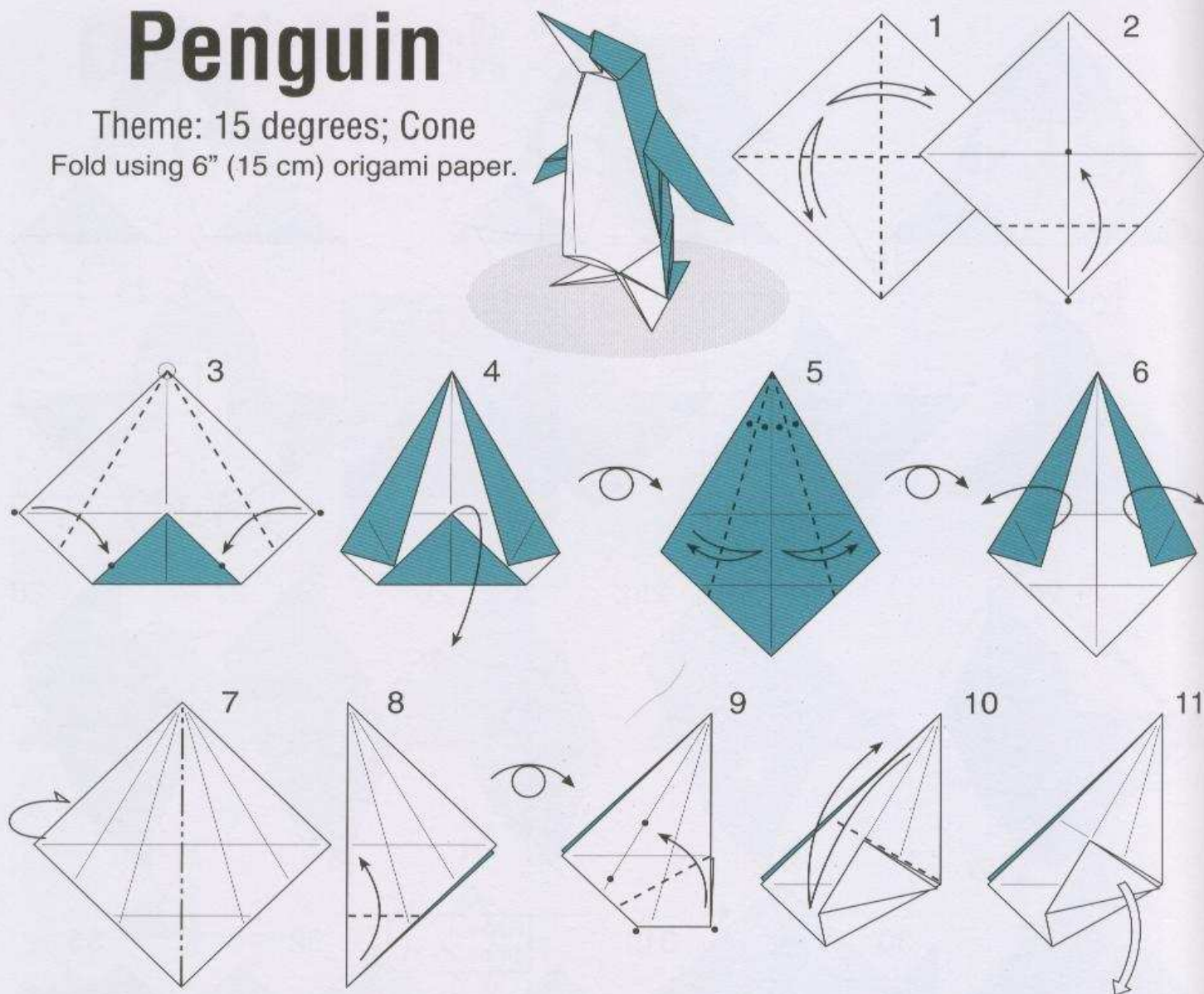
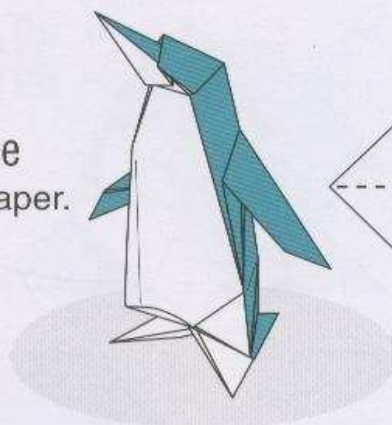


Penguin

Theme: 15 degrees; Cone

Fold using 6" (15 cm) origami paper.



