Draw Wheel Rims: Spoke Patterns and Tire Profile Comparison

Original tasks 1, 2, 3 / complete keys

Task 1

Draw a five-spoke rim plate with an outer tire radius of 55 mm, a rim edge radius of 40 mm, and five lugs. State the sidewall band width and the angular step for spokes and lugs.

Answer: Sidewall band width is 55 minus 40 equals 15 mm. Spoke step is 360 divided by 5 equals 72 degrees. Lug step is also 72 degrees for five lugs. Check: 5 times 72 equals 360 for both.

Reason: Subtract the rim edge radius from the outer tire radius to get the band. Divide 360 by the count to get the angular step, then multiply back to confirm the full circle.

Check: Measure the drawn band against the stated 15 mm hypothetical example and verify each adjacent spoke and lug angle is 72 degrees by center measurement.

Task 2

A mesh plate uses two crossing line sets between the hub circle and rim edge circle. The outer tire radius is 60 mm and the rim edge radius is 45 mm. Where must the crossings stay, and what is the band width?

Answer: Crossings must stay between the hub circle and the rim edge circle, inside the sidewall band. Band width is 60 minus 45 equals 15 mm. Check: 60 minus 45 equals 15.

Reason: The mesh pattern belongs to the rim area, so crossings should not spill into the sidewall band or over the hub. The band width comes from subtracting the two radii.

Check: Trace each crossing and confirm it lies between the hub circle and rim edge circle; measure the band width and compare with 15 mm as a hypothetical example.

Task 3

Compare a 12-spoke plate and a five-spoke plate that share an outer tire radius of 50 mm and a rim edge radius of 38 mm. Give the angular steps, the band width, and one visual difference.

Answer: 12-spoke step is 360 divided by 12 equals 30 degrees. Five-spoke step is 360 divided by 5 equals 72 degrees. Band width is 50 minus 38 equals 12 mm. The five-spoke plate looks more open because its spokes are farther apart.

Reason: Both plates share the same circles, so only the spoke count changes. Dividing 360 by each count gives the step, and subtracting the radii gives the band.

Check: Verify 12 times 30 equals 360 and 5 times 72 equals 360; measure the band against 12 mm as a hypothetical example and compare spoke spacing on both plates.

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Original tasks 4 / complete keys

Task 4

You choose a hypothetical outer tire radius of 48 mm and want a sidewall band of 10 mm. What rim edge radius do you need, and if you draw 8 spokes, what is the angular step?

Answer: Rim edge radius is 48 minus 10 equals 38 mm. Spoke step is 360 divided by 8 equals 45 degrees. Check: 8 times 45 equals 360, and 38 plus 10 equals 48.

Reason: Subtract the band width from the outer radius to find the rim edge radius. Divide 360 by the spoke count for the step, then reverse both operations to confirm.

Check: Add the rim edge radius and band width to recover the outer radius, and multiply the step by the spoke count to recover 360.

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Source rubric / reflection

- [ ] Three plates share the same outer tire circle, rim edge circle, and hub circle drawn from one center cross.
- [ ] Spoke patterns are evenly spaced and the arithmetic checks: step times count equals 360.
- [ ] Hub and lug layout is identical across plates, isolating spoke pattern as the comparison variable.
- [ ] Sidewall band is drawn between outer tire circle and rim edge circle with a consistent width.
- [ ] Comparison chart records spoke count, angular step, density note, and band width in one unit.
- [ ] All chosen numerical values are labeled as hypothetical examples, and lettering is consistent with x-height from baseline to midline.

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