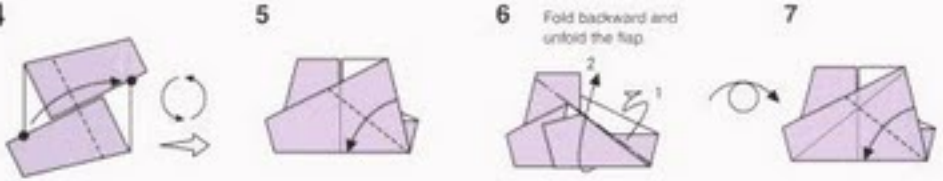


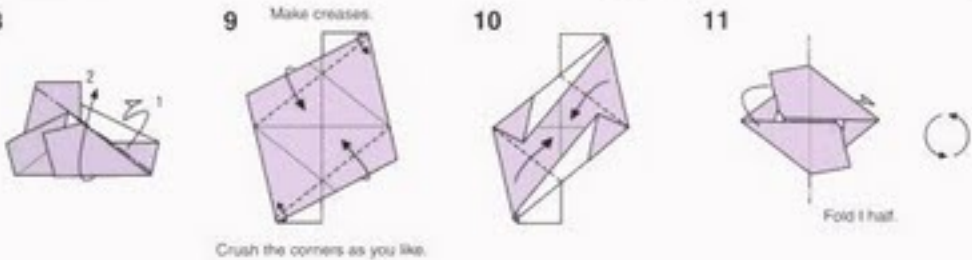
DIAGONALLY FOLDED TRIANGULAR UNIT

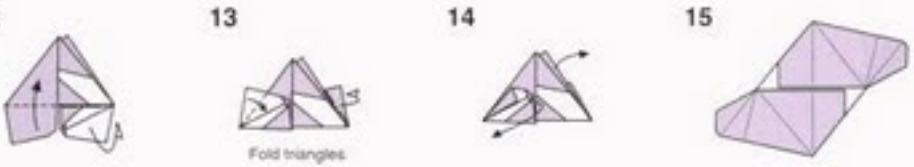
level ★★ 12cm×6cm

The hooks on the unit make the solid as sturdy as the double-sided hexagonal ring. It is easier to fold than you might think.



