

曲げる

親子関係とスキニング



Blender を起動する

General (全般) で

親子関係

オブジェクトの動きを他のオブジェクトに追従させる

User Perspective
(1) Collection | Cube

Scale または S → Z (z 軸方向に拡大縮小)

青い ■ をドラッグ

Scene Collection



Cube

Cube

Transform

Location X	0 m	🔒
Y	0 m	🔒
Z	0 m	🔒
Rotation X	0°	🔒
Y	0°	🔒
Z	0°	🔒
Mode	XYZ Euler	⌵
Scale X	1.000	🔒
Y	1.000	🔒
Z	1.000	🔒

> Delta Transform

> Relations

> Collections

> Instancing

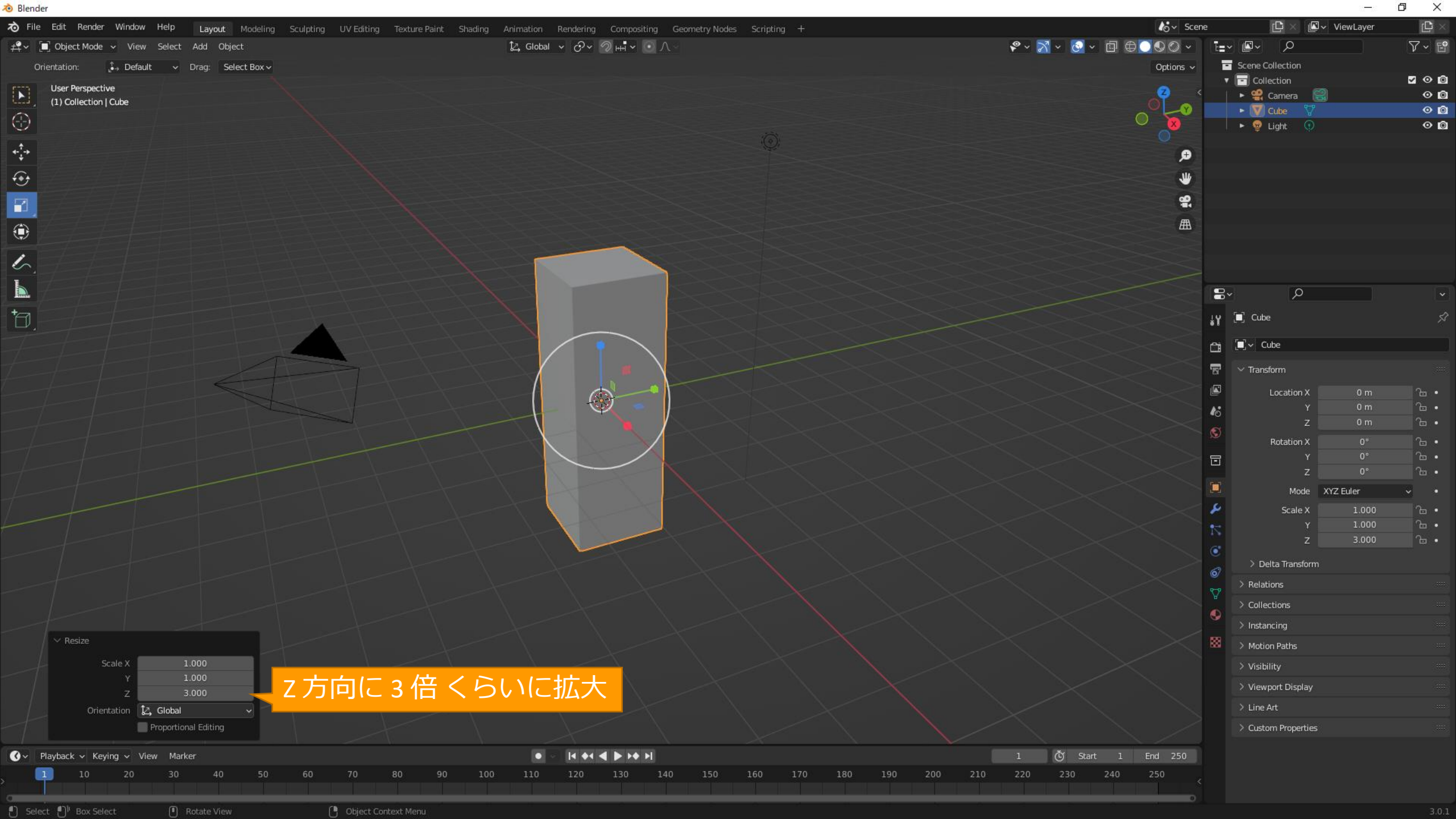
> Motion Paths

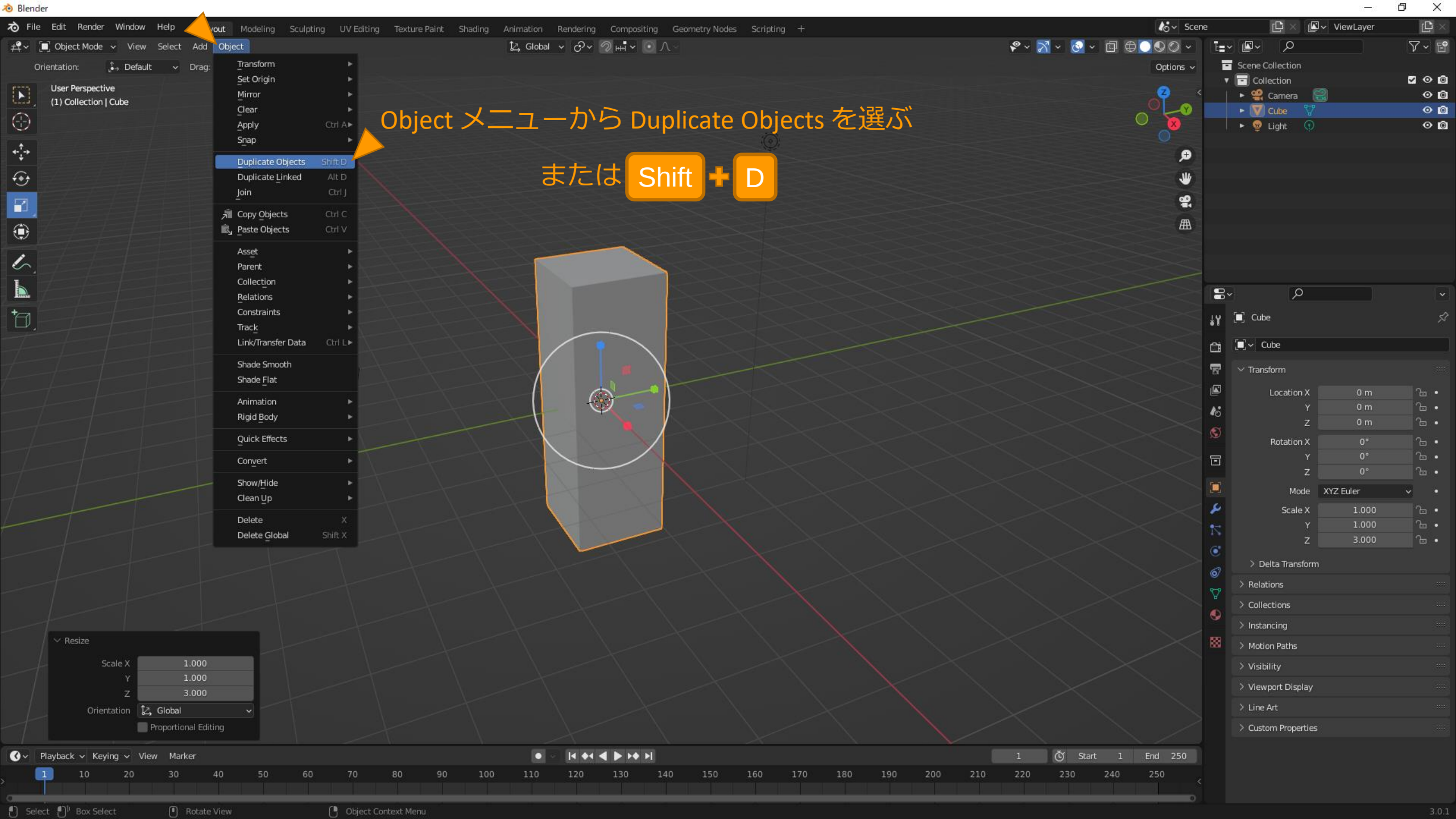
> Visibility

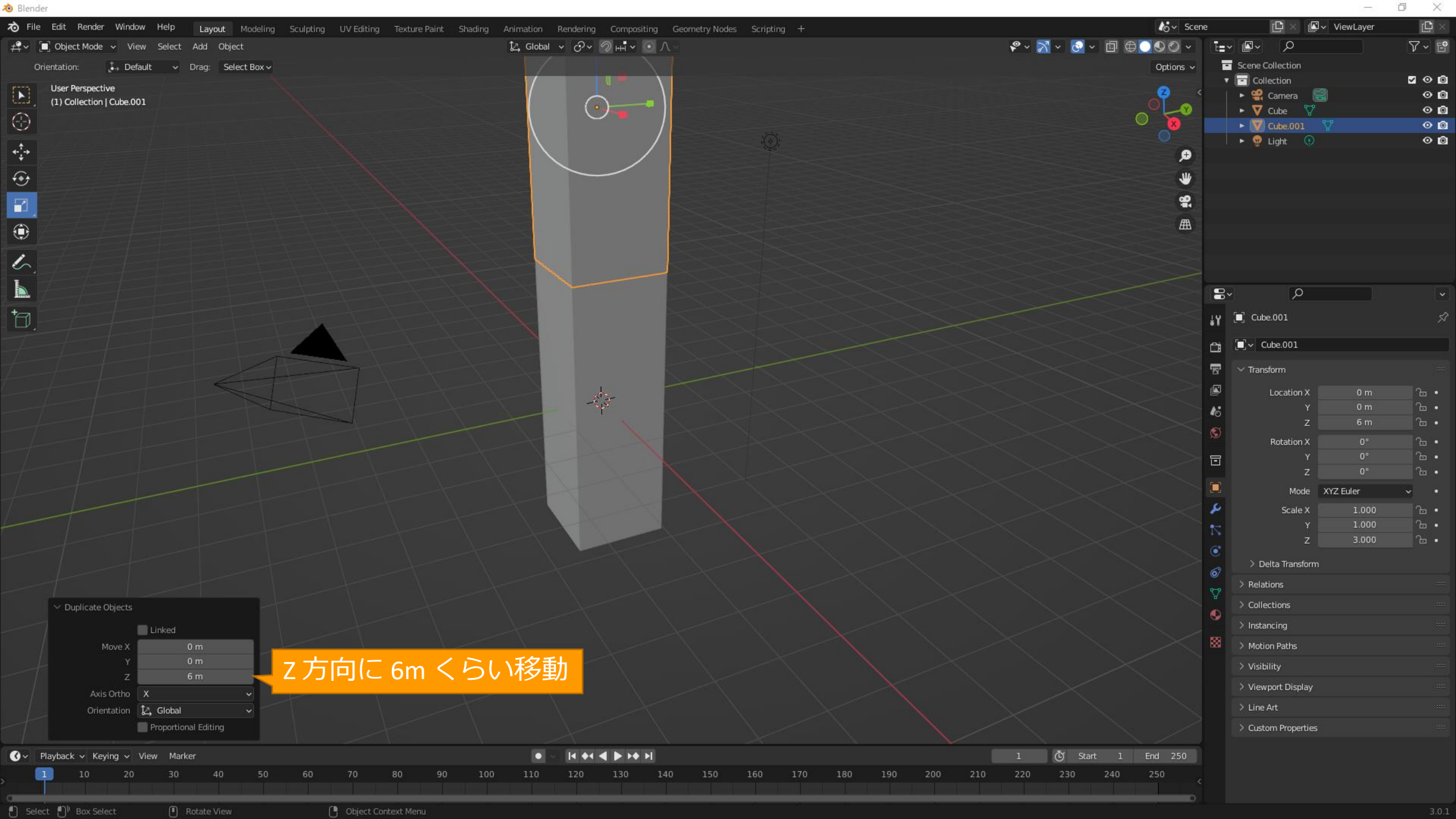
> Viewport Display

> Line Art

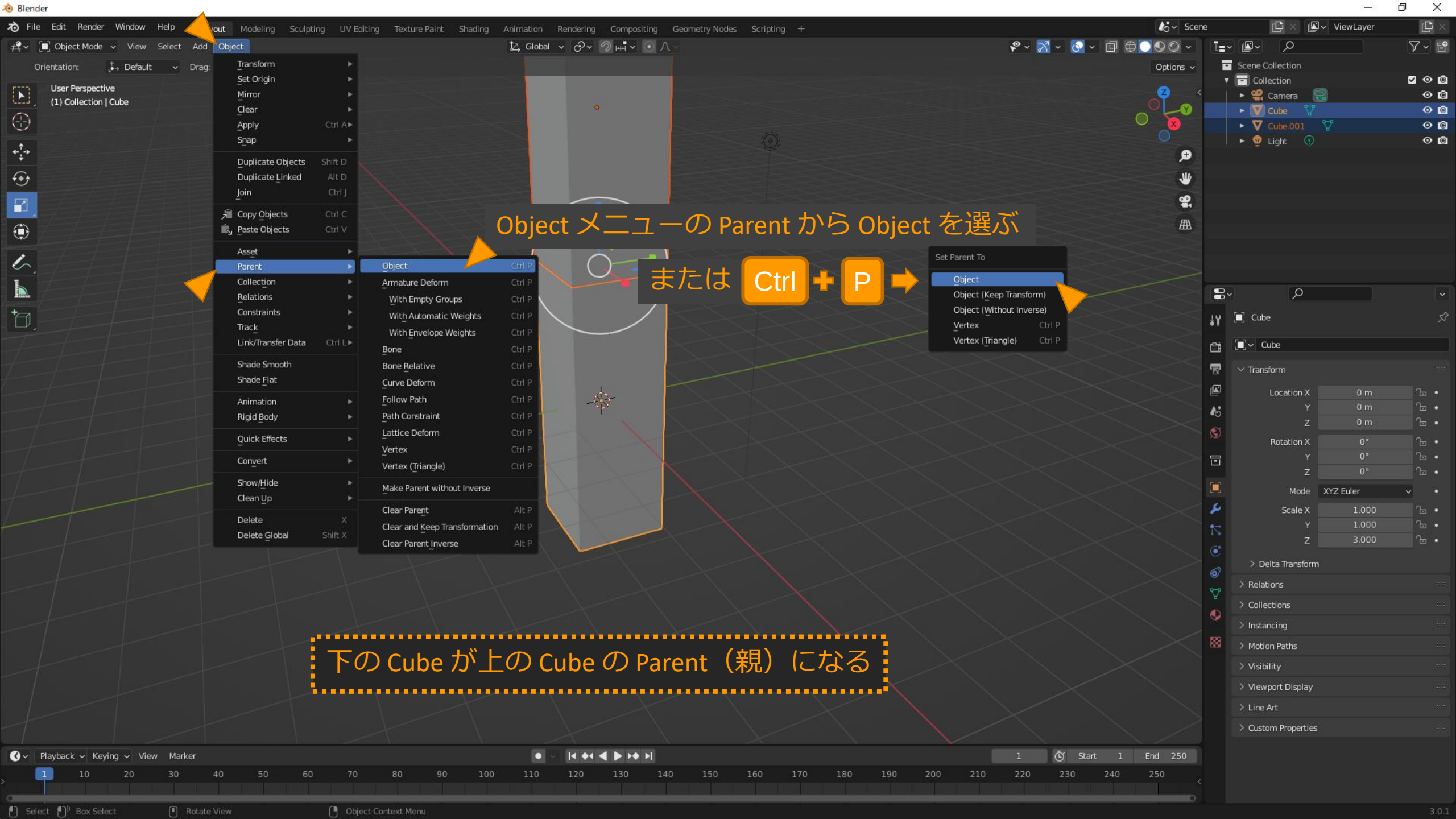
> Custom Properties







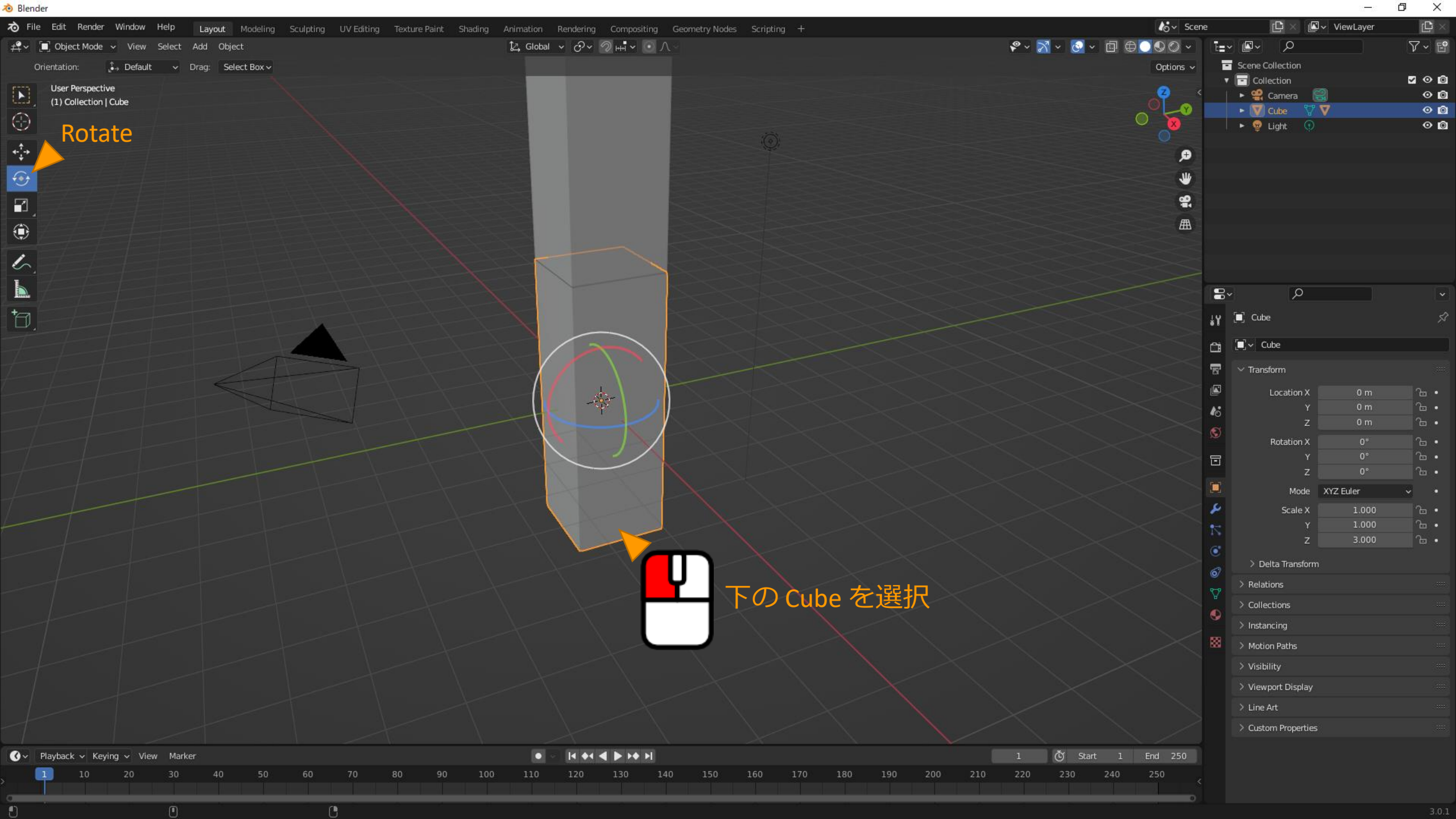
z 方向に 6m くらい移動



Object メニューの Parent から Object を選ぶ

または Ctrl + P

下の Cube が上の Cube の Parent (親) になる

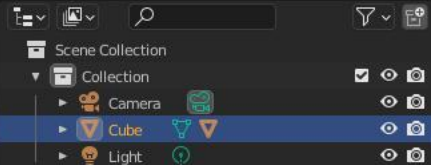


Rotation: -42.61 global

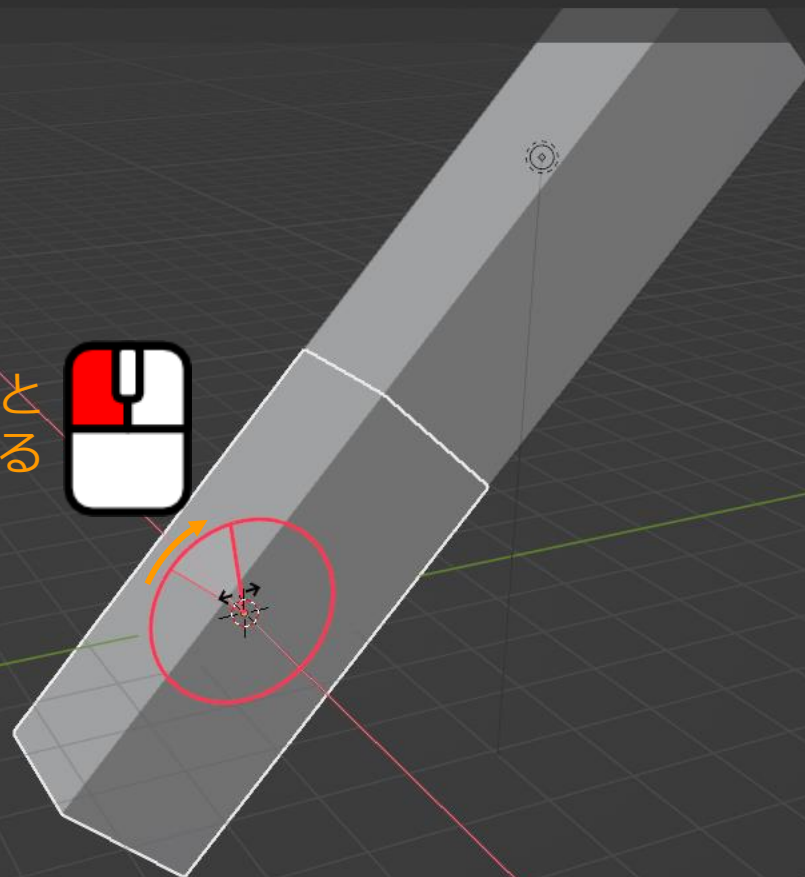
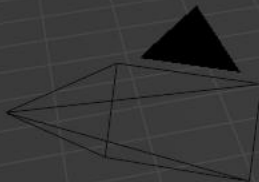
Orientation: Default Drag: Select Box

User Perspective
(1) Collection | Cube

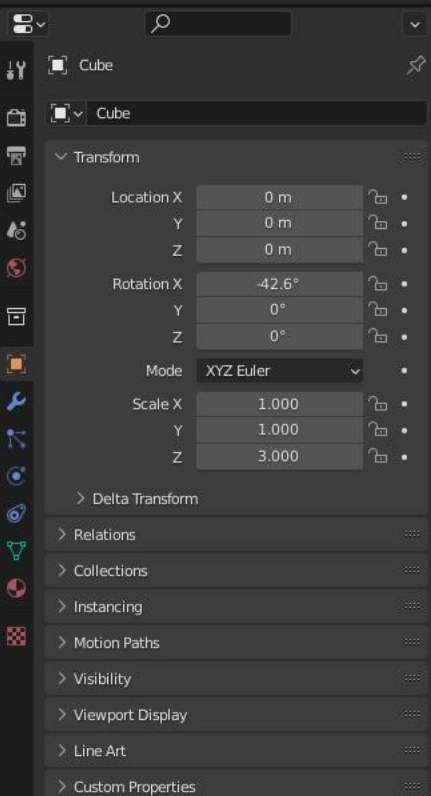
Options



下の Cube を回転すると
一緒に上の Cube も回転する



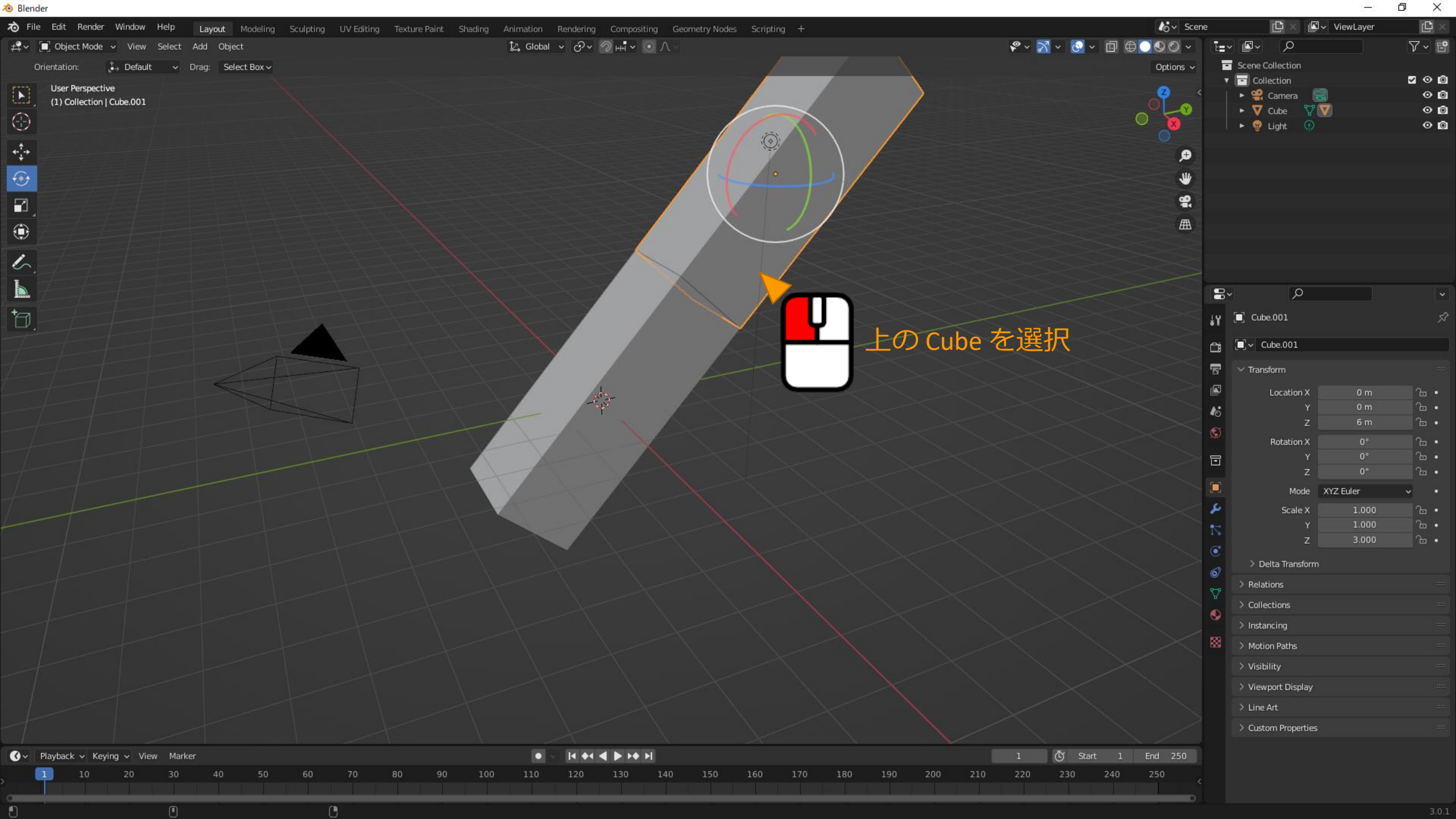
下の Cube（親）を動かすと上の Cube（子）もそれに追従する



Playback Keying View Marker

1 Start 1 End 250

1 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250



Rotation: -60.84 global

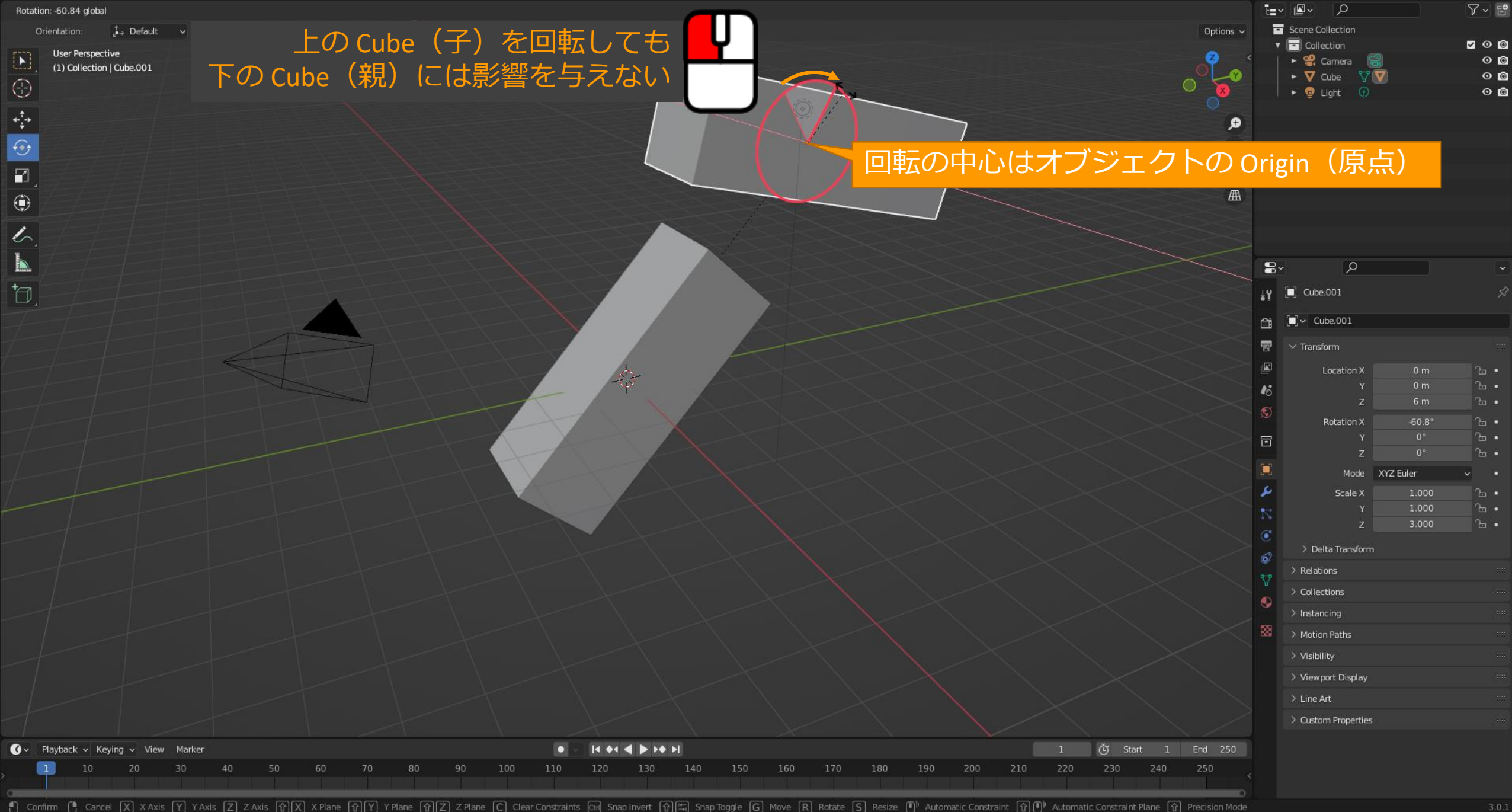
Orientation: Default

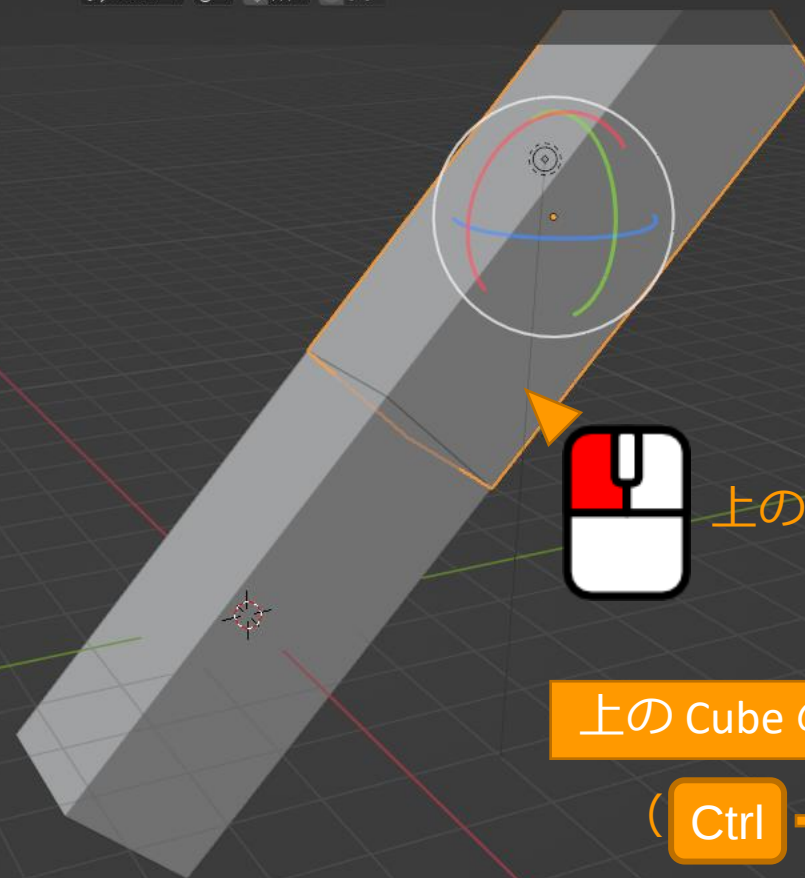
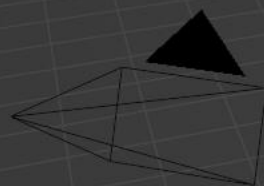
User Perspective
(1) Collection | Cube.001

上の Cube（子）を回転しても
下の Cube（親）には影響を与えない



回転の中心はオブジェクトの Origin（原点）



User Perspective
(1) Collection | Cube.001

上の Cube を選択

上の Cube の回転を元 (0, 0, 0) に戻す

(Ctrl + Z で戻してもよい)

