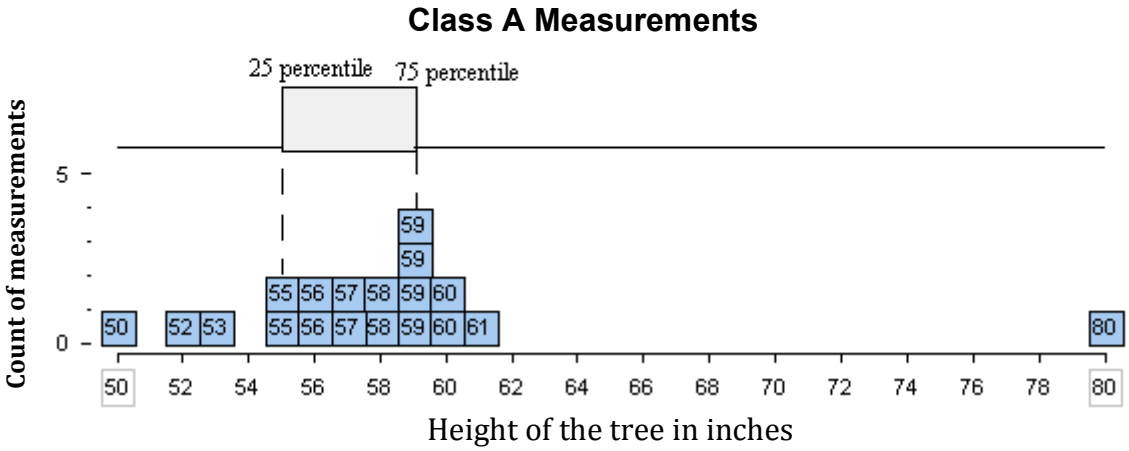
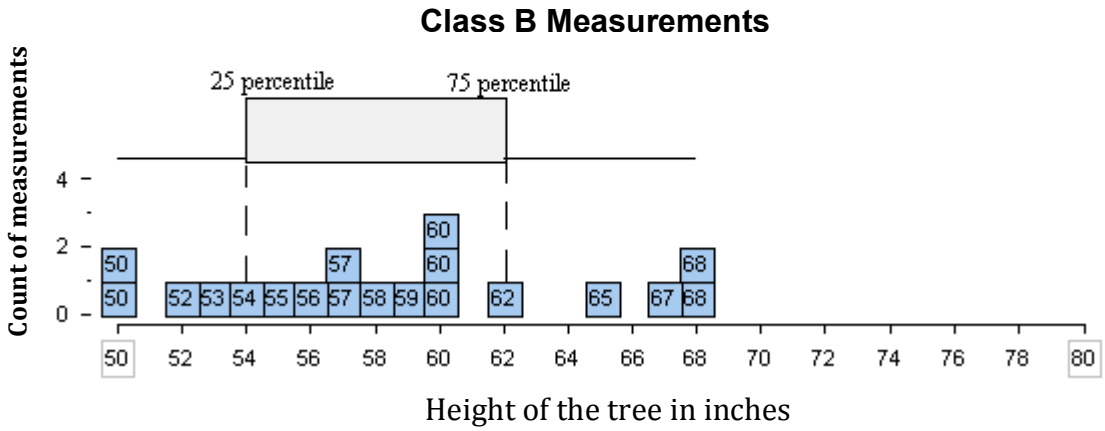
Unit Quiz

Leah and Mark's Method

Two classes of students measured the height of a young tree. Here are their results:





Leah and Mark wanted to know which class was more precise (less spread out in their measurements). They each came up with a different way to show how precise each class's measurements were.

Unit Quiz

Leah's Method:
She subtracted the lowest measurement from the highest measurement to get a measure of precision.

Mark's Method:
He subtracted the value at the 25th percentile from the value at the 75th percentile.

A. If you use **Leah's method**:

1. What is the measure of precision for **class A?** _____
   Show how you got the result.

2. What is the measure of precision for **class B?** _____
   Show how you got the result.

3. Based on Leah's method, which class is more precise, A or B?

Unit Quiz

B. If you use **Mark's method**:

4. What is the measure of precision for **class A?** _____
   Show how you got the result.

5. What is the measure of precision for **class B?** _____
   Show how you got the result.

6. Based on Mark's method, which class is more precise, **A or B?**

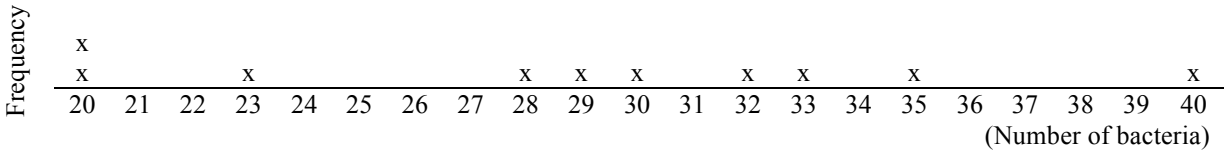
C. **Compare** Leah and Mark's methods. Which is a better method?
   Why do you think so?