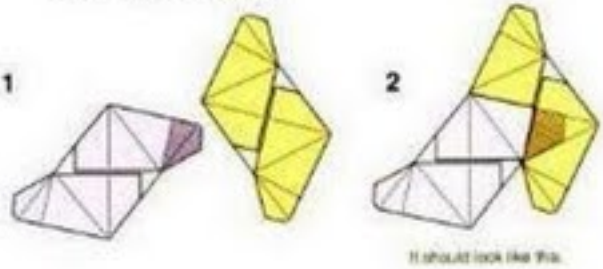


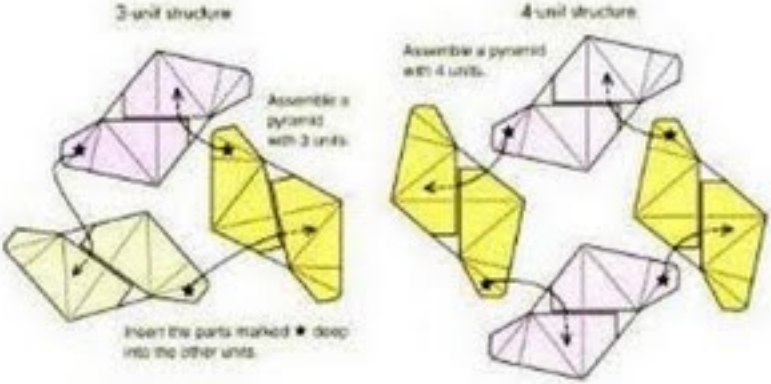




HINT ON ASSEMBLY 1

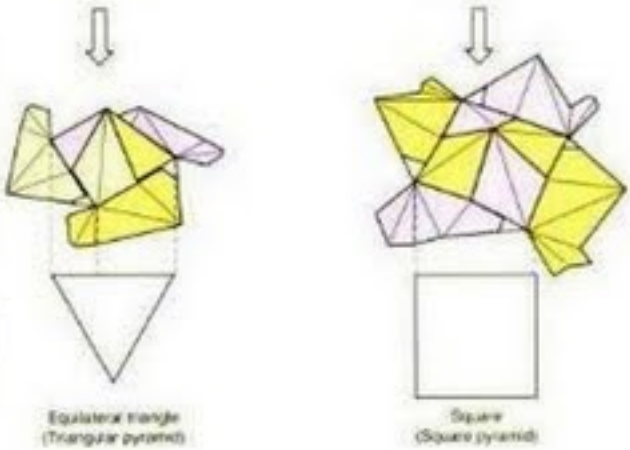
Insert the shaded part deep into the slit of the other unit. The tip works as a hook and makes the structure sturdy.





HINT ON ASSEMBLY 2

The bottom of each element is a triangle or a square, and each pyramid stands on it. This element lets you assemble a variety of solids. The double-sided convex hexagonal ring (p. 54) had a window on top, but these pyramids have no windows. The assembly method is the same as that of the double-sided convex hexagonal ring, but the slope of the top triangle is so gentle that you cannot assemble five-sided or six-sided pyramids.



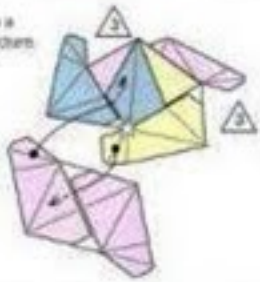
6-UNIT STRUCTURE Regular Tetrahedron Star, 12-UNIT STRUCTURE Regular Octahedron Star

level ★ | 12cm×6cm

Triangle Unit (p. 90)

(×6)

Begin with a 3-unit structure.



Regular Tetrahedron Star

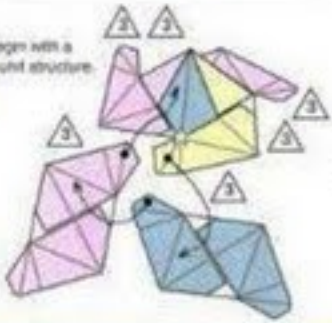
Three triangular pyramids join at the star.

△×4

Triangle Unit (p. 90)

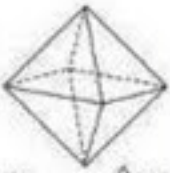
(×12)

Begin with a 3-unit structure.



Regular Octahedron Star

Four triangular pyramids join at the star.



△×8

30-UNIT STRUCTURE Regular Icosahedron Star

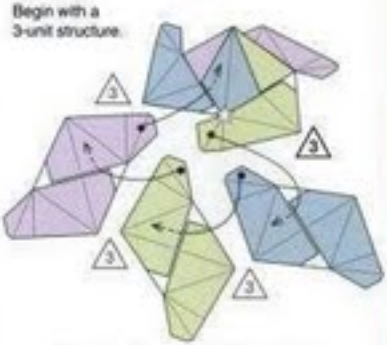
level ★★

12cm×6cm

Triangle Unit (p. 92)

(×30)

Begin with a 3-unit structure.