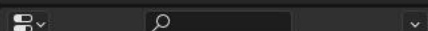
Rotate

Angle: -60.8°

Axis: X

Orientation: Global

☐ Proportional Editing



Cube.001

Cube.001

Transform

Location X 0 m

Y 0 m

Z 6 m

Rotation X 0°

Y 0°

Z 0°

Mode XYZ Euler

Scale X 1.000

Y 1.000

Z 3.000

Delta Transform

Relations

Collections

Instancing

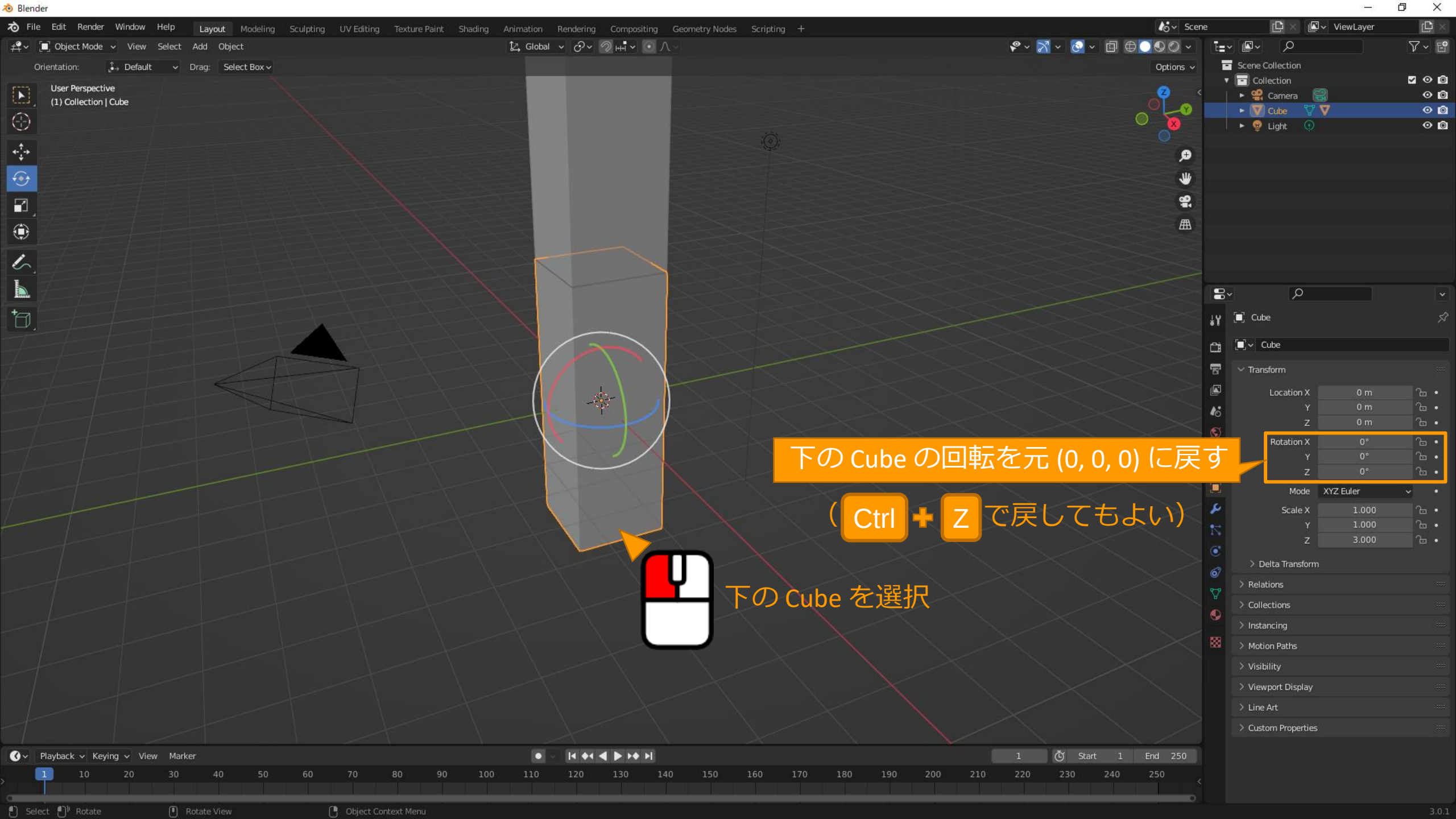
Motion Paths

Visibility

Viewport Display

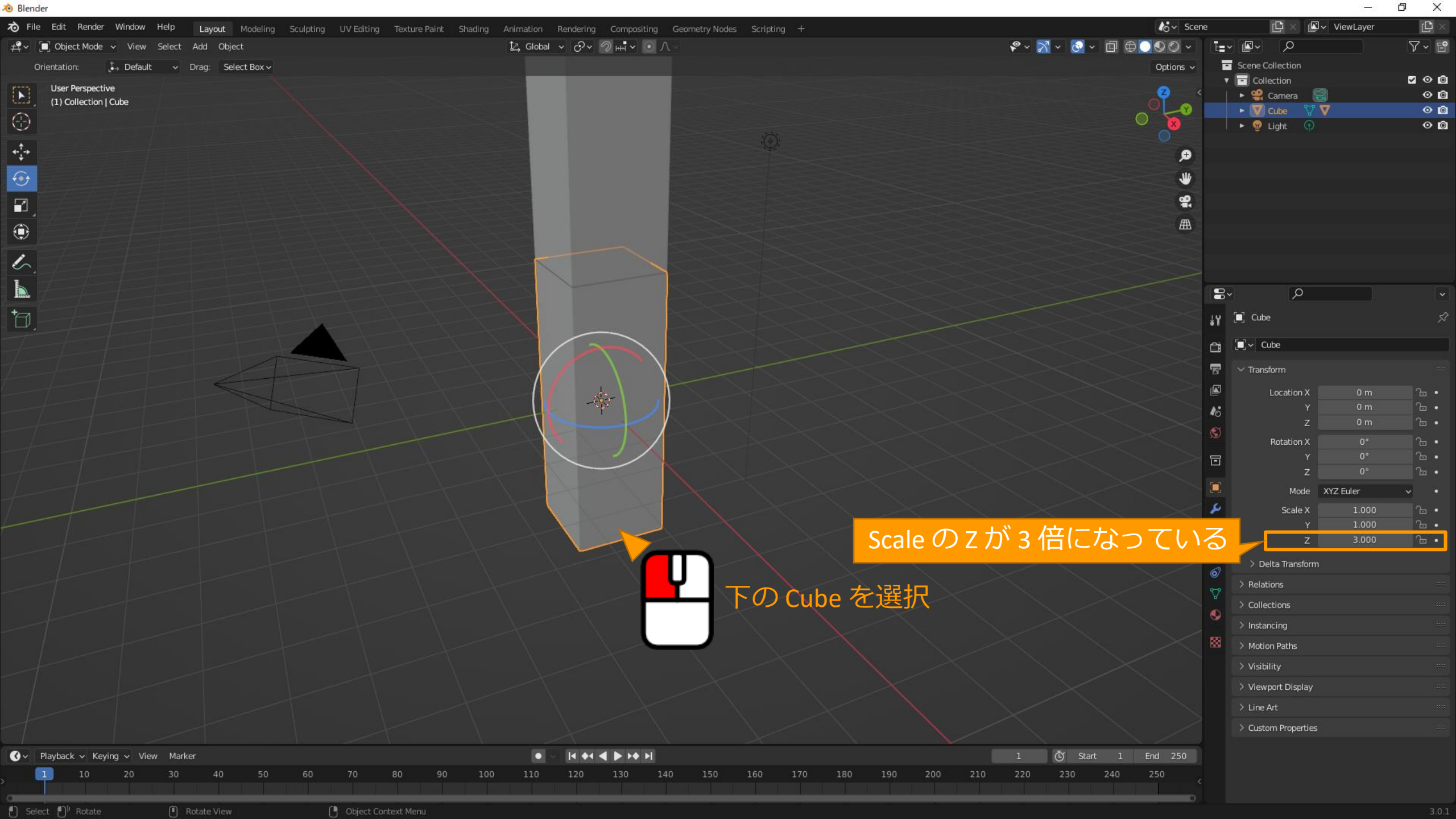
Line Art

Custom Properties



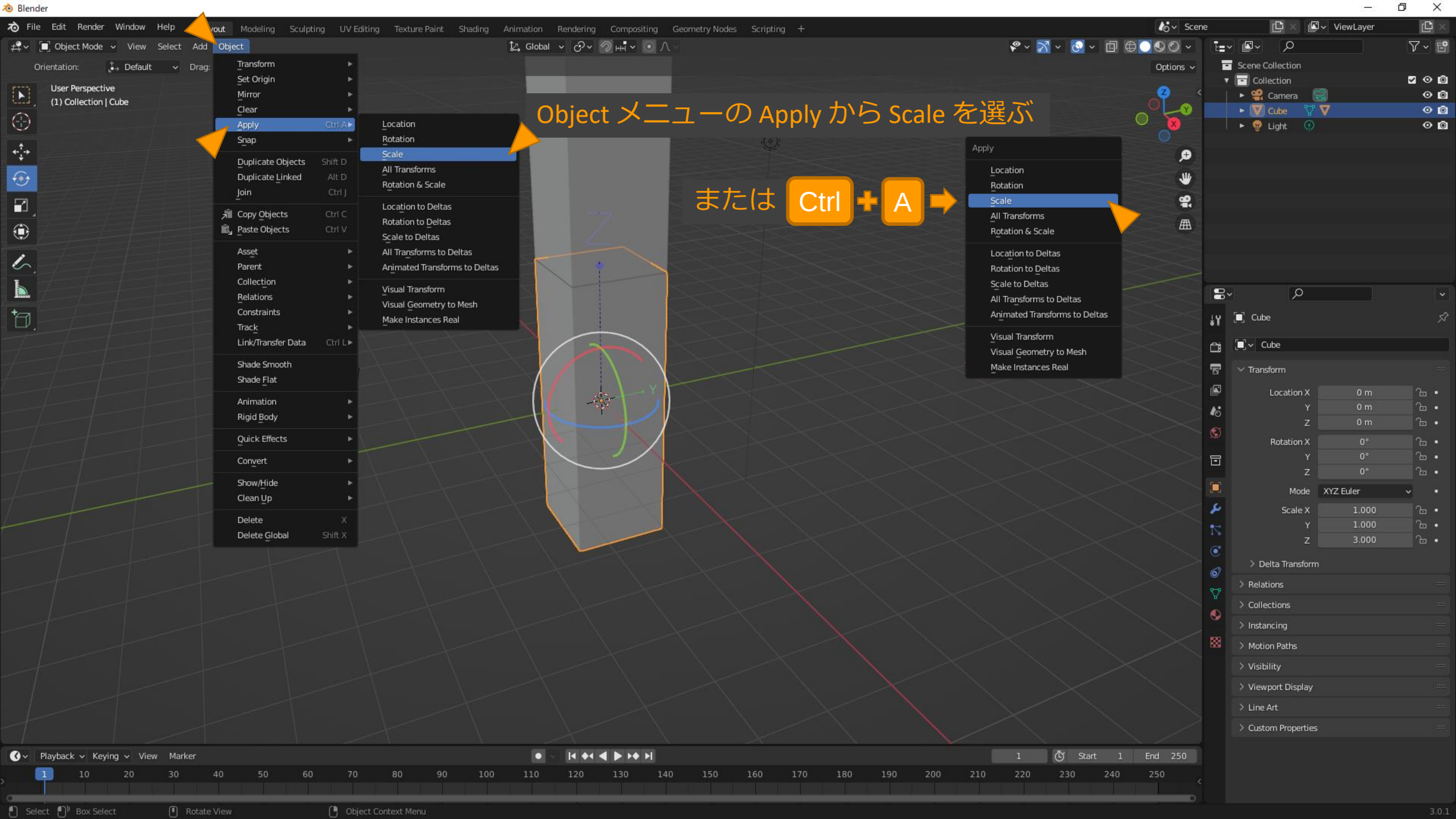
原点の移動

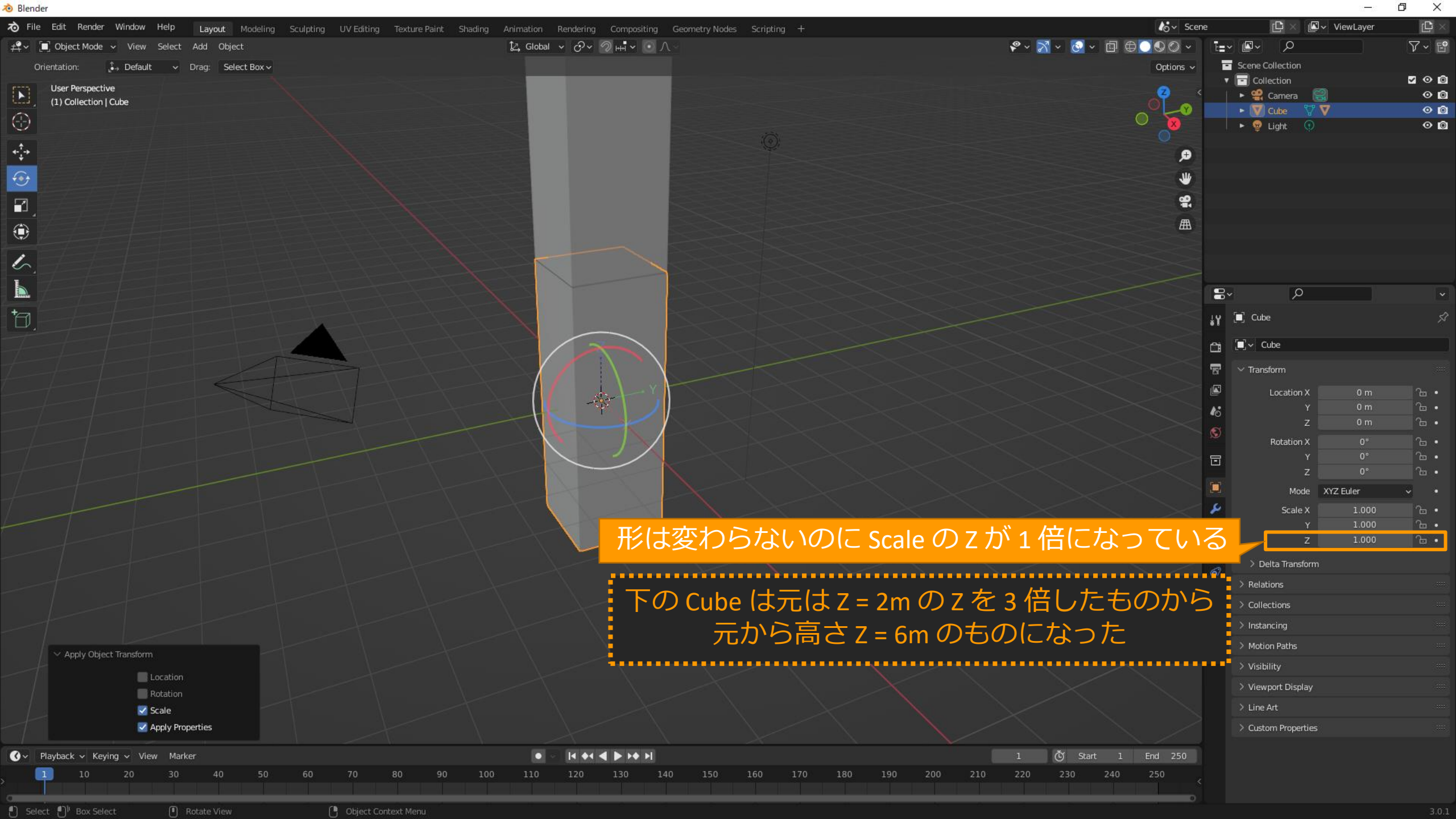
回転の中心位置（ピボット）を指定する



Scale の z が 3 倍になっている

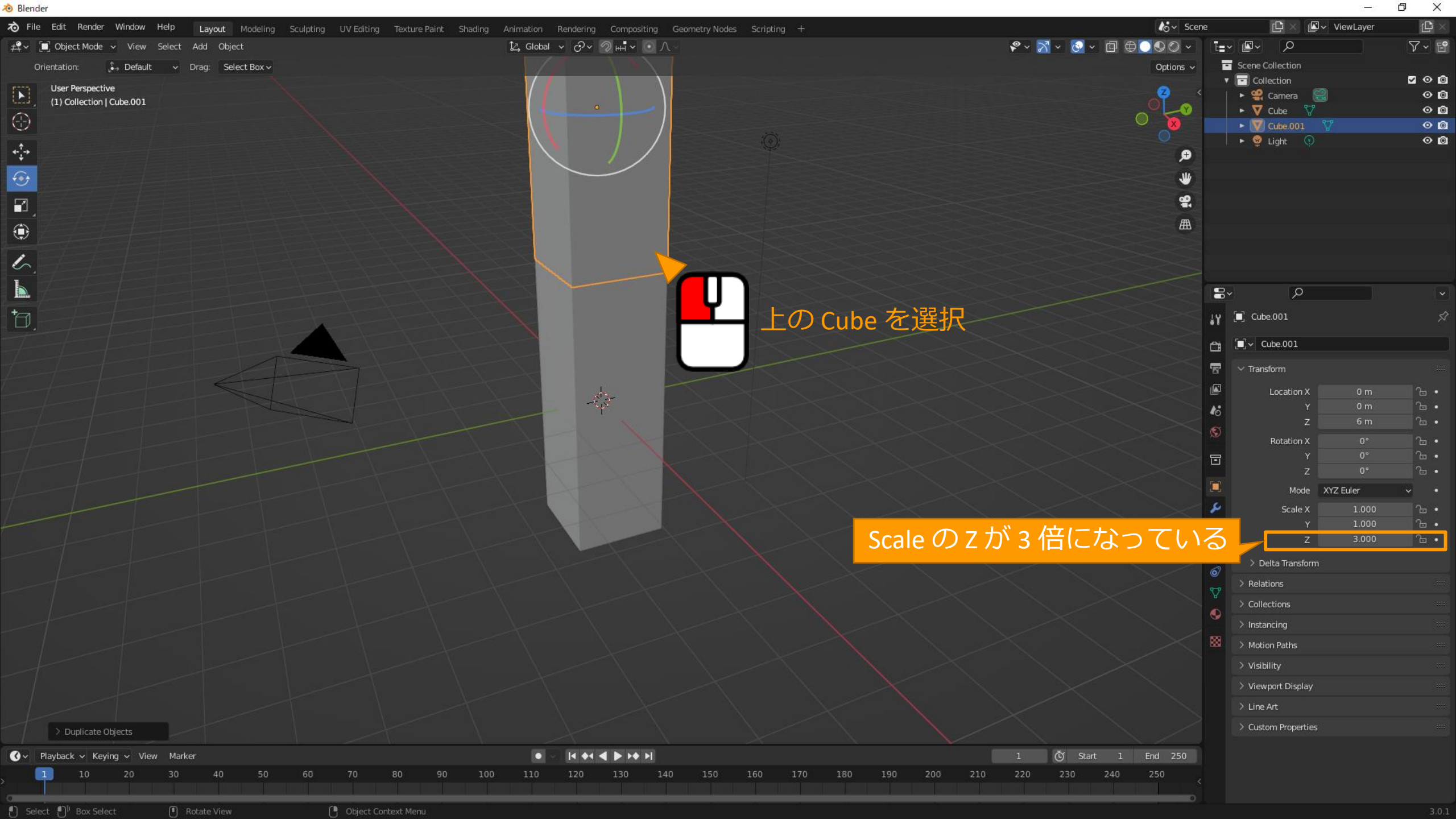
下の Cube を選択





形は変わらないのに Scale の Z が 1 倍になっている

下の Cube は元は Z = 2m の Z を 3 倍したもののから
元から高さ Z = 6m のものになった



Orientation: Default Drag:

User Perspective (1) Collection | Cube.001

Object Menu:

- Transform
 - Set Origin
 - Mirror
 - Clear
 - Apply** (Ctrl A)
 - Snap
- Duplicate Objects (Shift D)
- Duplicate Linked (Alt D)
- Join (Ctrl J)
- Copy Objects (Ctrl C)
- Paste Objects (Ctrl V)
- Asset
 - Parent
 - Collection
 - Relations
 - Constraints
 - Track
 - Link/Transfer Data (Ctrl L)
- Shade Smooth
- Shade Flat
- Animation
 - Rigid Body
- Quick Effects
- Convert
- Show/Hide
- Clean Up
- Delete (X)
- Delete Global (Shift X)

Object メニューの Apply から Scale を選ぶ

または **Ctrl + A**

Apply

- Location
- Rotation
- Scale**
- All Transforms
- Rotation & Scale
- Location to Deltas
- Rotation to Deltas
- Scale to Deltas
- All Transforms to Deltas
- Animated Transforms to Deltas
- Visual Transform
- Visual Geometry to Mesh
- Make Instances Real

Scene Collection

- Collection
 - Camera
 - Cube
 - Light

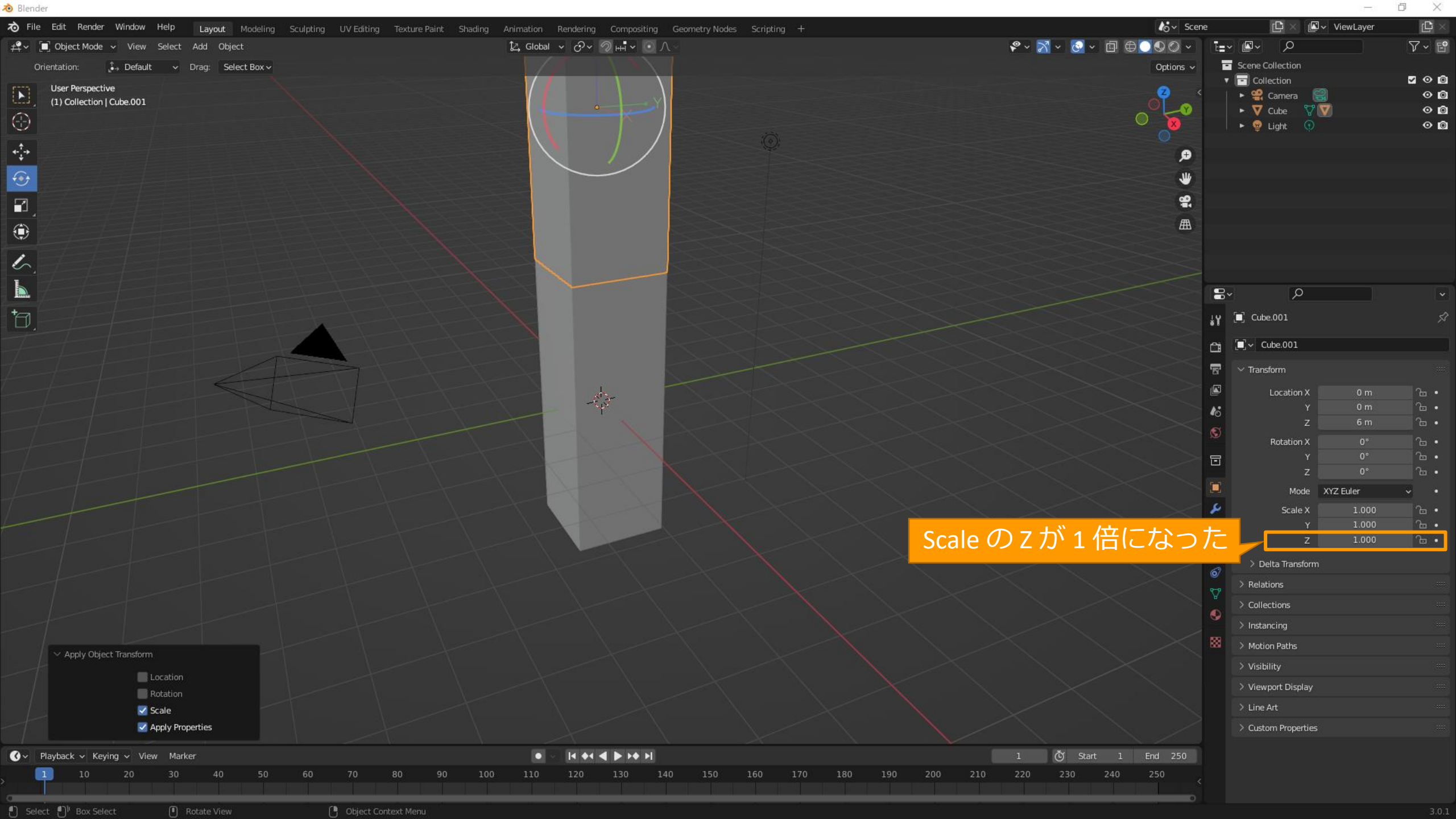
Cube.001

Transform

Location X	0 m
Y	0 m
Z	6 m
Rotation X	0°
Y	0°
Z	0°
Mode	XYZ Euler
Scale X	1.000
Y	1.000
Z	3.000

Delta Transform

- Relations
- Collections
- Instancing
- Motion Paths
- Visibility
- Viewport Display
- Line Art
- Custom Properties



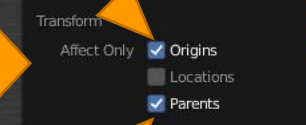
Scale の Z が 1 倍になった

User Perspective
(1) Collection | Cube

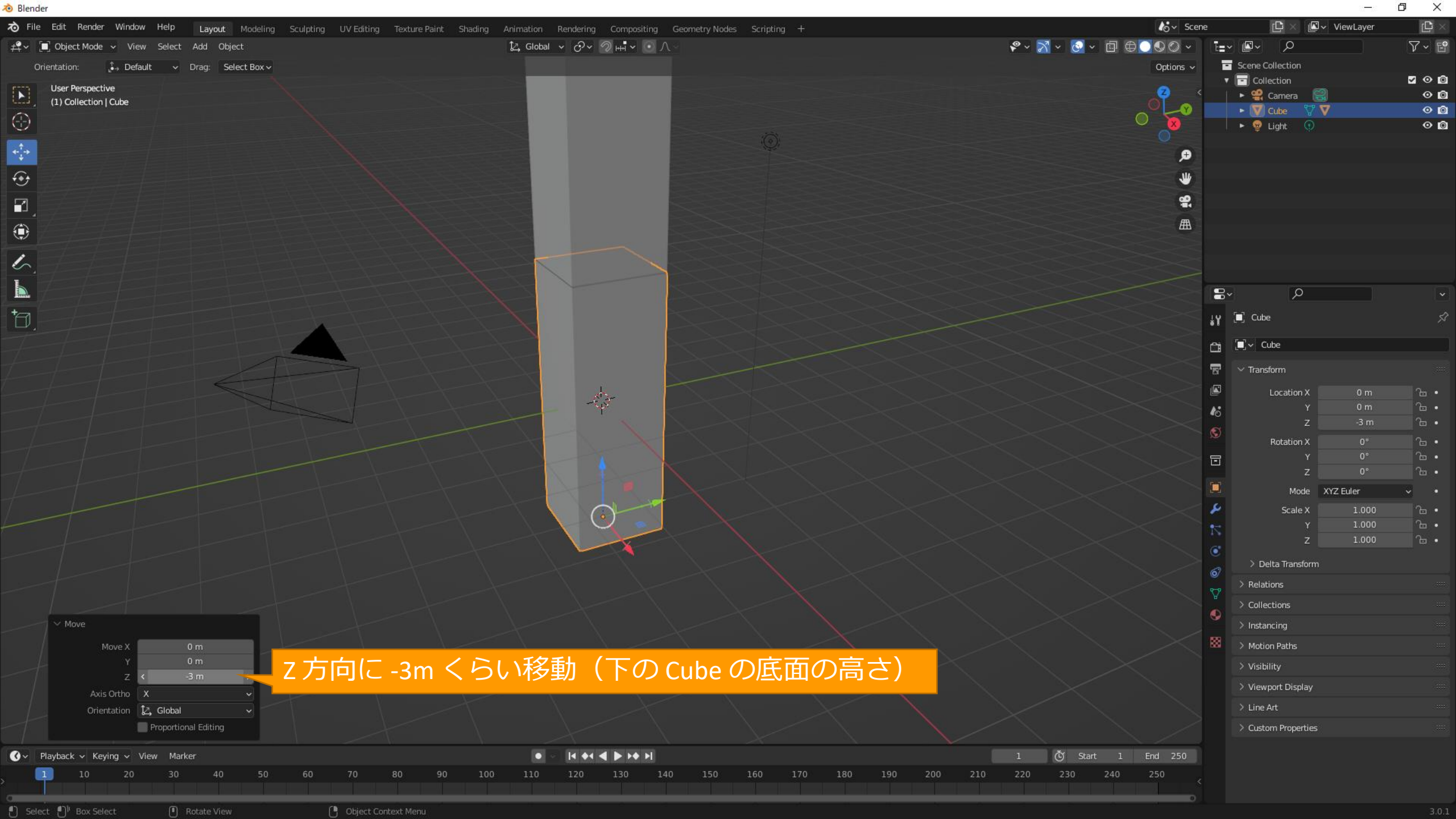
Move



- Options の (Affect Only) Origins にチェック
☑を入れば Origin だけを移動できる
- このとき Parents にもチェックを入れてお
かないと上の (子の) Cube も一緒に動く



青い↑を下にドラッグ



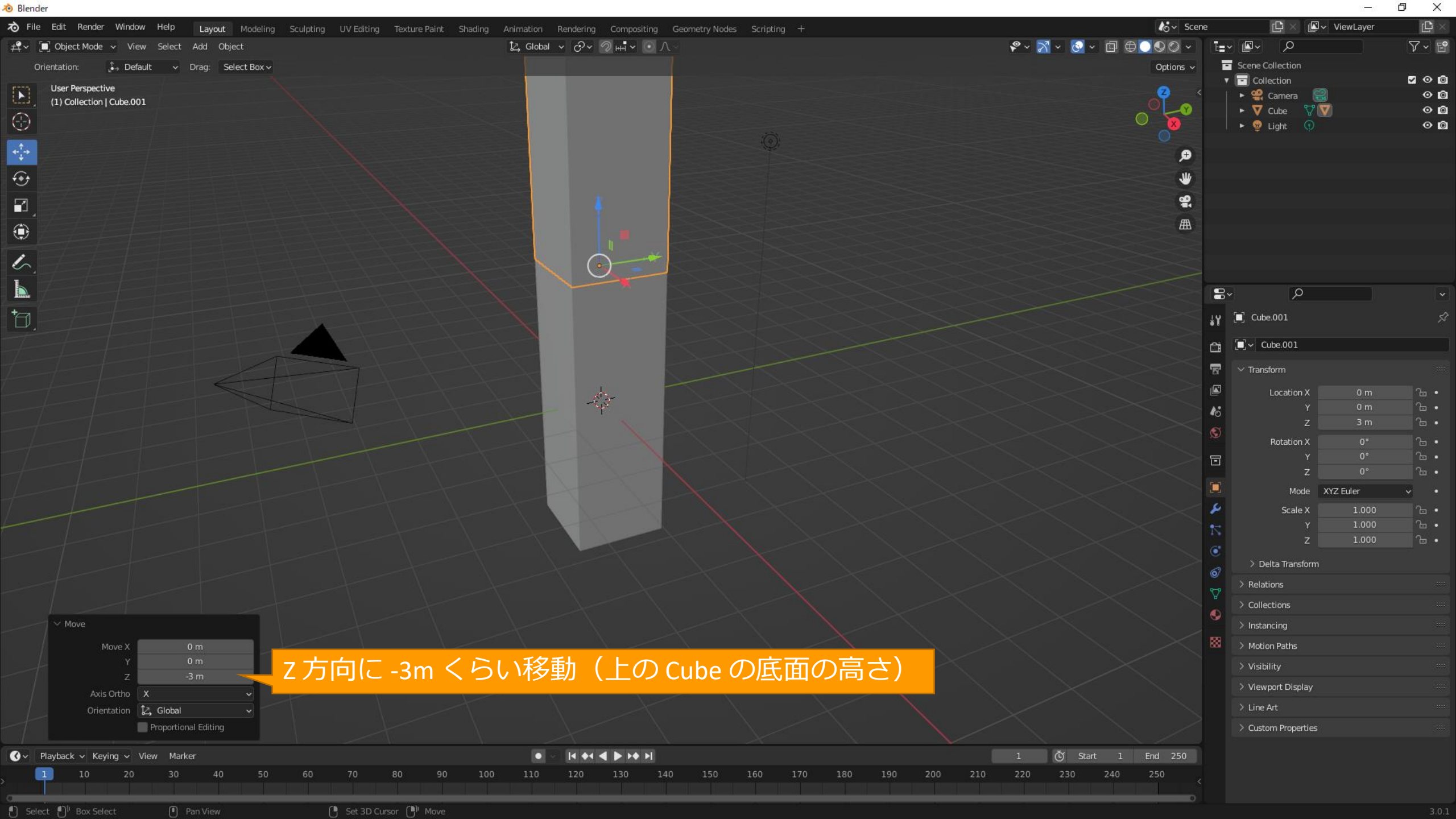
z 方向に -3m くらい移動（下の Cube の底面の高さ）



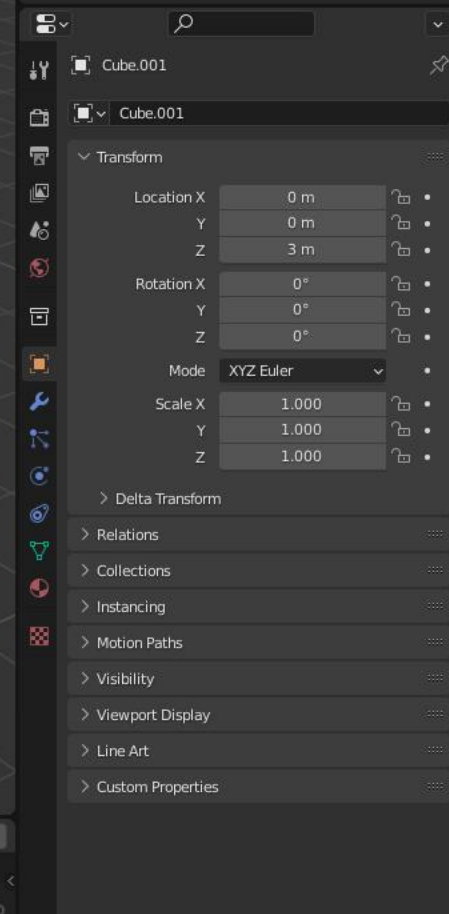
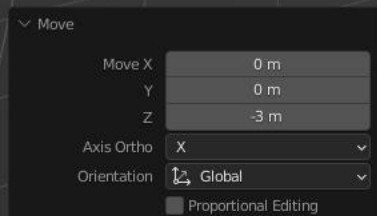
青い↑を下にドラッグ

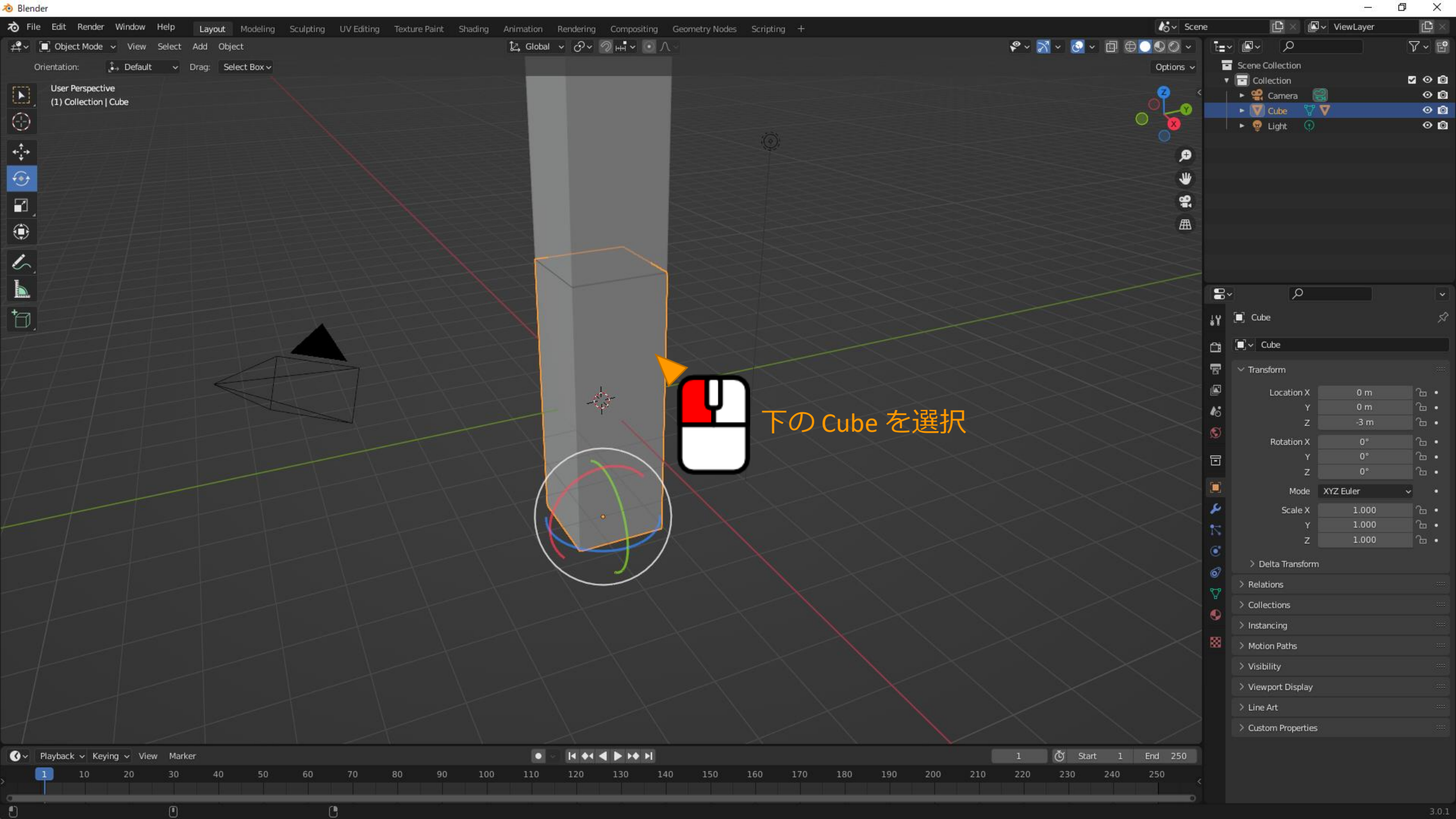


Location X	0 m	🔒
Y	0 m	🔒
Z	6 m	🔒
Rotation X	0°	🔒
Y	0°	🔒
Z	0°	🔒
Mode	XYZ Euler	▼
Scale X	1.000	🔒
Y	1.000	🔒
Z	1.000	🔒



