Draw a White Star: Point-Spacing Construction and Tracing Practice

Original tasks 1, 2 / complete keys

Task 1

A student marks five outer points on a circle but one gap is visibly wider. Describe two checks to find the error and one correction.

Answer: Measure the chord distances between adjacent outer points; the wider gap will have a larger chord. Fold along symmetry lines to see if halves align. Correction: re-divide the circle into five equal arcs and move the misplaced point to the correct division.

Reason: Equal spacing means equal chords for equal angular intervals. A wider gap indicates a larger angle, which breaks symmetry.

Check: Compare all five chord measurements and confirm they match within measurement uncertainty after correction.

Task 2

On a circle of radius 8 cm, a student places inner points at 3 cm, 3 cm, 4 cm, 3 cm, and 3 cm from the center. What is the likely visual effect and how should it be fixed?

Answer: The inner point at 4 cm will make one part of the star look more spiky or deep. Fix by moving that inner point to 3 cm on its symmetry line, then recheck all five inner radii.

Reason: Inner points should sit at a consistent radius; one outlier changes the star's proportions locally.

Check: Measure all five center-to-inner-point distances and confirm they are equal within measurement uncertainty.

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Original tasks 3, 4 / complete keys

Task 3

Describe the connection order for a five-pointed star using labels O1 to O5 for outer points clockwise and I1 to I5 for inner points between them. Start at O1 and go clockwise.

Answer: One valid order is O1 to I1 to O3 to I2 to O5 to I3 to O2 to I4 to O4 to I5 back to O1, where I1 lies on the symmetry line between O1 and O2, I2 between O2 and O3, I3 between O3 and O4, I4 between O4 and O5, and I5 between O5 and O1. The key is to skip one outer point each time and pass through an inner point between.

Reason: Star order connects non-adjacent outer points, with inner points acting as the inward vertices between them; each inner point sits on the bisector of the angle between two adjacent outer points on the circle.

Check: Trace the sequence and confirm it closes at O1 without crossing itself incorrectly and produces five sharp outer points.

Task 4

You have no compass and no protractor. Explain how to mark five equal divisions on a traced circle using folding, and state one limitation.

Answer: Fold the circle in half, then adjust folds until five equal wedges overlap; unfold and mark the crease intersections on the circle. Limitation: folding is approximate, so check chord distances and adjust by eye or ruler.

Reason: Equal wedges create equal angular intervals, which is the spacing requirement. Folding avoids tools but introduces small errors.

Check: Measure adjacent chord distances after marking; if one is larger, adjust the nearest point toward equal spacing.

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Source rubric / reflection

- [ ] Five outer points are spaced equally within a reasonable visual or measured tolerance.
- [ ] Five inner points lie on symmetry lines and at a consistent distance from the center.
- [ ] Connections follow star order and produce a closed five-pointed outline.
- [ ] The star is outline-only with a white interior, or shading is outside the star.
- [ ] Construction marks are light and final outline is clean and continuous.
- [ ] Valid alternatives are accepted if spacing and symmetry checks pass, even if line style differs.

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