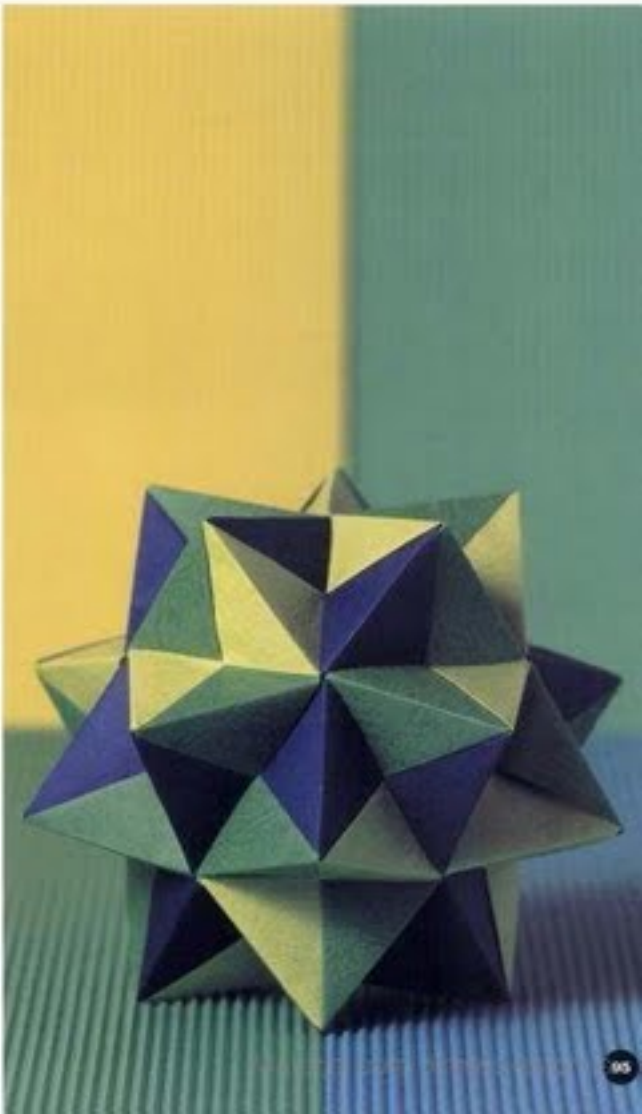
Five triangular pyramids join at the star.

⇩

Regular Icosahedron Star

Five triangular pyramids gather at the star.

△×20