Unit Quiz

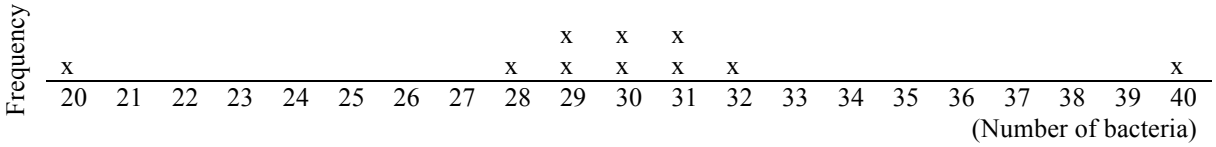
Consistency of Water Treatment Methods

A manager of a water treatment plant has two different methods for making water safe for animals to drink. The manager wants to use the method that is most consistent—the one that produces results that are most nearly alike. The chart shows the number of bacteria left after treatment in 100 ml samples of water, using each treatment method.

Method 1 (Mean = 29)



Method 2 (Mean = 30)



Show a way to calculate a measure of consistency that helps the manager make a decision on which treatment to use. Your way should work for other samples too.

1. Describe your way of calculating consistency (you do not need to do the actual calculations).

Unit Quiz

2. Explain why it is a good method for this situation.

3. Using the measure you chose, which method of water treatment is more consistent?

Unit Quiz Scoring Guide — Inventing Precision Unit 3

Leah and Mark's Method

Part A: (1) Measure of Precision for Class A, Leah's Method
Leah and Mark's Method and Conceptions of Statistics (CoS)

Level	Performance	Example
CoS(2b)	**Calculates statistics indicating variability.** Student correctly applies Leah's method, shows work, and arrives at correct result.	• Class A: 30. 80-50=30
CoS(2b-)	**Calculates statistics indicating variability.** Student correctly applies Leah's method, however, the result is incorrect because of errors such as computational mistakes. OR student gives the correct result without showing work.	• Class A: 30. • Class A: 80-50=20*
NL(ii)	**Student incorrectly applies Leah's method and gets incorrect results.**	• Class A: 58. I subtracted the smallest measurement which was 50-61 which gave me 11 so I counted 11 and it gave me 58 which was the median and mode. • Class A: -30. 50-80=-30.
NL(i)	**Attempts item but answers are irrelevant, unclear, implausible, unreasonable, or demonstrate that student did not understand the item.**	• I don't know.*
M	**Missing response.**	

Part A: (2) Measure of Precision for Class B, Leah's Method
Leah and Mark's Method and Conceptions of Statistics (CoS)

Level	Performance	Example
CoS(2b)	**Calculates statistics indicating variability.** Student correctly applies Leah's method, shows work, and arrives at correct result.	• Class B: 18. 68-50=18
CoS(2b-)	**Calculates statistics indicating variability.** Student correctly applies Leah's method, however, the result is incorrect because of errors such as computational mistakes. OR student gives the correct result without showing work.	• Class B: 16. • Class B: 68-50=8 *
NL(ii)	**Student incorrectly applies Leah's method and gets incorrect results.**	• Class B: 50. I subtracted 75-25=50 which was the lowest number on the chart.
NL(i)	**Attempts item but answers are irrelevant, unclear, implausible, unreasonable, or demonstrate that student did not understand the item.**	• I don't know.*
M	**Missing response.**	

Unit Quiz Scoring Guide — Inventing Precision Unit 3

Part A: (3) Which class is more precise, Leah's Method **Leah and Mark's Method and Conceptions of Statistics (CoS)**		
Level	**Performance**	**Example**
CoS(3c)	Generalizes the use of a statistic beyond its original context of application or invention. Student who calculate the precision scores correctly for both a(1) and a(2) arrives at conclusion consistent to previous calculations.	• Class A: 30, Class B: 18, Class B is more precise according to Leah's method.
CoS(3c-)	Generalizes the use of a statistic beyond its original context of application or invention. Student, despite not calculating the precision scores correctly for both a(1) and a(2), arrives at conclusion consistent to previous calculations (i.e., the one with smaller absolute value is more precise).	• Class A: 28, Class B: 18, Class B is more precise according to Leah's method. • Class A: -30, 50-80=-30, Class B: -18, 50-68=-18, Class B is more precise according to Leah's method.
NL(ii)	Student arrives at a conclusion that is inconsistent with previous calculation. Indicates student probably does not understand the concept of precision.	• Class A: 30, Class B: 18, Class A because they get closest to the measurement. • Class A: 30, Class B: 18, Class A because your value is 30, and it is bigger.
NL(i)	Attempts item but answers are irrelevant or unclear.	• I would draw a graph of 18 going to 30.
M	Missing response.	

Part B: (1) Measure for Class A, Mark's Method **Leah and Mark's Method and Conceptions of Statistics (CoS)**		
Level	**Performance**	**Example**
CoS(2b)	Calculates statistics indicating variability. Student correctly applies Mark's method, shows work, and arrives at correct result.	• Class A: 4. 59-55=4.
CoS(2b-)	Calculates statistics indicating variability. Student correctly applies Mark's method, however, the result is incorrect because of errors such as computational mistakes. OR student gives the correct result without showing work.	• Class A: 4 • Class A: 5. 59-55=5*
NL(ii)	Student incorrectly applies Mark's method and gets incorrect result.	• Class A: -4
NL(i)	Attempts item but answers are irrelevant or unclear.	• I don't know.*
M	Missing response.	