- Options の (Affect Only) Origins と Parents の
チェック□を外しておく



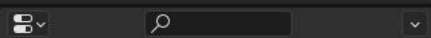


Rotation: -48.20 global

Orientation: Default Drag: Select Box

User Perspective
(1) Collection | Cube

Options



Cube

Cube

Transform

Location X	0 m	
Y	0 m	
Z	-3 m	
Rotation X	-48.2°	
Y	0°	
Z	0°	
Mode	XYZ Euler	
Scale X	1.000	
Y	1.000	
Z	1.000	

> Delta Transform

> Relations

> Collections

> Instancing

> Motion Paths

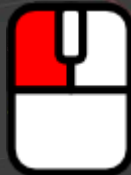
> Visibility

> Viewport Display

> Line Art

> Custom Properties

下の Cube（親）を回転すると
一緒に上の Cube（子）も回転する



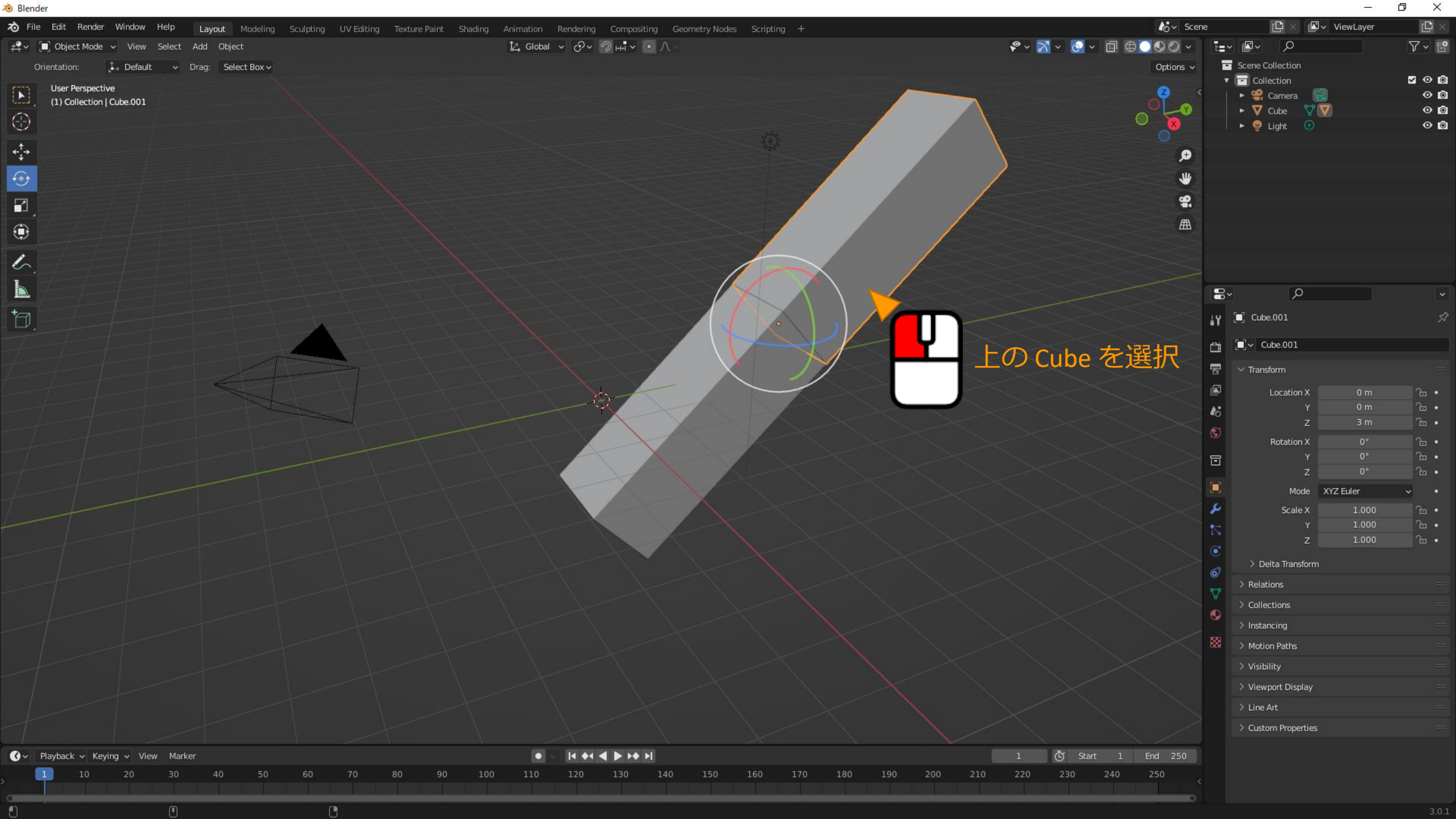
Playback Keying View Marker



1 Start 1 End 250

1 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

Confirm Cancel X X Axis Y Y Axis Z Z Axis X X Plane Y Y Plane Z Z Plane C Clear Constraints Ctrl Snap Invert Snap Toggle G Move R Rotate S Resize Automatic Constraint Automatic Constraint Plane Precision Mode

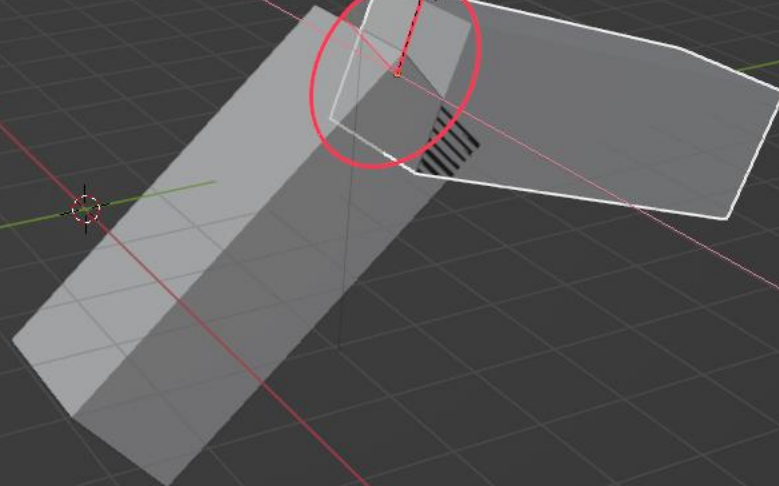
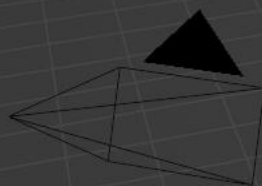


Rotation: -60.30 global

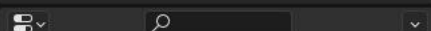
Orientation: Default Drag: Select Box

User Perspective
(1) Collection | Cube.001

上の Cube（子）を回転しても
下の Cube（親）には影響を与えない



Options



Cube.001

Cube.001

Transform

Location X	0 m	
Y	0 m	
Z	3 m	
Rotation X	-60.3°	
Y	0°	
Z	0°	
Mode	XYZ Euler	
Scale X	1.000	
Y	1.000	
Z	1.000	

> Delta Transform

> Relations

> Collections

> Instancing

> Motion Paths

> Visibility

> Viewport Display

> Line Art

> Custom Properties

Playback Keying View Marker



1 Start 1 End 250

User Perspective
(1) Collection | Cube.001

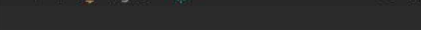
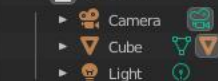
Select



Options

Scene Collection

Collection



Cube.001

Cube.001

Transform

Location X	0 m	
Y	0 m	
Z	3 m	
Rotation X	-60.3°	
Y	0°	
Z	0°	
Mode	XYZ Euler	
Scale X	1.000	
Y	1.000	
Z	1.000	

> Delta Transform

> Relations

> Collections

> Instancing

> Motion Paths

> Visibility

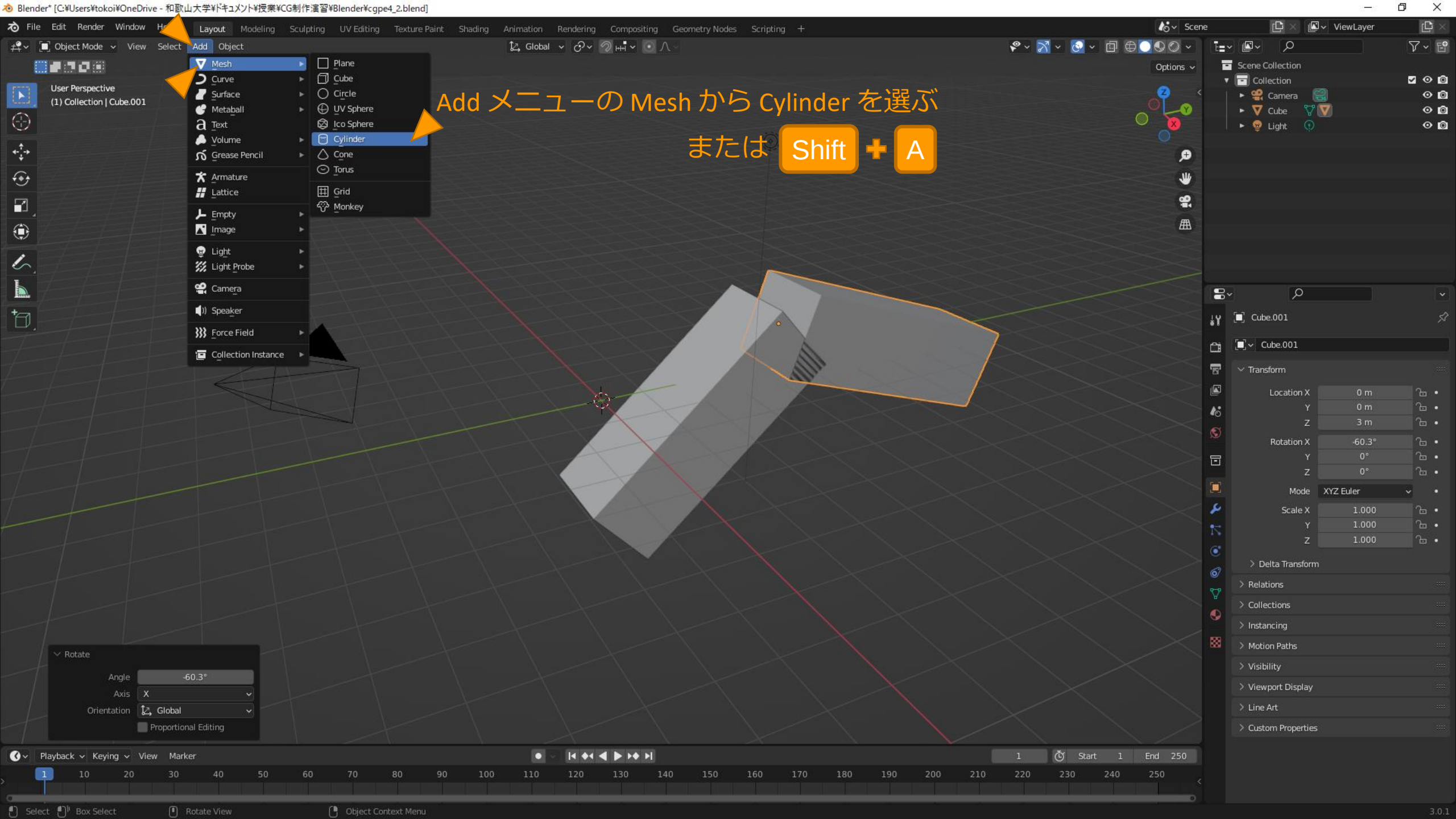
> Viewport Display

> Line Art

> Custom Properties

Rotate

Angle -60.3°
Axis X
Orientation Global
Proportional Editing



Add メニューの Mesh から Cylinder を選ぶ
または Shift + A

Rotate

Angle: -60.3°

Axis: X

Orientation: Global

Proportional Editing

Cube.001

Transform

Location X	0 m
Y	0 m
Z	3 m
Rotation X	-60.3°
Y	0°
Z	0°
Mode	XYZ Euler
Scale X	1.000
Y	1.000
Z	1.000

Delta Transform

Relations

Collections

Instancing

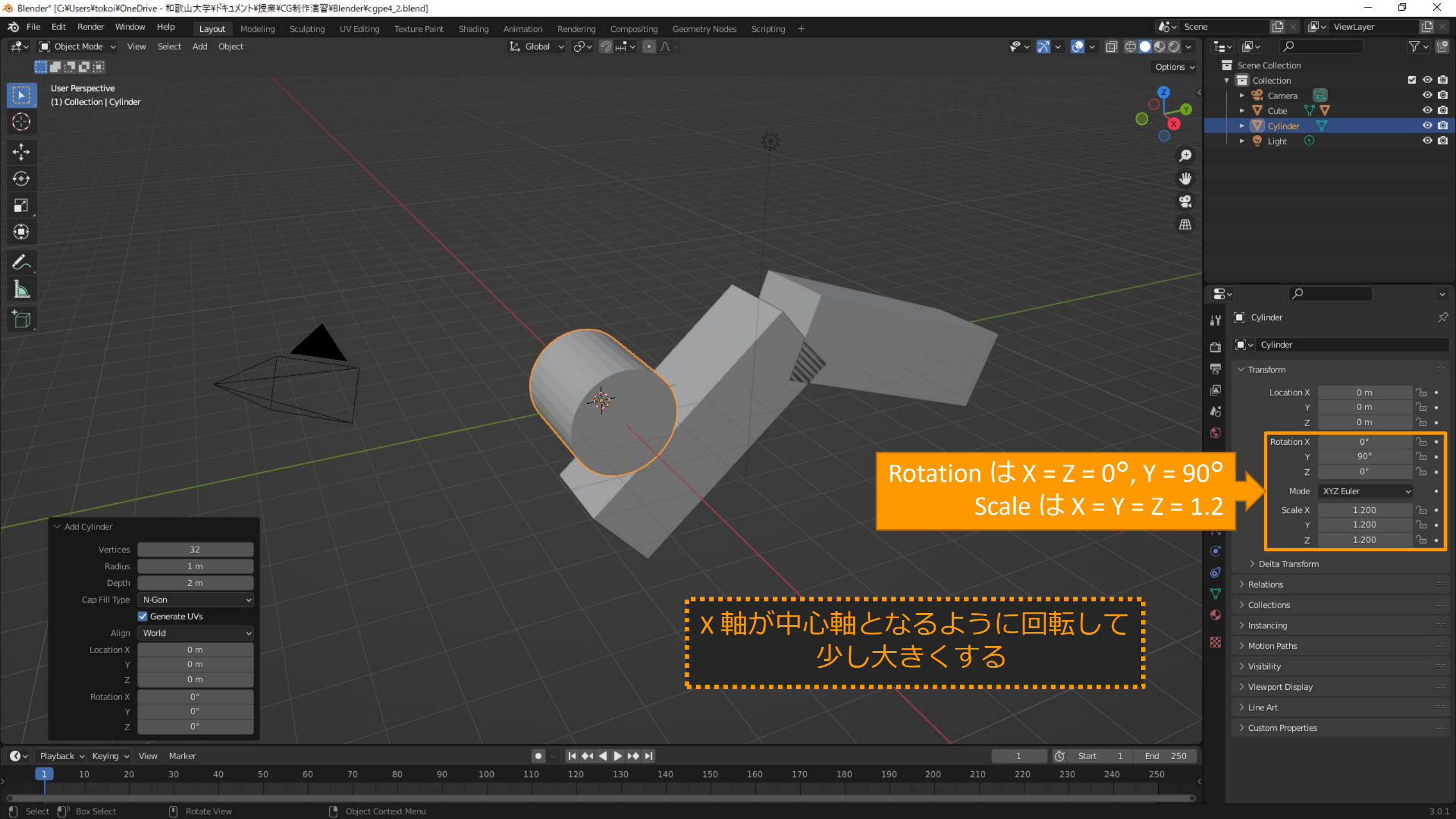
Motion Paths

Visibility

Viewport Display

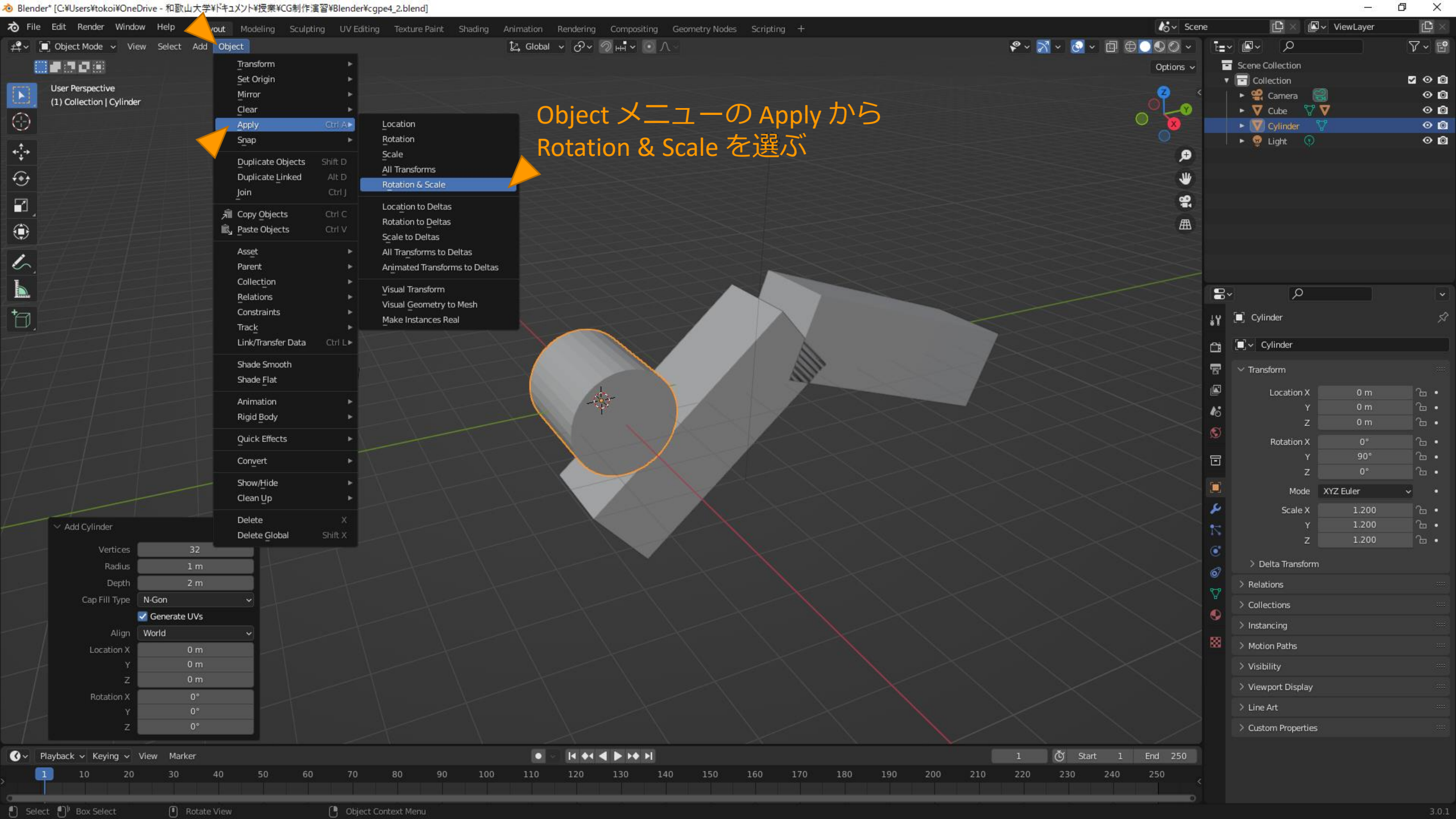
Line Art

Custom Properties

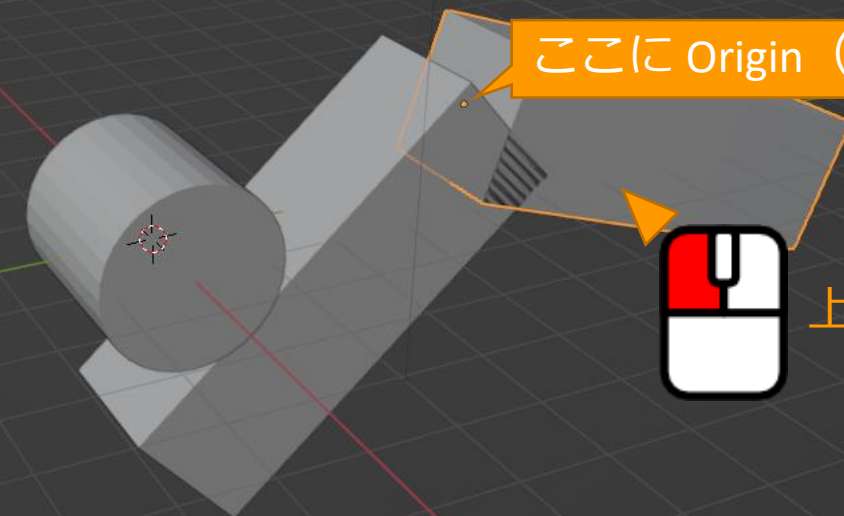
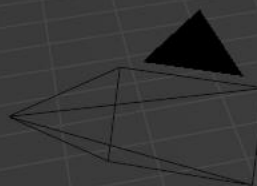


Rotation は $X = Z = 0^\circ$, $Y = 90^\circ$
Scale は $X = Y = Z = 1.2$

x 軸が中心軸となるように回転して
少し大きくする



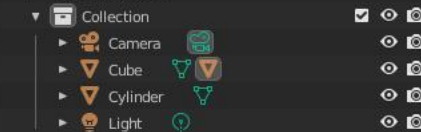
Object メニューの Apply から
Rotation & Scale を選ぶ

User Perspective
(1) Collection | Cube.001

ここに Origin (原点) がある

上の Cube を選択

Scene Collection



Cube.001

Cube.001

Transform

Location X	0 m	🔒
Y	0 m	🔒
Z	3 m	🔒
Rotation X	-60.3°	🔒
Y	0°	🔒
Z	0°	🔒
Mode	XYZ Euler	▼
Scale X	1.000	🔒
Y	1.000	🔒
Z	1.000	🔒

> Delta Transform

> Relations

> Collections

> Instancing

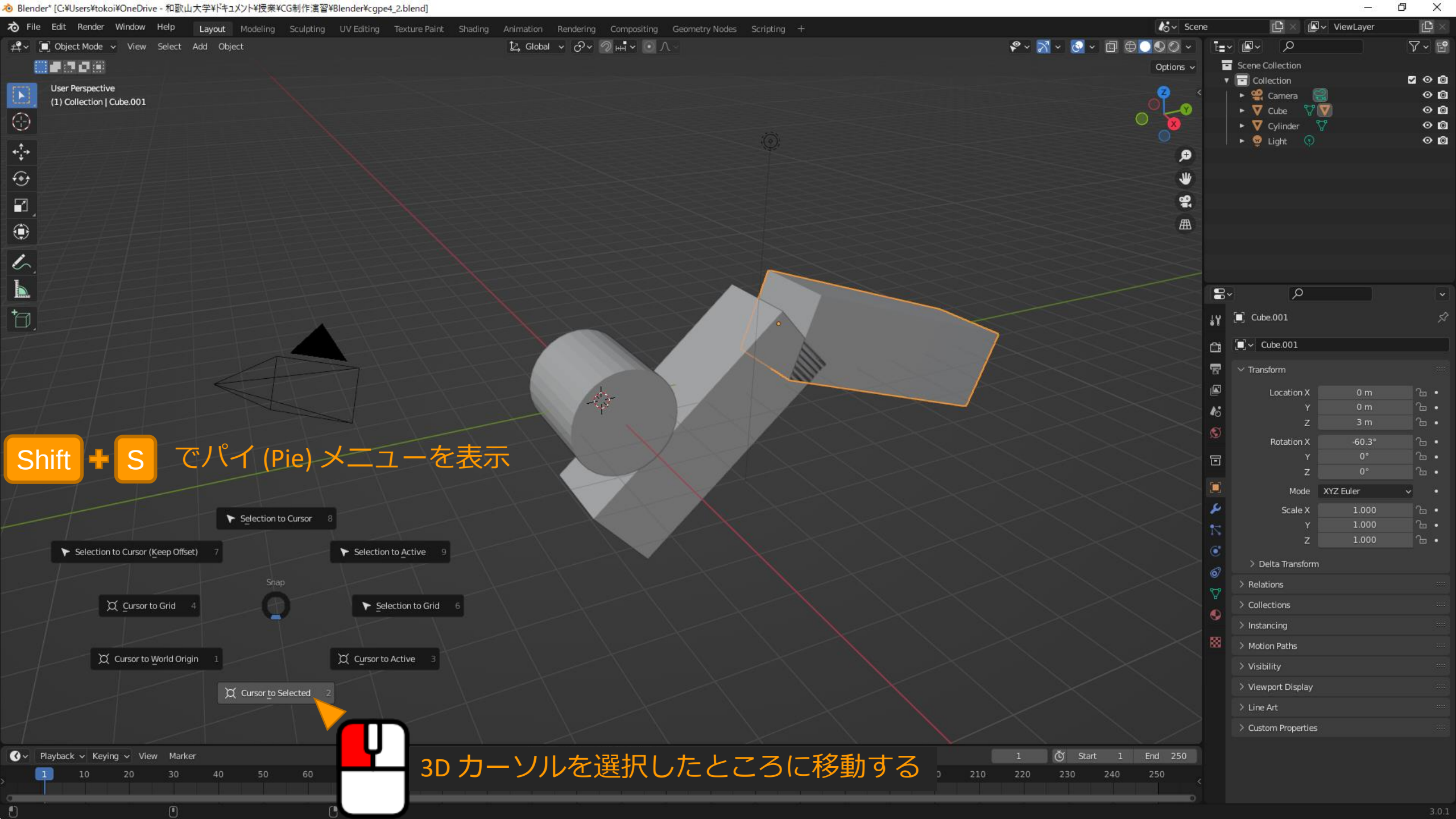
> Motion Paths

> Visibility

> Viewport Display

> Line Art

> Custom Properties



Shift + S でパイ (Pie) メニューを表示

- Selection to Cursor 8
- Selection to Cursor (Keep Offset) 7
- Selection to Active 9
- Cursor to Grid 4
- Selection to Grid 6
- Cursor to World Origin 1
- Cursor to Active 3
- Cursor to Selected 2



3D カーソルを選択したところに移動する

Scene Collection

- Collection
 - Camera
 - Cube
 - Cylinder
 - Light

Cube.001

Transform

Location X	0 m
Y	0 m
Z	3 m
Rotation X	-60.3°
Y	0°
Z	0°
Mode	XYZ Euler
Scale X	1.000
Y	1.000
Z	1.000

Delta Transform

Relations

Collections

Instancing

Motion Paths

Visibility

Viewport Display

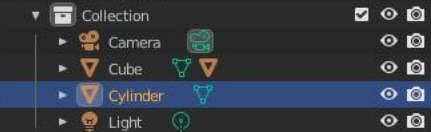
Line Art

Custom Properties

User Perspective
(1) Collection | Cylinder

Options

Scene Collection



ここに 3D カーソルが移動した



Cylinder を選択

Cylinder

Cylinder

Transform

Location X 0 m

Y 0 m

Z 0 m

Rotation X 0°

Y 0°

Z 0°

Mode XYZ Euler

Scale X 1.000

Y 1.000

Z 1.000

> Delta Transform

> Relations

> Collections

> Instancing

> Motion Paths

> Visibility

> Viewport Display

> Line Art

> Custom Properties

Playback Keying View Marker

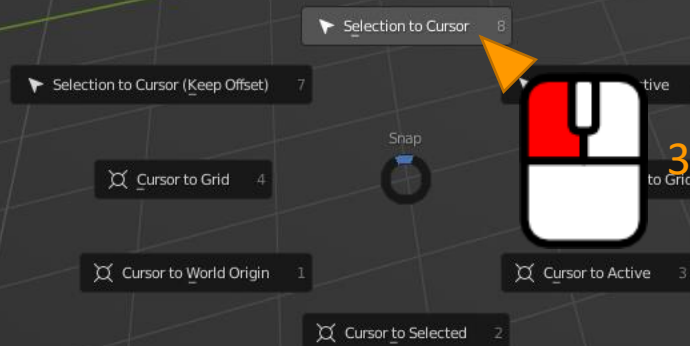


1 Start 1 End 250

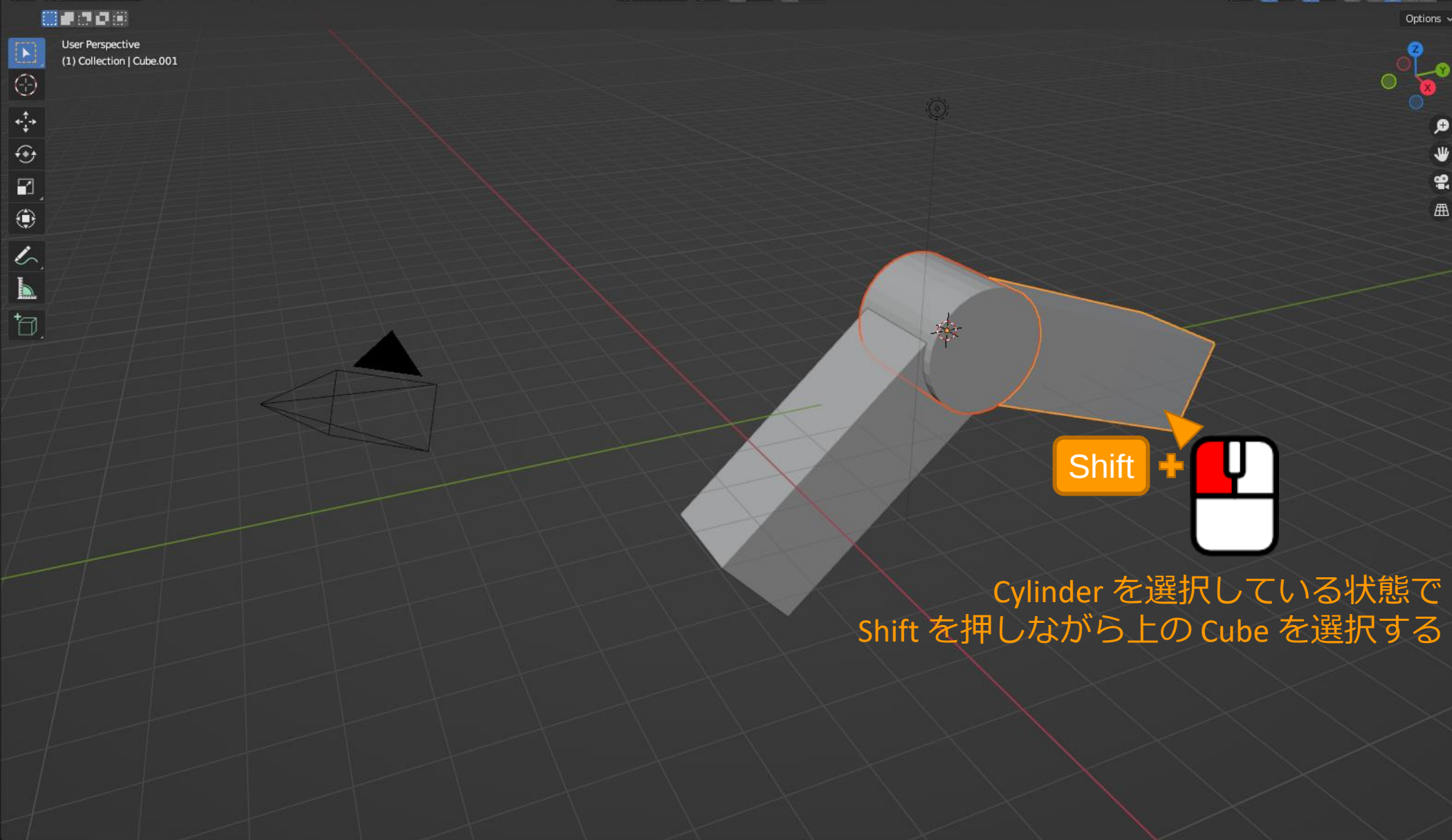
1 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

User Perspective
(1) Collection | Cylinder

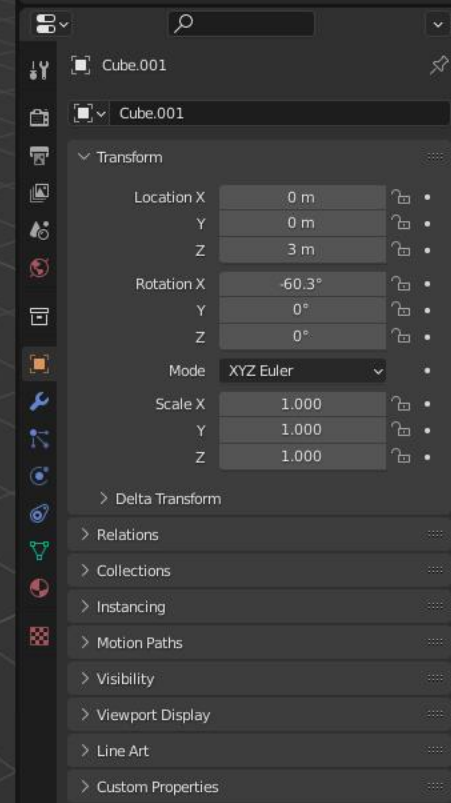
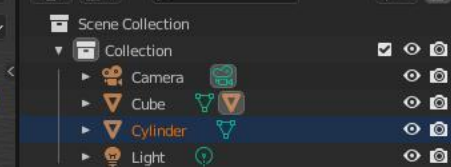
Shift + S でパイ (Pie) メニューを表示