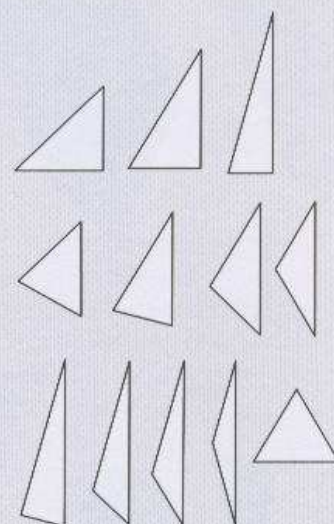
Using the 15° angle

The unit of angle in this model is not 22.5°, or a fourth of the right angle, but 15°, or a sixth of the right angle. The 15° angle is compatible with the square. You will notice that many points and lines meet each other in the sequence.

When we standardize the angle, we must define a unit angle. According to my experience, 15° and 22.5° are the most suitable to design, 30° is less suitable, and 18° and other degrees are difficult to use. When the unit is 15°, there are twelve types of triangle faces, which is much more than compared to the five when the unit is 22.5° (see *Wild Boar*). Among the twelve triangles shown on the right, three in the top row are basic.

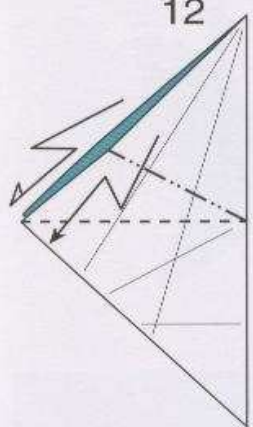
The unit angle can also be 45°. That is equal to simple box-pleating (see *Snake*). I said "simple" because of the following reasons.

What is standardized in box-pleating structure is the position of corners, rather than the angle, of creases. Using "advanced" box-pleating, we can make an ordered structure that is not based on any division of 360°.

