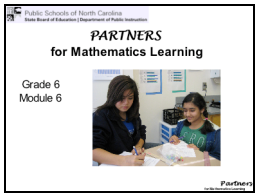
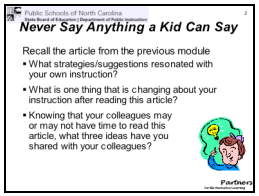
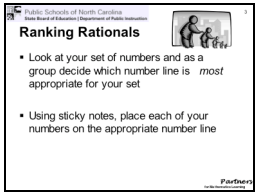
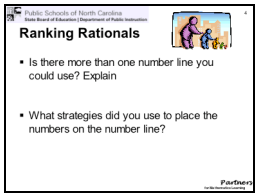
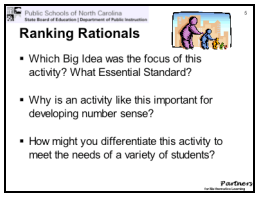
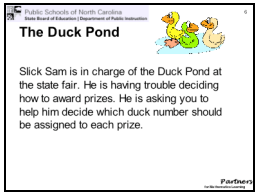
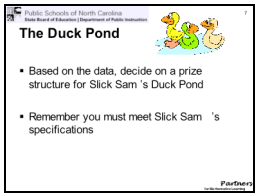
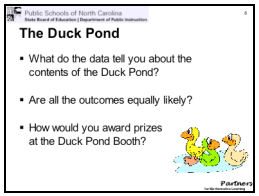
General Materials and Supplies:

Laptop, Projector, Power Cord	2 Colors of Sticky Notes	30 plastic ducks	*Scientific Shuffle* cards
Ranking Rational Number Cards	*Duck Pond* Handout	Chart paper and markers	
Adding Machine Tape	At least 3 dish pans	*Photo Booth* Handout	

Slide	Tasks/Activity	Personal Notes
	(slide 1) **Module 6** This module focuses on number and probability.	
	(slide 2) ***Never Say Anything a Kid Can Say Follow-Up*** *What strategies/suggestions resonated with your own instruction?* *What is one thing that is changing about your instruction after reading this article?* *Knowing that your colleagues may or may not have time to read this article, what three ideas have you shared with your colleagues?* Participants were asked to review the article before beginning this module. Allow participants to share their thoughts on this article.	
	(slide 3) **Ranking Rationals** Preparation ahead of time: Create and display the following number lines using these numbers as endpoints: 0 to 1, –5 to 5, –10 to 25, –100 to 100, and –5 to 100,000 Distribute one number card (Module Six, Handout One) to each group. • Have participants discuss the differences in the number lines displayed around the room. • As a group, decide which number line is most appropriate for your set of numbers. • Write each number on a sticky note. • Have participants place their sticky notes on the appropriate number line. **Note**: A percent is fundamentally different than a fraction or decimal. Percents are not considered	

	values, but operators. We look at percent in the context of "percent of some value". Last summer, we placed percents on a number line; this provoked the conversation about the value of 25% and where it should be located on the number line. 25% can not be placed on a number line, but 25% of a given value can be. So if you want to equate 25% with .25, then you are calculating 25% of 1.	
	(slide 4) **Ranking Rationals** *Is there more than one number line you could use? Explain.* • Set #1 is most appropriately placed on the 0 to 1 number line; however, the numbers could be placed on all of the number lines displayed. • Set #3 is most appropriately placed on the –10 to 25 number line; however, the numbers could be placed on the –100 to 100 number line. *What strategies did you use to place the numbers on the number line?* • Changed all fractions to decimals • Find percents of one • Grouped negative numbers • Converted scientific notation to standard form • Answers will vary	
	(slide 5) **Ranking Rationals** *Which Big Idea was the focus of this activity? What Essential Standard?* Expanded understanding and use of classes of numbers increases students' abilities to describe situations and solve problems Expanded knowledge of a positional base number system allows students to become increasingly proficient with comprehending and communicating about mathematical tasks *Why is an activity like this important for developing number sense?* • Students recognize and use number equivalencies • Students use benchmarks to position numbers • Students recognize relationships between positive and negative numbers • Students see that between every two rational numbers there is another rational number (*Idea of Betweenness*)	