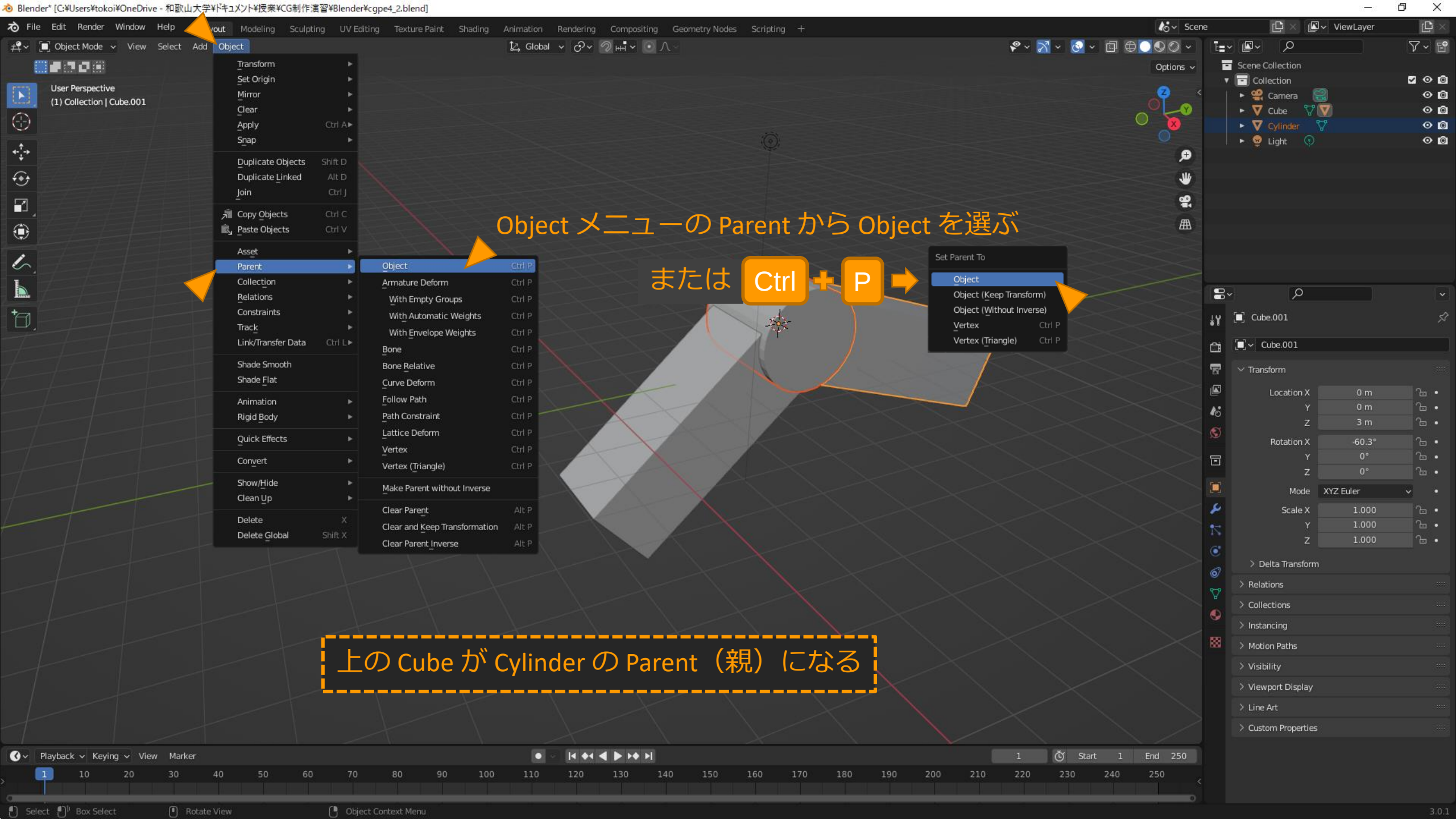


3D カーソルのところに選択したものを移動する



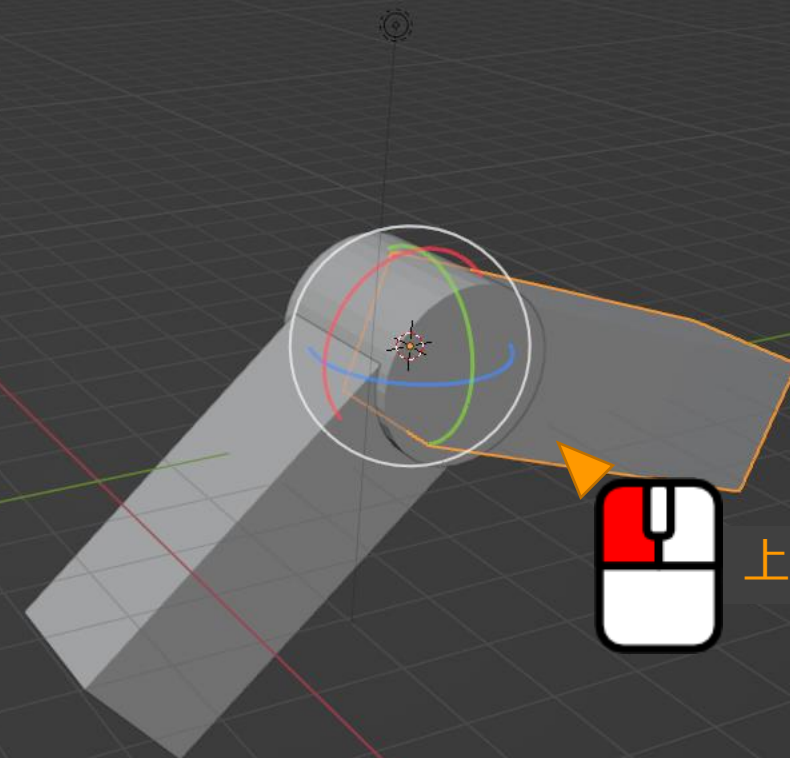
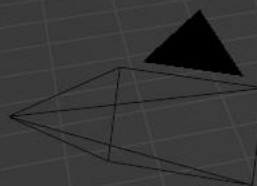
Cylinder を選択している状態で
Shift を押しながら上の Cube を選択する





User Perspective
(1) Collection | Cube.001

Rotate



上の Cube だけを選択

Scene Collection



Cube.001

Cube.001

Transform

Location X	0 m	🔒
Y	0 m	🔒
Z	3 m	🔒
Rotation X	-60.3°	🔒
Y	0°	🔒
Z	0°	🔒
Mode	XYZ Euler	▼
Scale X	1.000	🔒
Y	1.000	🔒
Z	1.000	🔒

> Delta Transform

> Relations

> Collections

> Instancing

> Motion Paths

> Visibility

> Viewport Display

> Line Art

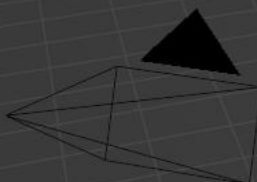
> Custom Properties

Rotation: 89.83 global

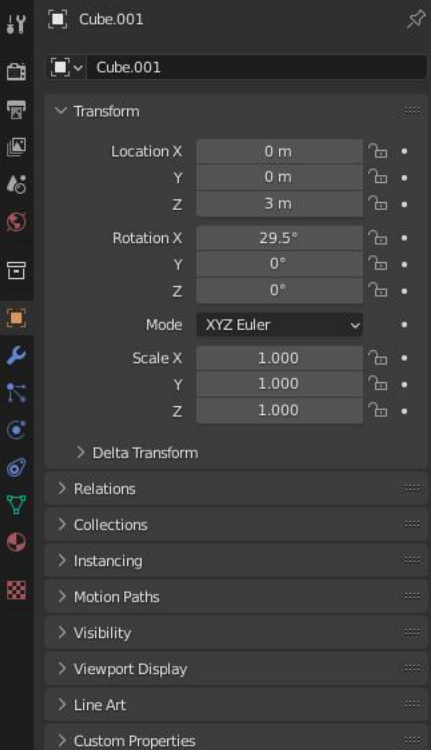
Orientation: Default Drag: Select Box

User Perspective
(1) Collection | Cube.001

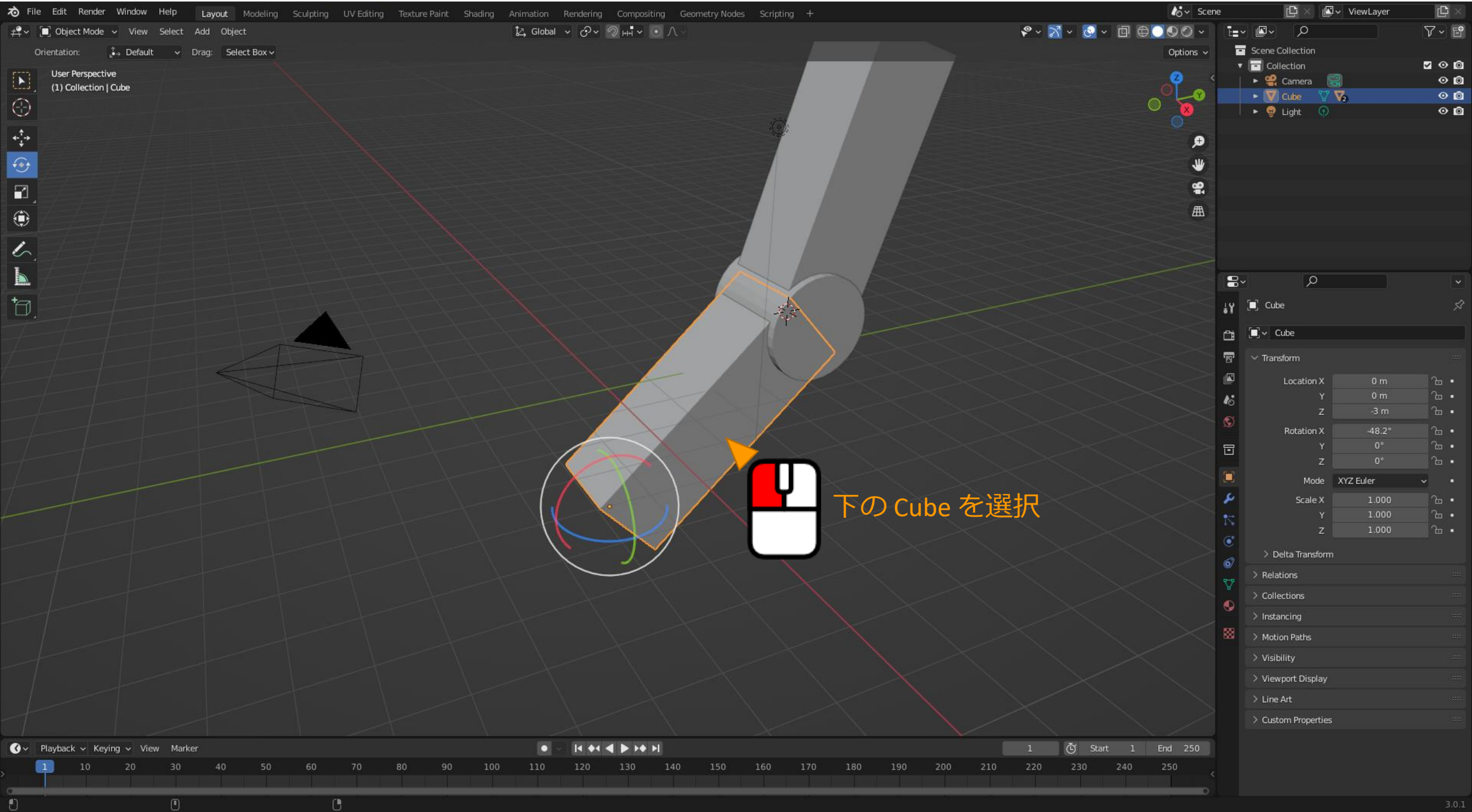
上の Cube（親）を回転すると
Cylinder（子）も一緒に回転する



Options



Playback Keying View Marker 1 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250



Rotation: 107.50 global

Orientation: Default Drag: Select Box

User Perspective
(1) Collection | Cube

Options

Scene Collection

Collection

Camera

Cube

Light

2

2

2

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2

下の Cube（親）を回転すると
一緒に上の Cube（子）も Cylinder（孫）も回転する

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Cube

Playback Keying View Marker

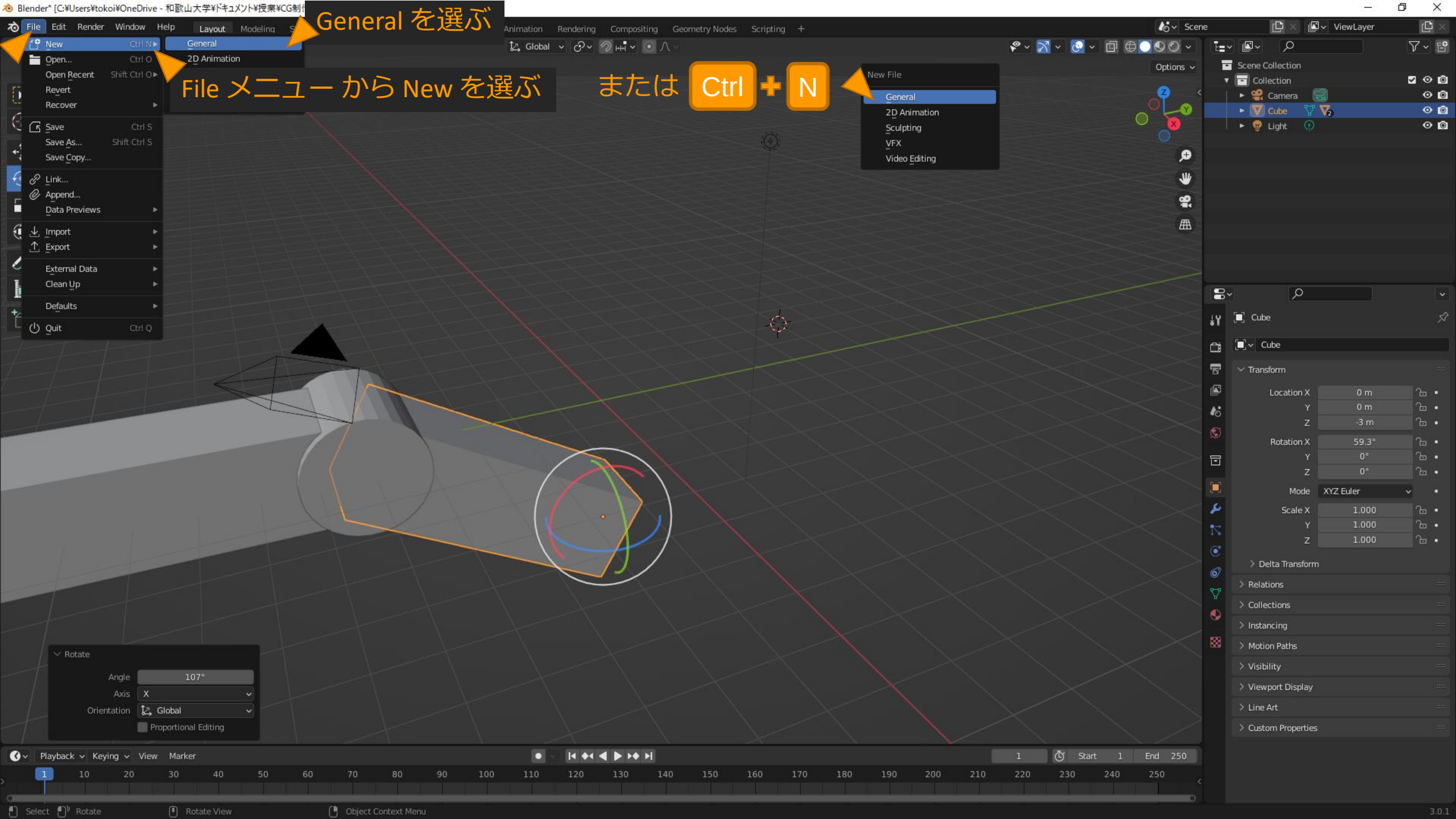
1 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

1 Start 1 End 250

ボーン

ひとつづきのものを曲げる

https://twitter.com/mask_3dcg/status/1486855305527177217



File メニュー から New を選ぶ

または Ctrl + N

New File

General

2D Animation

Sculpting

VFX

Video Editing

Rotate

Angle 107°

Axis X

Orientation Global

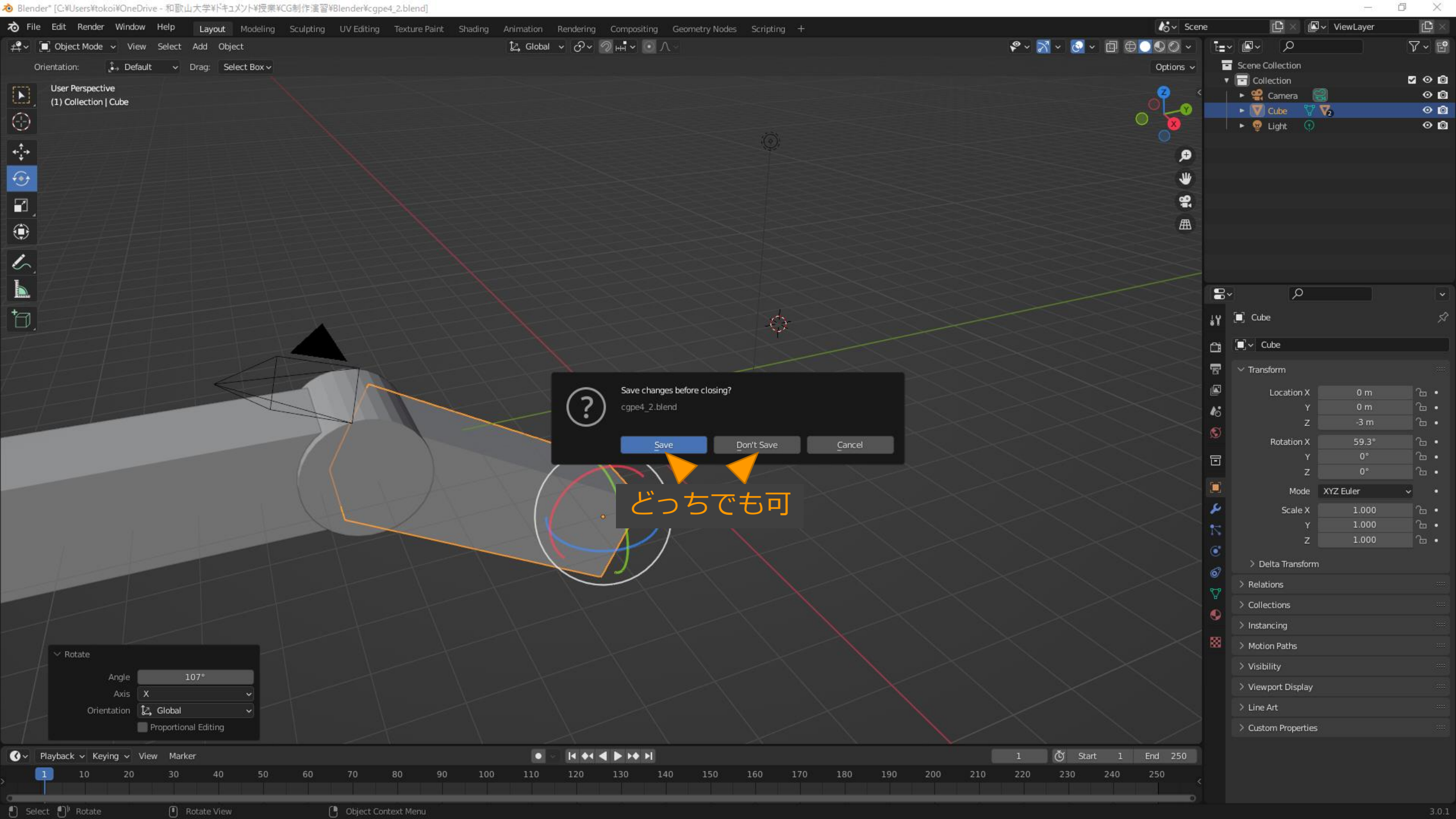
Proportional Editing

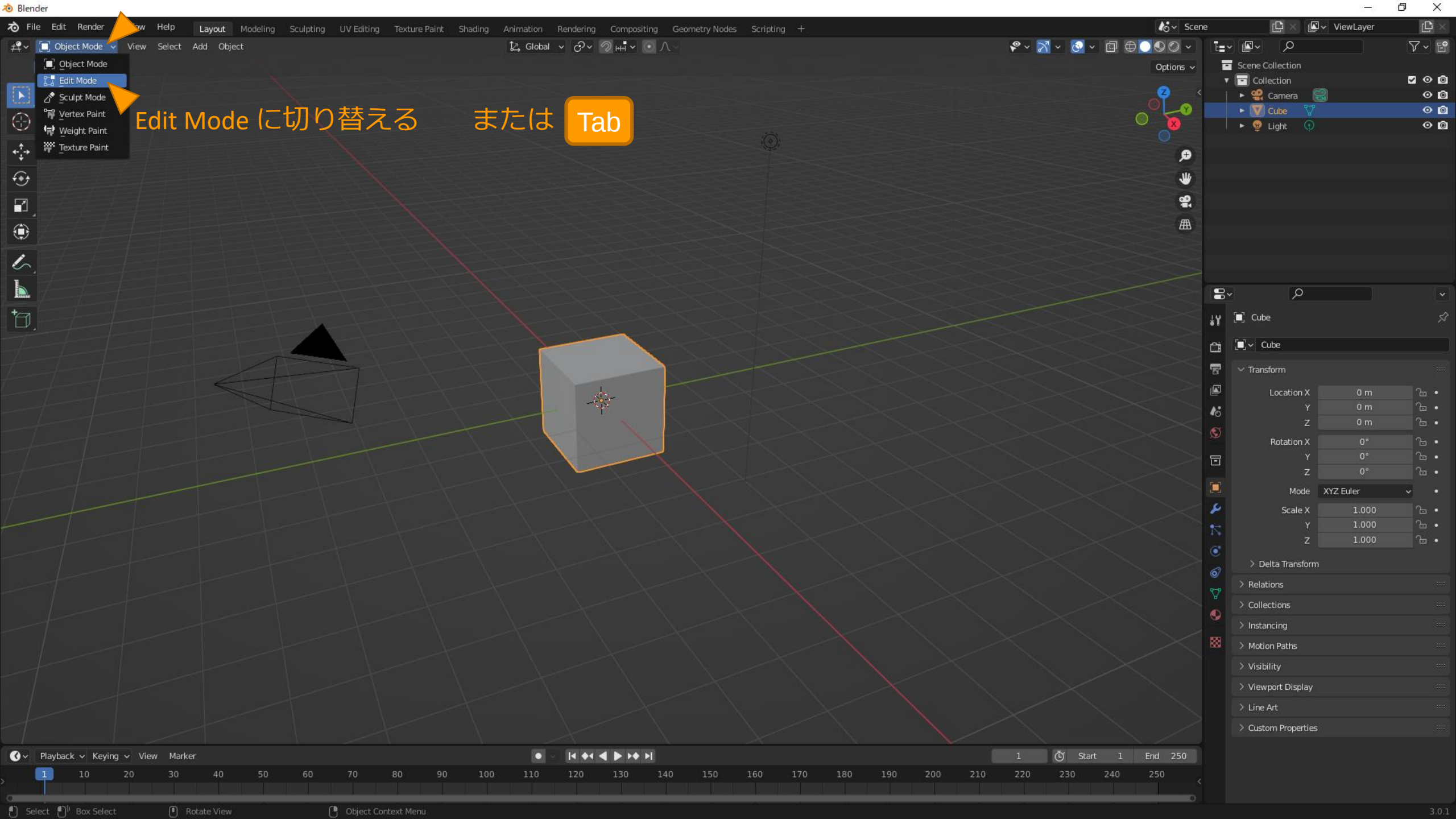
Playback Keying View Marker

1

10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

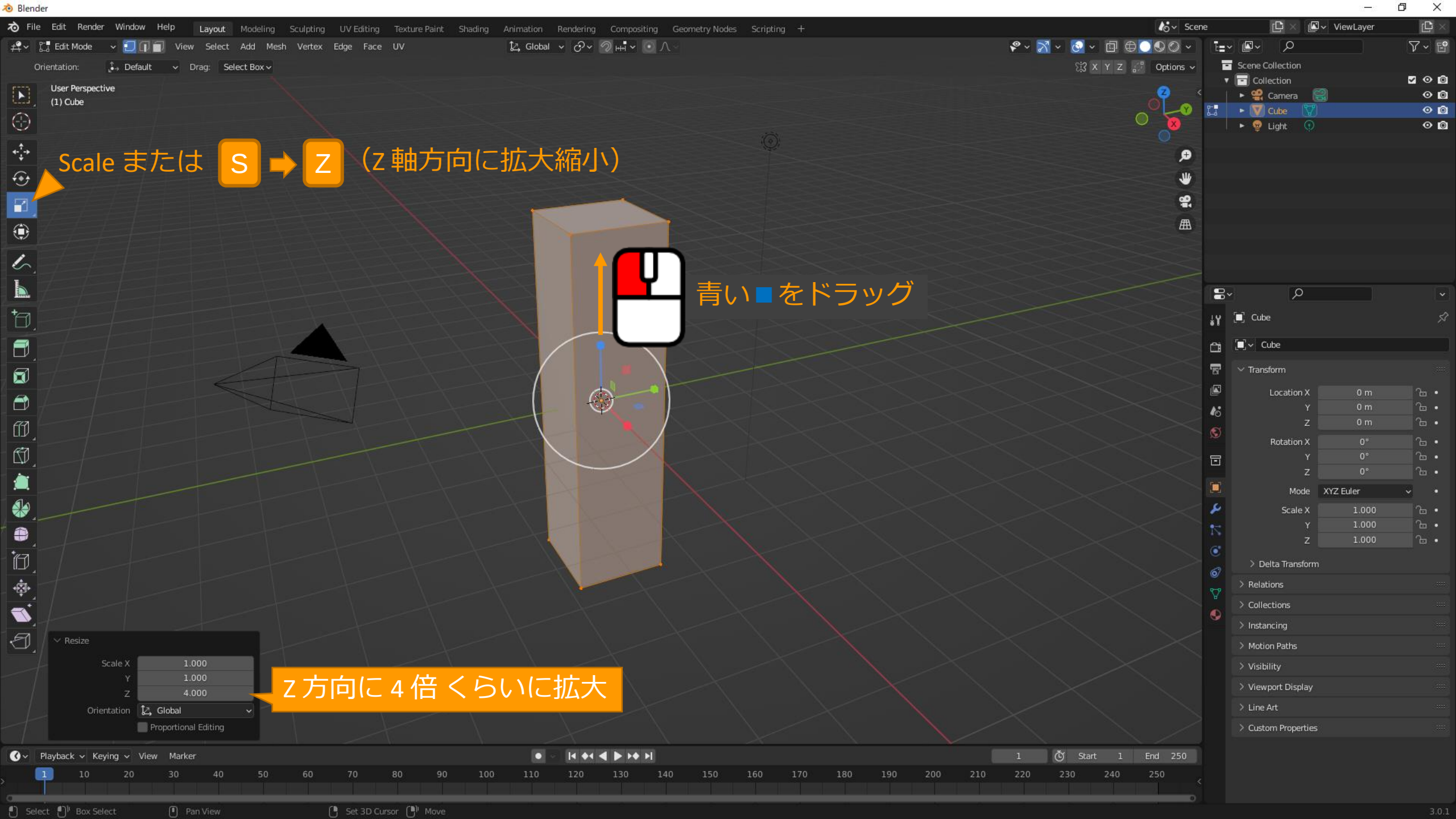
1 Start 1 End 250





Edit Mode に切り替える

または Tab



Scale または S → Z (z 軸方向に拡大縮小)

青い■をドラッグ

z 方向に 4 倍 くらいに拡大

▼ Resize

Scale X	1.000
Y	1.000
Z	4.000

Orientation: Global

☐ Proportional Editing

Cube

▼ Transform

Location X	0 m
Y	0 m
Z	0 m
Rotation X	0°
Y	0°
Z	0°
Mode	XYZ Euler
Scale X	1.000
Y	1.000
Z	1.000

