Unit Quiz

Name: _____

Grade: _____

Teacher: _____

Gender: Male (boy) _____ Female (girl)_____

Language you speak at home: _____

Unit Quiz

Exercise Ball

A group of 7 students measured the circumference of an exercise ball. Here are their measurements in inches:

42, 46, 45, 47, 43, 46, 46

1. Find the median, mode, and mean and enter your answers below. Show your work.

   The median is _____. The mode is _____. The mean is _____.

2. Tom forgot to put his measurement on the list. When the students added Tom's measurement to the list the mean and the median decreased, but the mode stayed the same. Which value is most likely to be Tom's measurement? Circle your choice:

   a. 43
   b. 45
   c. 46
   d. 47

   Explain why you chose this measurement:

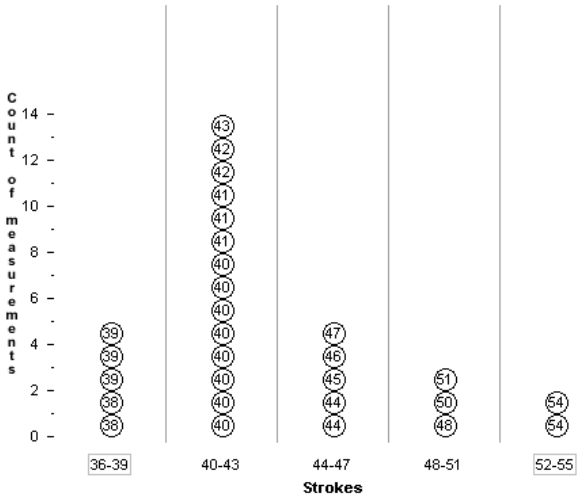
3. Five students in another classroom measured the circumference of the same ball. Their mean was found to be 46 inches. Of the five measurements, three are provided for you below. What could the other two measurements be, so that all five values will have a mean of 46? Show your work.

   44, 49, 47, ____ ____

Unit Quiz

Swimming Strokes

Twenty-nine people watched Mark swim across the pool. Each person counted the number of strokes Mark took to cross the pool. It was hard to count, so they didn't all get the same count. Next, they made a display of their data.



They want to know **how many strokes Mark actually made.** Someone said, "I think we can decide by finding the **mid-range** of the data. Find the lowest number and the highest number. **46** is in the middle of those two numbers, so this is a good estimate of the actual number of strokes that Mark made."

1. Do you agree that **46** is a good estimate of the actual number of strokes? Explain **why** or **why not.**

2. Using the **same data,** describe another way to estimate the actual number of strokes made by Mark.

Unit Quiz

3. Which method is better to find the **actual number of strokes**—finding the mid-range of the data or using the way you described in question 2? Why?

Unit Quiz Scoring Guide — Inventing Center Unit 2

Exercise Ball

Question 1a: Median Exercise Ball and Conceptions of Statistics (CoS)		
Level	**Performance**	**Example**
CoS(2a)	**Calculate the statistic for central tendency.** Correctly calculates median (*may or may not show work*).	• "median = 46"
CoS(2a-)	**Calculate a statistic, but no evidence of focusing on function.** Fails to order data before calculating median. Finds the middle number in the unordered set (i.e., median=47).	• "median=47"
CoS(2a--) confusion	Confuses median with other statistics such as mean (must show work).	• "median=315/7=45"*
NL(ii)	Incorrectly selects other numbers from the data (i.e., 42, 43, or 45) as the median.	• "median = 42" • "median = 43" • "median = 45" • "median = (45,46) "
NL(i)	**Response is irrelevant, unclear, or a restatement of given information.** Writes numbers that are incorrect and not plausible values.	• "9" • "22" • "7" • "106" • "Cool" • "I don't know."
M	Missing response	

*Mock student responses

Unit Quiz Scoring Guide — Inventing Center Unit 2

Question 1b: Mode Exercise Ball and Conceptions of Statistics (CoS)		
Level	**Performance**	**Example**
CoS(2a)	**Calculate the statistic for central tendency.** Correctly calculates mode (*may or may not show work*).	• "mode = 46"
CoS(2a-) Confusion	**Calculate the statistic for central tendency.** Confuses mode with other central tendency statistics (e.g., mean, median). Must show work.	• Student writes 'mode=45' and procedure of calculating a mean.
NL(ii)	Selects number from the data set provided but this number is not the correct mode.	• "mode = 42" • "mode = 43" • "mode = 45"
NL(i)	**Response is irrelevant, unclear, or a restatement of given information.** Writes numbers that are incorrect and not plausible. Specifically, writes numbers other than the measurements provided	• "mode = 5" • "mode = 30" • "mode = 12" • "Hals"
M	Missing response	

