Module 1- Focus on Fractions Script

Slide 1: this is module 1: use of manipulatives and strategies focus on fractions. This is part 1 of a 3 part Professional learning session for module 1. We encourage you to follow along and construct the visual representations discussed within this session. Feel free to pause the presentation at any point.

Slide 2: we are going to focus on 3 types of fraction models as we discuss the multiplication and division of fractions. The first is a set model. When using set models, it is important for students to know what defines the whole, what defines the parts and what the fraction means.

Slide 4: take a look at this set. The whole represented here is 12.

Slide 5: this set can be described by its fractional part. 1/2 of the set is yellow. The set is separated into 2 parts with equal amounts in each part. Therefore, 1/2 of 12 is 6.

Slide 6: 1/4 of the set is red. There are 3 red tiles noting 1/4 of 12 is 3. The whole was separated into four parts with equal quantities within each part.

Slide 7: consider the Birthday Cake task within Module 1. Students are required to use set models to determine how many jelly beans would go on each portion of the cake. Here we have 8 jelly beans. How many jelly beans would be on each portion of a cake cut into two halves?

Slide 8: remember with a set model, the parts are defined by the equal number of objects. Therefore, each half would need the same number of jelly beans. Here, the part is 4 and the whole is still 8. This model represents 1/2 X 8 which is 4.

Slide 9: what if the cake were split into quarters or fourths? The whole would be separated into equal parts leaving 2 jelly beans on each slice of the cake. 1/4 X 8 is 2.

Slide 10: (read the slide) use color tiles to answer the questions.

Slide 11: moving on to length models, when using these tools, the length of the tool determined the whole and the parts are defined as the equal distances or lengths.

Slide 12: some examples of linear models or length models for fraction representation are listed here. Within this presentation, we will discuss a few models. While reviewing the number line and Cuisenaire rods, think about how the same problems can be modeled with fraction strips and/or adding machine tape.

Slide 14: number lines came be used in multiple ways. This number line begins with zero and ends with 1. It has been separated into four equal parts and 1/4 is represented. For this problem, we are going to determine 1/2 of 1/4 or 1/2 X 1/4.

Slide 15: it is important to understand your whole in each situation or problem you solve. For this problem, what is our whole? If you're thinking 1, you may be expressing a misconception you have about fractions and the term whole. We're looking for the entire amount of which we want to find half. We are looking for half of 1/4, making it our whole for this problem. Using a double number line, noting they are of the same length, 1/4 is cut in half. To determine the value of the cut, one would only need to divide the new number line into equal parts. Because the two number lines are equivalent, we are able to find equivalent hash marks on the new number line which are aligned with the original number line. 1/2 of 1/4 or 1/2 X 1/4 is 1/8.

Slide 16: before moving on to the next slide, try first identifying the whole within this expression. Then, use the double number line strategy to find 1/4 of the given amount.

Slide 17: you should have determined only 2/3 of the original number line needed to be broken into four equal parts. We want to find what is 1/4 of it, so we must identify where one out of four equal parts would be located.

Slide 18: using the double number line, we are able to find equivalent values and separate the number line into equal parts. 1/4 of 2/3 is equivalent to 1/6.

Slide 19: taking it a step further let's look at finding more than a unit fraction. What do you notice about this problem? Do you think it would change your strategy at all?

Slide 20: notice the entire amount is only 1/3 which has been separated into five equal parts.

Slide 21: 2/5 is identified and an equivalent amount is noted using the double number line strategy.

Slide 22: students should have an opportunity to work flexibly with the manipulatives and decide which strategy is most efficient based on the problem they are solving. With that in mind, we will look at some of the same linear model examples being used to represent division of fractions.

Slide 23: similarly, to dividing whole numbers, when dividing fractions, students are to determine how many groups or sets of the divisor are within the dividend. Looking at this problem, we want to know how many 1/5s are in all of 4/5?
On the number line, 4/5 is represented. 1/5 is easy to identify as we are only dealing with one type of

piece, fifths.
Slide 24: There are 4 sets or groups of 1/5 within 4/5, so the quotient is 4.

Slide 25: take a look at this problem. Using the number line, changing the mixed number to an improper fraction is unnecessary. We are looking for the number of 2/3 within 1 and 1/3. Number line usage is very flexible; you can decide which numbers will be represented on your number line. Here we have represented 1 and 1/3. The jumps show the number of 2/3s within 1 and 1/3. Notice again here, when dealing with one kind of piece, in this case thirds, we are able to easily find the groups or sets.

Slide 26: with this problem, you'll see we aren't dealing with the same kind of piece. Here, we are using a double number line to solve. Take a moment to think about how we could adjust our fractions so they would have common denominators. Then think of how you would use a number line to solve.
Here we have two number lines of the same length. (Very important). One number line shows the dividend and the other shows the divisor.

Slide 27: we are looking for the number of 1/4s in all of 3/8. Using the number line, we can see there is one whole group of 1/4 and half of a group of 1/4. Therefore, the answer is 1 and 1/2.

Slide 29: the great thing about Cuisenaire rods, in my opinion, is the flexibility in showing fractional relationships or proportional relationships.

Slide 30: In this example the brown rod is the whole. Purple is 1/2 and red is 1/4.