> Delta Transform

> Relations

> Collections

> Instancing

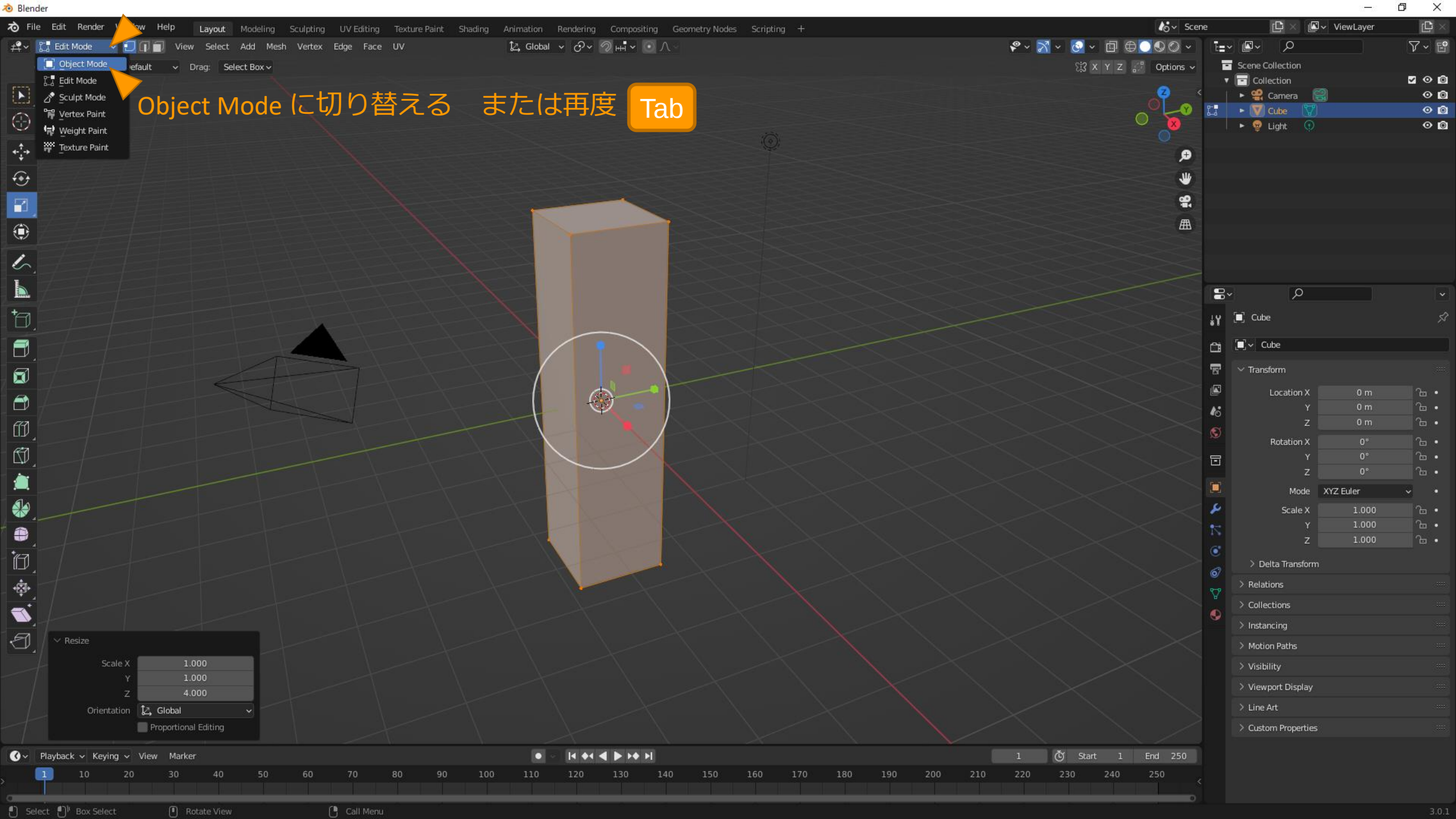
> Motion Paths

> Visibility

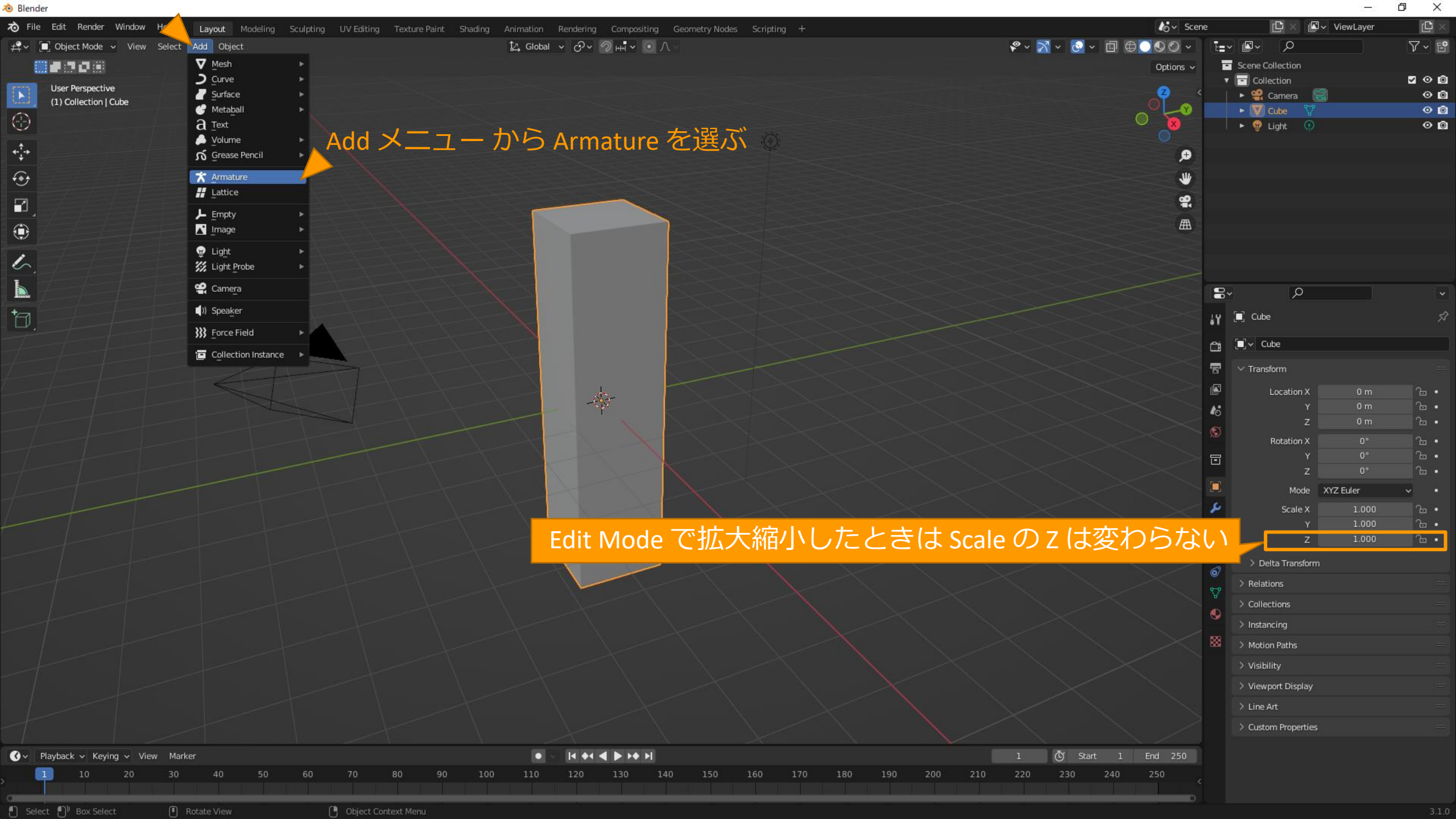
> Viewport Display

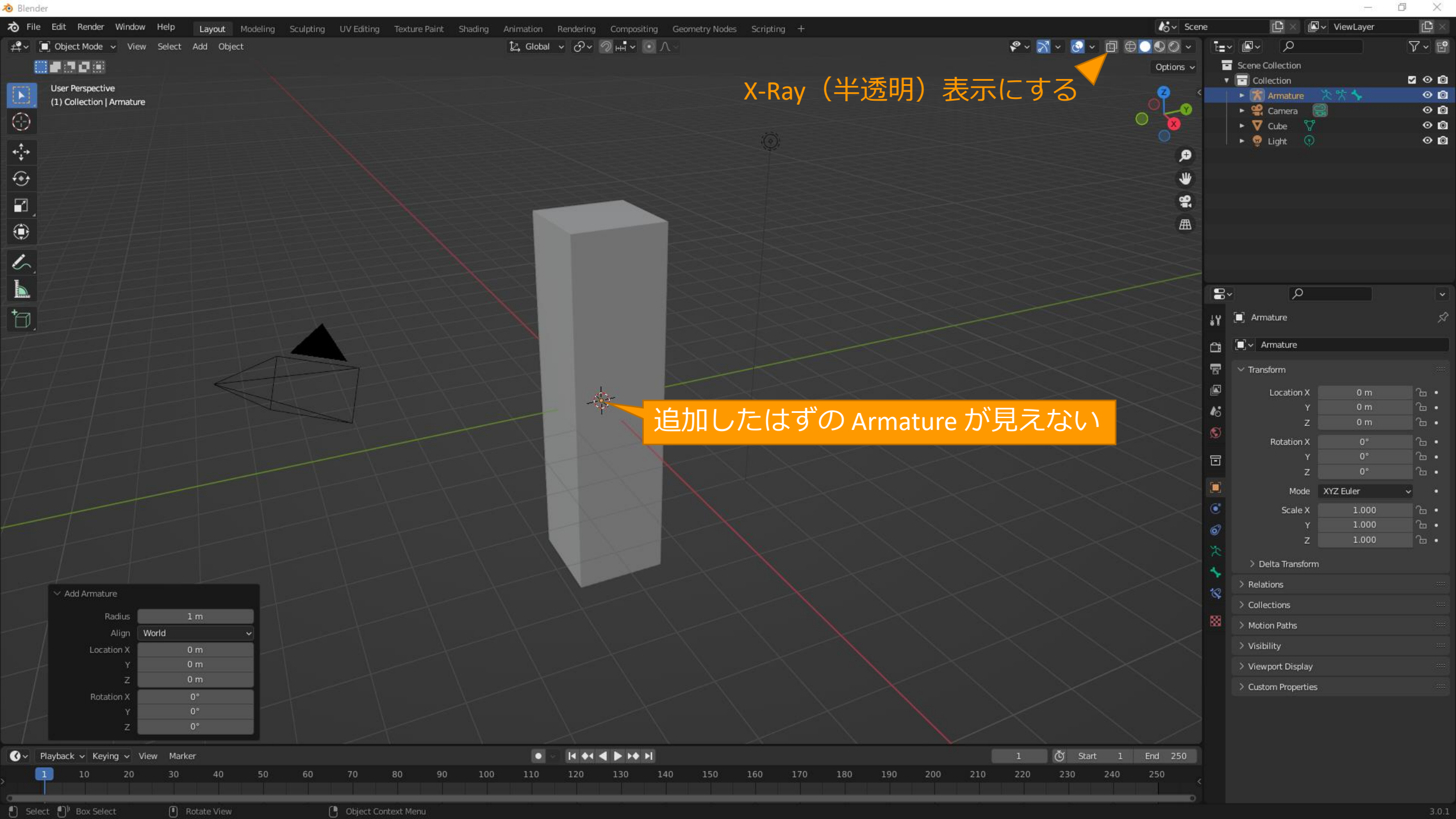
> Line Art

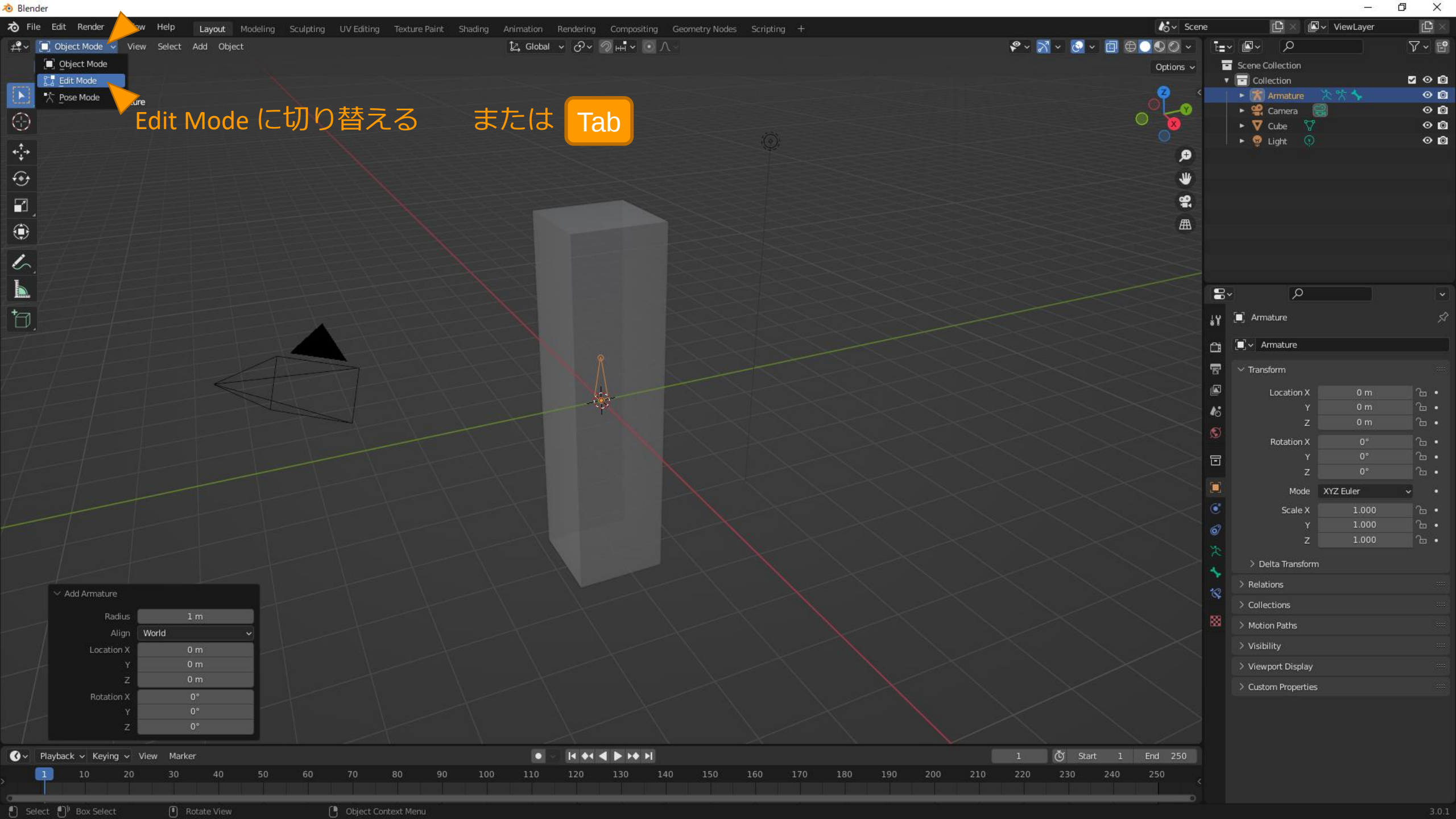
> Custom Properties



Object Mode に切り替える または再度 Tab

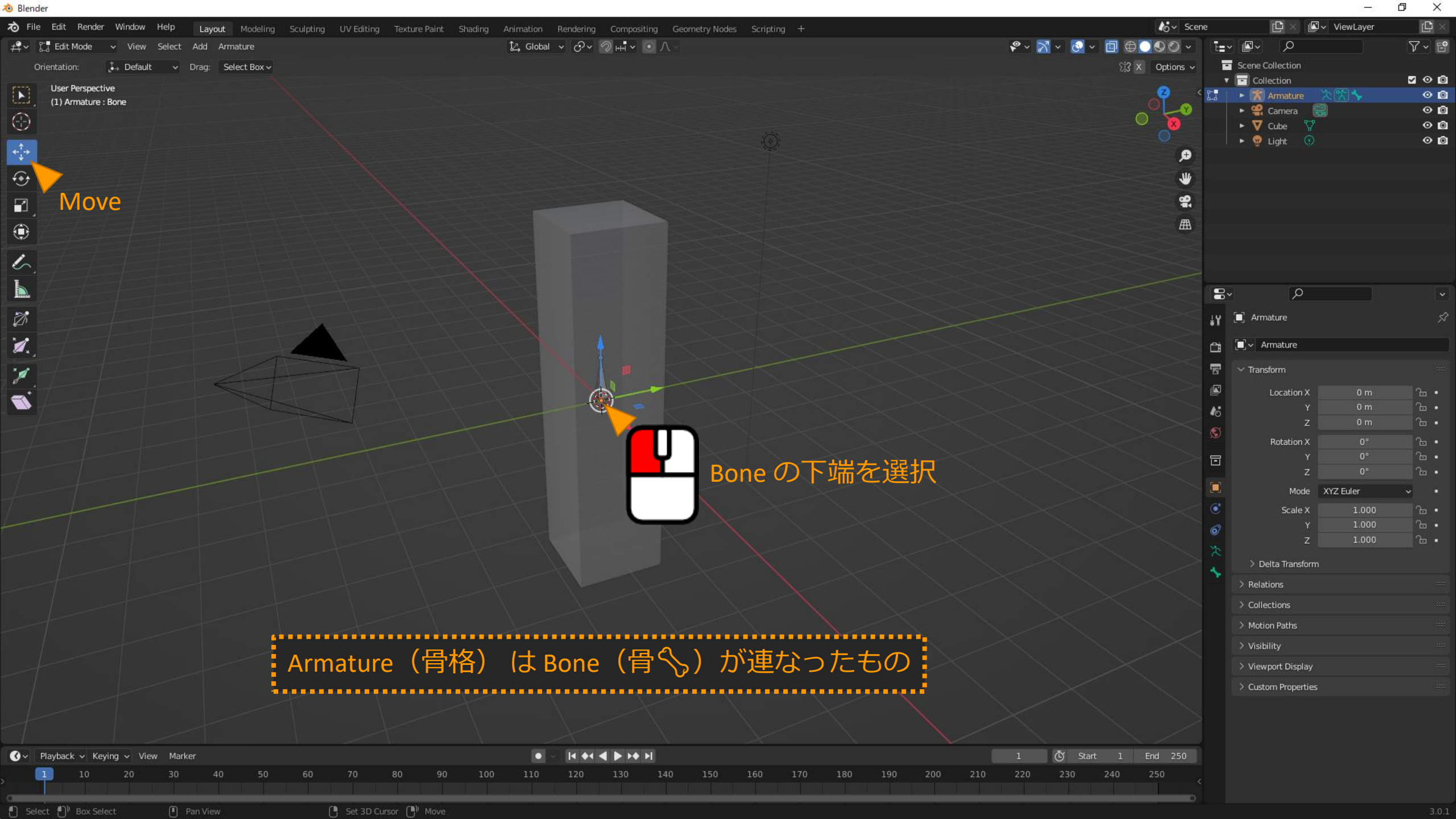






Edit Mode に切り替える

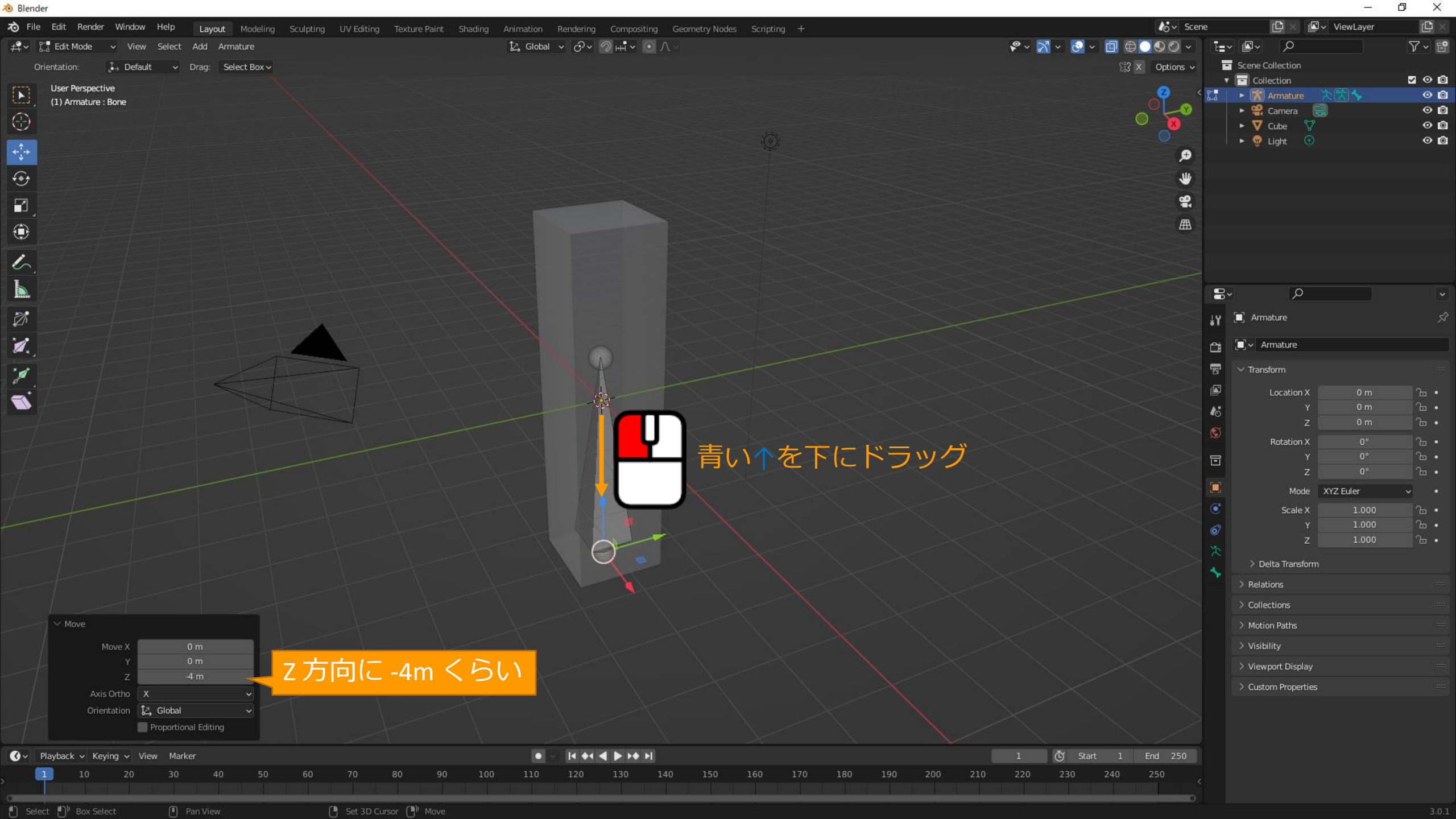
または Tab



Move

Bone の下端を選択

Armature (骨格) は Bone (骨) が連なったもの



青い↑を下にドラッグ

z方向に -4m くらい

Move

Move X	0 m
Y	0 m
Z	-4 m

Axis Ortho X

Orientation Global

Proportional Editing

Scene Collection

- Collection
 - Armature
 - Camera
 - Cube
 - Light

Armature

Transform

Location X	0 m
Y	0 m
Z	0 m
Rotation X	0°
Y	0°
Z	0°
Mode	XYZ Euler
Scale X	1.000
Y	1.000
Z	1.000

Delta Transform

Relations

Collections

Motion Paths

Visibility

Viewport Display

Custom Properties



User Perspective
(1) Armature : Bone



Bone の上端を選択

Scene Collection

Collection

Armature

Camera

Cube

Light

Armature

Armature

Transform

Location X 0 m

Y 0 m

Z 0 m

Rotation X 0°

Y 0°

Z 0°

Mode XYZ Euler

Scale X 1.000

Y 1.000

Z 1.000

Delta Transform

Relations

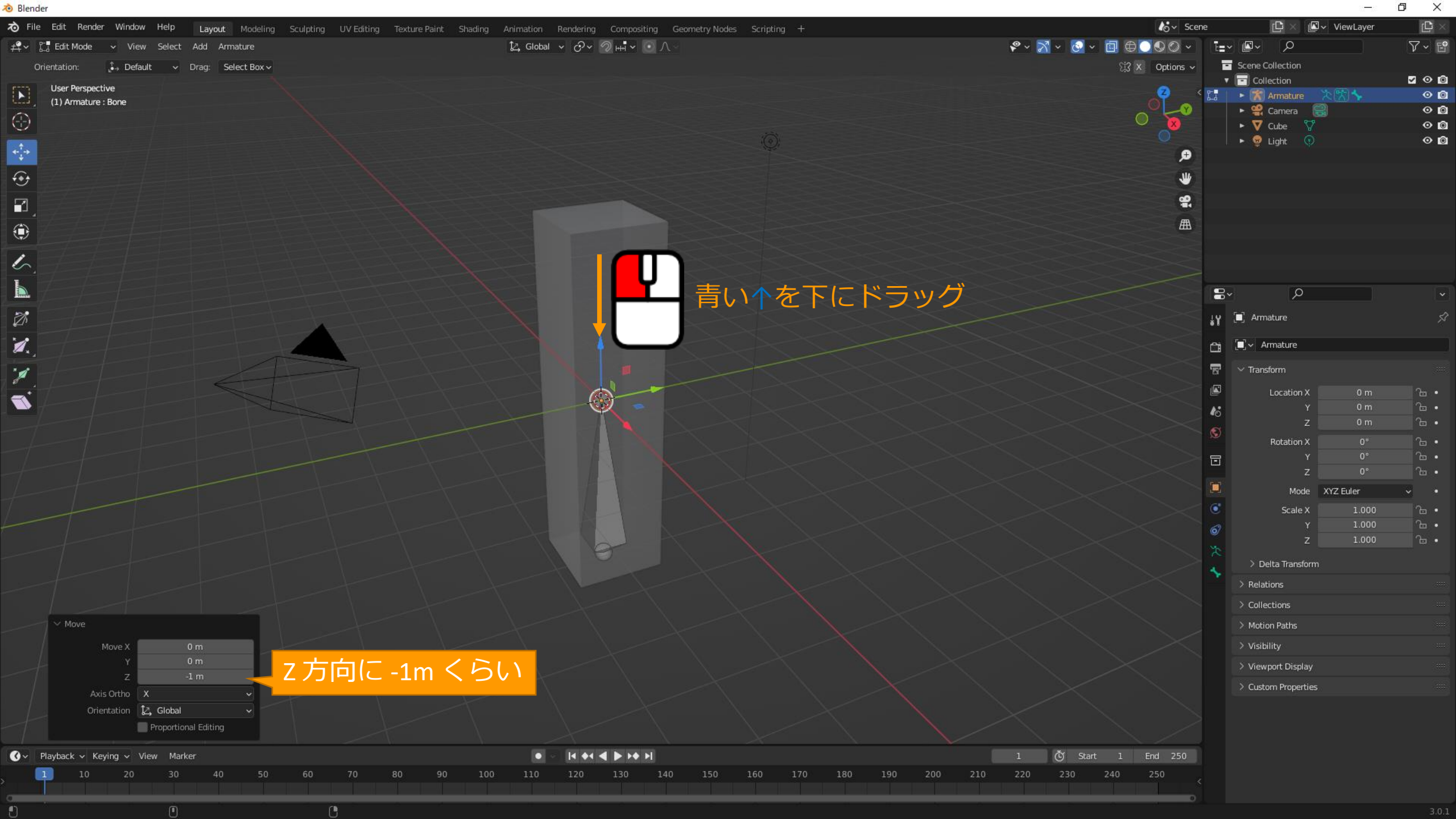
Collections

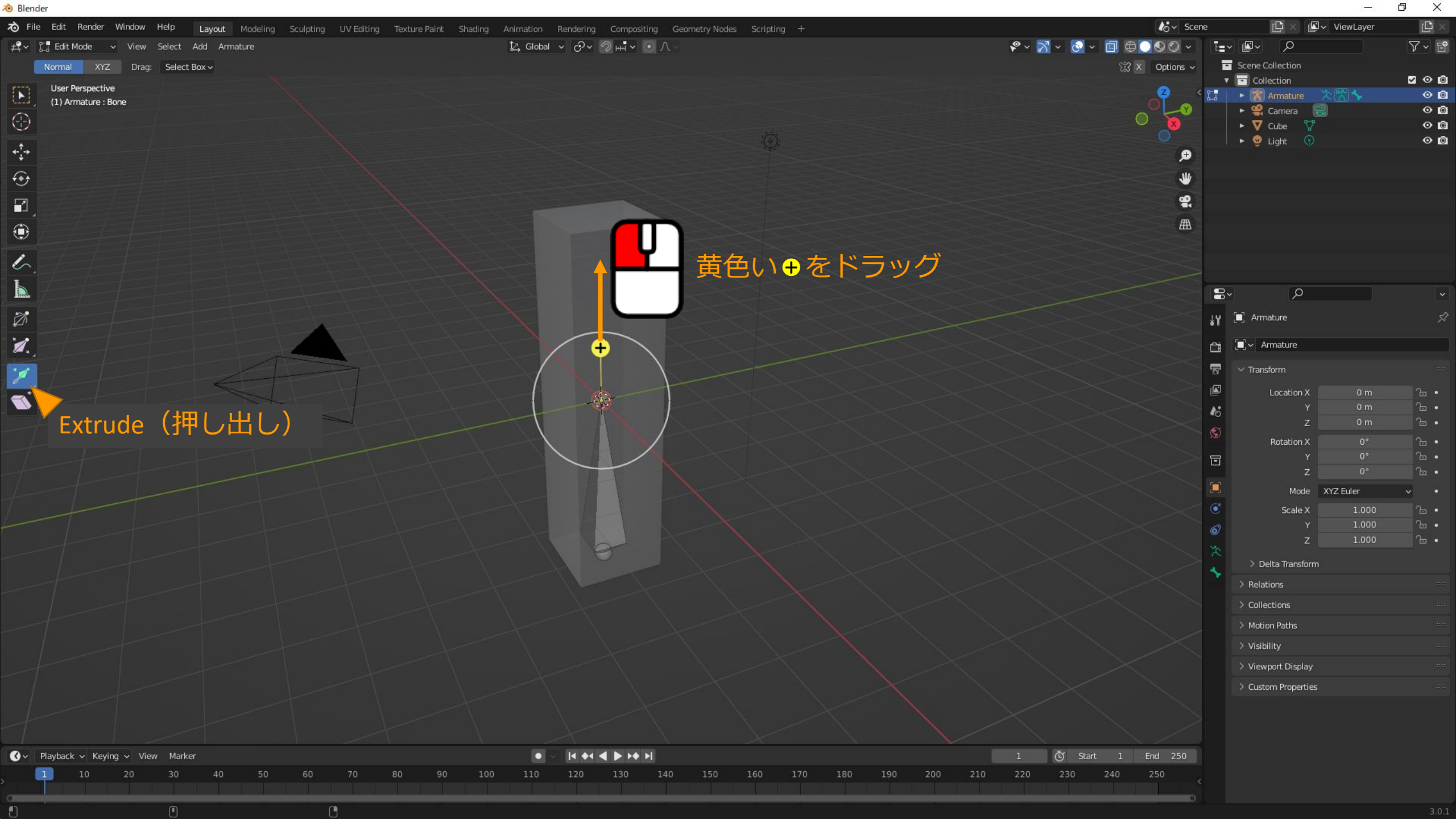
Motion Paths

Visibility

Viewport Display

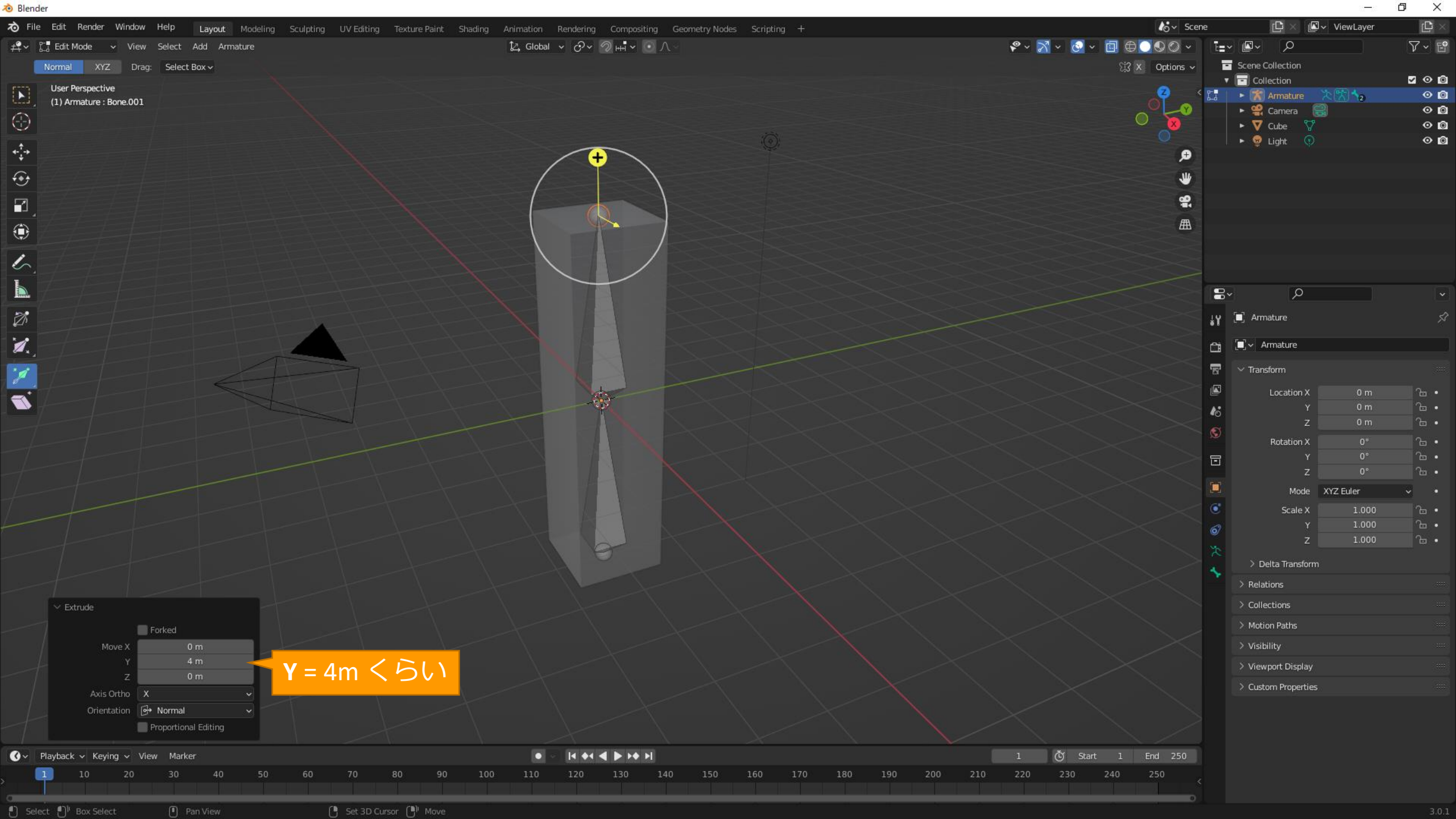
Custom Properties



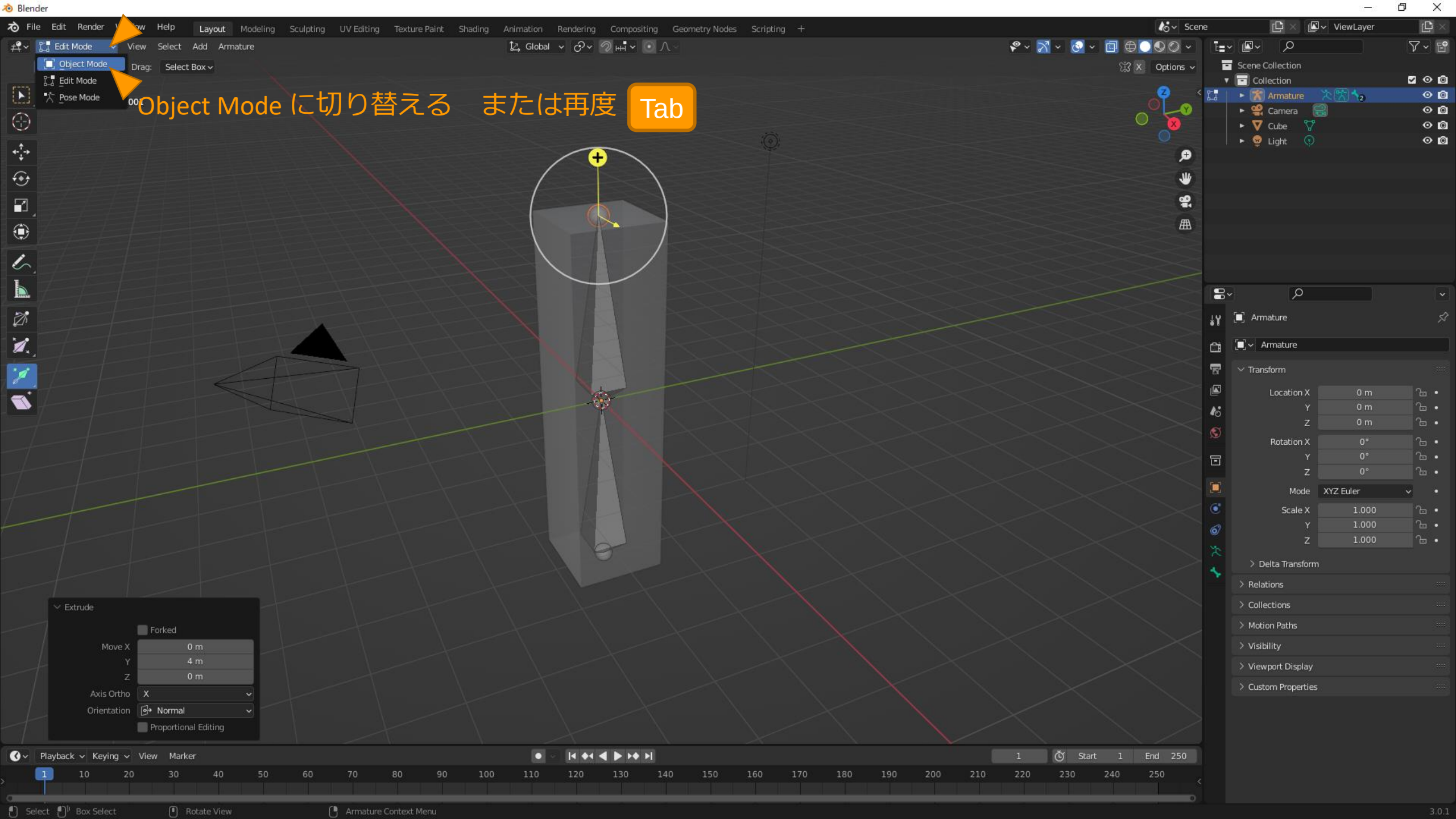


Extrude (押し出し)

黄色い+をドラッグ



Y = 4m くらい



Object Mode に切り替える または再度 Tab

Tab

Extrude

☐ Forked

Move X: 0 m

Y: 4 m

Z: 0 m

Axis Ortho: X

Orientation: Normal

☐ Proportional Editing

Armature

Transform

Location X	0 m
Y	0 m
Z	0 m
Rotation X	0°
Y	0°
Z	0°
Mode	XYZ Euler
Scale X	1.000
Y	1.000
Z	1.000

Delta Transform

Relations

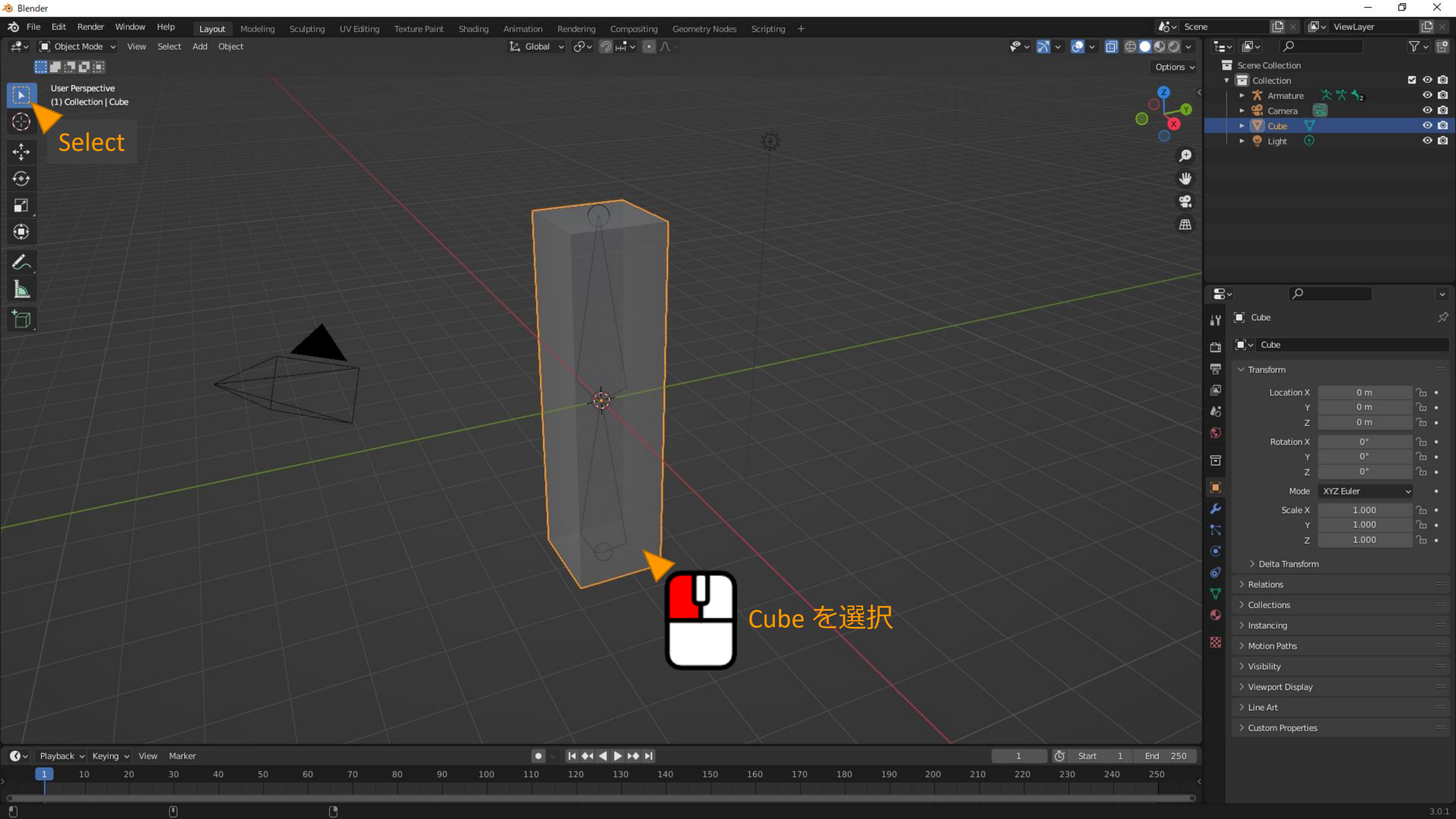
Collections

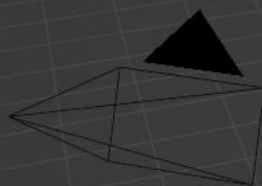
Motion Paths

Visibility

Viewport Display

Custom Properties



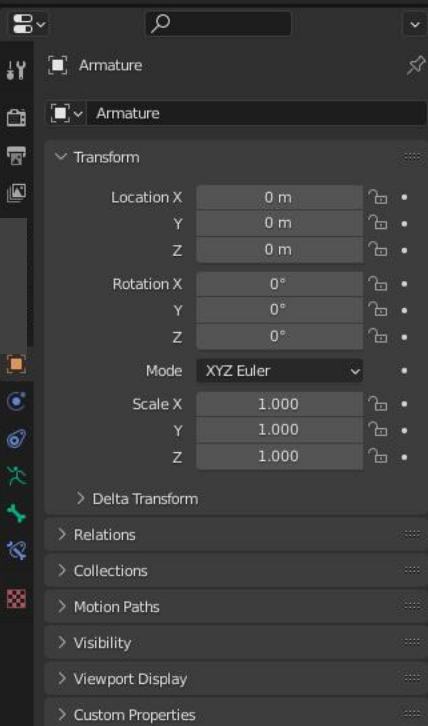
User Perspective
(1) Collection | Armature

