

Turkey Days with GeoGebra (tested reasonably well)

The turkey feathers are Bezier curves. My thanks to Jon Ingram for his Bezier curve tool .






You simply select this tool and click four times to create 4 points and a Bezier curve is created.

BTW: The turkey without animation can be changed by clicking and dragging points. Once the animations are added, the points are not “free” and you have to change their coordinates manually!




Open the GeoGebra file: turkeystart.ggb. This file has Bezier curve tool (last icon on right).

I recommend that you turn off labeling. Options -> Labeling -> No new objects.




A. Create the body and the feathers

1. Body: Draw a circle using  *Circle with Center through Point tool*.
 - a. Click on the  tool.
 - b. Click towards the *right side* of the drawing pad (point A will be drawn).
 - c. Move the mouse and click again (point B and the circle will be drawn).
2. Feather 1: Draw a feather using the  *Bezier curve tool*.
 - a. Click on the  tool. We will need to create 4 points.
 - b. Click on the circle on the left side (point C), then click way to the left and up a bit (point D), then click to the right (point E) and then click again on the circle above first point (point E).
 - c. Click on the  Move tool to move your points and make your feather as you want.
3. Feathers 2 and 3: Make a couple of more feathers. (You do not have to have the first and last points on the body circle, but if you move the body this will keep the feathers “attached”.)

B. Create the head and eye

4. Head: Draw another circle using  *Circle with Center through Point tool*.
 - a. Click on the  tool.
 - b. Click above and to the *right* of the body circle (point O will be drawn).
Move the mouse and click again (point P and the circle will be drawn).
5. Eye: Draw another circle using  *Circle with Center through Point tool*.
 - a. Click on O (you do not have to, but this will keep the eye and head together).
Move the mouse and click again (point P and the circle will be drawn).


C. Create the nose, neck and feet

6. Nose: Click on the  *Polygon tool*. Then click on the head circle twice and then out to the right and again on the first point you created.
7. Neck: Click on the  *Polygon tool*. Then click on the head circle twice and then on the body circle twice and again on the first point you created.
8. Feet: Click on the  *Polygon tool*. Then click on the body circle at the bottom, then down and to the left, then to the right, then back up and to the left and again on the first point you created.
9. Do this again for the other foot.

You have created 1 triangle, 3 quadrilaterals (and a bunch of points and segments)

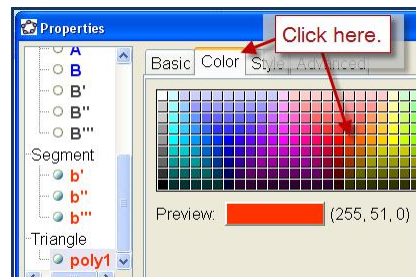
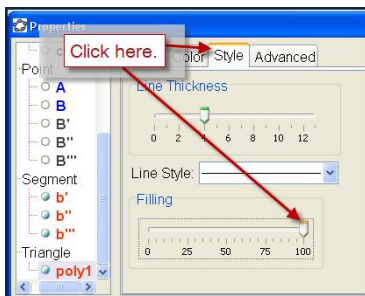
10. Save your file as turkey.ggb

D. Checkbox for Show Points

11. Since the points control our shapes, we will make a checkbox to show/hide points.
 - a. Select the  *Checkbox to Show/Hide Objects tool*.
 - b. Click somewhere in the *Drawing pad* and in the Caption field, type **Show Points**
 - c. Click on Apply. (We will connect this to all the points all at once in E.17)
 - d. Find the name of this checkbox by running your mouse over it. Remember it.

E. Fixing up Object properties

12. To get to the Properties dialog box:
 - a. Right-click on any object (but not inside a quadrilateral or circle) and select Properties at the bottom of the drop-down menu. The Properties window will open.
13. Turn off labels. If you forgot to switch off labeling:
 - a. In the left pane all the way at the top, click on Objects (to select everything).
 - b. Then in the right pane, on the Basics tab, deselect "Show Label".
14. Fill in circles, quadrilaterals and triangles.
 - a. In the left pane, click on category Circles.
 - b. Click on Style tab and click & drag slider for Filling to 100%.
 - c. Repeat d and e for category Quadrilaterals.
 - d. Repeat d and e for Triangle.



15. Color and layer circles and quadrilaterals.
 - a. In the left pane, click on a circle (the circles are in order: body, head, eye)
 - b. In the right pane, click on Color tab and then click on a color.
 - c. Repeat a and b with all circles and quadrilaterals (neck, then feet)
 - d. Repeat a and b with triangle (nose)
16. Color and thicken the feathers (we cannot fill them).
 - a. In the left pane, click on a circle (the circles are in order: body, head, eye)
 - b. In the right pane, click on Color tab and then click on a color.
 - c. Click on Style tab and click and drag Thickness to 7 (or whatever you want).
 - d. Repeat a -c with the other 2 curves.
17. Layer objects and connect points to checkbox.

