Draw a Halo Ring with Glow and Tilt: A Guided Construction

Original tasks 1, 2 / complete keys

Task 1

Draw a halo with a 45-degree tilt. Use a major axis of 8 cm and a minor axis of 2 cm. Place the halo center 4 cm above the top of a head oval. Describe the ellipse and placement.

Answer: A smooth ellipse centered 4 cm above the skull top, with major axis 8 cm along a 45-degree tilt line and minor axis 2 cm perpendicular to it. The ring's lowest point is about 1.08 cm above the skull top. Compute vertical half-extent as sqrt((a sin theta)^2 + (b cos theta)^2), using half the stated major and minor axis lengths for a and b, then subtract from the stated center height.

Reason: The 45-degree tilt line sets the major axis direction. The 2 cm minor axis gives a 4:1 ratio, strong foreshortening. Placing the center 4 cm above the skull top keeps the ring floating.

Check: Verify the major axis endpoints are 4 cm from center along the tilt line, the minor axis endpoints are 1 cm from center perpendicular to it, and the vertical ring-to-skull gap is about 1.08 cm, computed from both rotated semi-axes.

Task 2

Draw a halo with a 20-degree tilt. Use a major axis of 5 cm and a minor axis of 2.5 cm. Place the halo center 2 cm above the skull top. Add a near-glow band 1.5 cm wide and a far-glow band 0.75 cm wide. Describe the value order.

Answer: A smooth ellipse with a 20-degree tilt, major axis 5 cm, minor axis 2.5 cm, centered 2 cm above the skull top. The ring's lowest point is about 0.55 cm above the skull top. Compute vertical half-extent as sqrt((a sin theta)^2 + (b cos theta)^2), using half the stated major and minor axis lengths for a and b, then subtract from the stated center height. The core is darkest, the near-glow is medium, and the far-glow is lightest.

Reason: The 20-degree tilt is chosen independently of the 2:1 ratio, which gives moderate foreshortening. The glow bands are proportional to the minor axis. The value order makes the glow fade outward.

Check: Check that the minor axis is half the major axis, the tilt is 20 degrees, the vertical ring-to-skull gap is about 0.55 cm, computed from both rotated semi-axes, and the three values go dark to light from core to far-glow.

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Original tasks 3, 4 / complete keys

Task 3

A student draws a halo with a major axis of 6 cm and a minor axis of 1 cm, then shades a single thick outline. Identify two problems and give fixes.

Answer: Problem one: the 6:1 ratio makes the ellipse too thin and lens-like. Fix: increase the minor axis to at least 2 cm for a 3:1 ratio, which gives strong but readable foreshortening. Problem two: a single thick outline does not read as glow. Fix: use a core plus a near-glow and far-glow with lighter values.

Reason: For this worksheet, 6:1 is a very thin choice and 3:1 is the suggested revision. A smooth ellipse remains corner-free at either ratio; a pinched hand-drawn curve needs smoothing. The selected glow convention uses a value fade rather than one uniform outline.

Check: Measure the axes to confirm the ratio, and compare values on a test strip to confirm at least two glow steps.

Task 4

Draw a halo with a 30-degree tilt and a major axis of 7 cm. Choose a minor axis that gives a 3.5:1 ratio. Place the halo center 3 cm above the skull top. State the minor axis length and the gap check.

Answer: The minor axis is exactly 2 cm (7 divided by 3.5). At a 30-degree tilt, the vertical half-extent is sqrt((3.5 sin 30 degrees)^2 + (1 cos 30 degrees)^2) = sqrt(61)/4 cm, about 1.95 cm. Subtract this from the 3 cm center height: the ring-to-skull gap is about 1.05 cm.

Reason: Dividing the major axis by the ratio gives the minor axis. The gap check confirms the ring floats above the head.

Check: Verify 7 divided by 3.5 equals 2 cm, the major axis tilt is 30 degrees, both semi-axis contributions are included in the vertical half-extent, and the gap is about 1.05 cm.

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Source rubric / reflection

- [ ] Ellipse is smooth and closed with no corners.
- [ ] Major and minor axes are perpendicular and match the chosen ratio.
- [ ] Tilt axis passes through the halo center at the chosen angle.
- [ ] Halo center aligns with the head's vertical center line unless an offset is intentional.
- [ ] A visible gap exists between the ring's lowest point and the top of the head.
- [ ] Glow uses at least two value steps that fade outward.
- [ ] Core is darker than near-glow, and near-glow is darker than far-glow.
- [ ] Construction lines are erased or faint.
- [ ] Valid alternatives are accepted if the tilt, placement, and value order are consistent and checkable.

Reflection: What did you check, what did you change, and what will you try next?