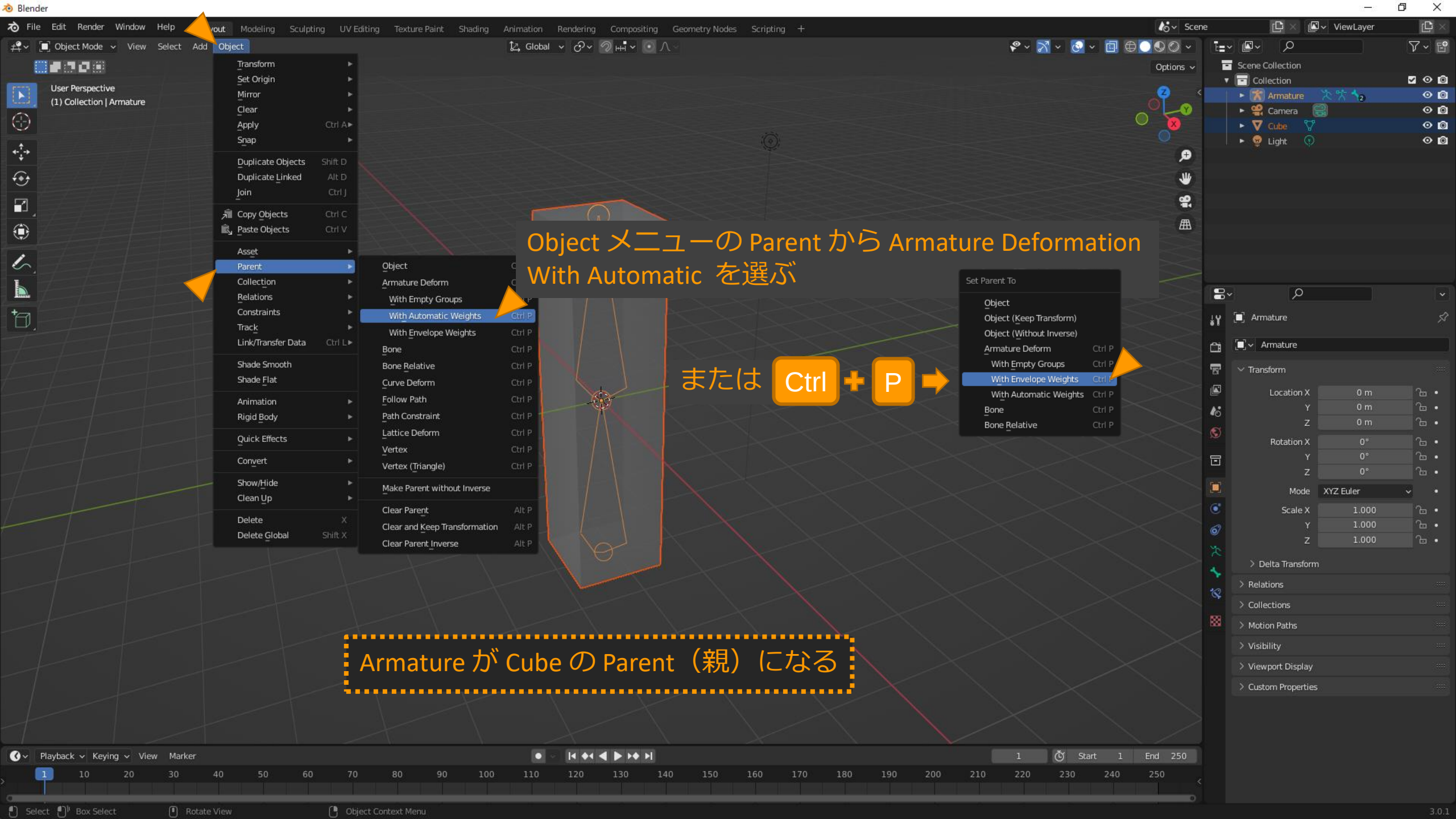
Shift

+



Cube を選択している状態で
Shift を押しながら Armature を選択する

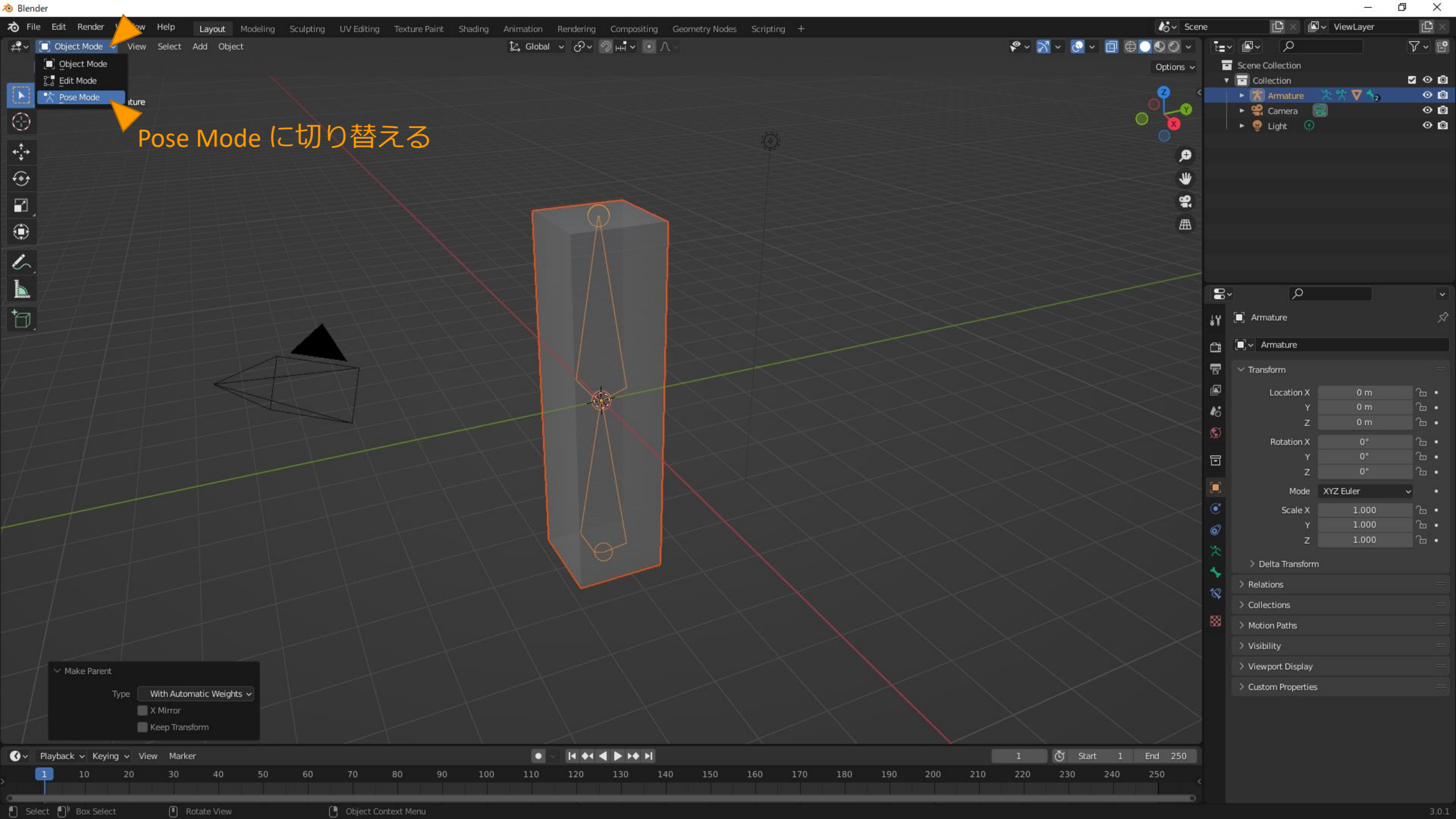




Object メニューの Parent から Armature Deformation With Automatic を選ぶ

または **Ctrl + P** →

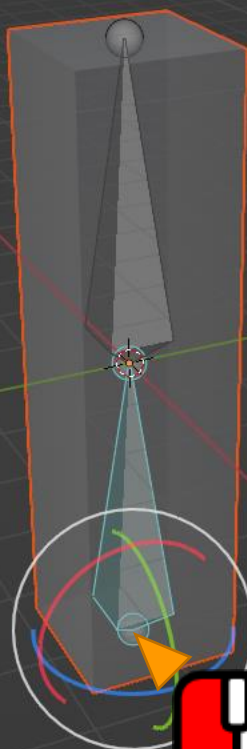
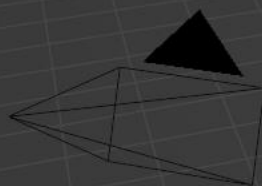
Armature が Cube の Parent (親) になる



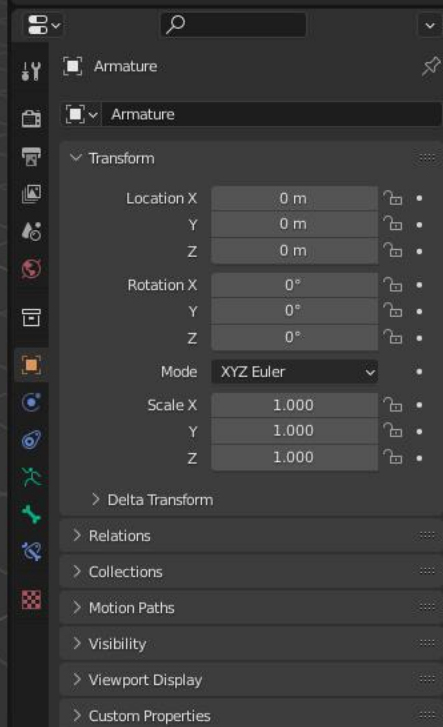
Pose Mode に切り替える

User Perspective
(1) Armature : Bone

Rotate

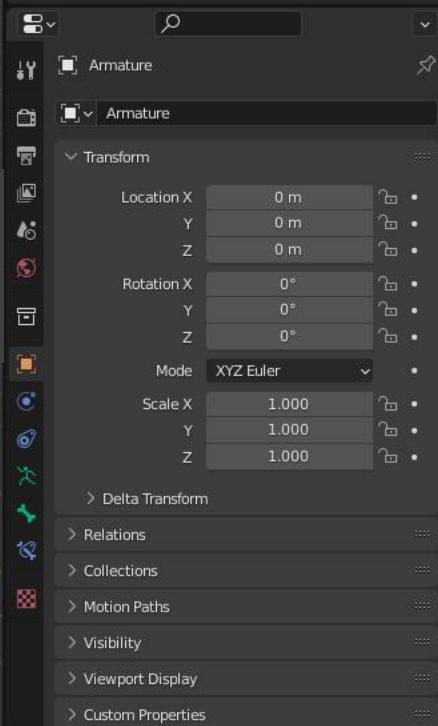
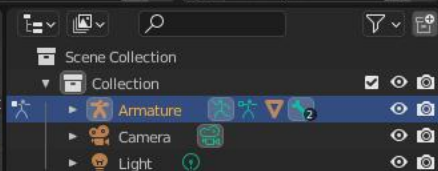


下の Bone の下端を選択



Rotation: -43.12 global

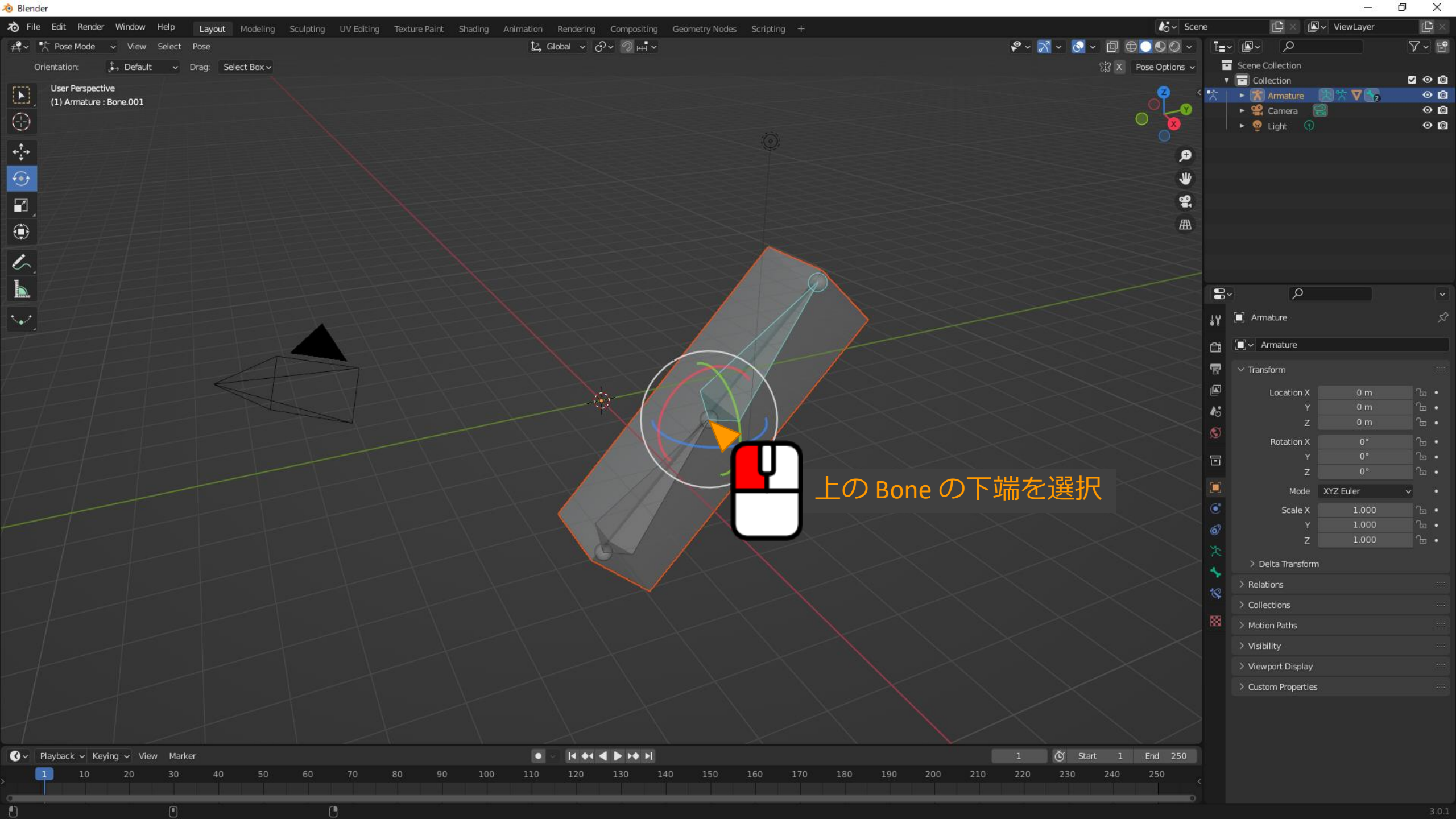
Orientation: Default Drag: Select Box

User Perspective
(1) Armature : Bone

下の Bone（の下端）を回転すると
一緒に上の Bone（下の Bone の子）も回転し
同時に Cube（Armature の子）も回転する

Playback Keying View Marker 1 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

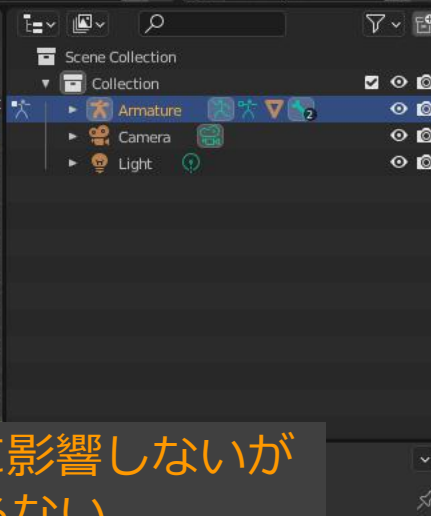
Confirm Cancel X X Axis Y Y Axis Z Z Axis X X Plane Y Y Plane Z Z Plane C Clear Constraints Ctrl Snap Invert Snap Toggle G Move R Rotate S Resize Automatic Constraint Automatic Constraint Plane Precision Mode



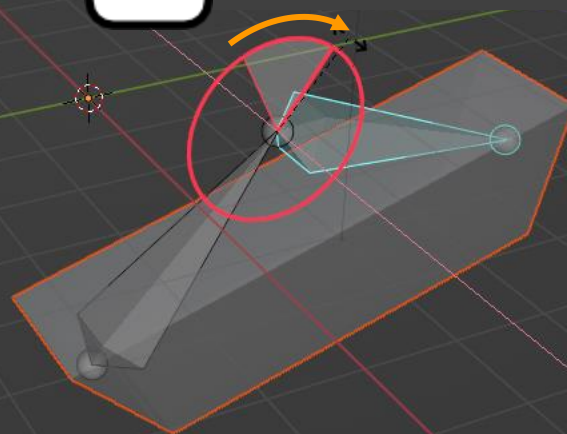
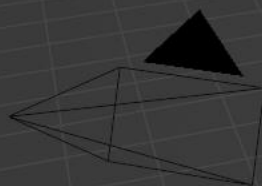
上の Bone の下端を選択

Rotation: -61.70 global

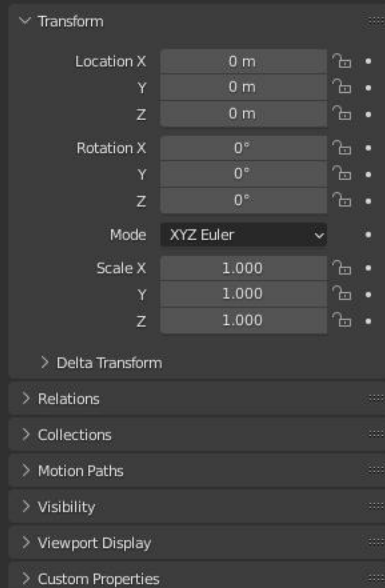
Orientation: Default Drag: Select Box

User Perspective
(1) Armature : Bone.001

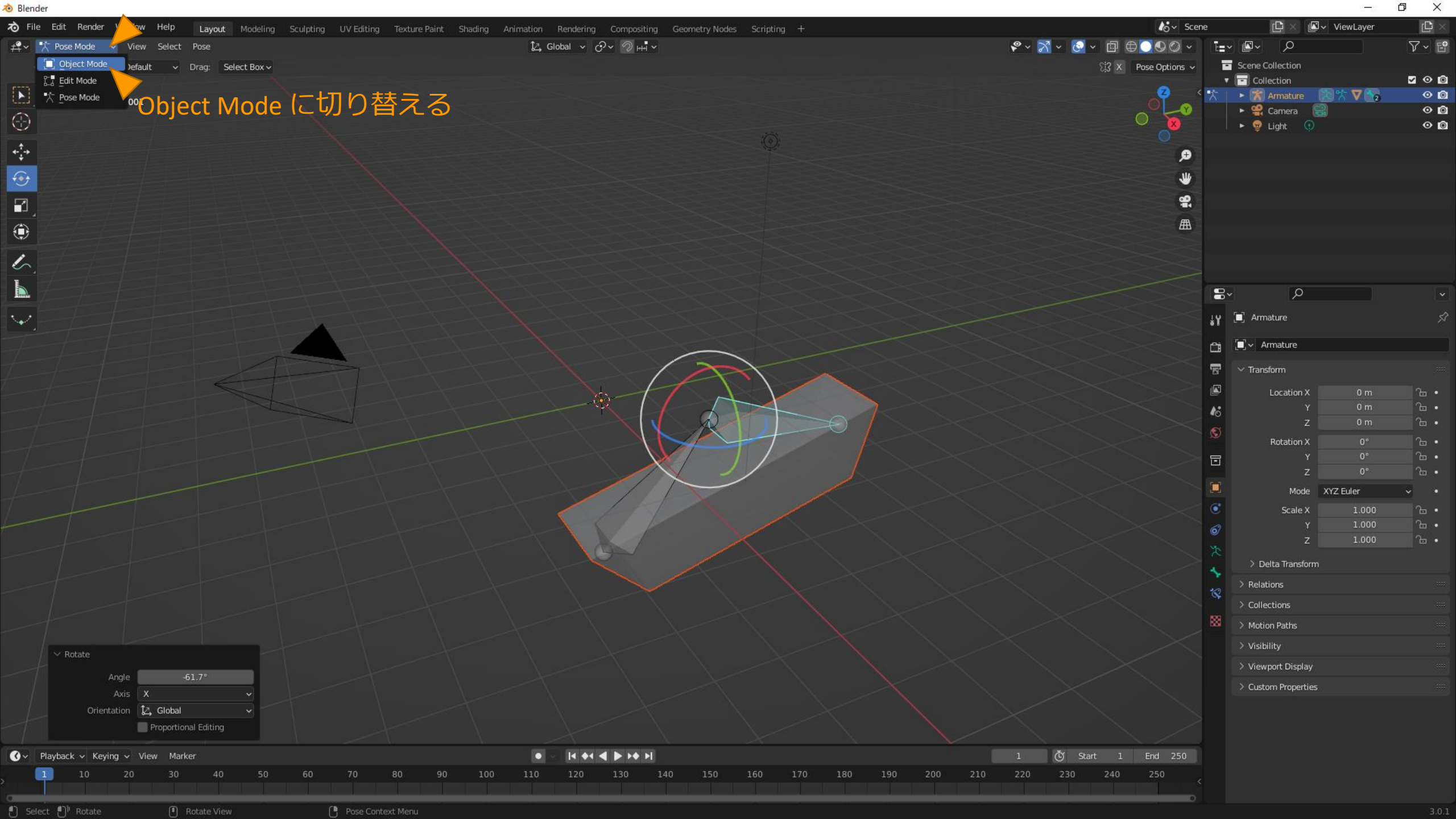
上の Bone（の下端）の回転は下の Bone に影響しないが
Cube（Armature の子）は変形するが曲がらない



Armature の変形は頂点の位置に影響する



Playback Keying View Marker 1 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250



Object Mode に切り替える

Rotate

Angle: -61.7°

Axis: X

Orientation: Global

Proportional Editing

Armature

Transform

Location X	0 m
Y	0 m
Z	0 m
Rotation X	0°
Y	0°
Z	0°
Mode	XYZ Euler
Scale X	1.000
Y	1.000
Z	1.000

Delta Transform

Relations

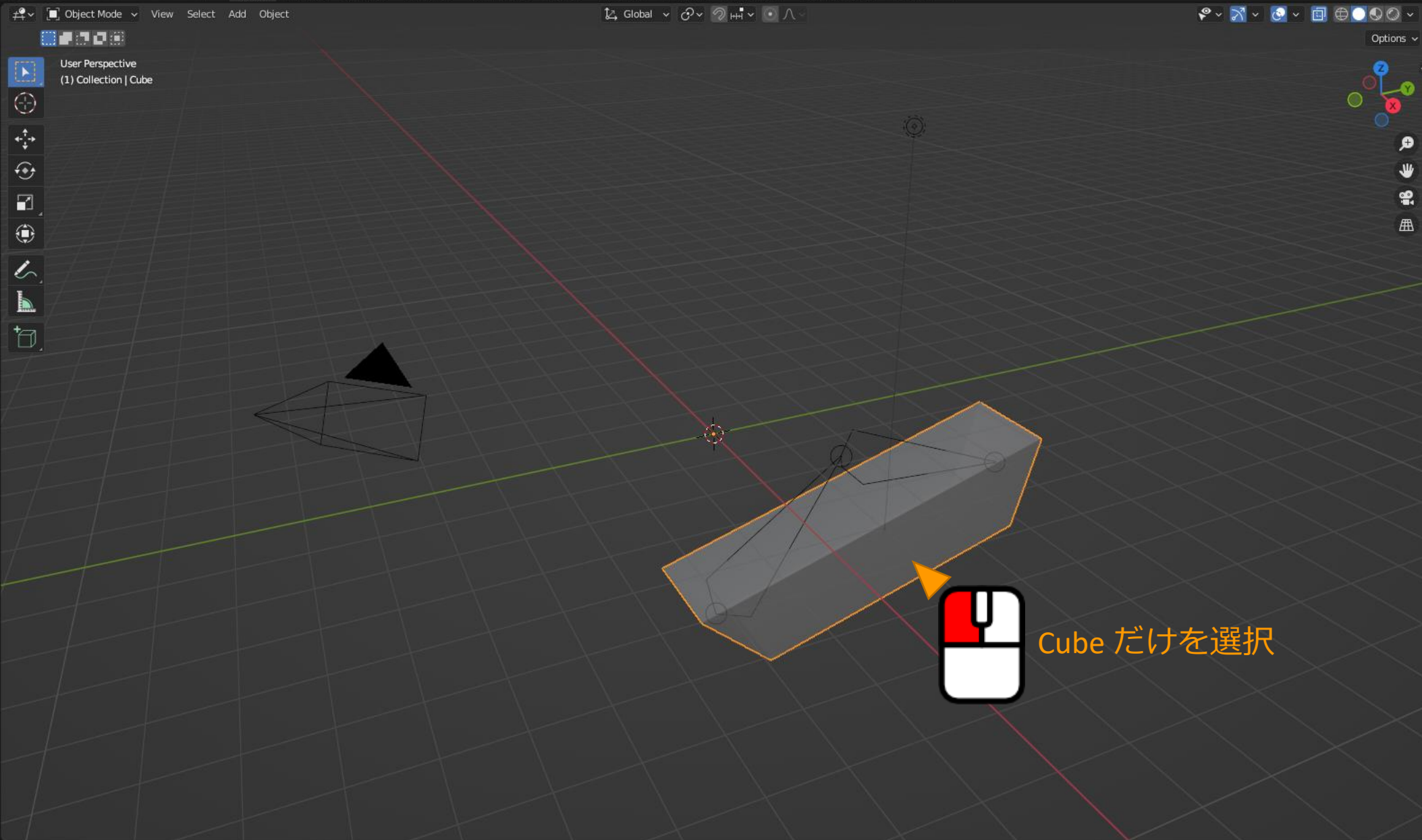
Collections

Motion Paths

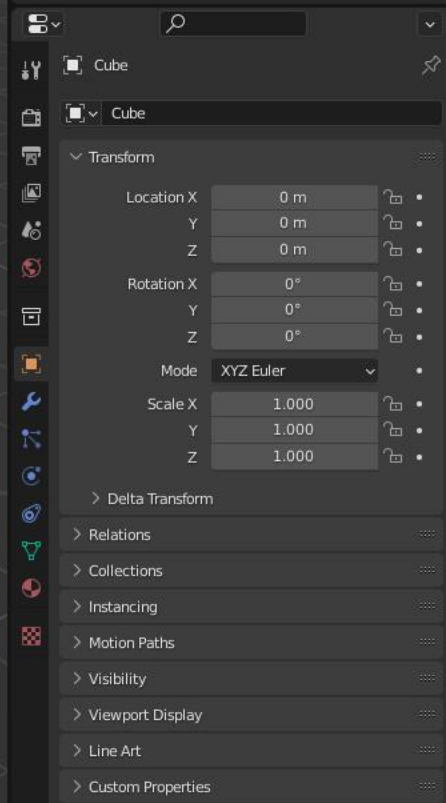
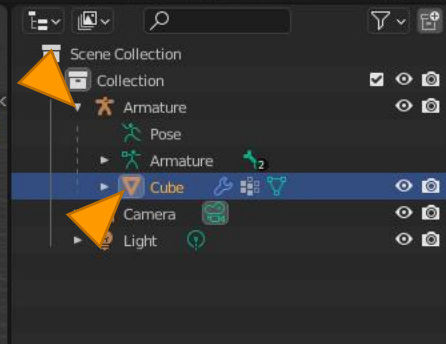
Visibility

