Draw a Ferris Wheel: Spoke Layout and Capsule Ring

Original tasks 1, 2 / complete keys

Task 1

A wheel has 16 capsules. Calculate the angle gap between adjacent capsule attachment points. Then state how many marks appear in one quadrant from the top vertical line to the horizontal line, including both endpoints.

Answer: The angle gap is 360 divided by 16, which equals 22.5 degrees. One quadrant contains five marks: 0, 22.5, 45, 67.5, and 90 degrees.

Reason: Dividing the full circle by the capsule count gives the gap. A quadrant spans 90 degrees, so the number of intervals is 90 divided by 22.5, which equals 4 intervals, giving 5 marks including both endpoints.

Check: Multiply the gap by the number of intervals: 22.5 times 4 equals 90 degrees. Count the marks: 0, 22.5, 45, 67.5, 90, which is five marks.

Task 2

A student uses a rim radius of 10 cm and makes each capsule 1.5 cm wide. Using the hypothetical convention that capsule width is about one-eighth of the rim radius, is 1.5 cm a reasonable width? Show the arithmetic.

Answer: One-eighth of 10 cm is 1.25 cm. A width of 1.5 cm is slightly larger than the convention but still close; it is reasonable if the capsules do not overlap.

Reason: The convention gives a starting size, not a rule. The check is whether adjacent capsules overlap. With 12 capsules, the rim circumference is about 2 times 3.14 times 10, which equals 62.8 cm, so the spacing along the rim is about 62.8 divided by 12, which equals about 5.2 cm. A 1.5 cm capsule fits within that spacing.

Check: Calculate one-eighth of the radius: 10 divided by 8 equals 1.25 cm. Compare 1.5 cm to 1.25 cm. Then estimate rim spacing: circumference divided by capsule count. Confirm that capsule width is less than spacing.

Draw a Ferris Wheel: Spoke Layout and Capsule Ring

Original tasks 3, 4 / complete keys

Task 3

A drawing has 12 spokes, but the student marked 13 capsule positions around the rim. What is the most likely error, and how can they check it using angle arithmetic?

Answer: The most likely error is a doubled or misplaced mark in one quadrant, or counting the top mark twice when mirroring. With 12 capsules, the gap is 30 degrees. The student should count intervals, not marks: 360 divided by 30 equals 12 intervals, which gives 12 capsules around a closed ring.

Reason: A closed ring has the same number of gaps as capsules. If the student counts 13 marks, one gap is too small or one mark is duplicated. Checking each quadrant for the correct number of marks and comparing opposite pairs will locate the error.

Check: List the angle positions from 0 to 330 in 30-degree steps. There should be 12 positions. If a position appears twice or an extra angle is inserted, remove it and recheck the mirror.

Task 4

A capsule at the top of the wheel is drawn 2 cm tall and 1 cm wide. A capsule at the right side is drawn 1 cm tall and 2 cm wide. Using the radial alignment convention, explain whether these two capsules are consistent, and state what should be checked.

Answer: They are consistent if each capsule's long axis points outward from the center. The top capsule should be taller than wide because its outward direction is vertical; the right capsule should be wider than tall because its outward direction is horizontal. Check that each capsule is rotated to match its spoke direction and that opposite pairs mirror correctly.

Reason: Radial alignment means the capsule's long axis follows the spoke. At the top, the spoke is vertical, so the long axis is vertical. At the right, the spoke is horizontal, so the long axis is horizontal. The dimensions swap because the orientation changes, not because the capsules are different sizes.

Check: Draw a short arrow from the center through each capsule. Confirm that the capsule's longer side is parallel to that arrow. Then compare the top capsule with the bottom capsule and the right capsule with the left capsule for matching size.

Draw a Ferris Wheel: Spoke Layout and Capsule Ring

Source rubric / reflection

- [ ] Center is clearly marked and all spokes meet at the hub.
- [ ] Rim is circular within the drawing's own scale and is drawn lightly before final lines.
- [ ] Capsule count divides 360 evenly, and the angle gap is stated or implied.
- [ ] Capsules are evenly spaced around the rim and mirrored across center lines.
- [ ] Each capsule is rotated so its long axis points outward from the center.
- [ ] Opposite capsule pairs match in size and alignment.
- [ ] Construction lines are erased or clearly subordinate to final lines.
- [ ] Valid alternatives are accepted: capsule shape may be rectangular or rounded, and spoke style may be single or double, provided spacing and radial alignment remain consistent.

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