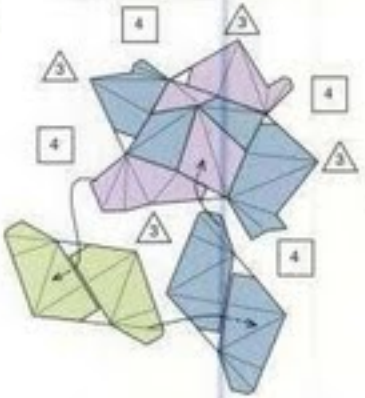


24-UNIT STRUCTURE Cuboctahedron Star | level ★★ | 12cm×6cm

Triangular Unit (p. 92)

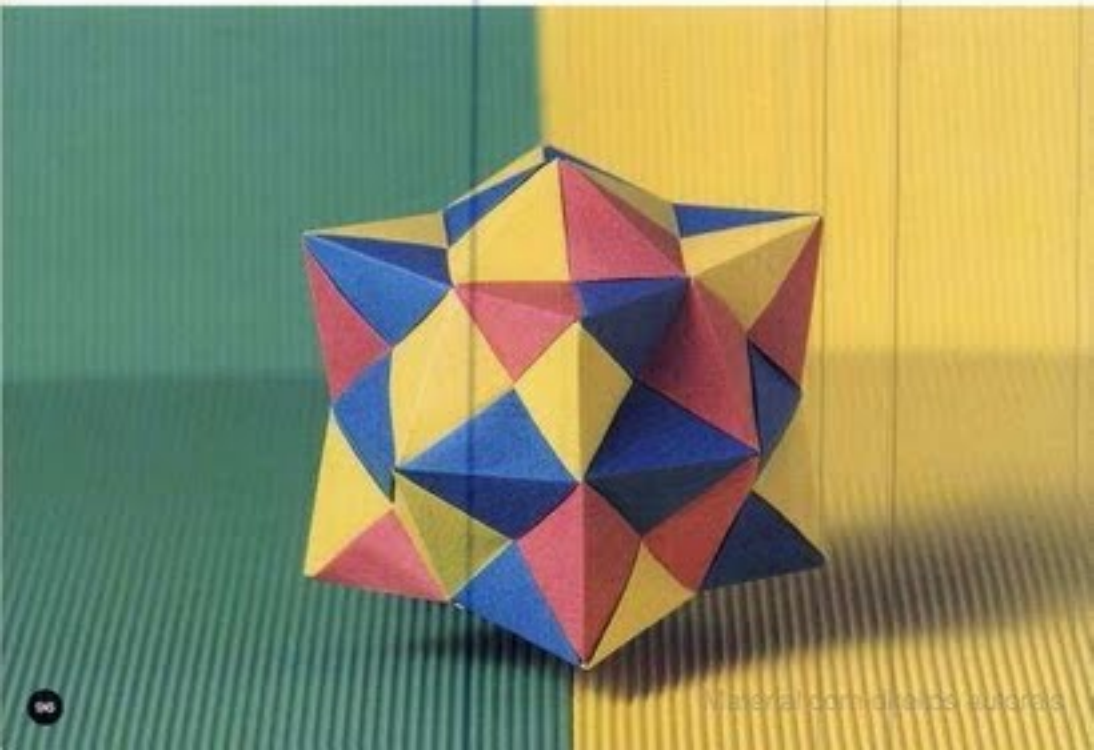
(×24)