We want the eye above the head above the neck and nose and also the body above the neck.

- a. In the left pane, click on the 1st circle (body).

- b. In the right pane, click on the Advanced tab and then change Layer to 1
 - c. In the left pane, click on the 2nd circle (head).
 - d. In the right pane, on the Advanced tab, change Layer to 1
 - e. In the left pane, click on the 3rd circle (eye).
 - f. In the right pane, on the Advanced tab, change Layer to 2
- We want the points to be on top of everything so that when we "Show Points" we can see them all.
- g. In the left pane, click on the category Points.
 - h. In the right pane, on the Advanced tab, change Layer to 3.
 - i. AGAIN in the right pane, on the Advanced tab, in the "Condition to show object" field, *type in the name of the checkbox*. (If you have forgotten the name, find category Boolean in the left pane. The name of the checkbox is the only Boolean variable there.)
- We are done.
- j. CLICK ON CLOSE to close the Properties dialog box.

18. Deselect the checkbox. All of your points should be hidden.



19. Save your file. (I saved this file as turkey.ggb.)

ANIMATION

Before animating, make final adjustments to the shape of the head, feathers and feet. (Select the checkbox and click and drag points until you are satisfied.) After animating you will only be able to adjust these points by manually changing their coordinates.

Watch the animation a bit. Now turn on the checkbox Show Points.

Animation 1: The head, the eye, the nose and the top of the neck move up and down. So we add an animated slider value to the y-coordinate of the center point of the head (and eye), the circle point of the head, the circle point of the eye and the end point of the nose. (The light blue points of the nose and neck will automatically move with the circle). Run your mouse over these points and write down their names. (Probably O, P, Q, T)

20. Make a slider using the  Slider tool.
- a. Click on  and in the drawing pad (we will hide this so it doesn't matter where).
 - b. Remember name! (Probably h.)
 - c. Min: -1, Max:1, Increment:0.01 - Don't click on Apply!
 - d. Click on Animation tab and change speed to 15 (else turkey's head moves very, very slowly)
 - e. Click on Apply.

21. Connect the points

- a. In the Algebra view or on the point itself, double-click on each of the 4 points and paste +h (or whatever the name of the slider) onto the y-coordinate.

• $O = (11.66, 4.14+h)$

double-click, paste here, hit Enter.


Notice that after hitting Enter, the object moves to "Dependent Objects" and no longer can be dragged in the Drawing pad.

22. Animate

- a. Right-click on the slider and select "Animation on".
- b. Watch the head go up and down and see if you like the distance and speed. (Right-click and choose Properties to change anything.)
- c. Click on the pause button (in the bottom left of the *Drawing pad*).
- d. Right-click on the slider and de-select "Show object".

Animation 2: The feet move left and right or rather the bottom points of the feet move horizontally in opposite directions. So we add a slider value to the x-coordinate of the points on one foot and subtract the same slider value to the x-coordinate of the points on the other foot. Run your mouse over these points and write down their names (probably $B_1, C_1, D_1, F_1, G_1, H_1$).

23. Make a slider using the  *Slider tool*.

- a. Click on  and in the drawing pad (we will hide this so it doesn't matter where).
- b. Remember name! (Probably i .)
- c. Min: -0.5 , Max: 0.5 , Increment: 0.01 - Don't click on Apply!
- d. Click on Animation tab and change speed to 12
- e. Click on Apply.

24. Connect the points

- a. In the Algebra view or on the point itself, double-click on each of the 3 points of one foot and paste $+i$ (or whatever the name of the slider) onto the x-coordinate.
- b. In the Algebra view, double-click on each of the 3 points of other foot and paste $-i$ (sign change!).

25. Animate

- a. Right-click on the slider and select "Animation on".
- b. Watch the feet walk and see if you like the distance and speed. (Right-click and choose Properties to change anything.)
- c. Click on the pause button (in the bottom left of the *Drawing pad*).
- d. Right-click on the slider and de-select "Show object".

Animation 3: The feathers move "in the wind". I just added different slider values to the y-coordinates of the far left point of each feather. Run your mouse over these points and write down their name (probably D, H, L). For sure, you can define another slider or whatever.

- e. To the y-coordinates of D added $+h$, to H added $+h-i$ and to L added $+i$.
- f. Click on the play button. The feathers should move.

26. Save your file. (I saved this file as turkeya.ggb.)