Fish Eye Drawing: Iris, Pupil, and Highlight Geometry

Original tasks 1, 2 / complete keys

Task 1

Draw an iris circle with diameter 40 mm and a round pupil with diameter 12 mm. Place a single circular highlight of diameter 5 mm in the upper-right quadrant, with the light direction stated as upper right. Measure and record the pupil-to-iris ratio and the highlight center offsets from the eye center.

Answer: Pupil-to-iris ratio is 12 divided by 40, or 0.3. The highlight center should have a positive horizontal offset and a positive vertical offset. For example, a hypothetical placement of 8 mm right and 9 mm above the center gives offsets +8 mm and +9 mm. The highlight radius is 2.5 mm, so its distance from the center is the square root of (8 squared plus 9 squared), about 12.0 mm, and its nearest edge is about 9.5 mm from the center, which is outside the pupil radius of 6 mm.

Reason: The ratio check confirms the pupil size relative to the iris. The quadrant check confirms the highlight matches the stated light direction. The distance check confirms the highlight does not overlap the pupil edge.

Check: Measure iris and pupil diameters with the same ruler, compute the ratio, measure highlight center offsets, and compare the highlight nearest edge distance to the pupil radius.

Task 2

Draw an iris circle with diameter 60 mm and a vertical slit pupil whose width is 8 mm and height is 30 mm, centered on the iris center. Place an oval highlight in the upper-left quadrant. State the light direction and check the iris ring width at top, bottom, left, and right.

Answer: The slit pupil is centered, so the iris ring width at left and right is half of 60 minus 8, or 26 mm each. At top and bottom, the ring width is half of 60 minus 30, or 15 mm each. The highlight is in the upper-left quadrant, matching an upper-left light direction. A hypothetical oval highlight of 6 mm by 4 mm placed 10 mm left and 11 mm above the center has offsets -10 mm and +11 mm and does not overlap the slit pupil if its nearest edge clears the pupil boundary.

Reason: The ring width check uses simple subtraction and division. The quadrant check confirms the highlight placement. The overlap check compares the highlight edge to the pupil boundary.

Check: Measure the iris diameter and pupil width and height, compute ring widths at four cardinal points, measure highlight offsets, and verify the highlight edge does not cross the pupil boundary unless intended.

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Original tasks 3, 4 / complete keys

Task 3

Draw an iris circle with diameter 45 mm and an oval pupil with horizontal diameter 15 mm and vertical diameter 20 mm, centered on the iris center. Place two small highlight circles in the upper-left quadrant and state that the light direction is upper left. Check the pupil-to-iris ratio using the horizontal diameter and confirm both highlights are in the correct quadrant.

Answer: The pupil-to-iris ratio using the horizontal diameter is 15 divided by 45, or about 0.333. Both highlight centers must have negative horizontal offsets and positive vertical offsets. For example, hypothetical highlights at 7 mm left and 8 mm above, and 12 mm left and 5 mm above, both satisfy the quadrant condition. Check that each highlight edge clears the pupil boundary or note any intentional overlap.

Reason: The ratio uses a consistent diameter choice. The quadrant check uses the sign of the offsets. The overlap check uses the distance from each highlight center to the pupil boundary.

Check: Measure the iris diameter and pupil horizontal diameter, compute the ratio, measure each highlight center offset, and compare each highlight nearest edge to the pupil boundary.

Task 4

Draw an iris circle with diameter 50 mm and a round pupil with diameter 18 mm. Place a highlight in the lower-right quadrant and state that the light direction is lower right. Add labels for iris, pupil, and highlight using the baseline-to-midline x-height convention. Measure your lowercase x-height and record it.

Answer: The pupil-to-iris ratio is 18 divided by 50, or 0.36. The highlight center must have a positive horizontal offset and a negative vertical offset to be in the lower-right quadrant. For example, a hypothetical highlight at 9 mm right and 10 mm below the center satisfies the condition. Labels should sit with lowercase letters between the baseline and the midline; a hypothetical measured x-height of 4 mm means the midline is 4 mm above the baseline. Leader lines should point to the correct parts without crossing other parts.

Reason: The ratio check confirms pupil size. The quadrant check uses the sign of the offsets. The label check uses the measured x-height and the baseline-to-midline convention.

Check: Measure iris and pupil diameters, compute the ratio, measure highlight offsets, measure your lowercase x-height, and verify each label sits between baseline and midline with a clear leader line.

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Source rubric / reflection

- [ ] Iris outer circle is present and its center is marked.
- [ ] Pupil shape is clearly defined and centered on the iris center, or any offset is explained.
- [ ] Iris ring width is checked at four cardinal points and variation is intentional or corrected.
- [ ] Highlight is placed in a quadrant consistent with the stated light direction.
- [ ] Highlight overlap with the pupil is either absent or intentional and noted.
- [ ] Labels, if used, follow the baseline-to-midline x-height convention and are legible.
- [ ] Measurements use consistent units and any ratios are computed correctly.
- [ ] Valid alternatives such as oval pupils or clustered highlights are accepted when consistent with the stated convention.

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