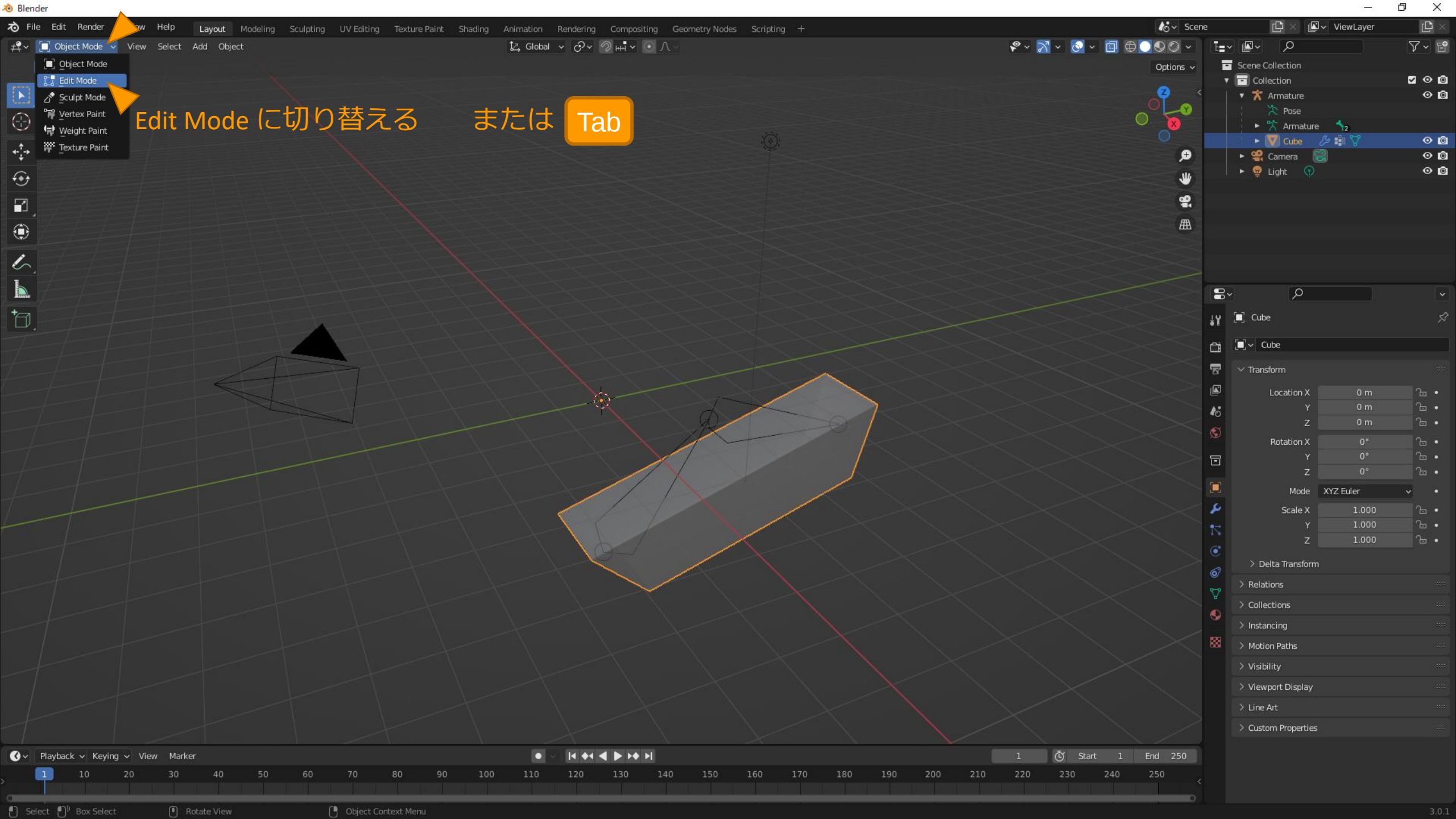
Viewport Display

Custom Properties



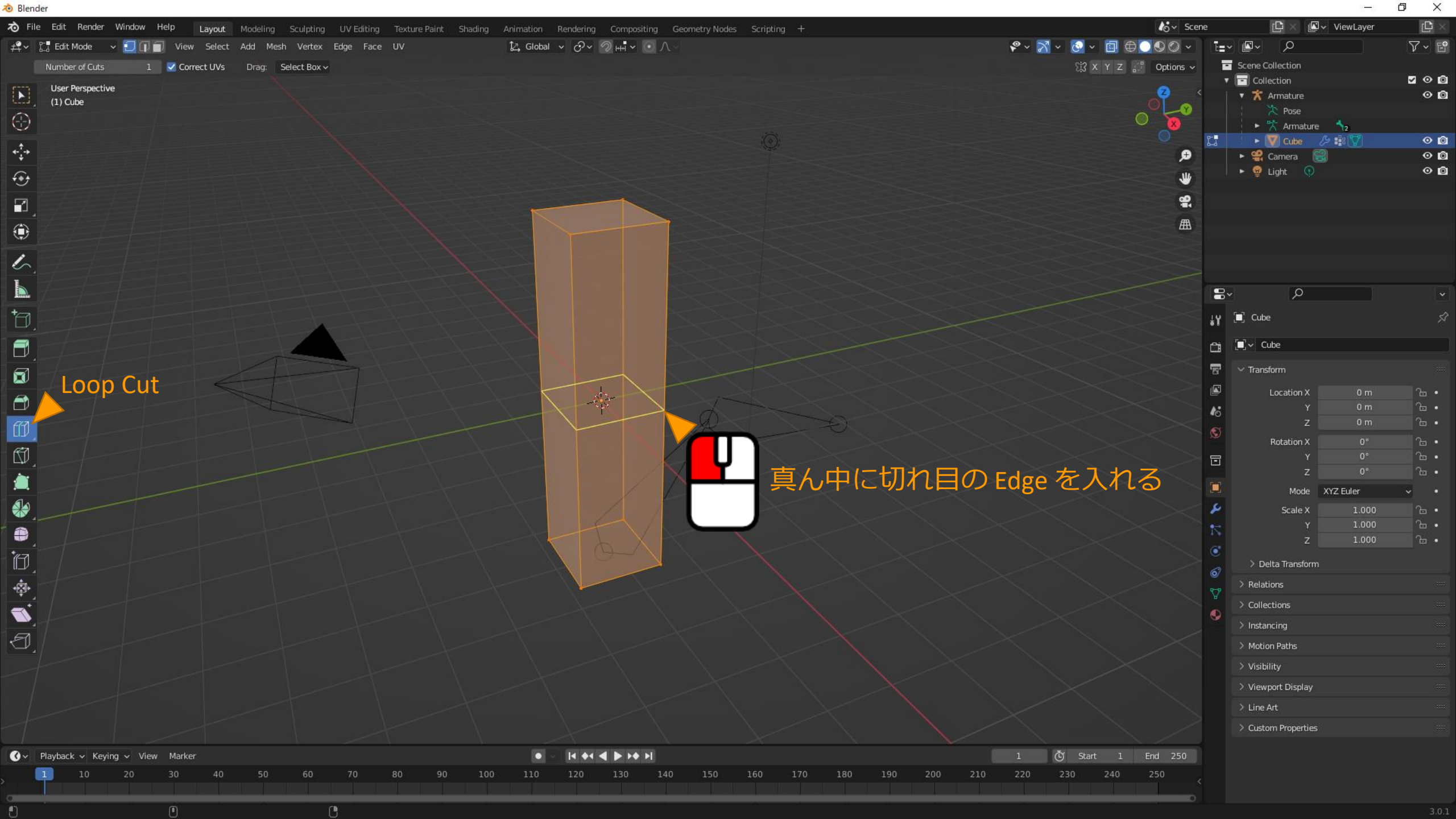
Cube だけを選択





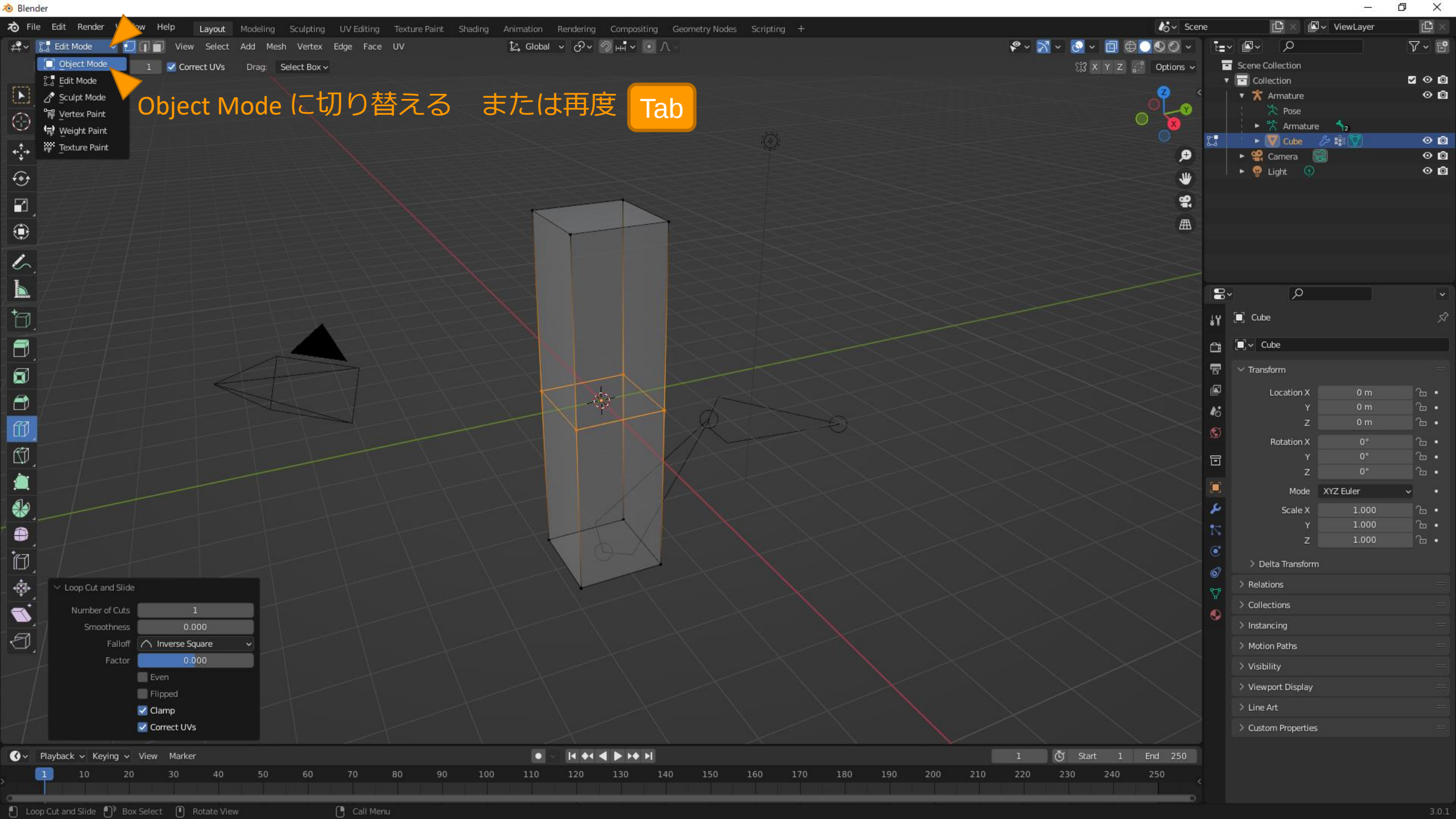
Edit Mode に切り替える

または Tab

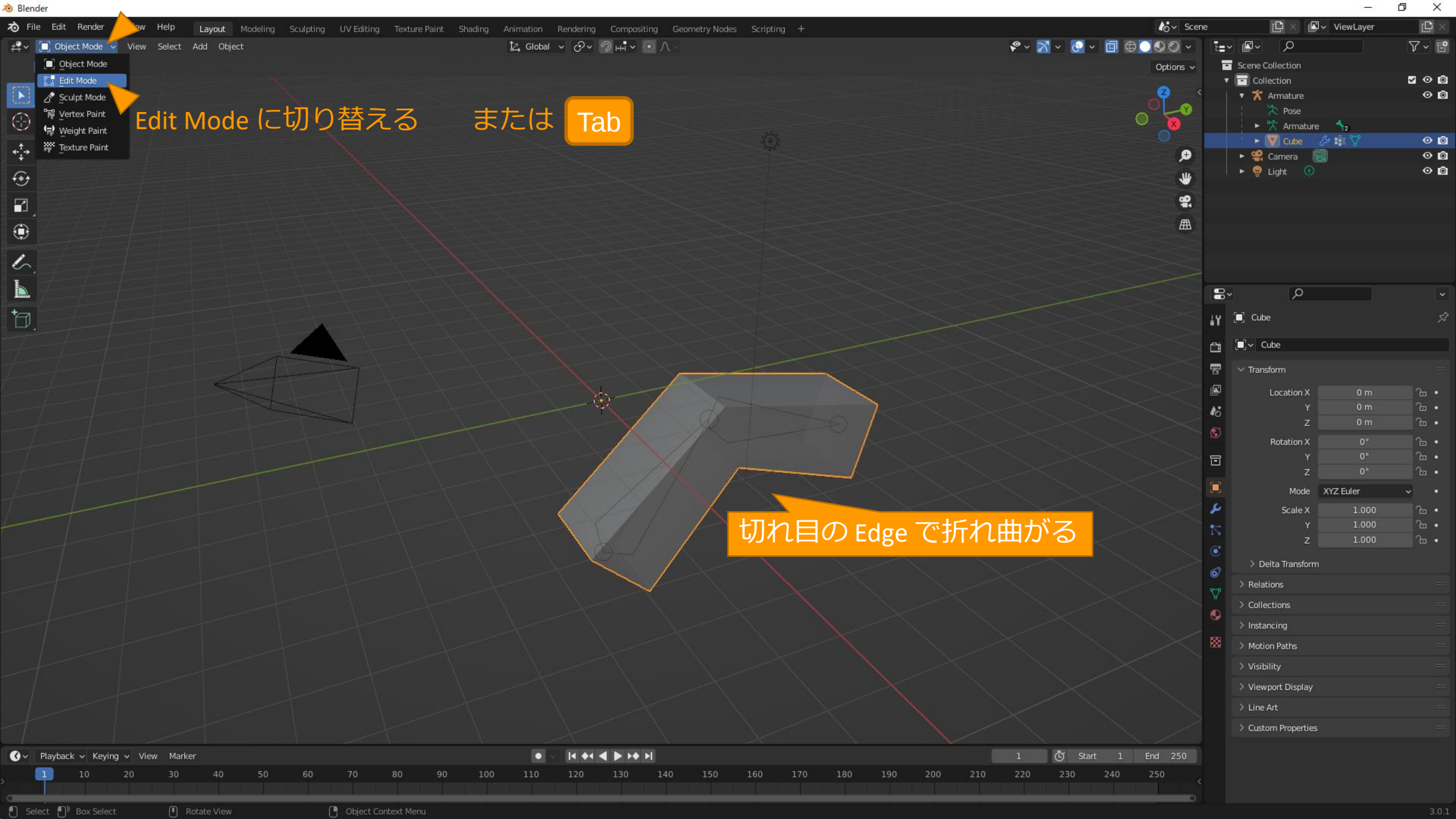


Loop Cut

真ん中に切れ目の Edge を入れる



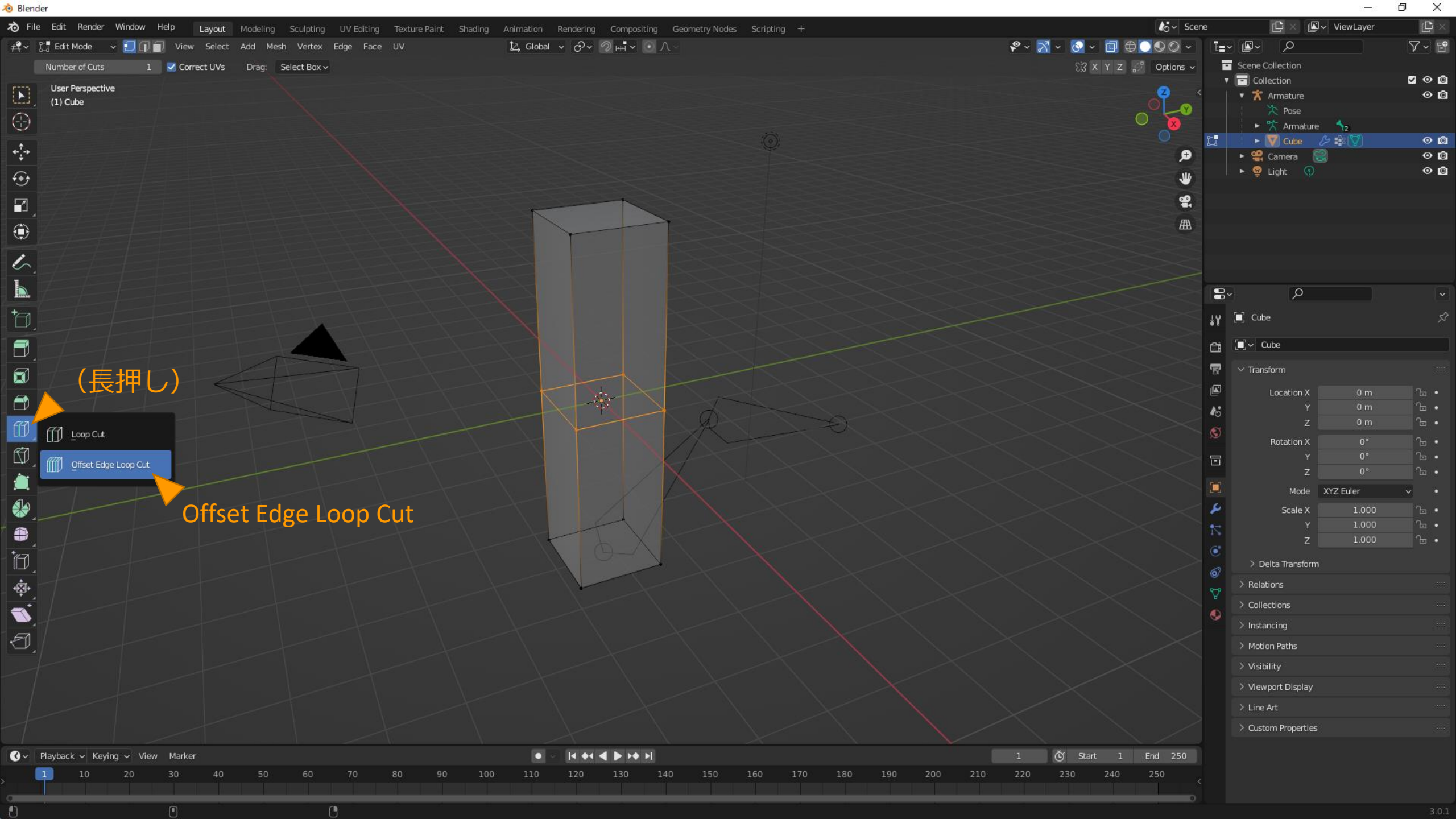
Object Mode に切り替える または再度 Tab



Edit Mode に切り替える

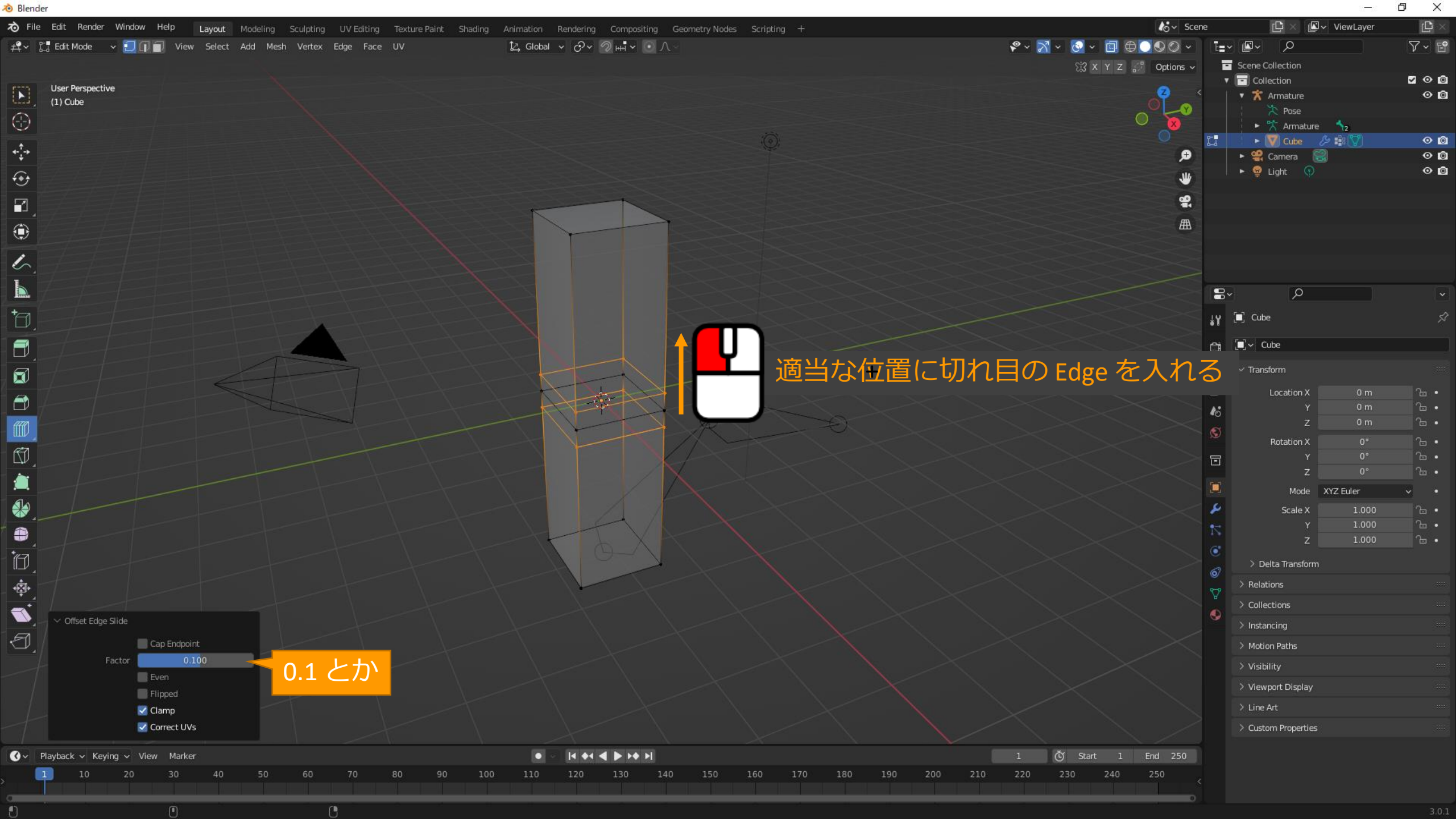
または Tab

切れ目の Edge で折れ曲がる



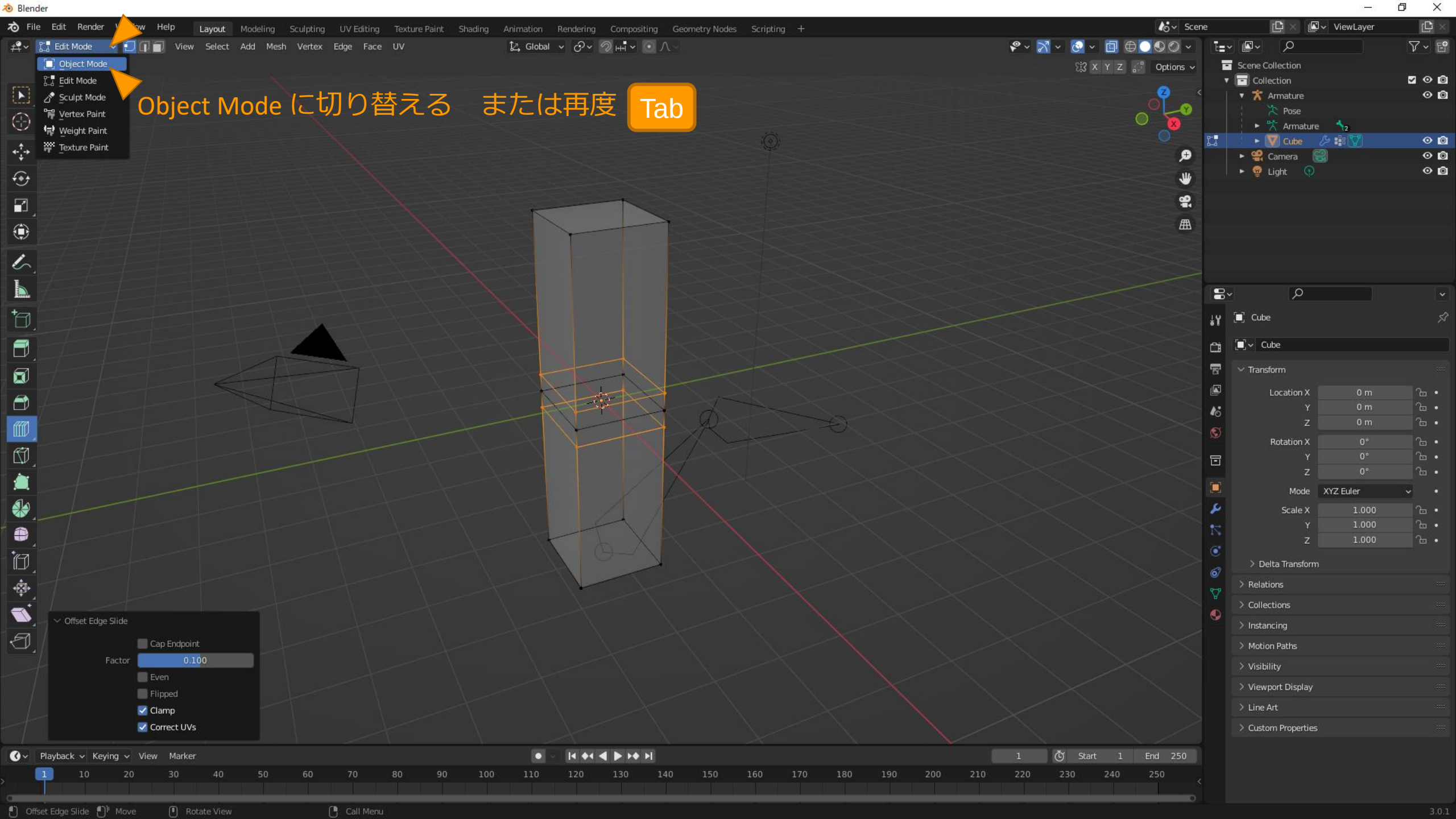
(長押し)

Offset Edge Loop Cut



適当な位置に切れ目の Edge を入れる

0.1 とか

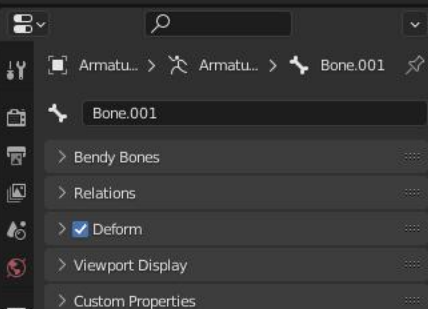
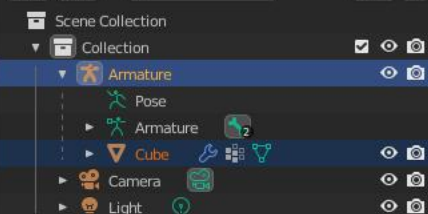


Object Mode に切り替える または再度 Tab

Tab

User Perspective
(1) Collection | Armature

Options



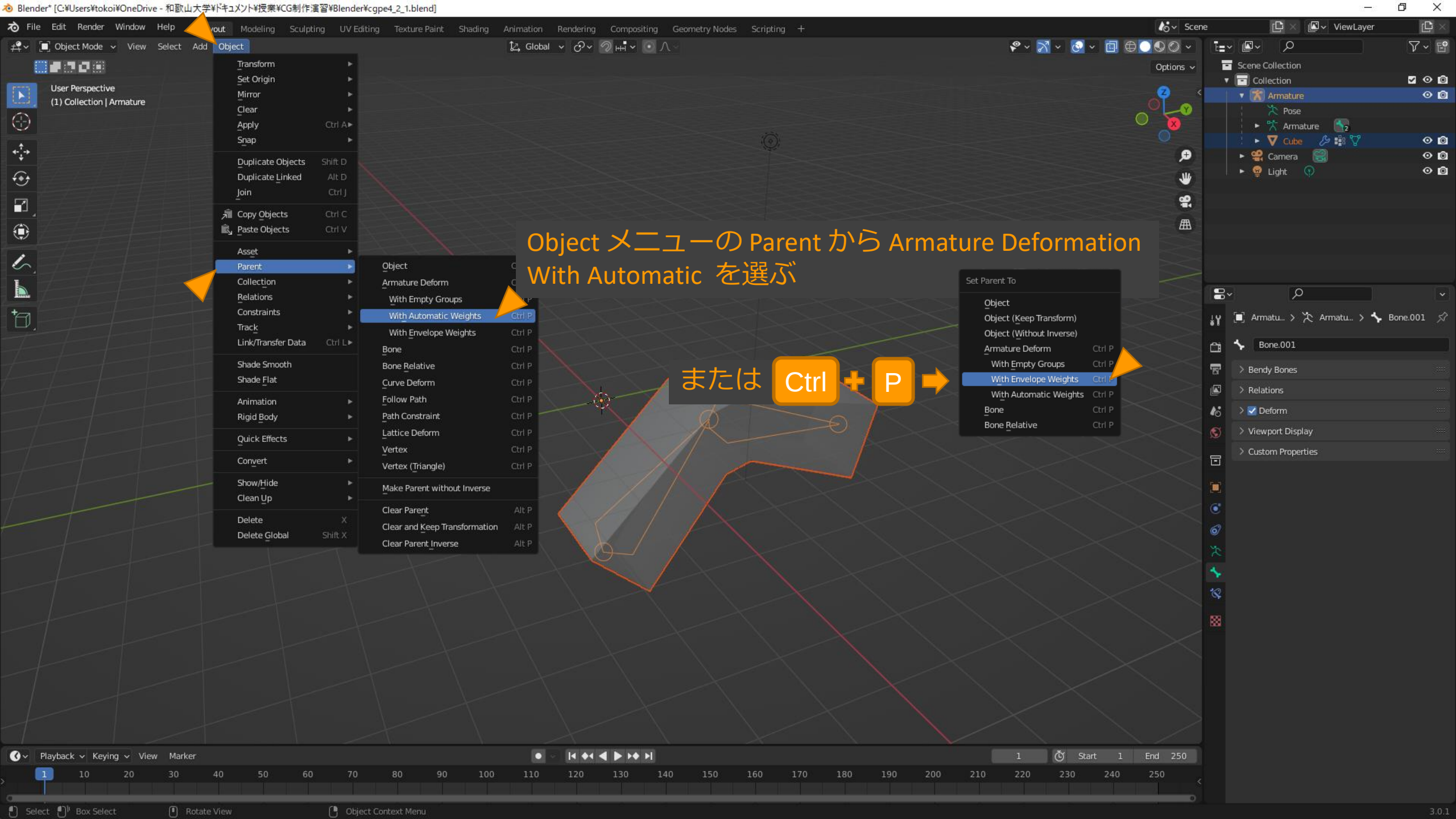
最初に作った中央の切れ目の Edge では曲がっていない

Shift

+

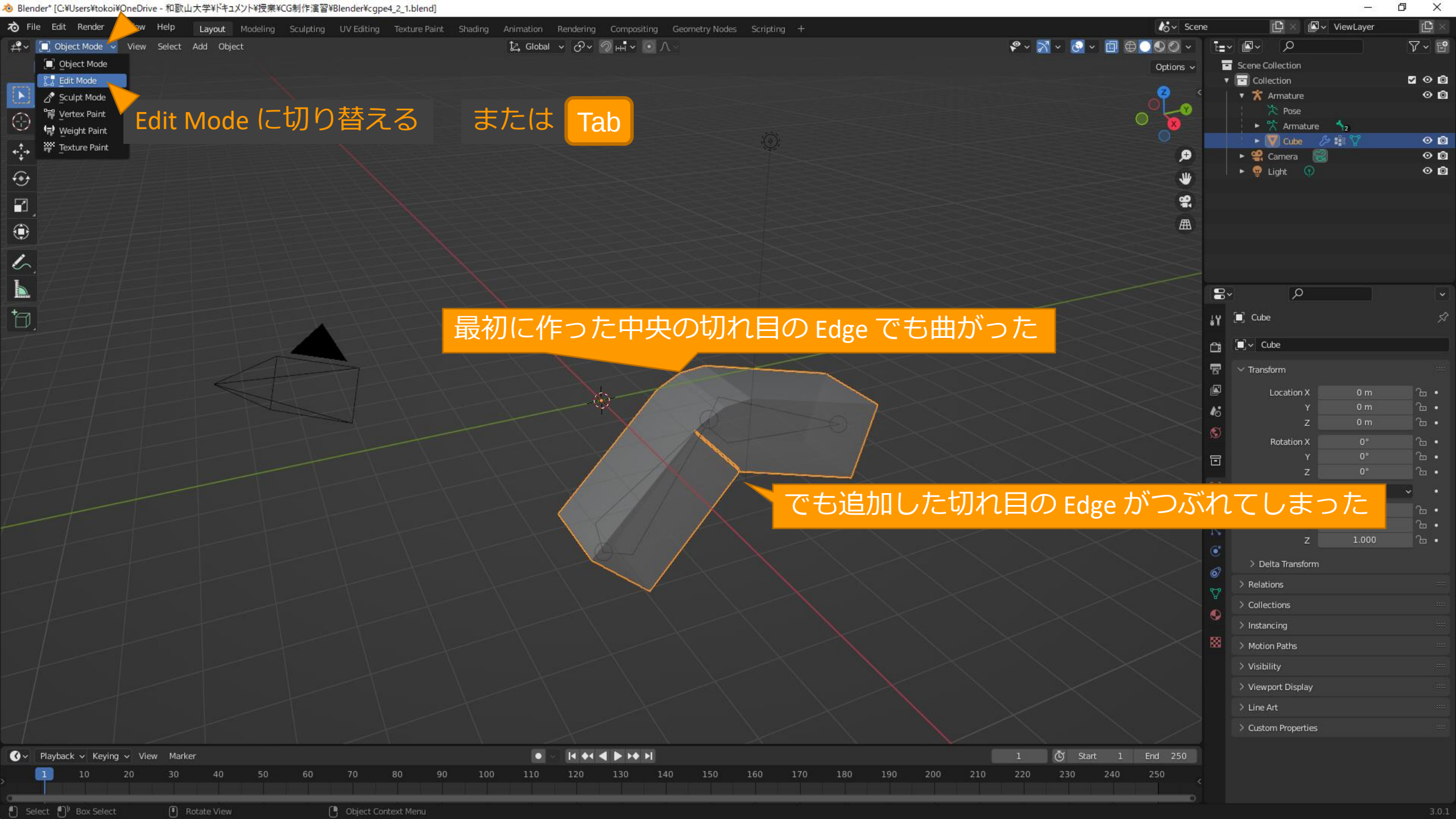


Cube を選択している状態で
Shift を押しながら Armature を選択する



Object メニューの Parent から Armature Deformation With Automatic を選ぶ

または Ctrl + P

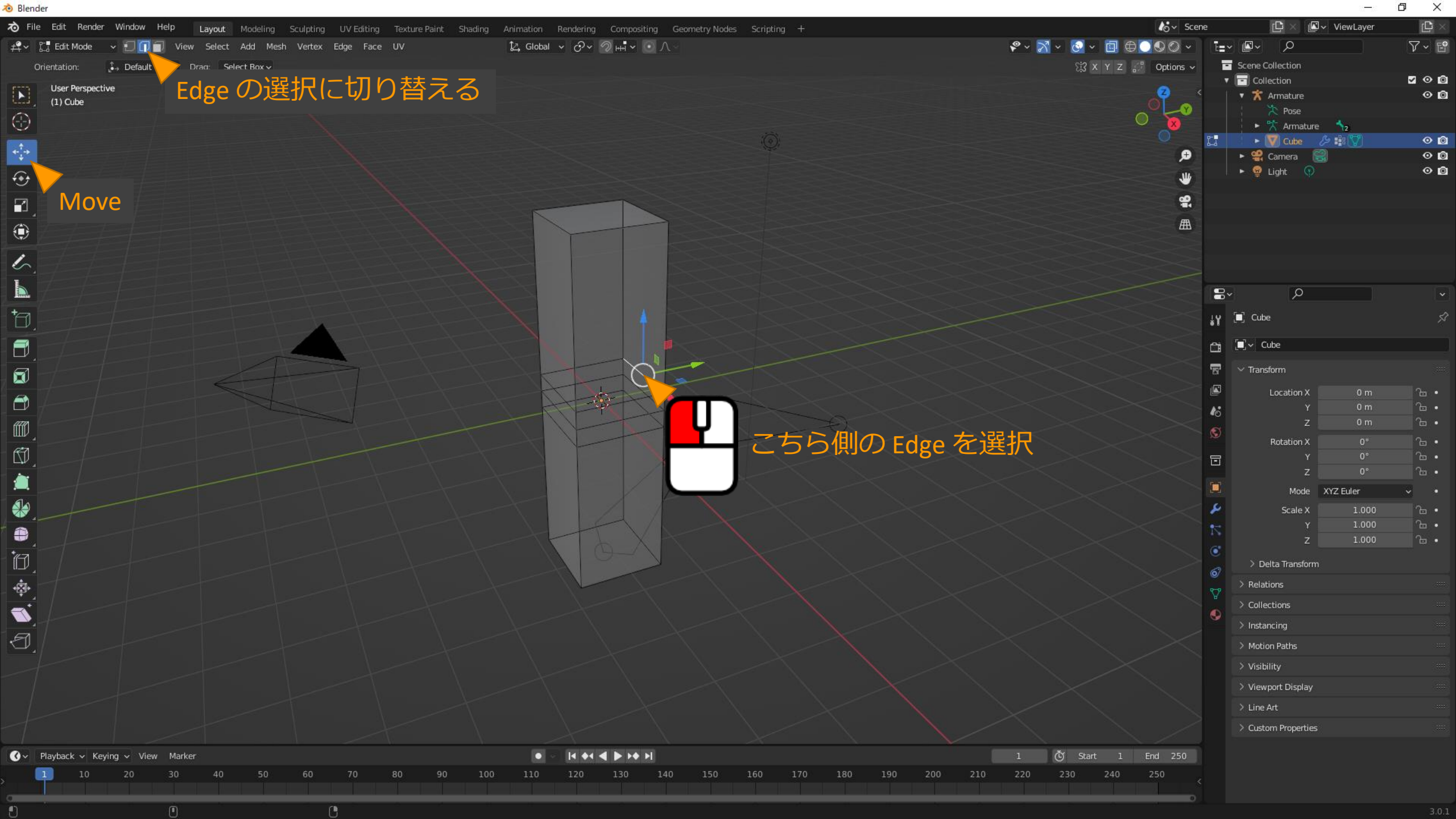


Edit Mode に切り替える

または Tab

最初に作った中央の切れ目の Edge でも曲がった

でも追加した切れ目の Edge がつぶれてしまった



Edge の選択に切り替える

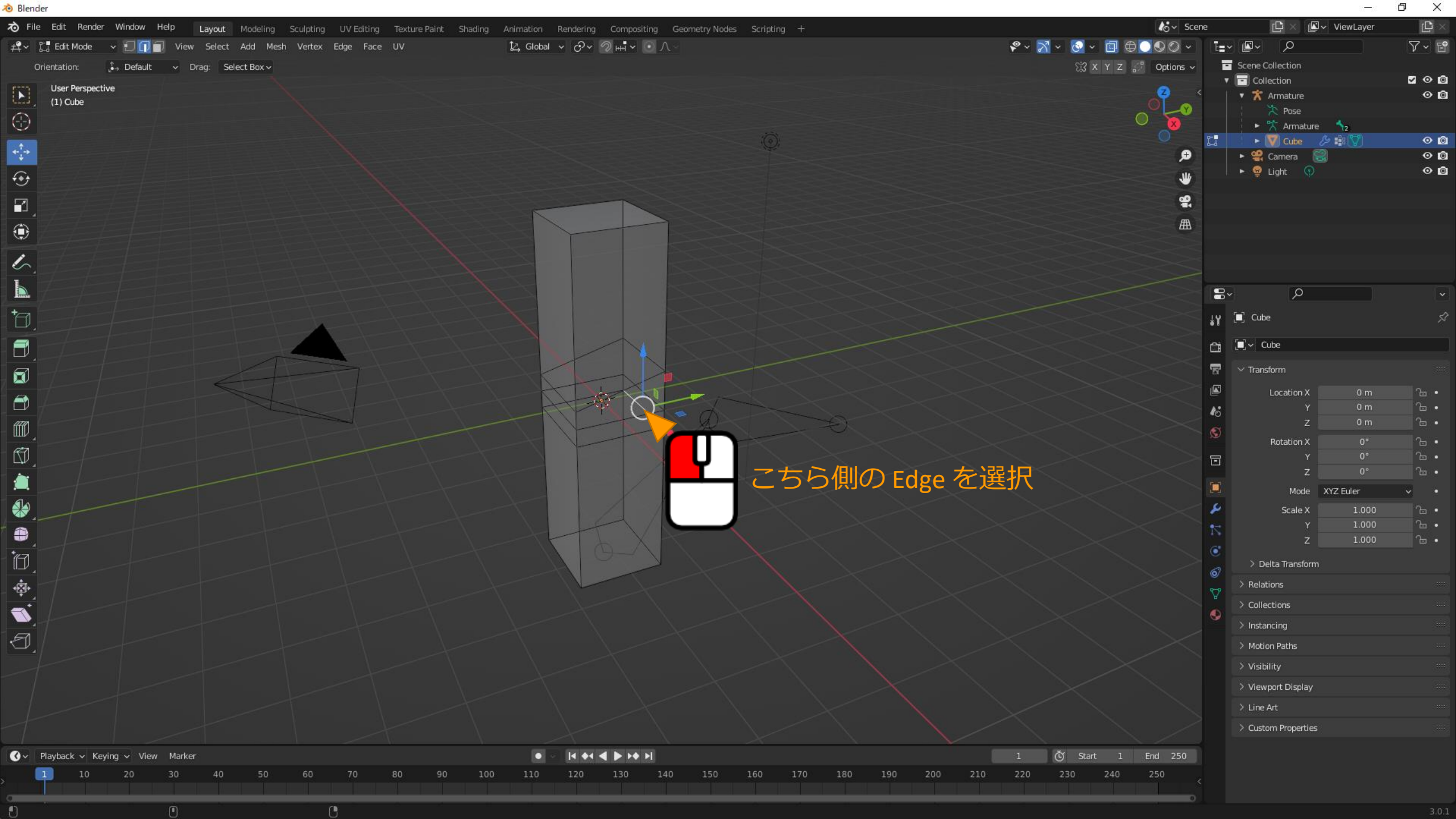
Move

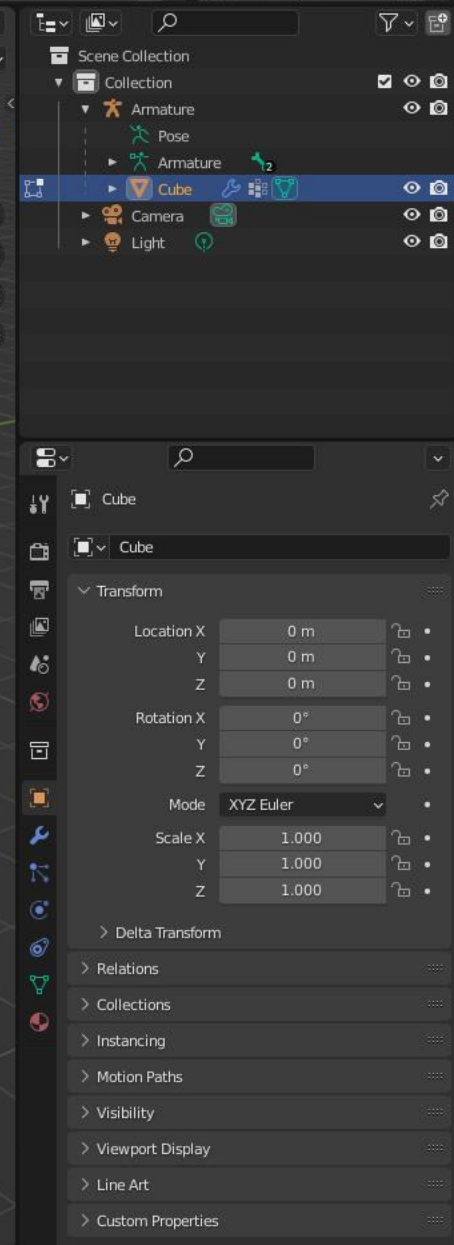
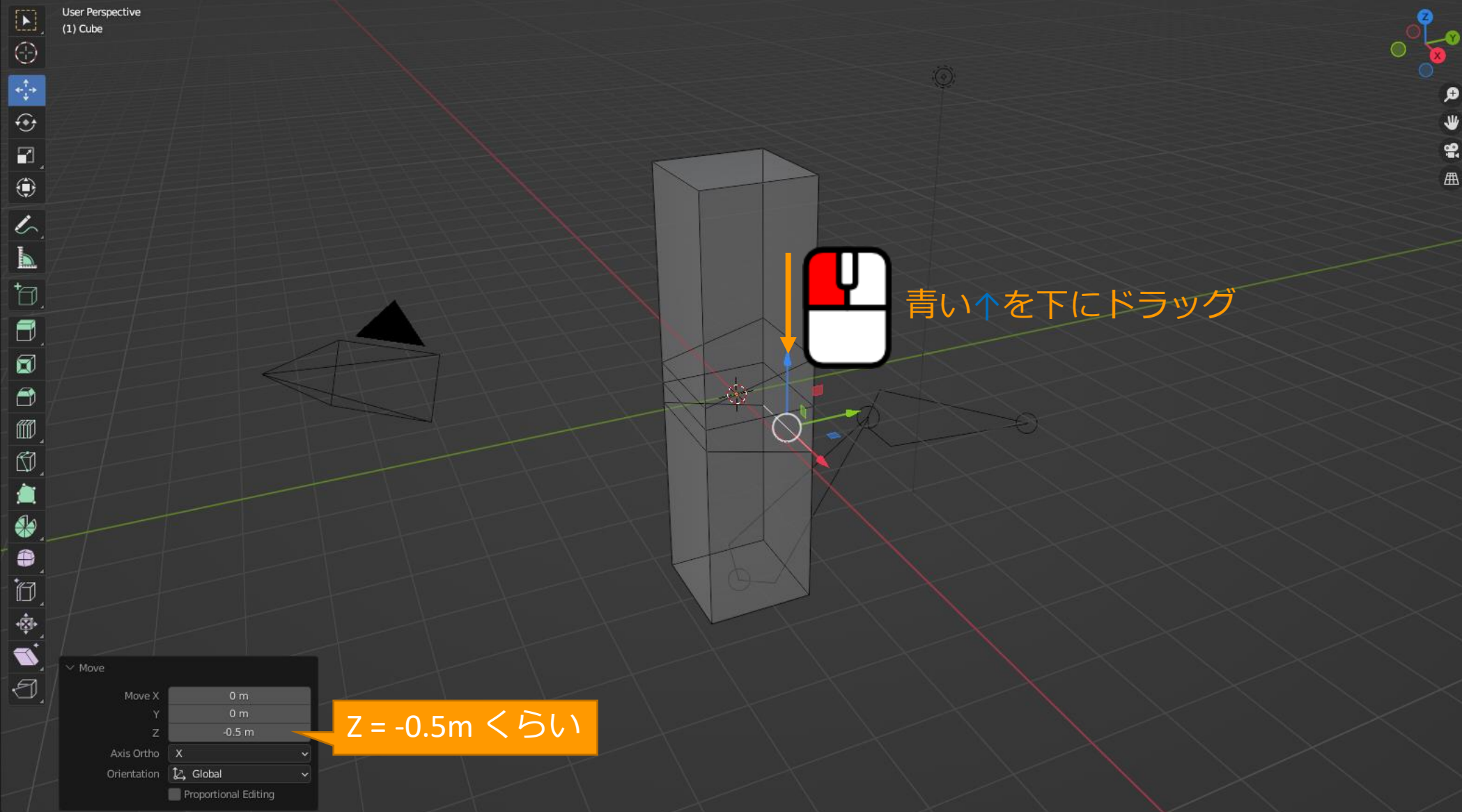
こちら側の Edge を選択