Unit Quiz Scoring Guide

Part B: (2) Measure for Class B, Mark's Method **Leah and Mark's Method and Conceptions of Statistics (CoS)**		
Level	**Performance**	**Example**
CoS(2b)	Calculates statistics indicating variability. Student correctly applies Mark's method, shows work, and arrives at correct result.	• Class B: 8. 62-54=8
CoS(2b-)	Calculates statistics indicating variability. Student correctly applies Mark's method, however, the result is incorrect because of errors such as computational mistakes. OR student gives the correct result without showing work.	• Class B: 8 • Class B: 4. 62-54=12*
NL(ii)	Student incorrectly applies Mark's method and gets incorrect result.	• Class B: 12. 59-62=12
NL(i)	Attempts item but answers are irrelevant or unclear.	• I don't know.*
M	Missing response.	

Part B: (3) Which class is more precise, Mark's Method **Leah and Mark's Method and Conceptions of Statistics (CoS)**		
Level	**Performance**	**Example**
CoS(3c)	Generalizes the use of a statistic beyond its original context of application or invention. Students who calculate the precision scores correctly for both b(1) and b(2) arrives at conclusion consistent to previous calculations.	• Class A: 4, Class B: 8. Class A is more precise according to Mark's method.
CoS(3c-)	Generalizes the use of a statistic beyond its original context of application or invention. Student, despite not calculating the precision scores correctly for both b(1) and b(2), arrives at conclusion consistent to previous calculations (i.e., the one with smaller absolute value is more precise).	• Class A: 1. 55-54=1. Class B: 3. 62-59=3. Class A is more precise according to Mark's method. • Class A: 1. 59-55=4. Class B: 3. 62-54=2. Class B is more precise according to Mark's method.
NL(ii)	Student arrives at a conclusion that is inconsistent with previous calculation. Indicates student probably does not understand the concept of precision.	• Class A: 18. Class B: 18. Class B is more precise if you take it look and look class A you know there is a big gap and that's why the hat line aren't equal.
NL(i)	Attempts item but answers are irrelevant or unclear.	• You already know what you are subtracting when you get your measurement.
M	Missing response.	

Unit Quiz Scoring Guide

Part C, Comparing Leah and Mark's Methods **Leah and Mark's Method and Conceptions of Statistics (CoS)**		
Level	**Performance**	**Example**
CoS(3f)	Choose statistics by considering qualities of a distribution.	• "Leah's method makes you think class B is more precise. Mark's method makes you think class A is more precise. I think Mark's method is better, because look at class A. You know there is a big gap but otherwise they are clumped together. Class B is more evenly spread out."*
CoS(3f-)	Considers qualities of a distribution, but incorrectly applies those qualities to choose a statistic.	• "I think Leah's method is better for Class A because there is an outlier."* • "Leah's is better because Mark's leaves out the big differences, and we are trying to measure how much we agree."
CoS (2b)	Using ease of calculation to justify choice of method, without regard to what the statistic is measuring.	• "Leah's method is easier. You just subtract."
NL(ii)	Student chooses a statistic without taking into consideration of the sample qualities. OR student considers both lead to the same conclusion either because they previously solve the prior two problems incorrectly, or because misunderstanding of the question.	• "Leah's method makes you think class B is more precise. Mark's method makes you think class A is more precise. I think I will choose the lowest number 4 to be most precise. And that's Mark's method. "* • "They do lead you to the same conclusion because class a is more precise than class b in both cases." [However, she previously had answered class b was more precise according to Leah's method.]
NL(i)	Attempts item but answers are irrelevant or unclear.	• I don't know.
M	Missing response.	

**Mock student responses*

Unit Quiz Scoring Guide — Inventing Precision Unit 3

Consistency of Water Treatments

Consistency of Water Treatments and Conceptions of Statistics (CoS)		
Level	**Performance**	**Example**
CoS(3b)	**Invent a sharable (replicable) measurement process to quantify a quality of the sample.**	• "I would subtract the number from the mean and add up the differences. Method 2 would be more consistent because it is less spread out than Method 1." *
CoS(2b)	**Calculate statistic indicating variability.** Student calculates a statistic without further considering it in relation to characteristics of the distribution.	• "They are about the same because the range is the same. Both are 40-20=20."*
CoS(1a)	**Use visual qualities of the data to summarize the distribution and provides a method that relies on only eyeballing the data.**	• "You can just look and tell. Method 2 is more consistent because it is less spread out." *
NL(ii)	Student makes a claim but does not describe ways to determine who is more consistent. Students use measures of center to compare consistency.	• "Method 2 is more consistent because its mean is 30 and method 1 is 29, which is less."* • "Method 2 is more consistent." *
NL(i)	Student does not understand what the question asks for.	• "I don't know what consistent means."*
M	Missing explanation.	

**Mock student responses*