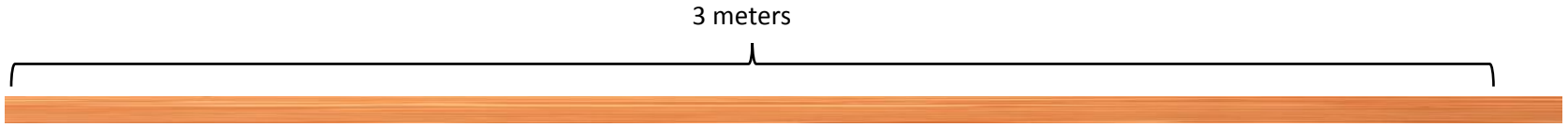
Task: Picture Frames Task **5th**

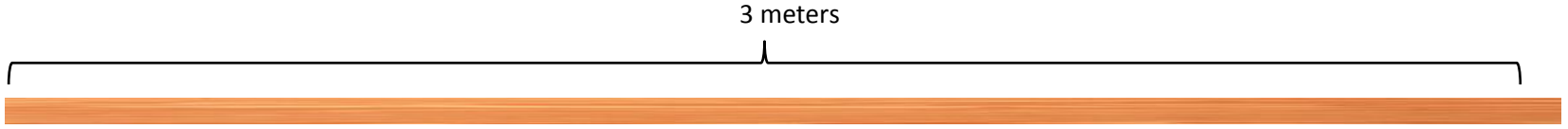
Emily wants to make different size picture frames. She bought 3 pieces of wood that are 3 meters long each. For each piece of wood, she wants to cut different lengths for her picture frames.

A. Emily wants to cut the first piece of wood into 9 equal parts. How long will each picture frame part be? Write an equation for this situation.

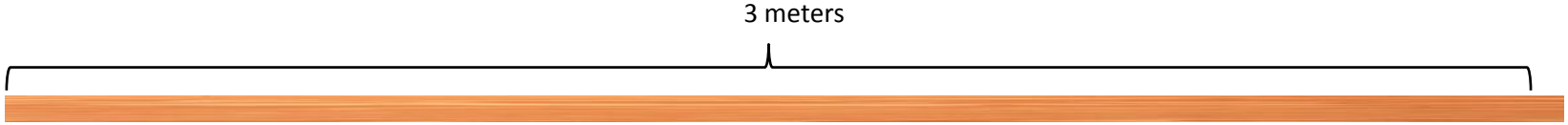


B. For the second piece of wood, Emily wants to make some picture frame parts that are either 1/4 or 1/5 meter long. Which size will give Emily the most picture frame parts? Explain how you determined your answer.

C. What are some other lengths that would give more picture frame parts than 1/4 and 1/5? Explain your thinking in words.



D. For the last piece of wood, explain the meaning of each number in the equation 3 ÷ 1/2 = 6 in context of the problem and show this on the diagram.



Common Core State Standards for Mathematical Content	Common Core State Standards for Mathematical Practice
5.NF.3. Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole*	1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and

numbers does your answer lie? 5.NF.7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.* c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*	critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

Essential Understandings

- Computation with rational numbers is an extension of computation with whole numbers but introduces some new ideas and processes.
- Division is defined by its inverse relationship with multiplication.