Slide 33: the 3rd type of model is area models. With this tool, the whole is defined by the area of the defined region and the parts are the equal area.

Slide 34: folding paper is a concrete way to visualize the multiplication of fractions using an area model.

Slide 38: the fourths are separated into thirds. We are trying to identify 1/3 of 3/4. Notice how the colors overlap. It shows what fractional part of the whole is 1/3 of 3/4. There are 12 equal parts and 3 parts are overlapping. 1/3 X 3/4 is 3/12.

Slide 39: This same strategy works with drawings as well. What would be the next step to represent 1/2 X 1/4?

Slide 45: in this example, each mixed number is decomposed into their whole numbers and fractions. The wholes are multiplied, each whole is multiplied by the others fraction and then the fractions multiplied by the each other.

Slide 47: the partial products are combined, remember the mixed numbers were decomposed.

Slide 48: notice in this strategy we are combining a whole number and an improper fraction. The final answer is not in simplest form but still reflects the correct answer.

Slide 50: earlier in the presentation we looked at dividing fractions with concrete materials and in representation form. Here we are connecting the representation to the abstract. Remember, when dividing we are looking for the number of the divisor within the dividend. For this problem we are dealing with one size piece, eighths.

Slide 51: because we are dealing the same size pieces, we are dividing 7 pieces into groups of 3.

Slide 52: here we are not dealing with the same size pieces. From our visual representation we are able to find equivalent fractions which have to same number of equal parts.

Slide 53: we now have a common denominator; two thirds is equivalent to six ninths.

Slide 54: because we are using the same size pieces now, we can focus on how many groups of six are in all of 4. We won't use the language "we cannot divide 4 by 6" because that will develop misconceptions. However, we realize there is not a whole group of 6 within 4, helping us reason that our quotient will be a fractional amount.

Slide 55: looking back at the visual representation, we see only 4 out of the 6 pieces of the six ninths are within the 4 pieces of four ninths.

Slide 56: four out of six can be written as four over six or four sixths. This can be simplified to two thirds.

Slide 58: here we want you to identify a pattern through the use of visual representations. For each problem, use an area model or length model to model the division problems. We have provided an example for the first expression. Directly next to the expression we are using an area model. The large rectangle represents one whole. We want to determine how many halves are within the 1 whole. We see the whole has 2 pieces within it. Therefore, the quotient of 1 divided by 1/2 is 2. Before moving on to the next slide, go through each expression using an area model or length model to verify the quotient.

Slide 59: take a moment to cross check the patterns you identified with the ones listed here. By looking for the patterns, the conjecture can be made, the dividend can be multiplied by the denominator of the divisor and it will result in the same quantity as our visual representation.

Slide 60: adding more to our conjecture. Here we are looking for the number of 2/3 in all of 2 wholes. We began by creating our 2 wholes followed by creating 3 equal parts within each whole. We see there are 6 pieces (2x3) or dividend multiplied by the denominator.

Slide 61: remember our goal is to identify the number of 2/3 within 2 wholes. Therefore, we are separating the 6 pieces into groups of 2. Another way to look at it is 6 divided by 2. Both perspectives result in 3. So 2 divided by 2/3 is 3.

Slide 62: retracing our thinking, we multiplied 2 times 3 giving us 6 pieces. We divided 6 by 2 as we looked for groups of 2 within six. The end conjecture is the invert and multiply strategy, invert the divisor and multiply by the dividend. This strategy is something students should have an opportunity to derive. Begin by having them look for patterns just as you did today.

Slide 64: what do you do when students struggle?

Slide 65: allow students to work at their own pace of understanding. It's perfectly fine for students to hover between the representational stage and abstract stage.

Slide 66: tiered tasks are a great way to allow students to work at their own pace of understanding while continuing to move through the curriculum. You may have a single task tiered at three different levels. Below expectation, at expectation and above expectation.

Slide 67: here is an example of a tiered task. The order of tiers does not matter. We have aligned tier 1 to above expectation, were students will work with larger numbers. Tier 2 and 3 still have the option of using understanding within the representational stage of CRA to solve the problem. Tier 2 must begin to bridge understanding from representational to abstract. Tier 3 is only required to use representations.

Slide 68: meeting with small groups of students is certainly beneficial. We have pulled suggestions for implementing small groups. The link listed will provide insight on how other teachers are implementing small groups at the secondary level.

Slide 70: this suggestion comes from the Social Emotional Learning in Mathematics session from Global Math Department. It lists a class size of 30 students to demonstrate you do not have to have a small class size to implement small group instruction. The GADOE is not suggesting the FOA class sizes should be increased to 30 students.

Slide 72: this suggestion comes from the Social Emotional Learning in Mathematics session from Global Math Department. It lists a class size of 30 students to demonstrate you do not have to have a small class size to implement small group instruction. The GADOE is not suggesting the FOA of algebra class sizes should be increased to 30 students.

Slide 73: The GaDOE has created a wiki space for high school teachers to engage in discussions about math teaching using the GSE. Here you'll find a forum to keep the conversation going, resources and who knows, you might make a few friends. It's a call to action and you are invited to make a difference. Access this online community here: https://ccgpsmathematics9-10.wikispaces.com/