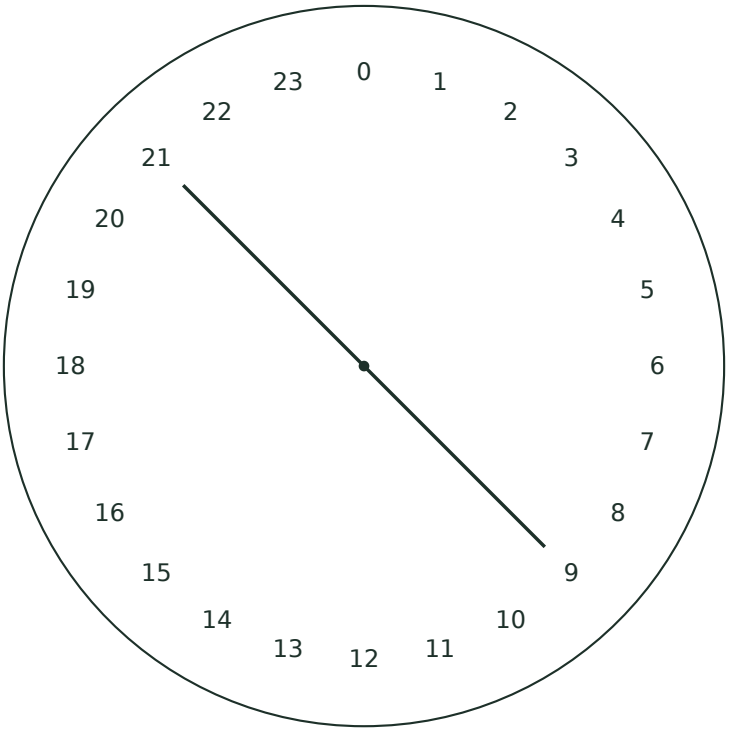
Draw a 24-Hour Clock Face: Numerals, Ticks, and Hands

EXERCISE 1 / ANSWERS

On a face with 0 at the top, at what angle clockwise is numeral 9? At what angle is numeral 21?



9: 135 degrees / 21: 315 degrees

Numeral 9 is at 135 degrees; numeral 21 is at 315 degrees.

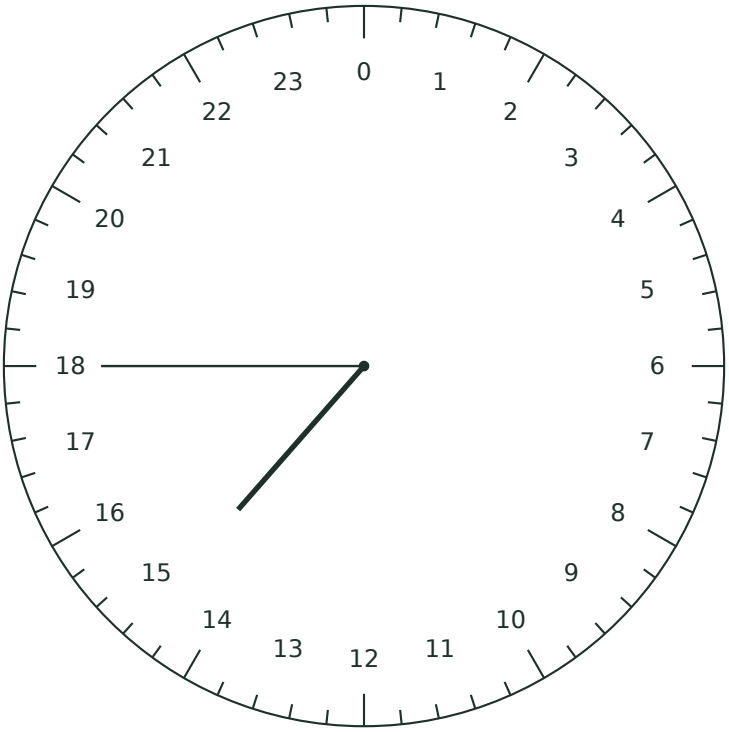
Why: Multiply the hour by 15: 9 × 15 = 135; 21 × 15 = 315. Since 21 − 9 = 12, the two numerals are opposite, and 315 − 135 = 180 degrees, which confirms the result.

Check: Subtract the angles: 315 − 135 = 180. Opposite numerals must be 180 degrees apart.

Draw a 24-Hour Clock Face: Numerals, Ticks, and Hands

EXERCISE 2 / ANSWERS

Compute the hour-hand and minute-hand angles for 14:45, measured clockwise from the top.



14:45 / hour 221.25 degrees / minute 270 degrees

Minute hand: 270 degrees. Hour hand: 221.25 degrees.