Explore Phase

Possible Solution Paths	Assessing and Advancing Questions
PART A: Student should indicate on the diagram 9 picture frame parts and see that they are a ¼ m each. They may write 3 ÷ 9 = 1/3 or 1/3 x 9 = 3 or 9 x 1/3 = 3.	Assessing Questions Show me how you divided the diagram the nine parts. Advancing Questions Can you show me how many parts are in one meter? How can you represent what is happening in your diagram with an equation?
PART B: Students may reason that because parts that are 1/5 are smaller, there will be more of them. Students may show on the diagram that for 1/5 lengths, there will be 5 parts per meter, so a total of 15 parts. Similarly, for 1/4 lengths there will be 4 parts per meter, so a total of 12 parts.	Assessing Questions How do the size 1/5 and 1/4 compare? How do you know? Advancing Questions If one is smaller than the other, can you squeeze in more or less of those into the 3m?
PART C: Students can give several unit fractions that give more picture frame parts, e.g., 1/6, 1/7, 1/8, etc. Students may also give fractions such as 2/11 or 3/16. Students should be able to justify that any fraction less than 1/5 will produce more picture frame parts than both 1/3 and 1/5.	Assessing Questions Explain to me how you decided on those lengths of picture frame parts. Advancing Questions How are all of those fractions related to 1/5? Why? What do you notice about the size of the parts and the number of parts?
PART D: Students should note the meaning of each number in the equation.	Assessing Questions Explain to me what is happening in this problem. What is Emily doing?

Students may say the 3 represents the length of the piece of wood, the ½ represents the length of one picture frame part, and the 6 represents the number of picture frame parts that can be made. Students may say that each of the 3m of wood is divided into 2 parts and there will be a total of 6 picture frame parts that can be made.	<u>Advancing Questions</u> How many m of wood is Emily starting with? Look back at your work for parts A and B. How can that help you?
Possible Student Misconceptions	
<u>PART A:</u> Students may not know how to divide 3m by 9 parts. Students may not be thinking about making all parts equal in length.	<u>Assessing Questions</u> Look at your diagram of the piece of wood. How can you make 9 equal pieces on the diagram? What operation is that? <u>Advancing Questions</u> Because there are three meters in one piece of wood, let's look at just 1. How long are the picture frame parts?
<u>PART B:</u> Students may think that because the 5 is bigger, the 1/5 parts will be bigger, so there will be more 1/4 m parts.	<u>Assessing Questions</u> Tell me why you think there will be more 1/4 m parts. <u>Advancing Questions</u> Which size part is larger? 1/4 or 1/5? How do you know?
<u>PART C:</u> Students may give fractions like 1/3, 1/2 thinking these are smaller and will give more parts.	<u>Assessing Questions</u> Why did you choose those fractions? Are those pieces longer or shorter than 1/4? 1/5? <u>Advancing Questions</u> How do you make fractions smaller? Why do you need smaller fractions?
<u>PART D:</u> Students may have trouble re-contextualizing the equation in terms of the picture frame parts and sizes.	<u>Assessing Questions</u> Go one number at a time. What does the three represent? <u>Advancing Questions</u> Think about the 1/2. What might that mean in terms of the picture frame? What might the 6 mean? How can you show this on the diagram?
Entry/Extensions	**Assessing and Advancing Questions**
If students can't get started…	<u>Assessing Questions</u> How long is the piece of wood? What is Emily trying to do? <u>Advancing Questions</u> What if the problem said Emily was trying to make three pieces – can you show me that? Now, how could you show 9 pieces?
If students finish early…	<u>Assessing Questions</u> Tell me how you determined the fractions you have for part C. What is the relationship between the size of the picture frame parts and the

	number of picture frame parts? Why? <u>Advancing Questions</u> How are the fractions in part C related to the number of picture frame parts you can make? Can you explain why dividing 3 by 1/2 in part D gives you 6? What do you think 4 ÷ 1/5 would be? Why?
Discuss/Analyze	
Whole Group Questions	
<u>PART A:</u> Who can show how you used the diagram to help you? What equation could explain what is represented by the diagram? What are some other equations you could use? How are these equations related?	
<u>PART B:</u> How did you decide? What did you need to consider? What do you notice about the size of the picture frame parts and the number of parts that can be made?	
<u>PART C:</u> Let's make a list of fractions that you came up with. Do all of these fractions work? How are all of these fractions related to 1/5? Who can explain why that relationship is so important?	
<u>PART D:</u> As we think about what is going on in this problem, who can identify what each of the numbers in this equation means? Let's notice that we are dividing 3 and getting a bigger number, 6? Why? What can we say when we divide a number like 3 by small numbers, like 1/2, 1/3, 1/4?	