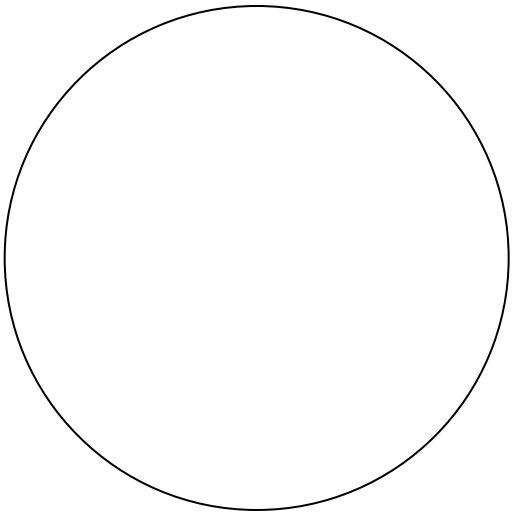
Unit Quiz

Angeline is learning how to make chocolate chip cookies from her mom. Her mom tells her that it is important that the size of the cookies is the same. The cookie dough scoop is supposed to make cookies of 10 cm in diameter. Her mom demonstrates how to use a cookie dough scoop. Angeline puts 15 scoops on a baking sheet and bakes them.

1. If Angeline is really good at scooping dough and her cookies are all the same size, how would you design a spinner to model her perfect scoop?



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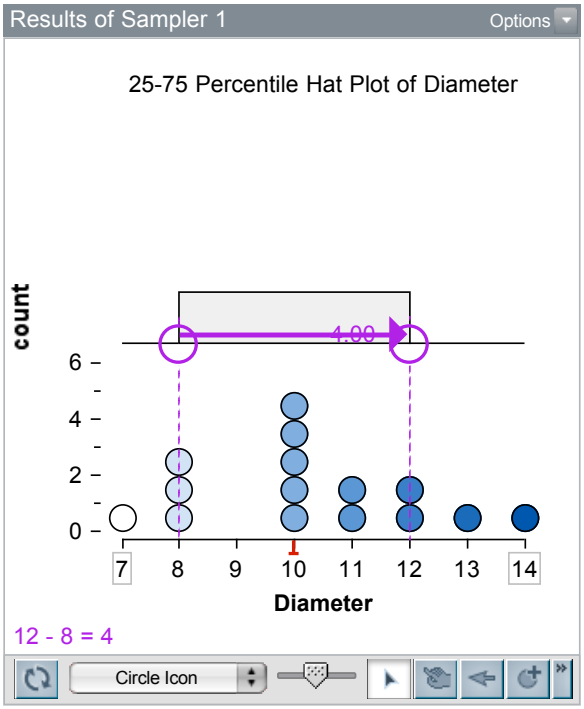
She measures the diameters of the 15 cookies. Here are the diameters of the 15 cookies.



2. Angeline and her mom think about why Angeline's cookies are all different sizes. Angeline figures that when she uses the scoop over and over again, the dough sticks to the scoop and that makes cookies smaller. Sometimes, she dips the scoop too hard and that makes cookies bigger. Angeline calls this scoop error. How would you design a spinner to model the scoop error?

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Unit Quiz

3. Run your model. Do you think your model is a good one?

   ☐ Yes

   Why?

   ☐ No

   Why not?

4. If not, how would you change your model?

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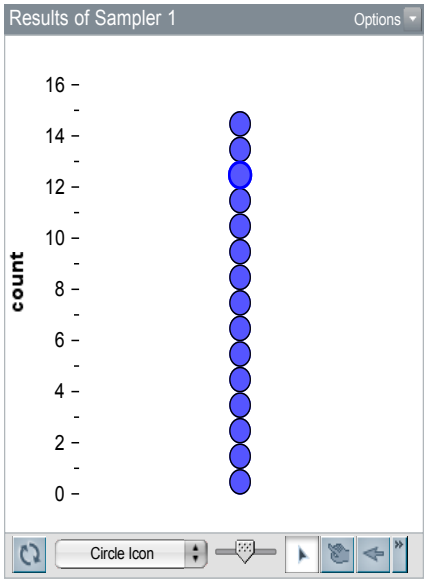
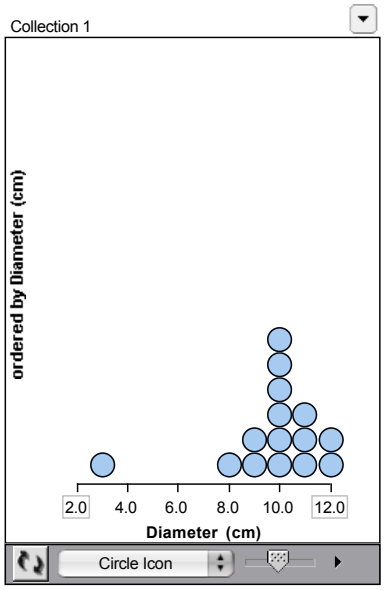
5. Her mom gives Angeline a tip that Angeline should put the scoop in water so that dough does not stick on the scoop. Angeline follows her mom's advice. Which display of the resulting cookie diameters is closest to the results that you might expect if her mom's advice is good?