Begin with a 4-unit structure.



Cuboctahedron Star

△×8 □×6

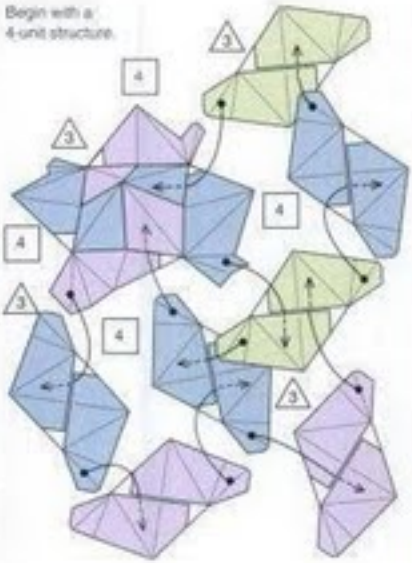


48-UNIT STRUCTURE Rhombic Cuboctahedron Star | level ★★ | 12cm×6cm

Triangular Unit (p. 92)

(×48)

Begin with a 4-unit structure.



△×8 □×18

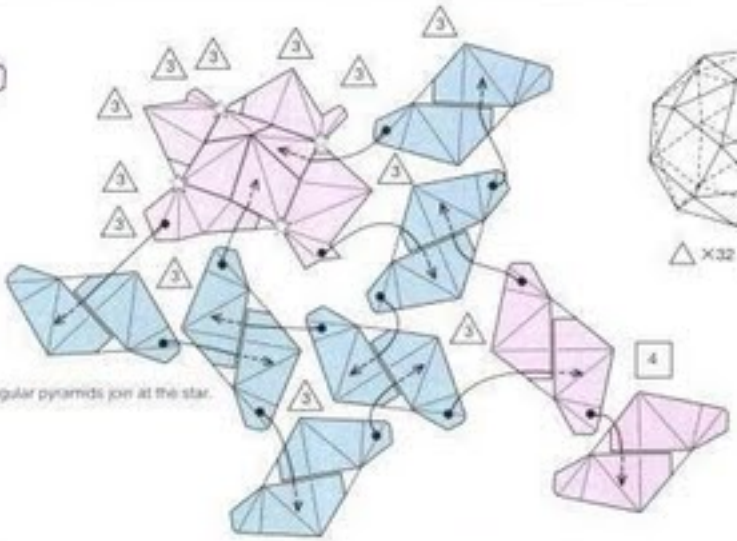
60-UNIT STRUCTURE Variant Cube Star

level ★★★

12cm×6cm

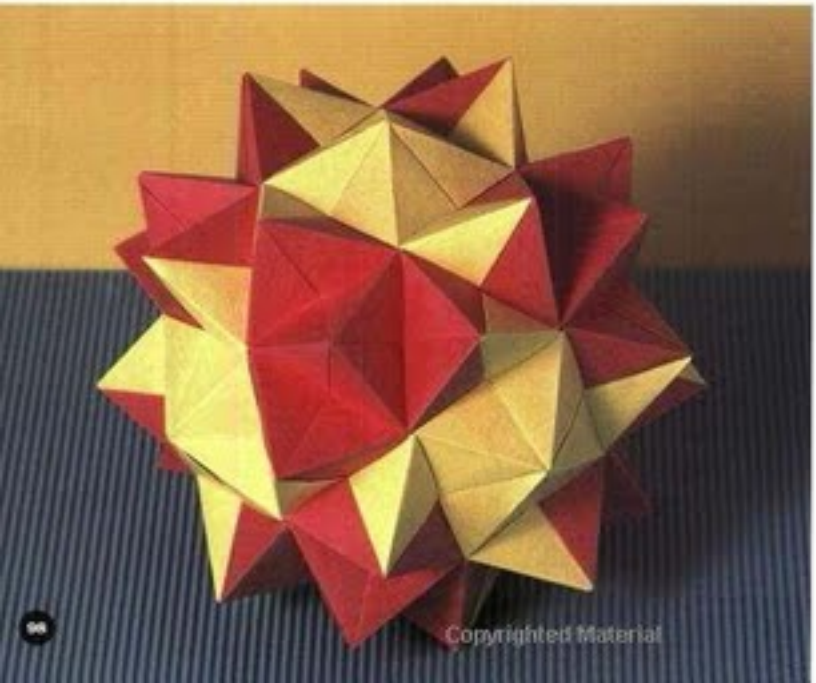
Triangle Unit (p. 92)

(×60)



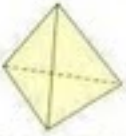
Four triangular pyramids join at the star.

△×32 □×6



POLYHEDRONS

Polyhedrons used in this book.



