Name _____ Score _____ Teacher _____ Date _____

Bootstrap Confidence Intervals

Use the supplied resample indices exactly. Classroom replicate counts illustrate mechanics and do not reliably estimate 95% coverage.

1. **A sample statistic is 11.857. Its 8 supplied bootstrap replicates are 11.429, 12.714, 14, 10.143, 12.286, 9.714, 11.714, 11.571. Find the 80% percentile interval using linear interpolation h=(B-1)p between ordered values.**

Reference: For confidence 1-alpha, take interpolated bootstrap quantiles at alpha/2 and 1-alpha/2. The short list is educational and not a reliable empirical 95% approximation.

2. **Data positions 1-5 contain [16, 9, 15, 12, 11]. The 11 bootstrap index rows are 32344; 21435; 22314; 54251; 32141; 52415; 31243; 33425; 42434; 24453; 41242. Use each row to form a resample and calculate its mean.**

Reference: Indices are one-based and sampling is with replacement. Repeated indices repeat observations. These few classroom replicates illustrate mechanics, not reliable 95% accuracy.

State assumptions and the quantile convention; round only final endpoints.

Name _____ Score _____ Teacher _____ Date _____

Bootstrap Confidence Intervals

Use the supplied resample indices exactly. Classroom replicate counts illustrate mechanics and do not reliably estimate 95% coverage.

3. **Data positions 1-6 contain [17, 10, 16, 13, 12, 13]. The 14 bootstrap index rows are 623551; 215543; 561636; 125132; 131313; 152224; 212121; 161136; 231241; 546253; 665453; 566563; 163331; 335351. Use each row to form a resample and calculate its median.**

Reference: Indices are one-based and sampling is with replacement. Repeated indices repeat observations. These few classroom replicates illustrate mechanics, not reliable 95% accuracy.

4. **The original estimate is 14 and 17 bootstrap replicates are 17, 17, 14, 14, 14, 17, 17, 14, 13, 17, 14, 14, 17, 14, 17, 14, 17. Find the 80% basic interval using linearly interpolated quantiles h=(B-1)p.**

Reference: If bootstrap quantiles are q_low and q_high, the basic interval is (2 theta-hat-q_high, 2 theta-hat-q_low).

State assumptions and the quantile convention; round only final endpoints.

Name _____ Score _____ Teacher _____ Date _____

Bootstrap Confidence Intervals

Use the supplied resample indices exactly. Classroom replicate counts illustrate mechanics and do not reliably estimate 95% coverage.

5. **Observed data are 8, 12, 18, 15, 14. A normal model is fitted with mean 13.4 and SD 6. Identify the parametric bootstrap step represented by synthetic resample 13.4, 19.4, 7.4, 13.4, 19.4, and compute its mean.**

Reference: A parametric bootstrap simulates new samples from the fitted distribution, then recomputes the statistic. It does not resample the observed rows directly.

6. **For data 9, 13, 8, 16, 15, 16, construct the empirical PMF, combining repeated observations.**

Reference: The empirical probability at a distinct value is its sample frequency divided by n.

State assumptions and the quantile convention; round only final endpoints.

Name _____ Score _____ Teacher _____ Date _____

Bootstrap Confidence Intervals

Use the supplied resample indices exactly. Classroom replicate counts illustrate mechanics and do not reliably estimate 95% coverage.

7. **A simulation of 26 confidence intervals at nominal 95% coverage contains the true parameter 25 times. Find observed coverage and interpret the difference.**

Reference: Observed coverage is covered/total. With only a few dozen repetitions, sampling variation is substantial; it neither proves nor disproves nominal long-run coverage.

8. **For data 11, 15, 10, 18, 17, construct the empirical PMF, combining repeated observations.**

Reference: The empirical probability at a distinct value is its sample frequency divided by n.

Name _____ Score _____ Teacher _____ Date _____

Bootstrap Confidence Intervals

Worked Answer Key

Use the supplied resample indices exactly. Classroom replicate counts illustrate mechanics and do not reliably estimate 95% coverage.

1. **A sample statistic is 11.857. Its 8 supplied bootstrap replicates are 11.429, 12.714, 14, 10.143, 12.286, 9.714, 11.714, 11.571. Find the 80% percentile interval using linear interpolation h=(B-1)p between ordered values.**

Reference: For confidence 1-alpha, take interpolated bootstrap quantiles at alpha/2 and 1-alpha/2. The short list is educational and not a reliable empirical 95% approximation.

Answer: (10.014, 13.1)

1. Sort the 8 replicates; use p=0.1 and p=0.9 with h=(8-1)p.
2. The interpolated percentile interval is (10.014, 13.1).

2. **Data positions 1-5 contain [16, 9, 15, 12, 11]. The 11 bootstrap index rows are 32344; 21435; 22314; 54251; 32141; 52415; 31243; 33425; 42434; 24453; 41242. Use each row to form a resample and calculate its mean.**

Reference: Indices are one-based and sampling is with replacement. Repeated indices repeat observations. These few classroom replicates illustrate mechanics, not reliable 95% accuracy.