*Mock student responses

Unit Quiz Scoring Guide — Inventing Center Unit 2

Question 1c: Mean Exercise Ball and Conceptions of Statistics (CoS)		
Level	**Performance**	**Example**
CoS(2a)	**Calculate the statistic for central tendency.** Uses correct procedure to calculate the mean (*may or may not show work*). Student may make computation errors in the work shown.	• "mean = 45, because 42+ 46+ 45+ 47+ 43+ 46+ 46= 315. 315/7 = 45" • "mean = 45" • "Mean = 25, because 42+ 46+ 45+ 47+ 43+ 46+ 46 = 315. 315/7 = 25."*
CoS(2a-) Confusion	Confuses mean with other central tendency statistics (e.g., mode, median). **Must show work.**	• Writes 46 and work shows procedure of calculating the median or mode
NL(ii)	**Relevant but incorrect response.** Uses incorrect procedure for calculating mean, for instances adds numbers but does not divide *OR* Writes a number within the range of the data set provided ([42, 47]) but this number is not the correct mean	• "mean = 42" • "mean = 43" • "mean = 46" • "mean = 47" • "mean = 315, because 42+ 46+ 45+ 47+ 43+ 46+ 46 = 315" • "315"
NL(i)	**Response is irrelevant, unclear, or a restatement of given information.** Writes numbers other than the measurements provided	• "mean = 5" • "mean = 30" • "mean = 12" • "Goah" • "A lot"
M	Missing response	

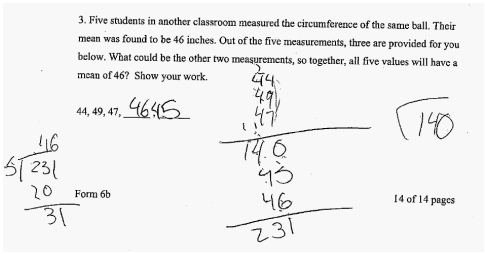
*Mock student responses

Unit Quiz Scoring Guide — Inventing Center Unit 2

Question 2: A forgotten measurement Exercise Ball and Conceptions of Statistics (CoS)		
Level	**Performance**	**Example**
CoS(3d)	**Predict how a statistic is affected by changes in its components or otherwise demonstrate knowledge of relations among components.** Students' values for mean, median, and mode are all within the range of 42-47 (the values given) Student chooses a value that is lower than (not equal to) the values for mean and median that he or she selected in Part 1.	• Student has correctly calculated the values in Q1 and chooses "a" (43) • Student says the mean is 46 and the median is 47 (in Q1), then chooses "b" • Student says the mean is 46 and the median is 45 (in Q1) and chooses "a"
NL(ii)	**Inconsistent choice.** Choose an answer that is **not smaller** than either the mean or median calculated in Q1. *OR* Student calculated values outside the range of 42-47 for Q1. Student may choose any answer	• Student calculates median as 76 and mean as 78 (for Q1), then chooses "a" (43) for Q2. • Student calculated mean and median correctly in Q1 and chooses "d" (47) for Q2 • Student wrote "I don't know" for part 1, and then chooses "a" for Q2.
NL(i)	Irrelevant attempt.	• Student chooses more than one answer or did not choose any option except scribbling.
M	Missing response	