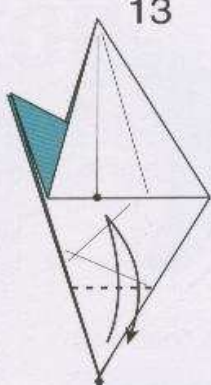


Triangles based on 15° angle units

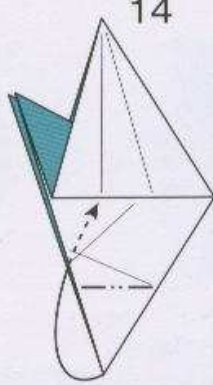
12



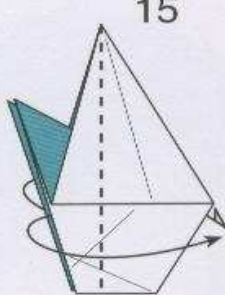
13



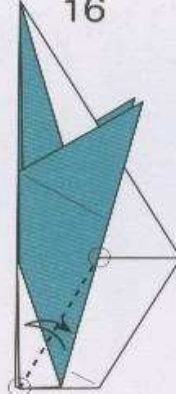
14



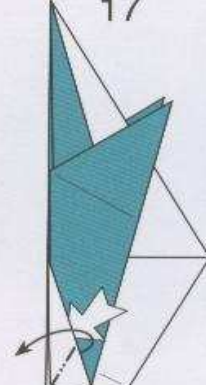
15



16

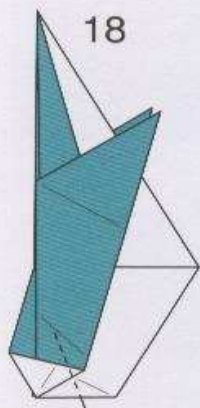


17

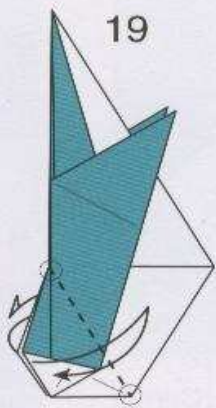


Inside reverse-fold

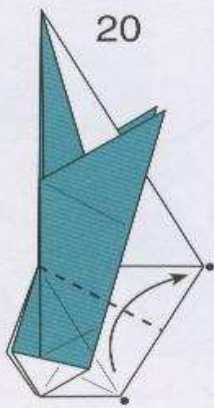
18



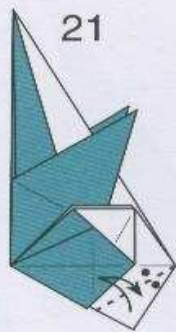
19



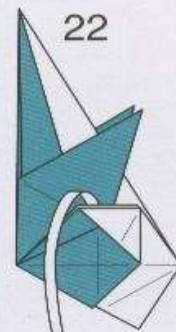
20



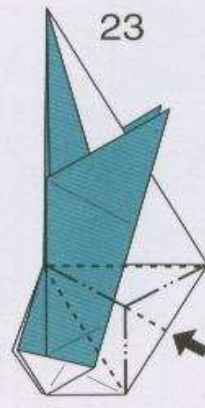
21



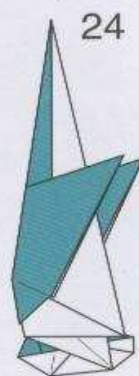
22



23



24

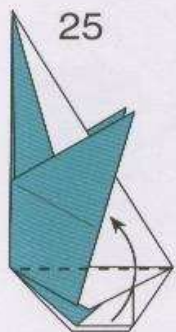


Repeat steps 16-17.

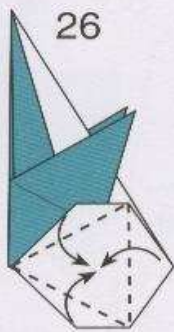
Unfold back to step 20.

Repeat steps 28-30.