Regular tetrahedron

△ ×4
6 sides
4 apices

Regular hexhedron Cube

□ ×6
12 sides
8 apices

Regular octahedron

△ ×8
12 sides
6 apices

Regular dodecahedron

⬠ ×12
30 sides
20 apices

Regular icosahedron

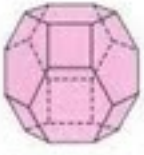
△ ×20
30 sides
12 apices

Truncated tetrahedron

△ ×4 ⬡ ×4
18 sides
12 apices

Truncated hexahedron

△ ×8 ⬡ ×6
36 sides
24 apices



Truncated octahedron

□ ×6 ⬡ ×8
36 sides
24 apices

Truncated dodecahedron

△ ×20 ⬡ ×12
90 sides
60 apices

Truncated icosahedron

⬠ ×12 ⬡ ×20
90 sides
60 apices

Cuboctahedron

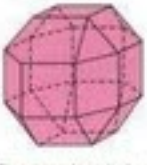
△ ×8 □ ×6
24 sides
12 apices

Icosa-dodecahedron

△ ×20 ⬠ ×12
60 sides
30 apices

Rhombic truncated octahedron

□ ×12 ⬡ ×8 ⬡ ×6
72 sides
48 apices



Rhombic cuboctahedron

△ ×8 □ ×18
48 sides
24 apices

Rhombic icosa-dodecahedron

△ ×20 □ ×30 ⬠ ×12
120 sides
60 apices

Rhombic truncated icosa-dodecahedron

□ ×30 ⬡ ×20 ⬡ ×12
180 sides
120 apices

Variant cube

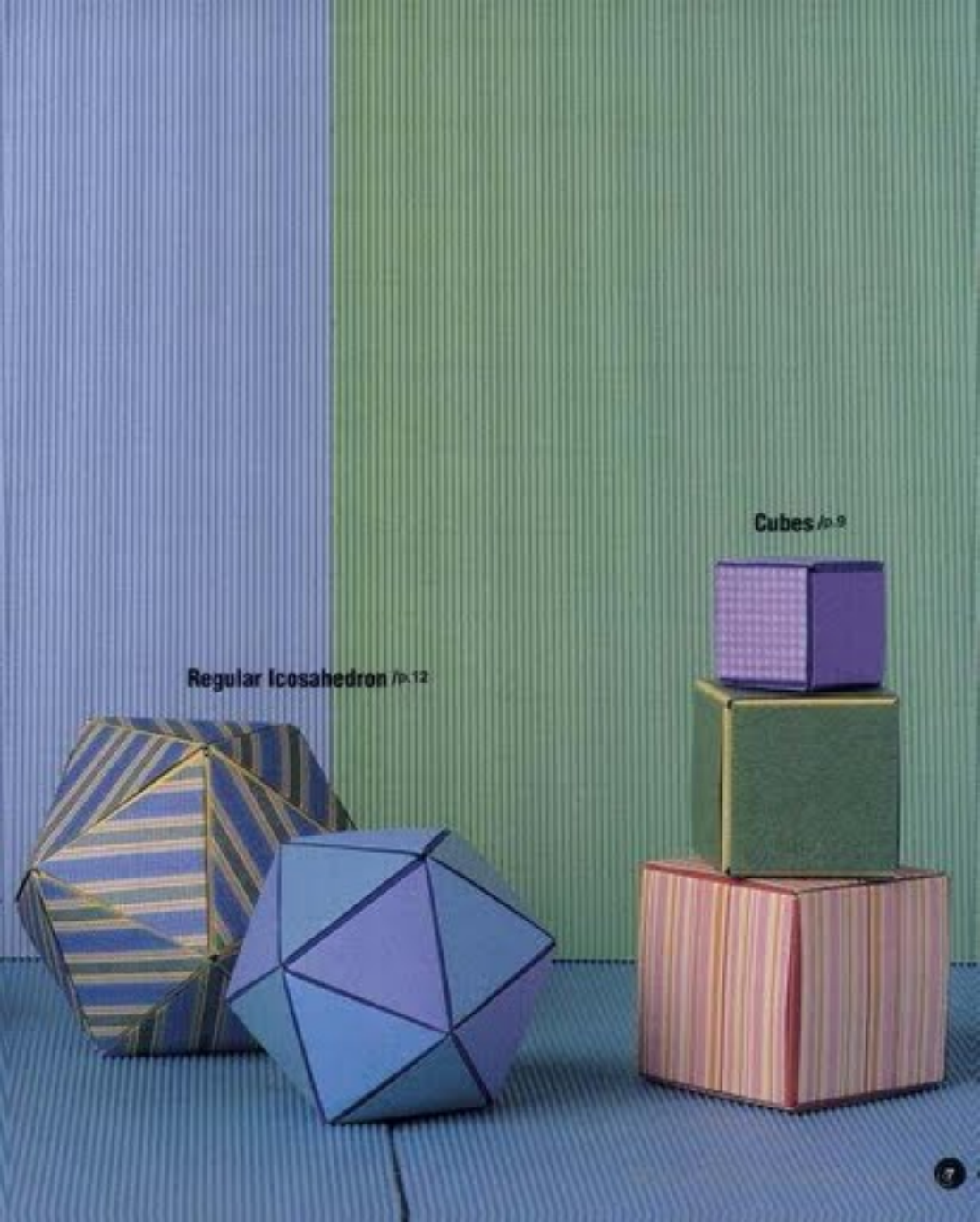
△ ×32 □ ×6
60 sides
24 apices

Variant dodecahedron

△ ×80 ⬠ ×12
150 sides
60 apices

1 SQUARE AND EQUILATERAL TRIANGULAR FLAT UNITS

Each side has a pocket into which a joint is inserted to make three-dimensional figures.