Answer: means: 12.6, 12.6, 12.2, 11.8, 13.6, 11.8, 13.4, 12.4, 12, 11.8, 11.6

1. Replace every index by its printed data value, preserving repetitions.
2. The 11 replicate means are 12.6, 12.6, 12.2, 11.8, 13.6, 11.8, 13.4, 12.4, 12, 11.8, 11.6.

Name _____ Score _____ Teacher _____ Date _____

Bootstrap Confidence Intervals

Worked Answer Key

Use the supplied resample indices exactly. Classroom replicate counts illustrate mechanics and do not reliably estimate 95% coverage.

3. **Data positions 1-6 contain [17, 10, 16, 13, 12, 13]. The 14 bootstrap index rows are 623551; 215543; 561636; 125132; 131313; 152224; 212121; 161136; 231241; 546253; 665453; 566563; 163331; 335351. Use each row to form a resample and calculate its median.**

Reference: Indices are one-based and sampling is with replacement. Repeated indices repeat observations. These few classroom replicates illustrate mechanics, not reliable 95% accuracy.

Answer: medians: 12.5, 12.5, 13, 14, 16.5, 11, 13.5, 16.5, 14.5, 12.5, 13, 13, 16, 16

1. Replace every index by its printed data value, preserving repetitions.
2. The 14 replicate medians are 12.5, 12.5, 13, 14, 16.5, 11, 13.5, 16.5, 14.5, 12.5, 13, 13, 16, 16.

4. **The original estimate is 14 and 17 bootstrap replicates are 17, 17, 14, 14, 14, 17, 17, 14, 13, 17, 14, 14, 17, 14, 17, 14, 17. Find the 80% basic interval using linearly interpolated quantiles h=(B-1)p.**

Reference: If bootstrap quantiles are q_low and q_high, the basic interval is (2 theta-hat-q_high, 2 theta-hat-q_low).

Answer: (11, 14)

1. Interpolated replicate quantiles are (14, 17).
2. Basic interval=(2(14)-17, 2(14)-14)=(11, 14).

Name _____ Score _____ Teacher _____ Date _____

Bootstrap Confidence Intervals

Worked Answer Key

Use the supplied resample indices exactly. Classroom replicate counts illustrate mechanics and do not reliably estimate 95% coverage.

5. **Observed data are 8, 12, 18, 15, 14. A normal model is fitted with mean 13.4 and SD 6. Identify the parametric bootstrap step represented by synthetic resample 13.4, 19.4, 7.4, 13.4, 19.4, and compute its mean.**

Reference: A parametric bootstrap simulates new samples from the fitted distribution, then recomputes the statistic. It does not resample the observed rows directly.

Answer: simulate from fitted N(13.4,6^2); replicate mean 14.6

1. The fitted-model draw is a parametric resample because its values need not be observed data values.
2. Its replicate mean is 14.6. Repeating this many times approximates the fitted-model sampling distribution.

6. **For data 9, 13, 8, 16, 15, 16, construct the empirical PMF, combining repeated observations.**

Reference: The empirical probability at a distinct value is its sample frequency divided by n.

Answer: P*(8)=1/6, P*(9)=1/6, P*(13)=1/6, P*(15)=1/6, P*(16)=2/6

1. 8: count 1, probability 0.167; 9: count 1, probability 0.167; 13: count 1, probability 0.167; 15: count 1, probability 0.167; 16: count 2, probability 0.333
2. The probabilities sum to 1; duplicate observations contribute to the same mass.

Name _____ Score _____ Teacher _____ Date _____

Bootstrap Confidence Intervals

Worked Answer Key

Use the supplied resample indices exactly. Classroom replicate counts illustrate mechanics and do not reliably estimate 95% coverage.

7. **A simulation of 26 confidence intervals at nominal 95% coverage contains the true parameter 25 times. Find observed coverage and interpret the difference.**

Reference: Observed coverage is covered/total. With only a few dozen repetitions, sampling variation is substantial; it neither proves nor disproves nominal long-run coverage.

Answer: 25/26=96.2% observed

1. Observed coverage=25/26=96.2%.
2. Compared with nominal 95%, the difference is 1.2 percentage points. A much larger simulation is needed for a stable coverage assessment.

8. **For data 11, 15, 10, 18, 17, construct the empirical PMF, combining repeated observations.**

Reference: The empirical probability at a distinct value is its sample frequency divided by n.

Answer: P*(10)=1/5, P*(11)=1/5, P*(15)=1/5, P*(17)=1/5, P*(18)=1/5

1. 10: count 1, probability 0.2; 11: count 1, probability 0.2; 15: count 1, probability 0.2; 17: count 1, probability 0.2; 18: count 1, probability 0.2
2. The probabilities sum to 1; duplicate observations contribute to the same mass.