95% Confidence Intervals — Answer Key

Large-sample Z method: CI = sample mean ± 1.96 × (s / √n)

Standard error (SE) = s / √n; margin of error (ME) = 1.96 × SE

Problem 1

n = 100; sample mean = 16.0; s = 3.0

SE = 3.0 / √100 = 0.30; ME = 1.96 × 0.30 = 0.588

95% CI: (15.41, 16.59)

Problem 2

n = 120; sample mean = 16.2; s = 3.6

SE = 3.6 / √120 ≈ 0.3286; ME ≈ 0.6441

95% CI: (15.56, 16.84) minutes

Problem 3

n = 100; sample mean = 7.8; s = 2.5

SE = 2.5 / √100 = 0.25; ME = 1.96 × 0.25 = 0.49

95% CI: (7.31, 8.29) minutes

Problem 4

n = 144; sample mean = 18.4; s = 4.8

SE = 4.8 / √144 = 0.40; ME = 1.96 × 0.40 = 0.784

95% CI: (17.62, 19.18) minutes

Problem 5

n = 64; sample mean = 6.7; s = 1.6

SE = 1.6 / √64 = 0.20; ME = 1.96 × 0.20 = 0.392

95% CI: (6.31, 7.09) hours

Problem 6

n = 225; sample mean = $138; s = $45

SE = 45 / √225 = 3.00; ME = 1.96 × 3.00 = 5.88

95% CI: ($132.12, $143.88)

Problem 7

n = 49; sample mean = $31.40; s = $7.00

SE = 7.00 / √49 = 1.00; ME = 1.96 × 1.00 = 1.96

95% CI: ($29.44, $33.36)

Problem 8 — Comparing Sample Sizes

Researcher B has the smaller margin of error because the larger sample reduces SE.

Researcher A (n = 36): SE = 12 / √36 = 2; ME = 1.96 × 2 = 3.92

95% CI: (24.08, 31.92) minutes

Researcher B (n = 144): SE = 12 / √144 = 1; ME = 1.96 × 1 = 1.96

95% CI: (26.04, 29.96) minutes

Four times the sample size gives half the margin of error.