*Mock student responses

Unit Quiz Scoring Guide — Inventing Center Unit 2

Question 3: Find missing values for a mean of 46 Exercise Ball and Conceptions of Statistics (CoS)		
Level	**Performance**	**Example**
CoS(3d)	**Predict how a statistic is affected by changes in its components or otherwise demonstrate knowledge of relations among components.** • Correctly provides any pair of two positive numbers whose sum is 90. For correct answer: may or may not show work. • A student can also be put at level 3D if he or she *shows work and demonstrates understanding of procedure* and approximately correct answers but makes a calculation mistake; the sum for their two measurements will not be 90 but can otherwise be between 85 and 95, excluding 90.	• "42 and 48. 44-46= -2, so I need 48-46=2;49-46 = 3, 47-46= 1, so I need 42-46=-4" • "43, 47" • "43,47. 46*5=230, 230-44-49-47=90, 43+47=90"*  3. Five students in another classroom measured the circumference of the same ball. Their mean was found to be 46 inches. Out of the five measurements, three are provided for you below. What could be the other two measurements, so together, all five values will have a mean of 46? Show your work. 44, 49, 47, 46 45 Form 6b 14 of 14 pages
NL(ii)	Provides a pair that does not sum to 90; either does not show work, or work indicated student did not know the correct procedure of calculating mean. (*Note*: This is different from CoS(2b) in which although student might provide values that did not sum to 90, their work indicated their mistakes were from calculation errors rather than conceptual ones.)	• "13, 12" • "35, 45" • "52, 50" • "46, 46" • "46, 4"
NL(i)	Response is irrelevant, unclear, or a restatement of given information.	• "It is impossible."
M	Missing response	

*Mock student responses

Unit Quiz Scoring Guide — Inventing Center Unit 2

Swimming Strokes

Question 1: Is 46 a good estimate of the actual number of strokes? Swimming Strokes and Conceptions of Statistics (CoS)		
Level	**Performance**	**Example**
CoS(3f)	**Choose statistics by considering qualities of one or more samples.**	• "No, because it only shows the mid-range and not which number of stroke most people got." • "No, I think it is 40 because most people got that number." • "No because it is not in the center clump."
CoS(3f-)	Disagree and reason that 46 is not representative of the sample.	• "No, because there is only one 46."
NL(ii)	Disagree but explanation is not clear or shows incorrect reasoning.	• "I do not believe that because I used a different method." • "If you divide 54 by 2 you get 27, not 46." • "Yes, because it's near the middle." • "Because it is the median of the measure if you only counted the unique ones."
NL(i)	Agree or irrelevant response.	• "I don't know."
M	Missing response.	

*Mock student responses

Question 2: Using the same data, describe another way to estimate actual strokes. ***Note:*** **Sometimes students did not fill out this part, but they gave a method in part A. Swimming Strokes and Conceptions of Statistics (CoS)**		
Level	**Performance**	**Example**
CoS(3c)	**Generalize the use of a statistic beyond its original context of application or invention.**	• "Use my method would be real easy. It used the mode. (1) Order the data (2) Make all the bin size 10 (3) Find the highest frequency bin (4) Find the mode of that bin."

Unit Quiz Scoring Guide — Inventing Center Unit 2

		• "If there are 29 numbers and you divide in half you get 14 and 1. [Starting from the least] Count to fourteen is 41. But think of 14 and 1 as 14.5. And there are 2 of them ½ + ½ = 1. 14=15 which is still 41." (Basically he described how to find the median.) • "Choose the mean." • "I think it is 40 because most people got that number." • "Find the median of the set and that's the actual number"
NL(ii)	Propose a method that is not justified, for example, a method that does not use all the values. Treat data as collection of individual numbers.	• "Add all the numbers up and find the one that is in the middle." • "You can count the unique ones and find the median." • "1st put in order 2nd find the mean and mode add them together there you go." • "You could count them."
NL(i)	Attempt item but answer describes no procedure or focusing on making a better display.	• "Make a bar graph." • "Use a tally chart." • "I couldn't find the answer."
M	Missing response.	

*Mock student responses

Unit Quiz Scoring Guide — Inventing Center Unit 2

Question 3: Which way is better to find the actual number of strokes? Swimming Strokes and Conceptions of Statistics (CoS) *Note:* **Sometimes students did not fill out this part, but they gave a method in part A.**		
Level	**Performance**	**Example**
CoS(3f)	**Choose statistics by considering qualities of one or more samples. Justify the answer with considerations of sample characteristics.**	• "My method is better because it concentrates on the clump that contains most of our counts. The middle of the range isn't even in the central clump."
NL(ii)	Compare two statistics using some criteria that are either not clear, or not justified statistically.	• "My way is more accurate." • "My way is easier." • "It has the most in it." • "My method is better because it will always find a number that exists. But using the method in the problem sometimes you might end up with a number that is not even in the collection!"* • "My method is better because it makes better sense."*
NL(i)	Attempt item but does not compare methods or answer is irrelevant.	• "That is a good question."
M	Missing response.	

*Mock student responses