Draw a Running Track: Lane Lines and Curve Construction

Original tasks 1, 2, 3 / complete keys

Task 1

A track has an inner semicircle radius of 2 cm and a lane width of 0.5 cm. What is the semicircle radius of the third lane line, counting the inner edge as lane zero?

Answer: 3.5 cm.

Reason: Each lane adds 0.5 cm to the radius. Lane zero is 2 cm, lane one is 2.5 cm, lane two is 3 cm, and lane three is 3.5 cm.

Check: Add 0.5 cm three times to 2 cm and confirm the total is 3.5 cm.

Task 2

You draw a track with inner straight segments of 10 cm and inner semicircle radius of 4 cm. You want four lanes with a lane width of 1 cm. What are the straight length and semicircle radius of the outermost lane line?

Answer: Straight length 10 cm; semicircle radius 8 cm.

Reason: Offsetting outward does not change the straight length, so it stays 10 cm. The outermost lane line is offset 4 cm total (four lanes times 1 cm), so its radius is 4 cm plus 4 cm equals 8 cm.

Check: Confirm the straight length is unchanged and add the total offset to the inner radius: 4 + 4 = 8 cm.

Task 3

A learner draws lane lines with a constant semicircle radius of 5 cm for every lane while the inner radius is 4 cm and the lane width is 1 cm. Describe the spacing problem at the curves and state the correct radius for the second lane line.

Answer: The lane lines converge at the curves because the radius does not increase; spacing shrinks. The correct second-lane radius is 6 cm.

Reason: With a constant radius, each new lane line sits at the same curve position, so the gap between lanes closes. The second lane line needs the inner radius plus two lane widths: 4 + 2 = 6 cm.

Check: Measure the gap between the first and second lane lines at the curve; it should be 1 cm. Verify the second radius by adding 1 cm twice to 4 cm.

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Original tasks 4 / complete keys

Task 4

You have drawn a track with inner radius 3 cm and lane width 1 cm for three lanes. At one curve, you measure the gap between the first and second lane lines as 0.6 cm. What is the most likely error, and what should you check?

Answer: The second lane line's radius is likely too small; it should be 5 cm. Check the compass setting and the center point for that curve.

Reason: The first lane line radius should be 4 cm and the second 5 cm, giving a 1 cm gap. A 0.6 cm gap suggests the second radius is about 4.6 cm, so the compass was set incorrectly or the center shifted.

Check: Measure the second lane line's radius from the center point; it should be 5 cm. Re-measure the gap at several points on the curve to confirm.

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Source rubric / reflection

- [ ] Track outline is a closed rounded rectangle with two straight sides and two semicircular ends.
- [ ] Semicircle centers lie on the horizontal centerline and the two ends mirror each other.
- [ ] Straight segments meet the semicircles tangentially, with no visible corner or gap.
- [ ] Lane lines are concentric and spaced evenly by the chosen lane width around the whole track.
- [ ] Each lane line's semicircle radius equals the inner radius plus that lane's total offset.
- [ ] Line weight is consistent and lane gaps remain visible.
- [ ] Any labeling is legible, consistent, and placed outside the track so it does not obscure lane lines.
- [ ] Construction lines are erased or faint, and the final drawing is clean.

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