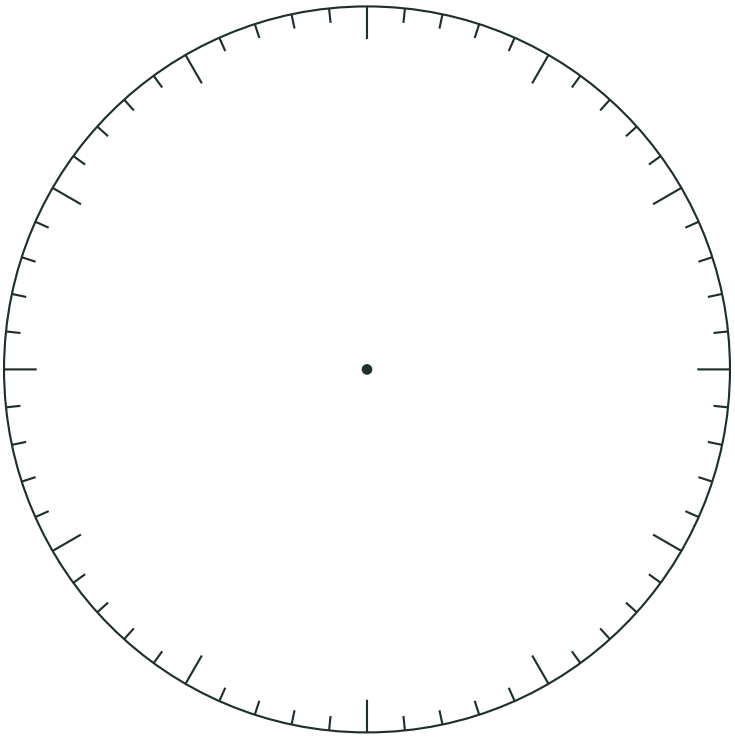
Why: Minute angle = 6 × 45 = 270. Hour angle = 15 × 14 + 0.25 × 45 = 210 + 11.25 = 221.25. The hour hand lies between numeral 14 (210 degrees) and numeral 15 (225 degrees).

Check: Recompute 15 × 14 = 210 and 0.25 × 45 = 11.25; sum to 221.25. Confirm 221.25 is between 210 and 225.

Draw a 24-Hour Clock Face: Numerals, Ticks, and Hands

EXERCISE 3 / ANSWERS

A circle has radius 48 mm. How many minute ticks are needed, and what is the angle between adjacent minute ticks?



60 outer minute ticks / 6 degrees per tick

60 minute ticks; 6 degrees between adjacent ticks.

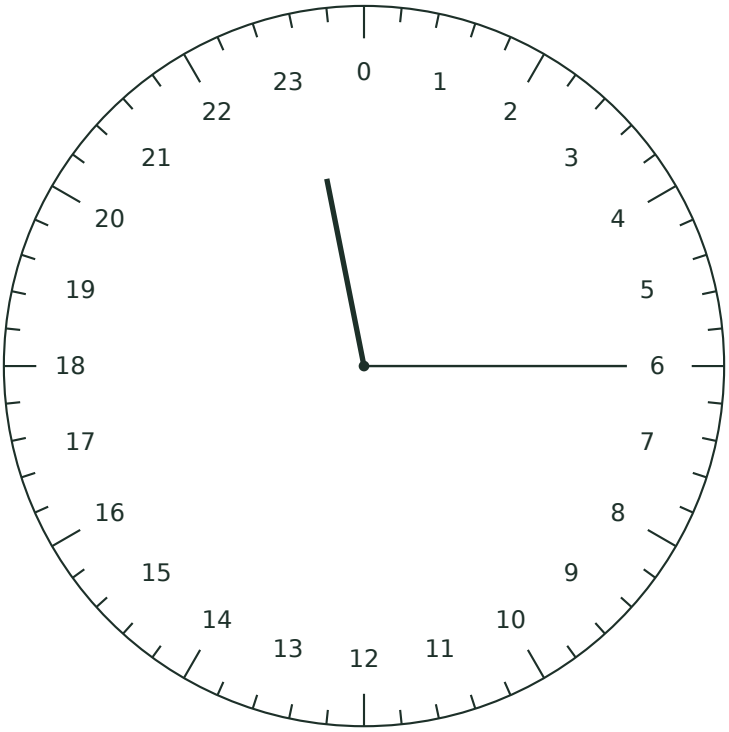
Why: The minute hand makes one full turn per hour, so its scale has 60 ticks. The full circle is 360 degrees: 360 divided by 60 is 6 degrees. The separate 24-hour numeral scale does not change the minute tick count. The radius changes tick separation on paper, but not their count or angle.

Check: Multiply 60 by 6 degrees to obtain 360 degrees, confirming that the minute ticks close the circle.

Draw a 24-Hour Clock Face: Numerals, Ticks, and Hands

EXERCISE 4 / ANSWERS

At 23:15, which numeral is the hour hand nearest, and what is its exact angle?



23:15 / hour 348.75 degrees / nearest numeral 23

The hour hand is nearest numeral 23 at 348.75 degrees.

Why: Hour angle = 15 × 23 + 0.25 × 15 = 345 + 3.75 = 348.75. Numeral 23 is at 345 degrees and numeral 0 is at 360 degrees, so the hand is 3.75 degrees past 23 and 11.25 degrees before 0.

Check: Confirm 348.75 is between 345 and 360; subtract 345 to get 3.75 and subtract 348.75 from 360 to get 11.25.