	How might you differentiate this activity to meet the needs of a variety of students? • Use less numbers • Use fewer classifications of numbers • Have students create the number lines • Answers will vary	
	(slide 6) **The Duck Pond** Ask participants to find *The Duck Pond* handout (Module Six, Handout Two) and read the scenario. *Slick Sam is in charge of the Duck Pond at the state fair. He is having trouble deciding how to award prizes. He is asking you to help him decide which duck number should be assigned to each prize.* <u>Preparation ahead of time:</u> There will be 10 ducks. Label 4 ducks with a 4, 2 ducks with a 2, and 4 ducks with a 3. There will be no ducks with the number one. (1 is the MP3 player, 2 is the Frisbee, 3 is the lollipop, and 4 is the no prize, however 3 and 4 may be interchangeable.) Float the 10 ducks in a dishpan with water. Have participants choose a duck from the pond and record their number on the class frequency table. Each participant should choose one duck and place the duck back in the pond. Have participants record the class data on their handout.	
	(slide 7) **The Duck Pond** • Provide participants ample time to create a prize structure for Slick Sam. • Remind them about Slick Sam's specifications. 1. He doesn't want to give away the MP3 player. 2. He wants to award prizes no more than 60% of the time. 3. He doesn't mind giving away lollipops.	



(slide 8) **The Duck Pond**

What do the data tell you about the contents of the Duck Pond?

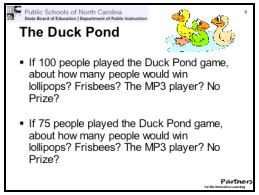
- No duck with a number one was chosen.
- Answers will vary based on the data.

Are all the outcomes equally likely?

- Answers will depend on the data, but participants will no that no ones appear in the data.

How would you award prizes at the Duck Pond Booth?

- Answers will vary, but participants should recognize that Duck 1 should be assigned the MP3 player, and Duck 2 should be assigned the Frisbee.
- Ducks 3 and 4 are interchangeable with no prize and lollipop.



(slide 9) **The Duck Pond**

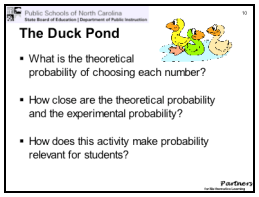
If all 100 people played the Duck Pond game, about how many people would win lollipops? Frisbees? The MP3 player? No Prize?

40 people will win no prize, 40 people will win a lollipop, 20 people will win a Frisbee and 0 people will win the MP3 player

If 75 people played the Duck Pond game, about how many people would win lollipops? Frisbees? The MP3 player? No Prize?

Note: some students may not have been exposed to finding percents or using proportions at the 6^{th} grade level. It is important to note strategies that 6^{th} graders use to make these predictions.

30 people will win no prize (4 out of every 10 people will win no prize therefore there are 7 groups of 10 in 75 which leads to 7 groups of 4 and a half a group of 4 → 7(4) + 2 = 30) (OR 4 groups of 10%: 7.5 + 7.5 + 7.5 + 7.5)
30 people will win a lollipop
15 people will win a Frisbee (7 groups of 2 and a half a group of 2)
0 people will win the MP3 player



(slide 10) **The Duck Pond**

Let's Reveal. What is the theoretical probability of choosing each number?

No prize: 40% of the ducks $\frac{40}{100} = \frac{2}{5}$

Lollipop: 40% of the ducks $\frac{40}{100} = \frac{2}{5}$

Frisbee: 20 % of the ducks $\frac{20}{100} = \frac{1}{5}$

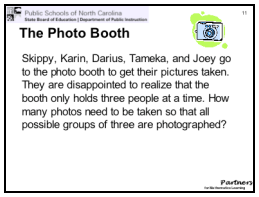
MP3 player: 0% of the ducks

How close are the theoretical probability and the experimental probability?

Answers will vary, but should be a be close match

How does this activity make probability relevant for students?

- Many students will have experienced this game
- Simulations make math real



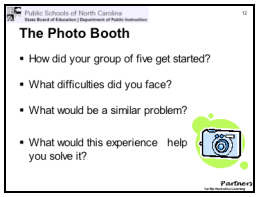
(slide 11) **The Photo Booth**

Organize participants into groups of five. Ask participants to find the *Photo Booth* handout (Module Six, Handout Three).

Read the following scenario.

Skippy, Karin, Darius, Tameka, and Joey go to the photo booth to get their pictures taken, They are disappointed to realize that the booth only holds three people at a time. How many photos need to be taken so that all possible groups of three are photographed?

