Toilet Isometric Drawing: Bowl, Tank, Seat and Base

Original tasks 1, 2 / complete keys

Task 1

Construct a toilet with tank height 3 units, tank depth 2 units, tank width 2 units, bowl opening 3 units long and 2 units wide, seat offset 0.2 units, and base height 1 unit. Use 1 unit = 10 mm. Describe each construction step and state two checks.

Answer: Axes: vertical plus two 30-degree receding axes. Tank: 30 mm height, 20 mm depth, 20 mm width box. Bowl: 30 mm by 20 mm parallelogram on the isometric plane; draw both diagonals, mark the crossing as centre, and sketch an ellipse tangent to all four sides. Seat: second ellipse offset 2 mm outward on the same plane. Base: 10 mm high box centred under the bowl. Checks: opposite parallelogram sides equal; centre line through all parts.

Reason: Each part follows the isometric convention. The tank is a box, the bowl opening is a horizontal ellipse constructed tangent to its parallelogram, the seat shares that plane, and the base is a centred box. The checks test projection consistency and alignment.

Check: Measure opposite sides of each parallelogram and confirm equality within pencil width. Verify all receding edges are at 30 degrees and the centre line is continuous.

Task 2

A student draws the bowl as a true circle inside a square. Explain the error and describe how to correct it using an isometric parallelogram. Include one measurement check.

Answer: The error is using a square and circle instead of an isometric parallelogram and ellipse. Correct by drawing a parallelogram whose sides follow the two receding axes, drawing both diagonals and marking their crossing as the centre, then sketching a smooth ellipse tangent to all four sides and symmetric about the parallelogram centre. Find the tangency points by construction; they lie at the side midpoints only if the parallelogram is a rhombus. Check symmetry by confirming tangency on each side and that the ellipse is symmetric about the centre.

Reason: A horizontal circle appears as an ellipse in isometric projection. The parallelogram defines the correct plane, the diagonal crossing gives the centre, and tangency to the four sides guides a symmetrical ellipse.

Check: Confirm tangency on all four sides at the constructed tangency points and symmetry about the centre. Confirm parallelogram sides are parallel to the isometric axes. If the parallelogram is a rhombus, the tangency points should also fall at the side midpoints.

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Original tasks 3, 4 / complete keys

Task 3

Given tank height 5 units, tank depth 2 units, tank width 3 units, bowl opening 4 units long and 3 units wide, seat offset 0.3 units, and base height 1 unit, list the millimetre marks on each axis at 1 unit = 10 mm and describe where the seat ellipse is placed.

Answer: Vertical axis: 50 mm for tank height, plus 10 mm for base height below the bowl. Receding axes: 20 mm tank depth and 30 mm tank width; bowl parallelogram 40 mm by 30 mm. Seat ellipse: same isometric plane as the bowl opening, centred on the same point, offset outward by 3 mm. Base box: 10 mm high, centred under the bowl.

Reason: Marks are converted by the stated scale. The seat must share the bowl plane to remain a horizontal ring in projection. The base is a separate shorter box centred under the bowl.

Check: Confirm each mark equals the unit value times 10 mm. Measure the seat offset at two opposite points; both should be about 3 mm.

Task 4

Describe how to check a finished toilet isometric drawing for three common errors: non-vertical height edges, bowl drawn as a circle, and misaligned centre line. Give one simple measurement for each check.

Answer: Height edges: place a straightedge vertically beside each height edge; any tilt indicates an error. Bowl: check that the ellipse is tangent to all four sides of its isometric parallelogram and symmetric about the parallelogram centre; a true circle cannot remain tangent to a non-rhombic parallelogram. Centre line: measure from the centre line to the left and right edges of the tank and bowl; corresponding distances should match.

Reason: Each check targets a specific projection rule. Vertical edges must stay vertical, horizontal circles become ellipses tangent to their isometric parallelogram, and all parts share a centre line.

Check: Use a straightedge for verticality, confirm ellipse tangency to all four parallelogram sides, and compare left and right distances from the centre line at tank and bowl.

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Source rubric / reflection

- [ ] Isometric axes: vertical edges vertical; receding edges at 30 degrees; scale labeled.
- [ ] Tank: box constructed with parallel edges; visible faces correct; lid and button on top plane.
- [ ] Bowl: ellipse constructed inside an isometric parallelogram; smooth and symmetrical; correct plane.
- [ ] Seat ring: larger concentric ellipse on the same plane with consistent offset.
- [ ] Base: centred box under the bowl; common centre line maintained.
- [ ] Labels and readability: parts labeled clearly; line weights consistent; valid alternative styles accepted.

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