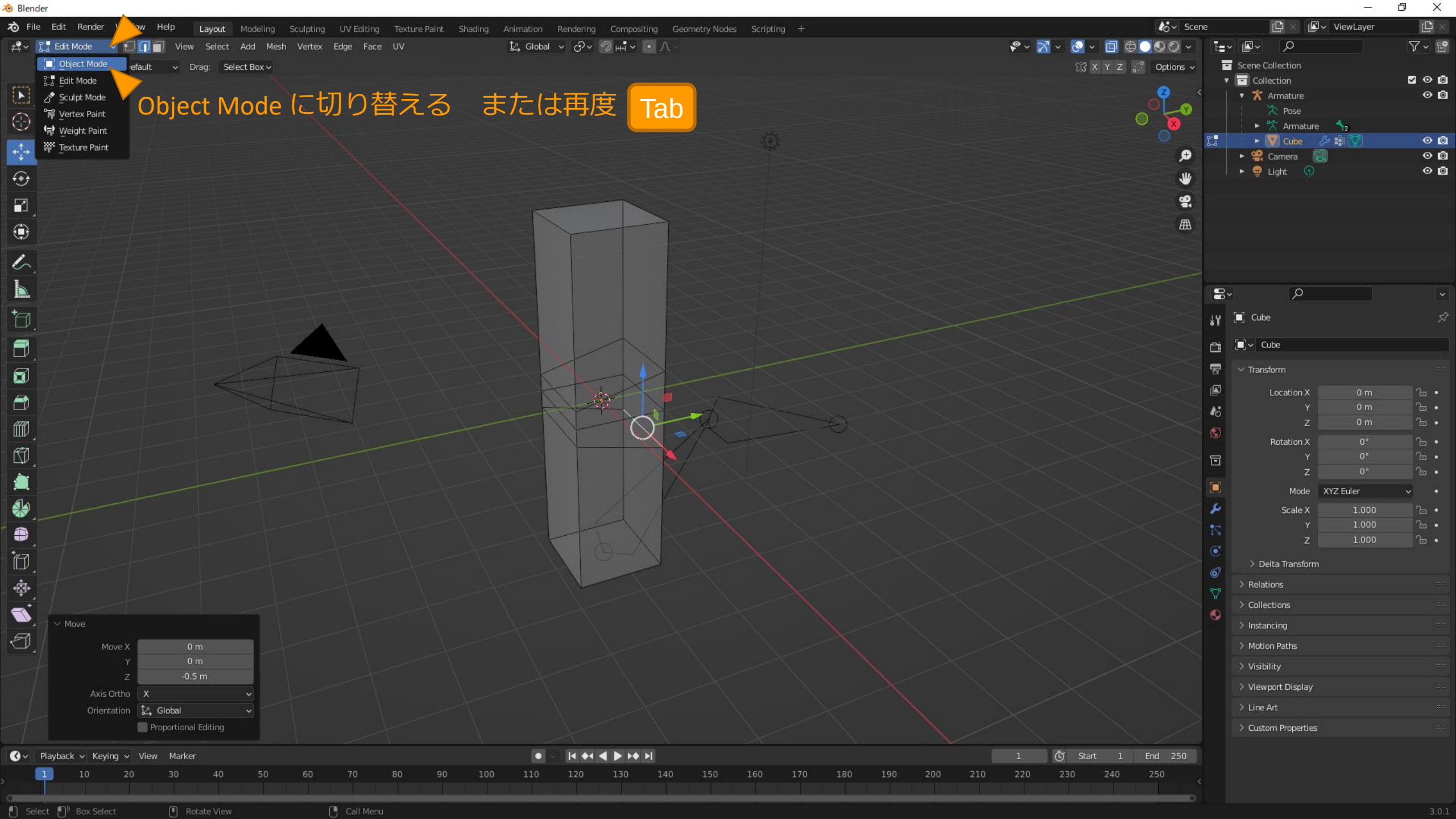
User Perspective
(1) Cube

青い↑をドラッグ

Z = 0.5m くらい







Object Mode に切り替える または再度 Tab

Tab

Move

Move X	0 m
Y	0 m
Z	-0.5 m

Axis Ortho X

Orientation Global

Proportional Editing

Cube

Transform

Location X	0 m
Y	0 m
Z	0 m
Rotation X	0°
Y	0°
Z	0°
Mode	XYZ Euler
Scale X	1.000
Y	1.000
Z	1.000

Delta Transform

Relations

Collections

Instancing

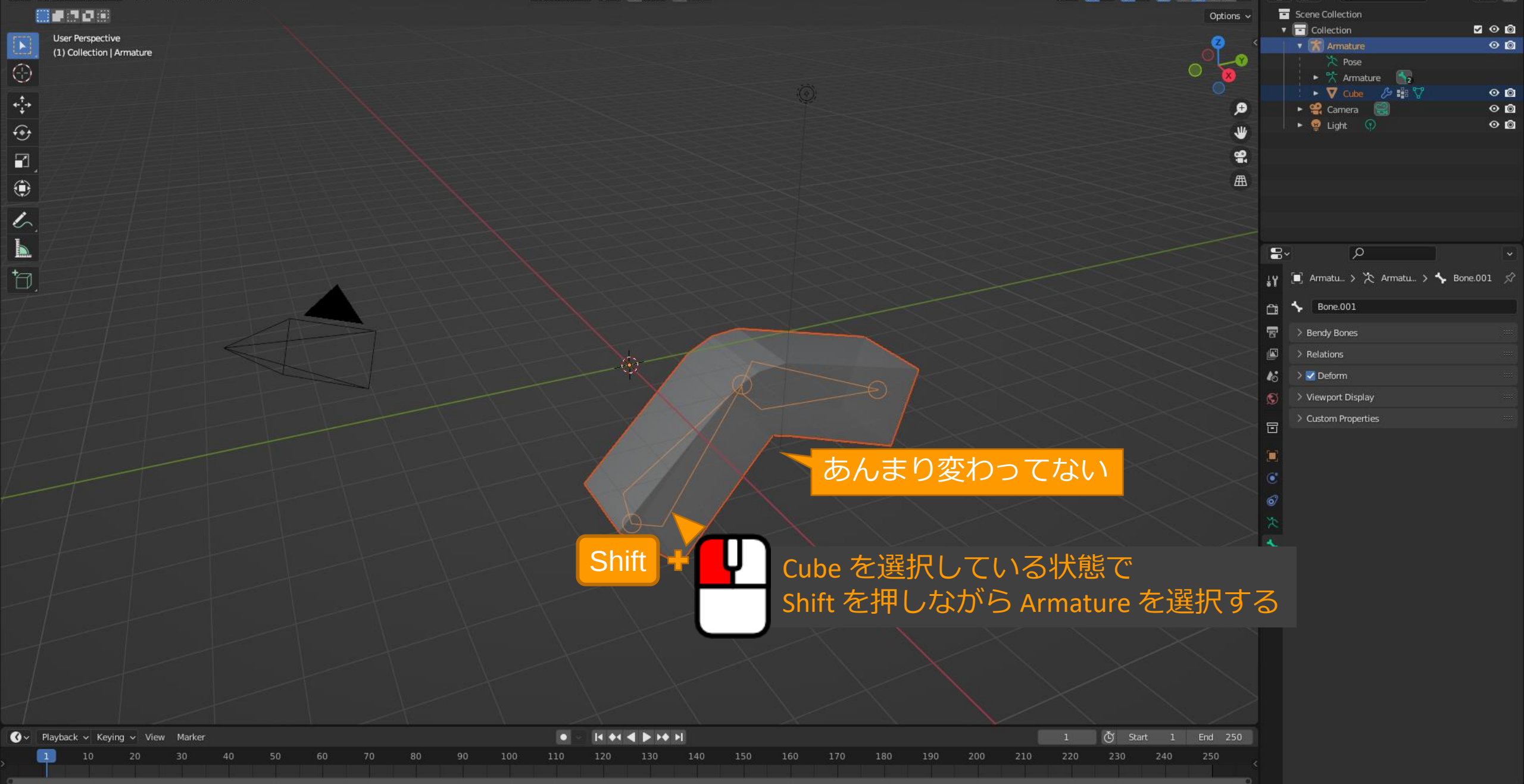
Motion Paths

Visibility

Viewport Display

Line Art

Custom Properties



Object メニューの Parent から Armature Deformation With Automatic を選ぶ

または **Ctrl + P** →

Set Parent To

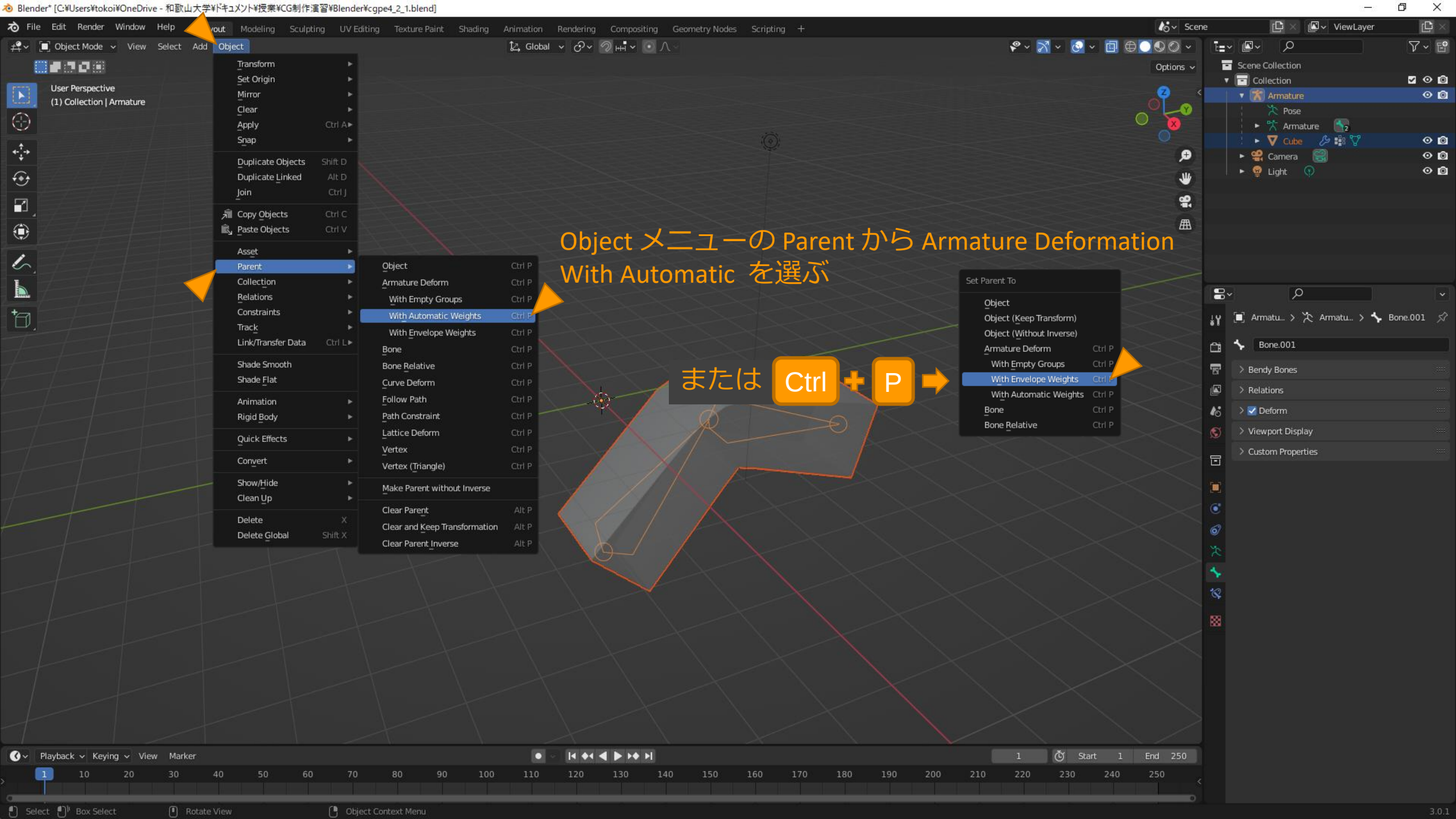
- Object
- Object (Keep Transform)
- Object (Without Inverse)
- Armature Deform
- With Empty Groups
- With Envelope Weights**
- With Automatic Weights
- Bone
- Bone Relative

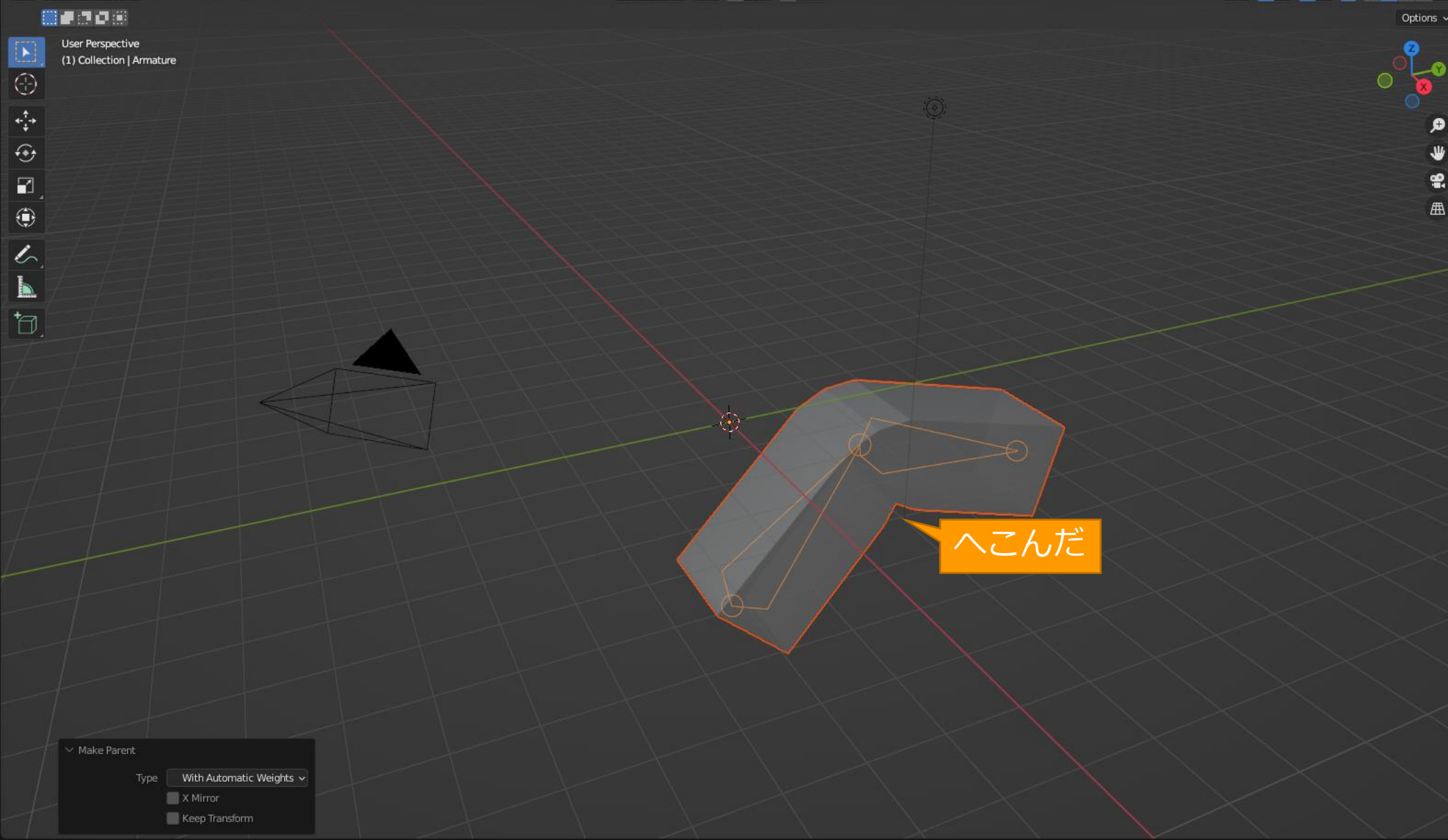
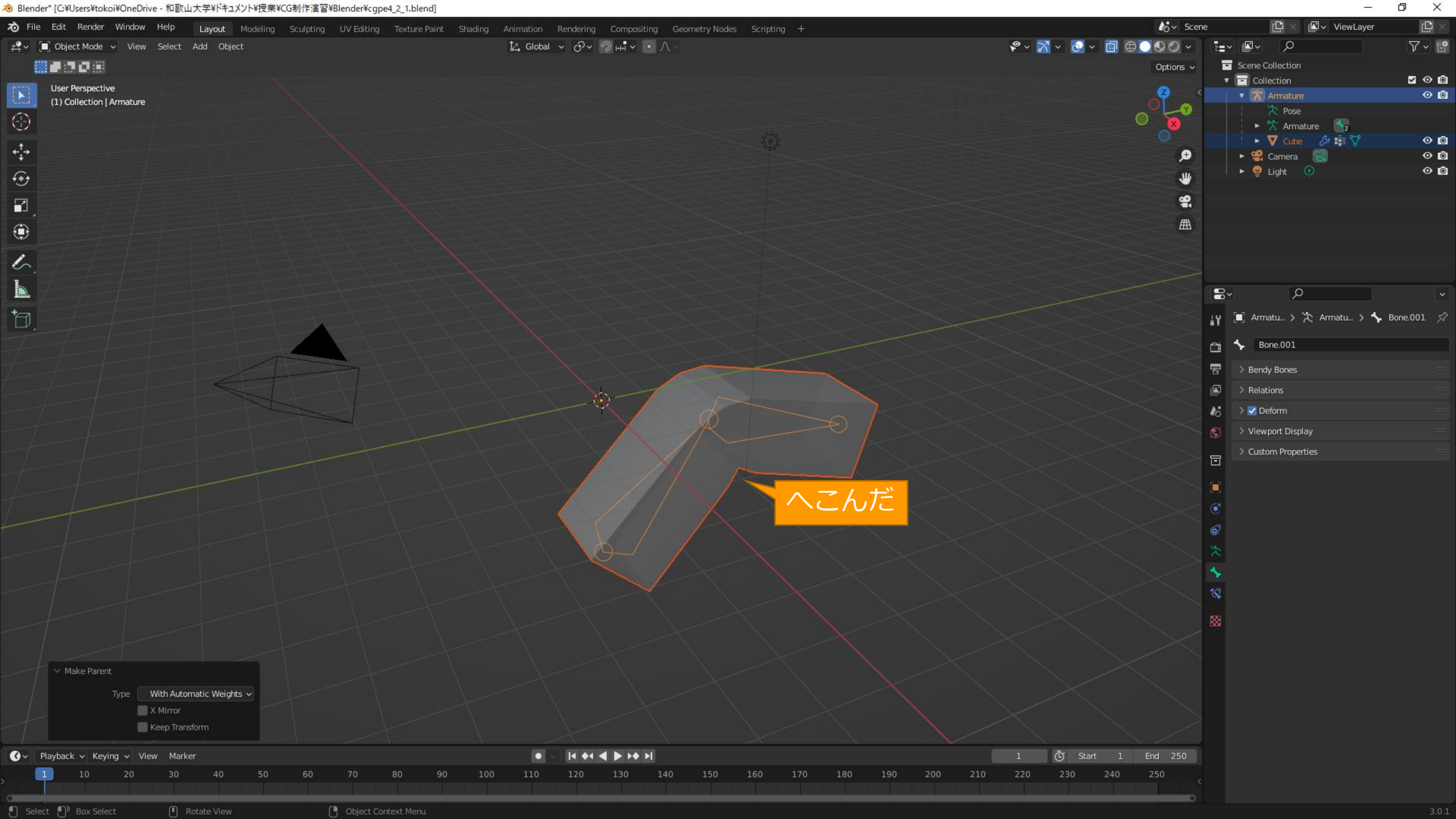
Object メニューの Parent から Armature Deformation With Automatic を選ぶ

または **Ctrl + P** →

Set Parent To

- Object
- Object (Keep Transform)
- Object (Without Inverse)
- Armature Deform
- With Empty Groups
- With Envelope Weights**
- With Automatic Weights
- Bone
- Bone Relative





Scene Collection

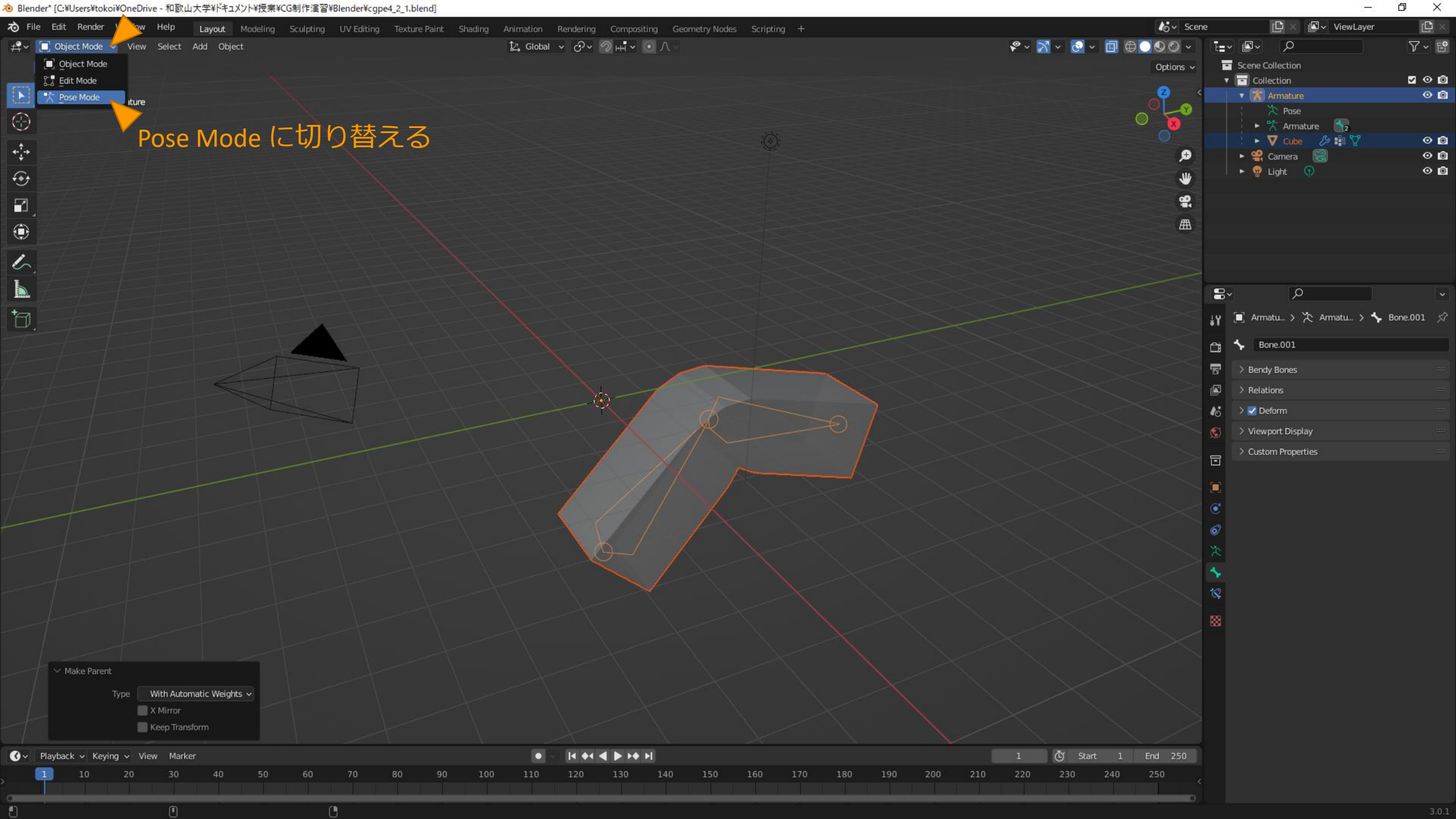
- Collection
 - Armature
 - Pose
 - Armature
 - Cube
 - Camera
 - Light

Options

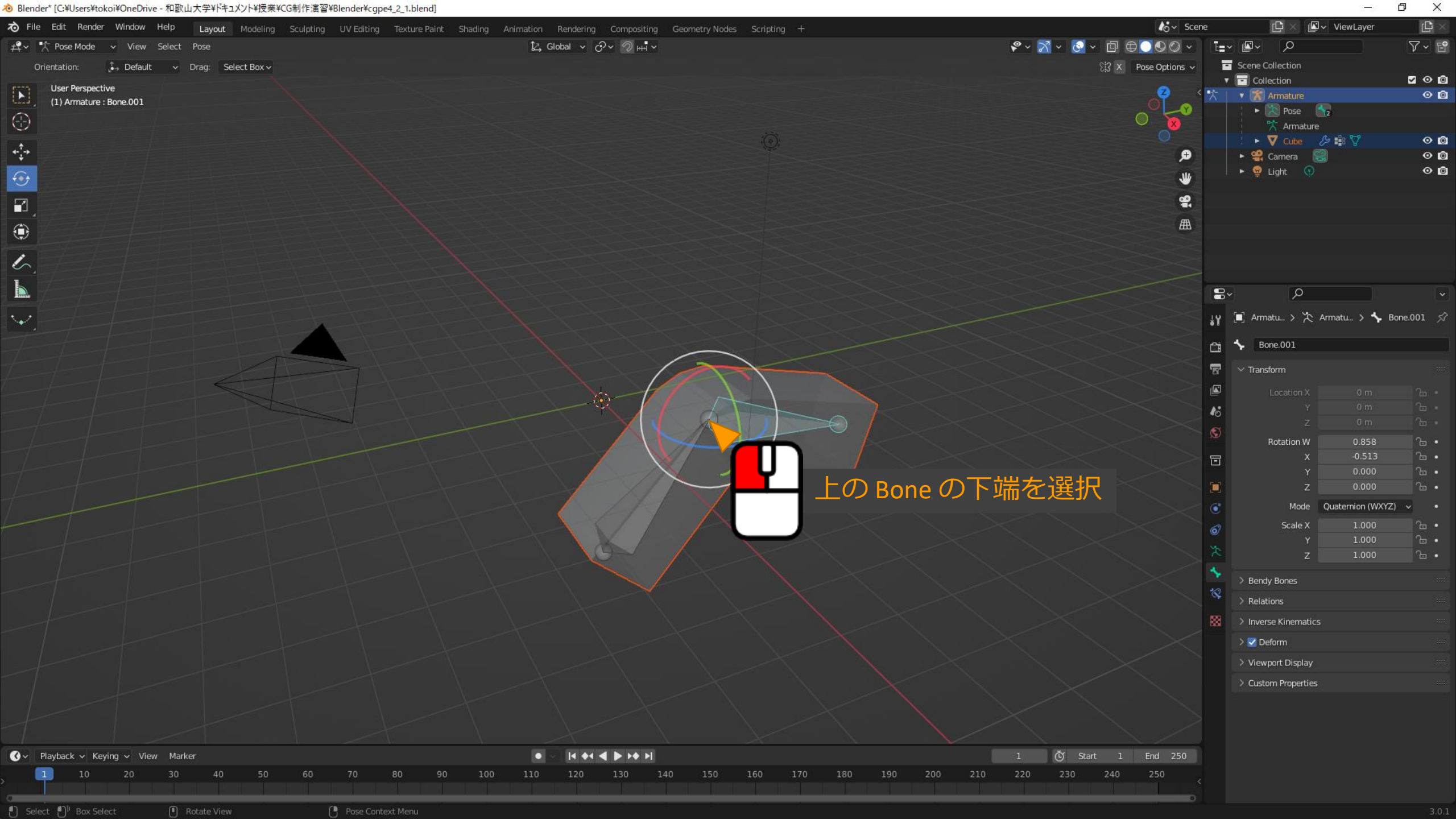
Armature > Armature > Bone.001

Bone.001

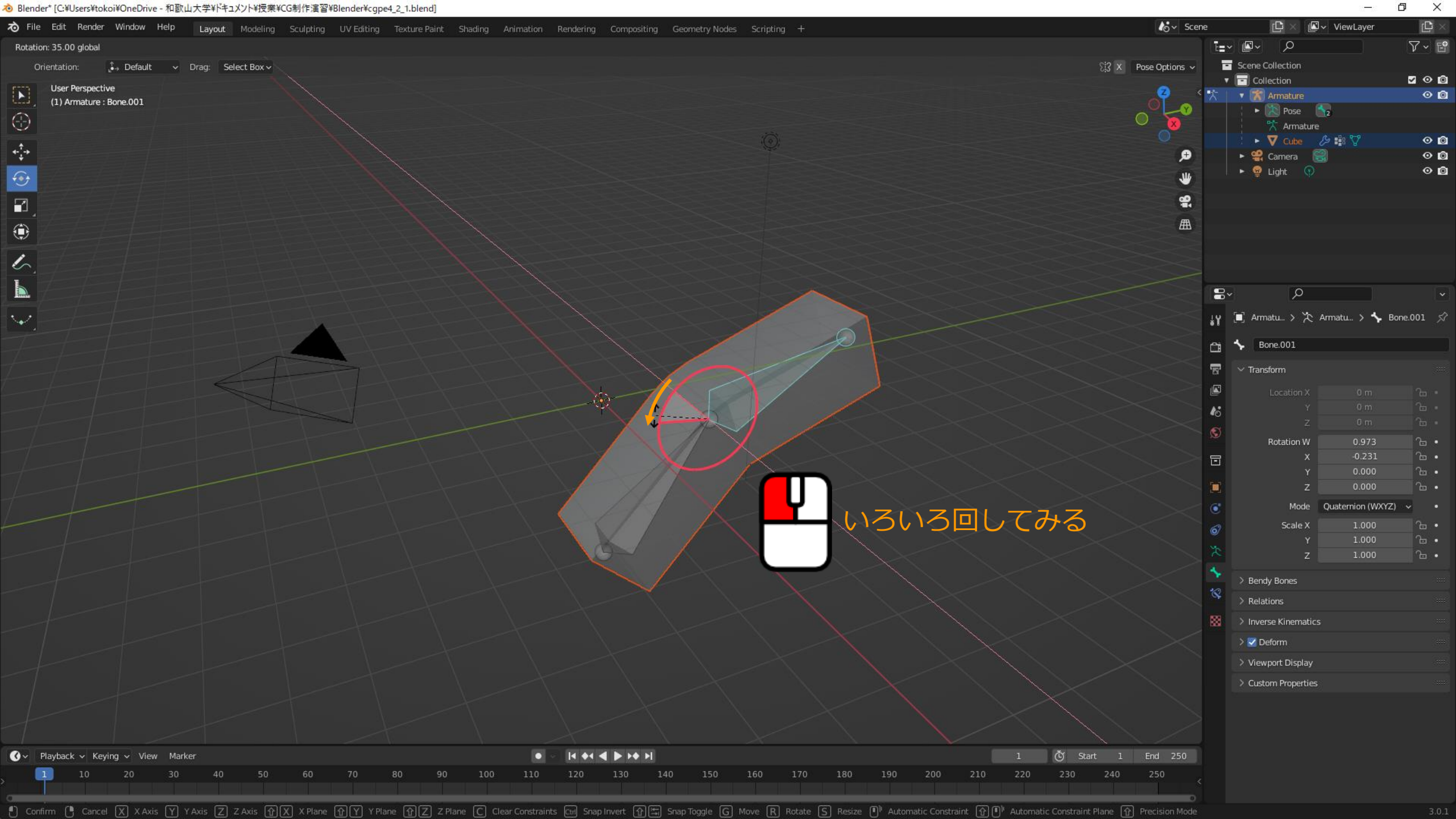
- Bendy Bones
- Relations
- Deform
- Viewport Display
- Custom Properties



Pose Mode に切り替える



上の Bone の下端を選択



User Perspective
(1) Armature : Bone.001

Scene Collection
Collection
Armature
Pose
Armature
Cube
Camera
Light

Bone.001

Transform

Location X	0 m
Y	0 m
Z	0 m
Rotation W	0.973
X	-0.231
Y	0.000
Z	0.000
Mode	Quaternion (WXYZ)
Scale X	1.000
Y	1.000
Z	1.000

Bendy Bones
Relations
Inverse Kinematics
Deform
Viewport Display
Custom Properties