Encourage participants to act out the problem. (If available, teachers might use a Polaroid camera or digital camera and allow participants to actually take pictures.)



(slide 12) **The Photo Booth**

How did your group of five get started?

- Acted out the scenario
- Mathematically found the total number
- Made a organized list of possibilities – the sample space

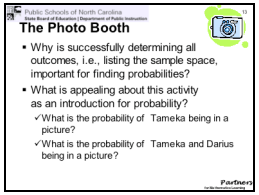
What difficulties did you face?

- Organizing the information
- Eliminating duplicity of groups of three (i.e. students might argue that order makes a difference)

What would be a similar problem? How would this experience help you solve it?

- With 5 different pizza toppings, how many different 3 topping pizzas are possible?
- Keeping an organized list of the possibilities

Answer: 10 groups of three or the sample space of
SKD, SKT, SKJ, SDT, SDJ, STJ, KDT, KTJ, KDJ, DTJ



(slide 13) **The Photo Booth**

Why is successfully determining all outcomes, i.e. listing the sample space, important for finding probabilities?

- Students have to find the total number of outcomes to determine probability, particularly in situations where all outcomes are equally likely.

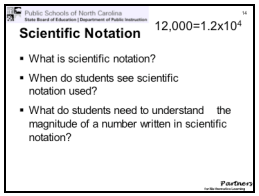
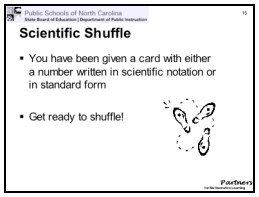
Why is this activity a good introduction for probability?

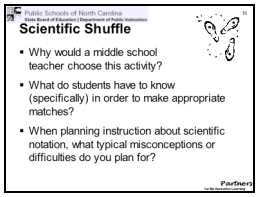
- Students need to be able to keep an organized list to determine the possible outcomes for an event (i.e. determine the sample space)
- Students can relate to this activity.

Follow-up Questions:

What is the probability of Tameka being in a picture? $\frac{3}{5}$ or 60%

Ask participants to explain how they found the probability.

	What is the probability of Tameka and Darius being in a picture together? $\frac{3}{10}$ or 30%. Ask participants to explain how they found the probability.	
	(slide 14) **Scientific Notation** *What is Scientific Notation?* *When do students see it used?* *What do students need to understand the magnitude of a number written in scientific notation?* Answers will vary. We have talked about number equivalencies before; now let's look at scientific notation and standard form. This is a new objective for sixth grade and it's important to help students understand that scientific notation is just an abbreviated way to write large and small numbers. Example: If every driver in the United States had the right amount of air in their tires of their car, then the United States would save 700,000,000 gallons of gas a year. (700,000,000 gallons = 7×10^8 gallons)	
	(slide 15) **Scientific Shuffle** Directions for the workshop leader: There are 30 scientific notation and standard form cards (Module Six, Handout Four). Include enough cards (matches) in your set to match the number of participants in your group. • Randomly pass out the cards to the participants. • Go to the hallway or outside. • Ask participants with the scientific notation cards to order themselves from least to greatest. • Directly across from this group, but facing the other way, have the participants with the standard form cards line up from least to greatest. Then have the participants face each other and walk forward to find their equivalent match.	



(slide 16) **Scientific Shuffle**

Why would a middle school teacher choose this activity?

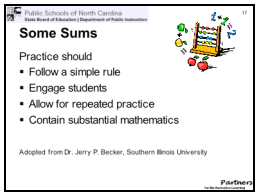
- Gets students up and moving
- Provides engaging practice
- Students think that they are not doing math
- Makes math fun

What do students have to know specifically to make appropriate matches?

Student need to be able to understand and interpret values written in scientific notation, as well as the mechanics of moving between scientific and standard forms.

When planning instruction about scientific notation what typical misconceptions or difficulties do you plan for?

Answers will vary

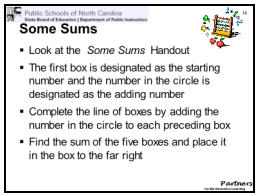


(slide 17**) Some Sums**

Practice is important for middle school students. Middle school students should gain fluency with all operations for rational numbers. Dr Jerry Becker said the following of practice:

Practice should

- *Follow a simple rule*
- *Engage students*
- *Allow for repeated practice*
- *Contain substantial mathematics*



(slide 18) **Some Sums**

We are going to do some practice and find the substantial mathematics within it.

