Drawing a Sitting Person: Hip Angle and Leg Placement

Original tasks 1 / complete keys

Task 1

Construct a seated figure with a hip angle of 120 degrees, a knee angle of 90 degrees, and a thigh of 1.5 head units. The lower leg is 1.5 head units. Describe the guide lines and where the foot lands relative to the knee.

Answer: Draw the hip point. Draw the torso line upward 2.5 head units. Draw the thigh line from the hip at 120 degrees from the torso, tilting forward. Mark the knee at the end of the 1.5-unit thigh. Turn 90 degrees at the knee in the opposite rotational direction from the hip turn; the total turn is 120 minus 90 equals 30 degrees in the hip's rotational direction, so the lower-leg line tilts 30 degrees from the torso line toward the same side as the thigh (forward, away from the torso's back). With a 1.5-unit lower leg, the ankle is displaced horizontally from the knee by 1.5 times sin(30 degrees) = 0.75 head units, so the ankle sits noticeably forward of the knee. Draw the foot on a floor line. Draw the chair seat as a line meeting the thigh near the hip and supporting it along its length, and the chair back behind the hip.

Reason: The hip turn of 120 degrees and the knee turn of 90 degrees are in opposite rotational directions, so the total turn from torso to lower leg is 120 minus 90 equals 30 degrees in the hip's rotational direction. The lower leg therefore tilts 30 degrees from the torso line toward the same side as the thigh (forward, away from the torso's back), and the ankle is displaced 1.5 times sin(30 degrees) = 0.75 head units horizontally from the knee. The chair seat supports the thigh near the hip, and the chair back meets the torso behind the hip.

Check: Measure the hip angle and confirm it is 120 degrees. Measure the knee angle and confirm it is 90 degrees. Compute the total turn as 120 minus 90 equals 30 degrees; confirm the lower leg is 30 degrees from the torso line toward the same side as the thigh (forward, away from the torso's back). Compute the horizontal ankle offset as 1.5 times sin(30 degrees) = 0.75 head units and confirm the ankle is noticeably forward of the knee. Check that the ankle is on the floor line and the chair seat supports the thigh near the hip.

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Original tasks 2 / complete keys

Task 2

Construct a seated figure with a hip angle of 80 degrees, a knee angle of 100 degrees, and a torso of 2.5 head units. The thigh is 1.5 head units and the lower leg is 1.5 head units. Describe the chair back placement.

Answer: Draw the hip point and the torso line upward 2.5 head units. Draw the thigh line at 80 degrees from the torso, leaning slightly toward the chest. Mark the knee at the end of the 1.5-unit thigh. Turn 100 degrees at the knee in the opposite rotational direction; the signed total turn from torso to lower leg is 80 minus 100 equals negative 20 degrees, i.e. 20 degrees in the knee's rotational direction (opposite the hip's turn). The lower leg therefore tilts 20 degrees from the torso line toward the knee's turn side (backward relative to the thigh's forward lean). Place the ankle on a floor line. Draw the chair back as a line meeting the torso behind the hip, not at the hip point, and the seat supporting the thigh near the hip.

Reason: An 80-degree hip angle is slightly less than a right angle, so the thigh leans toward the chest. A 100-degree knee angle turns the lower leg in the opposite rotational direction from the hip turn, giving a signed total turn of 80 minus 100 equals negative 20 degrees, i.e. 20 degrees in the knee's rotational direction (opposite the hip's turn). The lower leg therefore tilts toward the knee's turn side (backward relative to the thigh's forward lean). The chair back meets the torso behind the hip so the torso has support; the seat supports the thigh near the hip.

Check: Measure the hip angle and confirm it is 80 degrees. Measure the knee angle and confirm it is 100 degrees. Compute the signed total turn as 80 minus 100 equals negative 20 degrees, i.e. 20 degrees in the knee's rotational direction (opposite the hip's turn), and confirm the lower leg is 20 degrees from the torso line toward the knee's turn side (backward relative to the thigh's forward lean). Check that the chair back line meets the torso behind the hip and the seat supports the thigh near the hip.

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Original tasks 3 / complete keys

Task 3

A seated figure has a hip angle of 90 degrees and a knee angle of 90 degrees. The thigh is 1.5 head units and the lower leg is 1.5 head units. The ankle is drawn 1.5 head units below the knee. Is the lower leg vertical? Explain using arithmetic.

Answer: Yes. With a 90-degree hip angle and a 90-degree knee angle turning in opposite rotational directions, the turns cancel: 90 minus 90 equals 0 degrees, so the lower leg is parallel to the torso. If the torso is vertical, the lower leg is vertical. The ankle 1.5 head units below the knee matches a vertical lower leg of 1.5 head units.

Reason: The hip angle and knee angle determine the direction of the lower leg. A 90-degree hip angle makes the thigh horizontal when the torso is vertical. A 90-degree knee angle then turns the lower leg back by the same amount in the opposite rotational direction, so the lower leg is parallel to the torso (a 0-degree total turn). The length check confirms the ankle position.

Check: Subtract the knee angle from the hip angle because they turn in opposite rotational directions: 90 minus 90 equals 0 degrees total turn. Confirm the thigh is horizontal and the lower leg is vertical. Measure the lower leg length and confirm it is 1.5 head units.

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Original tasks 4 / complete keys

Task 4

Construct a seated figure with a hip angle of 100 degrees and a knee angle of 80 degrees. The torso is 2.5 head units, the thigh is 1.5 head units, and the lower leg is 1.5 head units. Describe the foot placement and one valid alternative proportion.

Answer: Draw the hip point and the torso line upward 2.5 head units. Draw the thigh line at 100 degrees from the torso, tilting forward. Mark the knee at the end of the 1.5-unit thigh. Turn 80 degrees at the knee in the opposite rotational direction; the total turn from torso to lower leg is 100 minus 80 equals 20 degrees in the hip's rotational direction, so the lower leg tilts 20 degrees from the torso line on the same side as the thigh's lean (forward, away from the chest). Place the ankle on a floor line. A valid alternative is a shorter thigh of 1.2 head units, as long as the hip and knee chain remains readable and the head unit stays consistent.

Reason: A 100-degree hip angle opens the thigh forward. An 80-degree knee angle turns the lower leg in the opposite rotational direction from the hip turn, giving a total turn of 100 minus 80 equals 20 degrees from the torso line on the same side as the thigh's lean (forward, away from the chest). The alternative thigh length is valid under the rubric if the chain stays clear.

Check: Measure the hip angle and confirm it is 100 degrees. Measure the knee angle and confirm it is 80 degrees. Compute the total turn as 100 minus 80 equals 20 degrees and confirm the lower leg is 20 degrees from the torso line on the same side as the thigh's lean (forward, away from the chest). Confirm the alternative thigh length is consistent with the head unit and the ankle is on the floor line.

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Source rubric / reflection

- [ ] Hip joint is marked and the hip angle is recorded in degrees.
- [ ] Thigh line connects the hip to a separate knee point.
- [ ] Knee angle is recorded and matches the drawn lower-leg direction.
- [ ] Lower leg connects the knee to an ankle placed on a support line.
- [ ] Chair seat and back lines support the thigh and torso at believable points.
- [ ] Head unit is consistent across torso, thigh, and lower leg.
- [ ] Valid alternatives are accepted if the hip and knee chain remains readable.

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