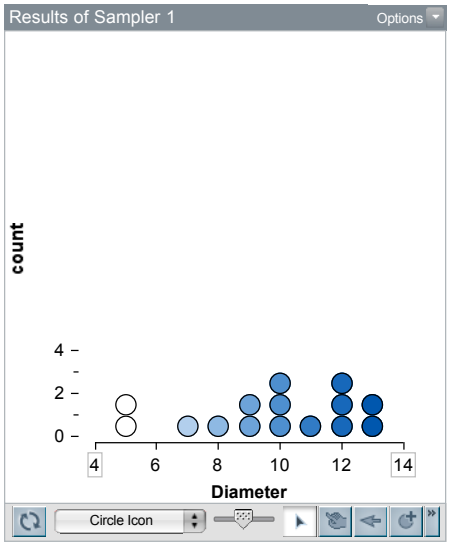
a.



b.



c.



Why?

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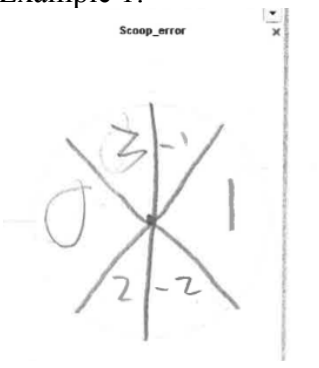
Unit Quiz Scoring Guide — Modeling Measurements Unit 6

Modeling Cookie Dough

Question 1: Modeling Cookie Dough and Modeling Variability (MoV)		
Level	**Performance**	**Example**
MoV(3a)	**Use chance device to model uncertain outcomes.**	• Student labels the entire spinner "10" or "10 cm." • Student divides the spinner into sections, but all sections are labeled "10" or "10 cm."
NL(ii)	Response is relevant but unclear. Student may also answer yes or no without providing an explanation.	• Student treats the spinner as a literal cookie. • Student does not think that spinners can model perfect measurement. • Student draws sections on the spinner representing different measurements.
NL(i)	Response is irrelevant, unclear, or a restatement of given information. Student doesn't compare the real data to any attributes of the model. Includes responses where student does not attempt to design a spinner.	• "I'm not sure." • "?"
M	Missing response	

*Mock student responses

Question 2: Modeling Cookie Dough and Modeling Variability (MoV)		
Level	**Performance**	**Example**
MoV(4b)	**Create model of total variability as a composition of chance (and perhaps, constant) devices.** Students construct a spinner where each section represents a different "scoop error".	• Example 1: 

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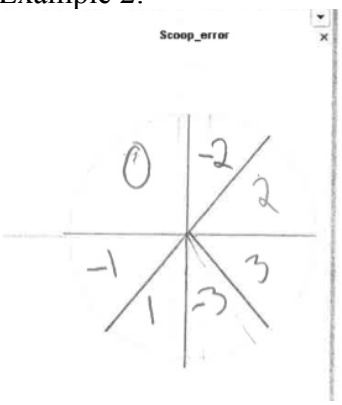
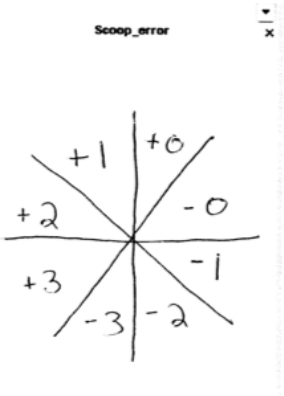
Unit Quiz Scoring Guide — Modeling Measurements Unit 6