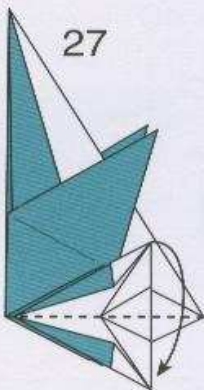
25



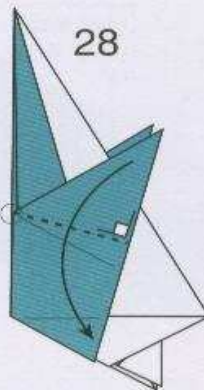
26



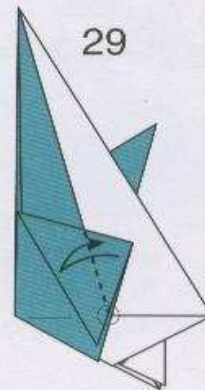
27



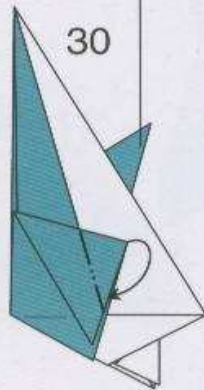
28



29

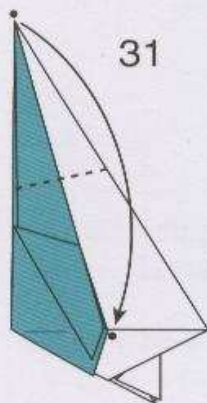


30

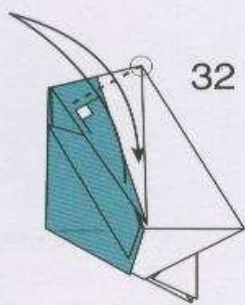


Inside reverse-fold

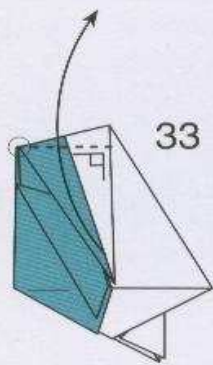
31



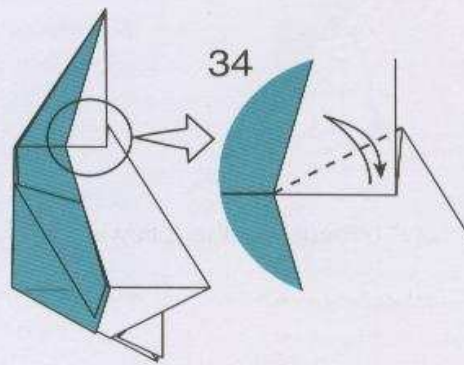
32



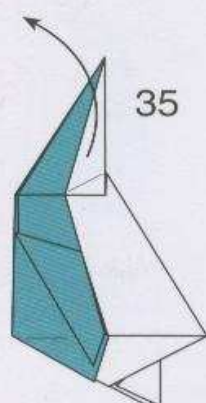
33



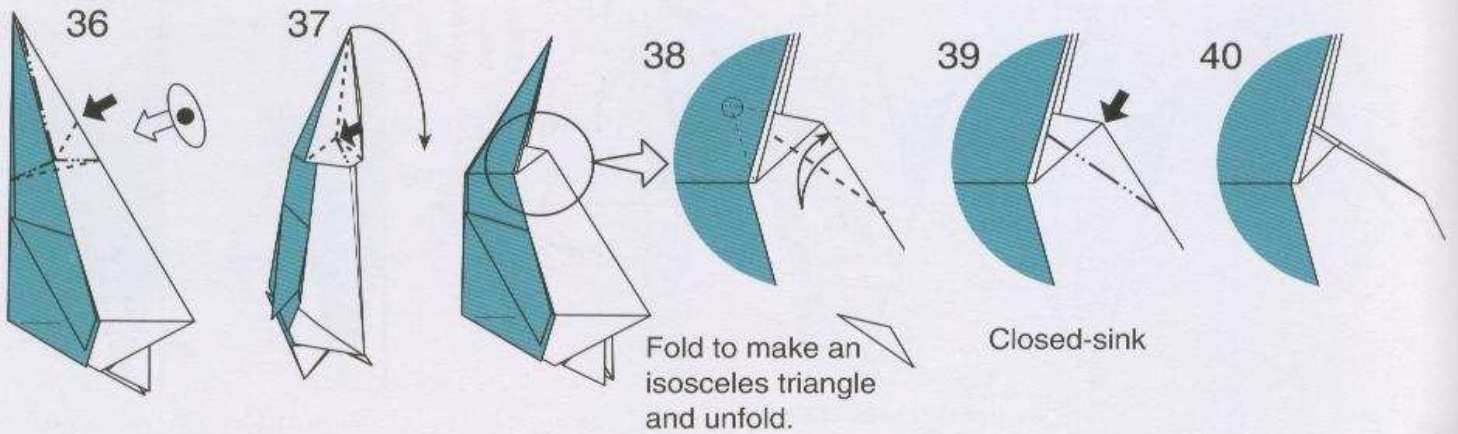
34



35

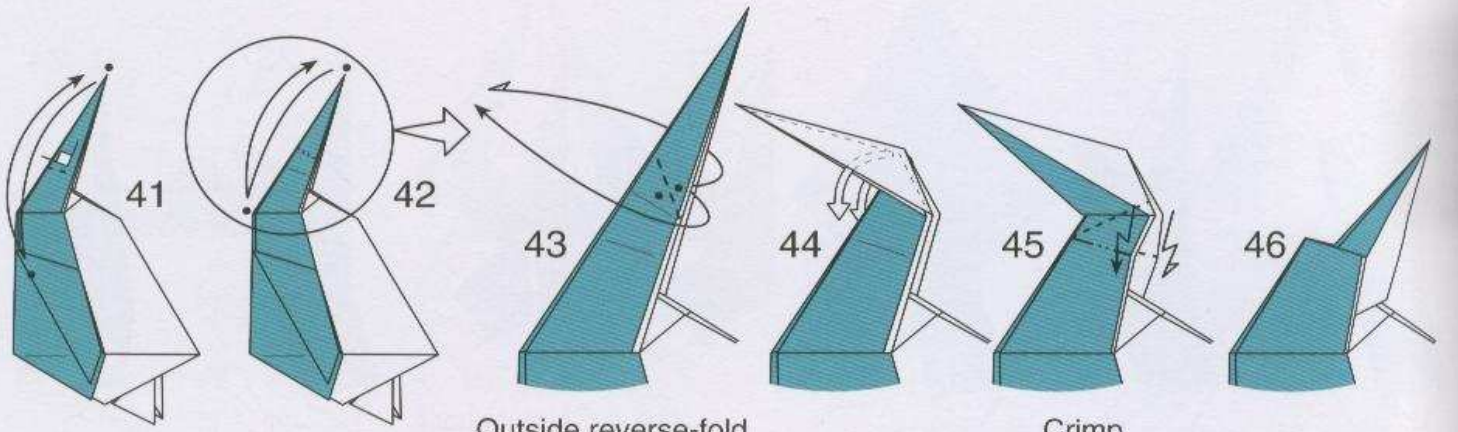


Unfold back to step 31.



