Draw a Flanged Mace: Head Geometry and Handle Attachment

Original tasks 1, 2 / complete keys

Task 1

Draw a four-flange mace head with an outer radius of 25 mm and a core radius of 8 mm. Calculate the angular spacing between flange centre lines and state it. Use flange widths of 7 mm at the core and 3 mm at the tip. Add a handle 100 mm long with top diameter 10 mm and bottom diameter 7 mm, and a collar 12 mm wide and 8 mm tall.

Answer: Angular spacing is 360 divided by 4, which equals 90 degrees. The drawing shows four flanges at 0, 90, 180, and 270 degrees on a 25 mm outer circle, a core circle of 8 mm radius, flange widths tapering from 7 mm to 3 mm, a 100 mm handle tapering from 10 mm to 7 mm, and a 12 mm by 8 mm collar at the top.

Reason: Four flanges divide the circle into four equal parts, so each adjacent pair is 90 degrees apart. The stated radii and widths define the head size and taper. The handle length and diameters define the shaft, and the collar dimensions define the attachment.

Check: Measure the angle between adjacent flange centre lines and confirm it is 90 degrees within your drawing tolerance. Measure the outer and core radii and confirm they match 25 mm and 8 mm. Measure the handle top and bottom widths and confirm 10 mm and 7 mm.

Task 2

A six-flange mace head has an outer radius of 35 mm. Calculate the straight-line distance from the centre to a flange tip along a radial line. Then draw the head with a core radius of 12 mm and flange widths of 9 mm at the core and 5 mm at the tip. Add a handle 140 mm long with top diameter 14 mm and bottom diameter 9 mm, and a collar 16 mm wide and 12 mm tall.

Answer: The straight-line distance from the centre to a flange tip along a radial line is the outer radius, 35 mm. The drawing shows six flanges at 60-degree spacing, a 12 mm core radius, flange widths tapering from 9 mm to 5 mm, a 140 mm handle tapering from 14 mm to 9 mm, and a 16 mm by 12 mm collar.

Reason: The flange tip lies on the outer construction circle, so the radial distance is the outer radius. The angular spacing for six flanges is 360 divided by 6, which equals 60 degrees. The remaining dimensions define the core, flange taper, handle, and collar.

Check: Measure from the centre to a flange tip and confirm it is 35 mm. Measure adjacent flange angles and confirm 60 degrees. Measure the handle top and bottom widths and confirm 14 mm and 9 mm.

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Original tasks 3, 4 / complete keys

Task 3

Draw an eight-flange mace head with an outer radius of 40 mm and a core radius of 15 mm. Calculate the angular spacing and state it. Use flange widths of 10 mm at the core and 6 mm at the tip. Add a handle 160 mm long with top diameter 16 mm and bottom diameter 10 mm, and a collar 18 mm wide and 14 mm tall. Label the core, two flanges, collar, and handle.

Answer: Angular spacing is 360 divided by 8, which equals 45 degrees. The drawing shows eight flanges at 45-degree spacing on a 40 mm outer circle, a 15 mm core radius, flange widths tapering from 10 mm to 6 mm, a 160 mm handle tapering from 16 mm to 10 mm, and an 18 mm by 14 mm collar. Labels are placed outside the object with leader lines.

Reason: Eight flanges divide the circle into eight equal parts, so adjacent flange centre lines are 45 degrees apart. The radii and widths define the head, and the handle and collar dimensions define the shaft and attachment. Labels make the parts identifiable.

Check: Measure adjacent flange angles and confirm 45 degrees. Measure the outer and core radii and confirm 40 mm and 15 mm. Confirm labels are outside the object and leader lines touch the named parts.

Task 4

Design a six-flange mace head with an outer radius of 28 mm and a core radius of 9 mm. Choose flange widths at the core and tip that taper by 4 mm, and state your chosen values. Add a handle 110 mm long with a taper of 4 mm between top and bottom diameters, and state your chosen diameters. Add a collar 13 mm wide and 9 mm tall. Calculate the angular spacing and state it.

Answer: Angular spacing is 360 divided by 6, which equals 60 degrees. One valid choice is flange widths of 8 mm at the core and 4 mm at the tip, which taper by 4 mm. One valid choice for the handle is top diameter 12 mm and bottom diameter 8 mm, which taper by 4 mm. The drawing shows six flanges at 60-degree spacing, a 9 mm core radius, the chosen flange taper, a 110 mm handle with the chosen diameters, and a 13 mm by 9 mm collar.

Reason: The angular spacing follows from dividing 360 by the number of flanges. The taper requirement is met by choosing any two widths or diameters that differ by 4 mm. Different valid choices are acceptable as long as the stated values are used consistently in the drawing.

Check: Measure adjacent flange angles and confirm 60 degrees. Measure the flange widths at the core and tip and confirm they differ by 4 mm. Measure the handle top and bottom diameters and confirm they differ by 4 mm. Confirm the collar dimensions match 13 mm by 9 mm.

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Source rubric / reflection

- [ ] Radial symmetry: flange centre lines are spaced at equal angles within the stated tolerance (for six flanges, 60 degrees).
- [ ] Flange geometry: each flange tapers between the stated widths and has a flat or rounded tip, not a sharp spike.
- [ ] Handle taper: top and bottom widths match the chosen values and the sides converge smoothly.
- [ ] Attachment: a collar or socket is drawn at the top of the handle and touches the head core.
- [ ] Line convention: outer contours use one outline weight and internal or construction lines use a lighter weight.
- [ ] Labels: core, flange, collar, and handle are labeled legibly with leader lines outside the object.
- [ ] Valid alternatives: different flange counts, widths, or handle lengths are acceptable if the angles and measurements are stated and internally consistent.

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