		• Example 2:  • Example 3: 
MoV(3a)	**Use chance device to model uncertain outcomes.** Student uses the blank spinner to model the entire system.	• All sections of the spinner represent different measurements (as opposed to error). For example, the spinner might have sections for 9, 10, or 11 cm.
NL(ii)	Response is relevant but unclear. Student may also answer yes or no without providing an explanation.	• Student treats the spinner as a literal cookie. • Student does not think that spinners can model perfect measurement. • Student draws sections on the spinner representing different measurements.
NL(i)	Response is irrelevant, unclear, or a restatement of given information. Student doesn't compare the real data to any attributes of the model. Includes responses where student does not answer whether the	• "I'm not sure." • "?" • "27"

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Unit Quiz Scoring Guide — Modeling Measurements Unit 6

	model is good.	
M	Missing response	

*Mock student responses

Question 3: Modeling Cookie Dough and Modeling Variability (MoV)		
Level	**Performance**	**Example**
MoV(5a)	**Judge model fit in light of variability across repeated simulation with the same model.**	• "It's a bad model because if we ran it a bunch of times, we would keep getting the outlier even though it's not likely."* • It is a good model, because even though the mean changes with each run it is mostly very close to 10.*
MoV(4c)	**Compare model output to data and judge adequacy.**	• I ran it once and its shape was a lot like the data, so it is a good model. • The model median and the data median match. • The model IQR is pretty close to the observed IQR.
MoV(3b)	**Evaluate fit of chance device by appealing to relations between simulated and observed values.** Student compares the values or the shape of the modeled data to the display of the original data and emphasizes resemblance.	• "Yes, because the results are almost alike." • "Yes, because it looks like the original one." • "Yes, you don't know if you're getting it right above or below the measurement. Just like with the measurement."
MoV(3b-)	**Evaluate fit of chance device by appealing to relations between simulated and observed values.** Student looks for literal resemblance in values OR students look for the structure of the spinner to literally resemble the original data	• "Yes, all the numbers are the same." • "Yes, because it has the same numbers as the outcome." • "No, because it doesn't show all the answers." • "Yes, it shows exactly the measurements." • "Yes, he has more on 158 because there are a lot of 158s on the spinner." • "No, he needs more 158 pieces on the

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		spinner."*
MoV(3a)	**Use chance device to model uncertain outcomes.**	• "Yes, because you used a spinner to show the chances of each measurement"* • "Yes because it gives each number a probability of being landed on." • "It has an equal chance of landing on each of them."
NL(ii)	Response is relevant but unclear. Student may also answer yes or no without providing an explanation.	• "Spinners are good models." * • "No because there are not even."
NL(i)	Response is irrelevant, unclear, or a restatement of given information. Student doesn't compare the real data to any attributes of the model. Includes responses where student does not answer whether the model is good.	• "Maybe. I'm not sure." • "?" • "27"
M	Missing response	

Question 4:

Students' responses to question 4 are likely to be highly variable, and are dependent on the decisions they made in questions two or three. In general, look for and encourage students to look for ways to improve their model. Here are few likely improvements students might think about:

- Changing from using one spinner to using multiple spinners to account for variability
- Changing the signs of the errors to account for over and under estimates
- Changing the size of the sectors to account for probability structure (giving smaller errors the larger sectors since they are the most likely)

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Unit Quiz Scoring Guide — Modeling Measurements Unit 6

Question 5: Modeling Cookie Dough and Modeling Variability (MoV)		
Level	**Performance**	**Example**
MoV(2a)	**Describe how a process or a change in process affects variability.** **Student describes that the center would likely stay the same, but the variability would decrease.**	• "b, because it is a clump in the middle, but the clump is tighter than the others." • "not a, because 10 is still the most, and it is still not going to be perfect. So it must be b or c. I think it's b."
NL(ii)	Response is relevant but unclear. Student may also answer yes or no without providing an explanation.	• "Spinners are good models." * • "No because there are not even."
NL(i)	Response is irrelevant, unclear, or a restatement of given information. Student doesn't compare the real data to any attributes of the model. Includes responses where student does not answer whether the model is good.	• "I'm not sure." • "?" • "27"
M	Missing response	

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