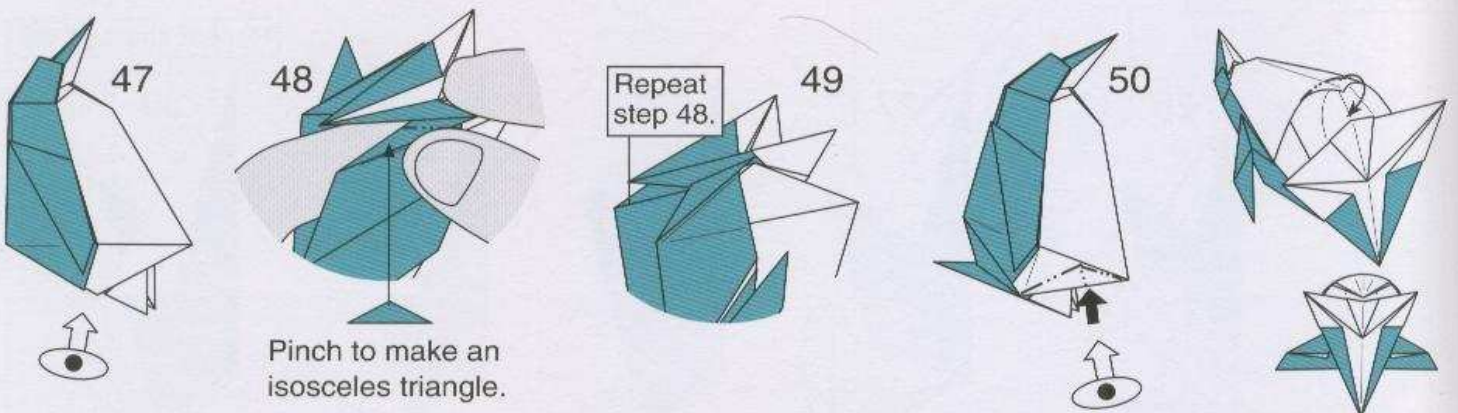
Fold to make an isosceles triangle and unfold.

Closed-sink



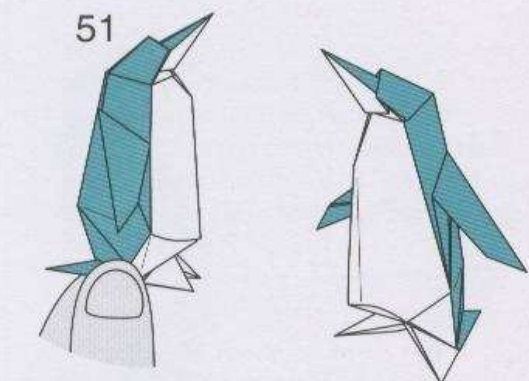
Outside reverse-fold

Crimp.



Pinch to make an isosceles triangle.

Repeat step 48.

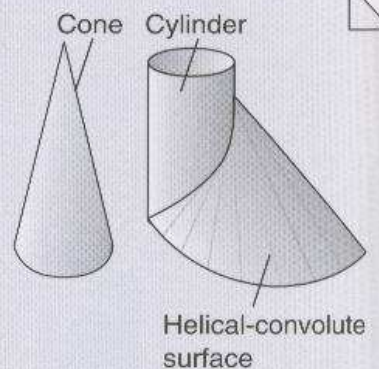


Reinforce the creases made in steps 48 and 49 to keep the back closed.

Finished.

Curved surfaces that can be made from flat surfaces.

Although any curved surface, when divided into tiny areas, can be approximated from a plane, only three types of curved surface are developable, in other words, can be developed onto a plane. They are the conical, cylindrical, and tangent surfaces. The basic idea of *Penguin* is, besides using 15° angle unit, making a three-dimensional body with a conical surface instead of a polyhedron that is a combination of planes. The earlier version of this model was closer to the cone.



Examples of conical, cylindrical, and tangent surfaces: a cone, a cylinder, and a helical-convolute surface.