Look at the Some Sums Handout.

The first box is designated as the starting number and the number in the circle is designated as the adding number.

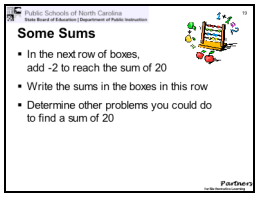
Complete the line of boxes by adding the number in the circle to each preceding box.

Find the sum of the five boxes and place it in the box to the far right.

Have the participants follow the directions and monitor to make sure they understand.

(For the first row the values in the boxes are 2, 5, 8, 11, 14, (space) 40)

Be sure to share and check the answers in the first row before going on.



(slide 19) **Some Sums**
Continue with the next set of directions and monitor while the participants determine how to find which numbers should fit in the boxes.
In the next set of boxes, designate the number you add as -2 and designate the sum as 20. Determine the numbers in the boxes.
Be ready to talk about how the mean of the numbers in the five boxes should be the middle number. That is 20/5 = 4, so 4 should be the middle number. Once participants determine how to find the mean, they can complete most of the numbers. You might use balancing (explained in last summer's staff development) to prove that the middle number is the mean.
Example:

+◯

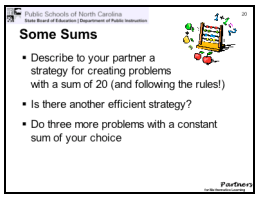
12	9	6	3	0	30

That is:

12	9	6	3	0
-6	-3		+3	+6
6	6		6	

The balance point is 6, so 6 is the mean of the five numbers.

Determine other problems you could do to find a sum of 20
Answers will vary.



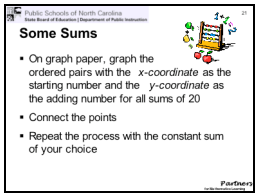
(slide 20) **Some Sums**
Continue with the instructions on the slide:
Describe to your partner a strategy for creating problems with a sum of 20 (and following the rules).
Is there another efficient strategy?
Do three more problems and with a constant sum of your choice
Answers will vary.

Monitor the participants to determine if they are following directions.
Another way to talk about the numbers is in terms of *x* and *y*.
If the starting number is *x* and the number added is *y*, then the first box should be x and it follows

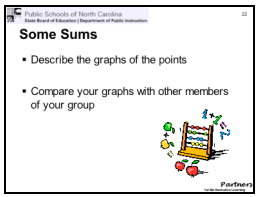
that the second box is $x + y$ and so on.

x	x+y	x+2y	x+3y	x+4y	5x+10y

So five times the middle number is $5(x + 2y) = 5x + 10y$.

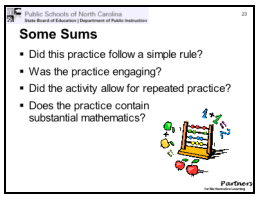


(slide 21) **Some Sums**
Ask the participants to graph the ordered pairs with the *x-coordinate* as the starting number and the *y-coordinate* as the adding number for all sums of 20 and connect the points.
On the same coordinate plane, repeat the process with the constant sum of their choice.



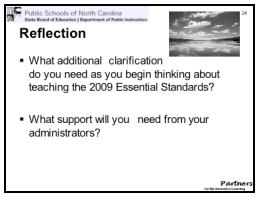
(slide 22) **Some Sums**
Describe the graphs of the points.
The connected points should determine a straight line. The lines are parallel and have the same slope. All of the lines have a slope of -1. You may need to discuss this in terms of rate of change.
The equation is $x + y = C$ where C is a constant , so $y = -x + C$.

Compare your graphs with other members of your group.



(slide 23) **Some Sums**
Did this practice follow a simple rule?
Answers will vary.
Was the practice engaging?
Answers will vary.

Did the practice allow for repeated practice?
Answers will vary.
Does the practice contain substantial mathematics?
Sums, mean, average, coordinates, parallel lines, finding an unknown

	(slide 24) **Reflection** *What additional clarification do you need as you begin thinking about teaching the 2009 Essential Standards?* *What do you need from your administrators to support the teaching and learning of the Essential Standards?* Ask participants to create a list related to each question that they will share with their district leadership.	
	(slides 25-28) **Credits for the project and closing slides**	