Cubes /p.9
Regular Icosahedron /p.12

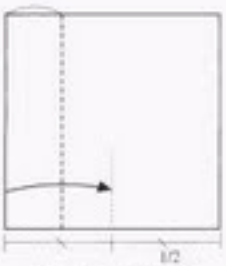
SQUARE FLAT UNITS

level ★

15cm × 15cm

Assemble by inserting joints into four pockets.

1



This width is not fixed.
Fold wherever you like.

2

Align the edges.

3

This width is not fixed.
Fold wherever you like.

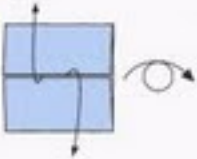
4

Align the edges.

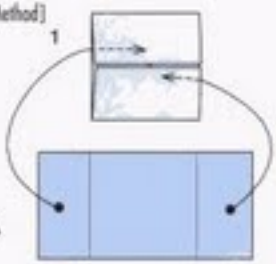
5

(× 2)

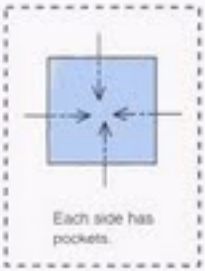
Unfold one of the units.



[Assembly Method]

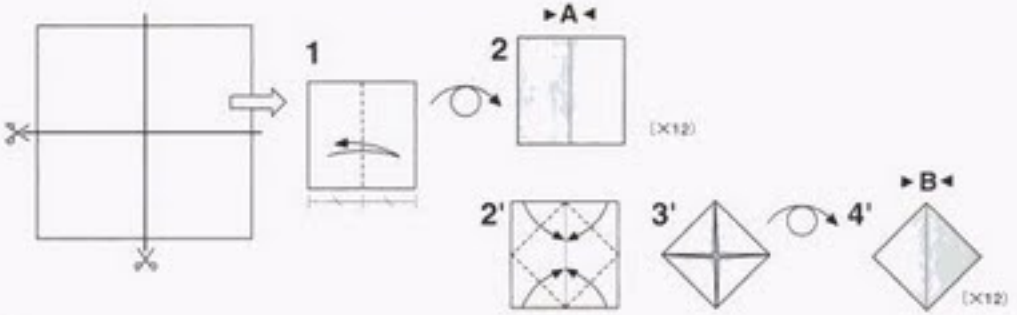


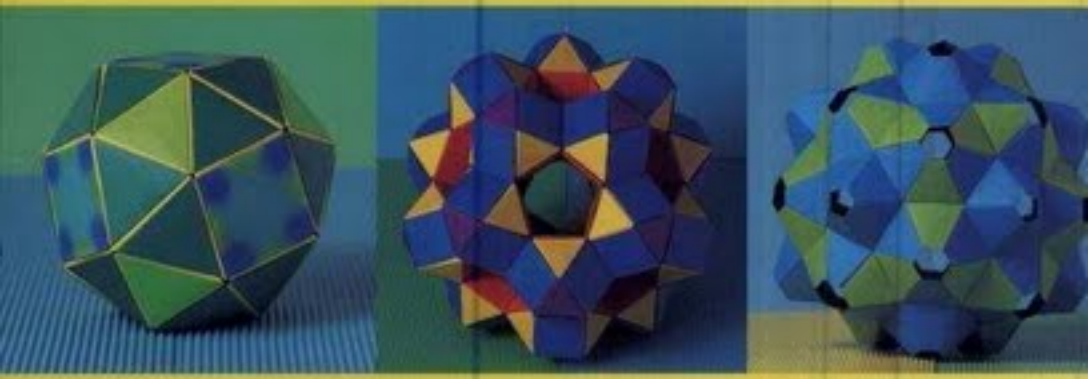
Tuck both sides into the pockets.



Each side has pockets.

Joints ● Use Method A for joints, but when the paper is thick or difficult to assemble, use B.





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