Draw an Aircraft Planform: Wing Sweep, Fuselage Axis, and Tail Layout

Original tasks 1, 2, 3 / complete keys

Task 1

A grid shows a fuselage centerline. The wing root is at station 3 and the tip at station 6. The tip is 4 squares above the centerline. Draw the lateral reference at station 3 and calculate the sweep angle to the leading edge. State the reference.

Answer: Horizontal run is 3 squares, vertical rise is 4 squares. Sweep angle = arctan(4/3) ≈ 53 degrees from the lateral reference to the leading edge.

Reason: The lateral reference is perpendicular to the centerline. The leading edge forms a right triangle with run 3 and rise 4, so the angle from the lateral line is arctan(rise/run).

Check: Verify the triangle sides on the grid and confirm the angle is measured from the lateral line, not the centerline.

Task 2

A planform has a tail station at 9 and a tail trailing edge at station 11 along the centerline. The tail half-span is 2.5 squares each side. State the tail span and tail chord in grid squares.

Answer: Tail span = 5 squares total. Tail chord = 2 squares.

Reason: Span is twice the half-span: 2 × 2.5 = 5. Chord is the distance along the centerline from station 9 to station 11: 11 − 9 = 2.

Check: Confirm both sides of the tail are equal distance from the centerline and that chord is measured along the fuselage axis.

Task 3

A learner measures sweep as 40 degrees from the fuselage centerline. Explain the error and give the corrected reference line to use.

Answer: Sweep should be measured from a lateral line perpendicular to the fuselage centerline, not from the centerline itself. Draw a lateral reference at the wing root and measure the angle to the leading edge from that line.

Reason: The centerline runs nose to tail; sweep is defined relative to a lateral direction. Using the centerline changes the reference and produces a different angle.

Check: Check that the reference line is perpendicular to the centerline and that the angle is labeled with its reference.

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Original tasks 4 / complete keys

Task 4

On a grid, place the wing root at station 2 and the tip at station 5. The tip is 3 squares above the centerline. Draw the lateral reference and calculate the sweep angle to the leading edge. Then place a tail at station 8 with half-span 2 squares and chord 1.5 squares. List the labels you would include.

Answer: Sweep angle = arctan(3/3) = 45 degrees from the lateral reference to the leading edge. Tail span = 4 squares total; tail chord = 1.5 squares. Labels: fuselage axis, lateral reference at station 2, sweep 45 degrees to leading edge, tail span 4 squares, tail chord 1.5 squares.

Reason: Run is 3 squares and rise is 3 squares, giving a 45-degree angle. Tail span is twice the half-span, and chord is the stated length along the centerline.

Check: Verify the 45-degree angle by checking equal run and rise, confirm tail symmetry, and ensure every label states a reference or unit.

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Source rubric / reflection

- [ ] Fuselage centerline is drawn and labeled as the fuselage axis.
- [ ] Wing root and tip stations are marked and connected by a leading edge.
- [ ] A lateral reference line is drawn at the wing root and the sweep angle is measured from it.
- [ ] The sweep reference (leading edge or trailing edge) is stated.
- [ ] Tail span is symmetric about the centerline and labeled with units.
- [ ] Tail chord is labeled with units.
- [ ] A line and label convention is stated and followed.
- [ ] Valid alternative references or scales are accepted if labeled and arithmetically consistent.

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