

# Formative Assessment Design

## Purpose of the assessment

According to the [Common Core State Standards](#), by the end of sixth grade math, students should be able to fluently use all operations with fractions (addition, subtraction, multiplication, and division). Grant Wiggins and Jay McTighe say that planning towards exit-level goals is more important than short-term, content-related goals (2005, p. 58). Because several of these operations require that students know how to find common denominators, and I know some of my students still don't know how to do this, I will be assessing whether they understand this skill prior to teaching the unit. The purpose of this assessment will be for me to be able to identify which of my students need to be retaught how to find common denominators before expecting them to be able to fluently do this while adding, subtracting, and dividing fractions.

## Pre-assessment instruction

Grant Wiggins and Jay McTighe say that teachers are designers of learning experiences and “assessments to diagnose student needs to guide our teaching and [...] determine whether we have achieved our goals” (2005, p. 13). These learning experiences happen both before and after a formative assessment; Dr. Lorrie Shepard says that assessment should be a midpoint, rather than an endpoint (2000, p. 10).

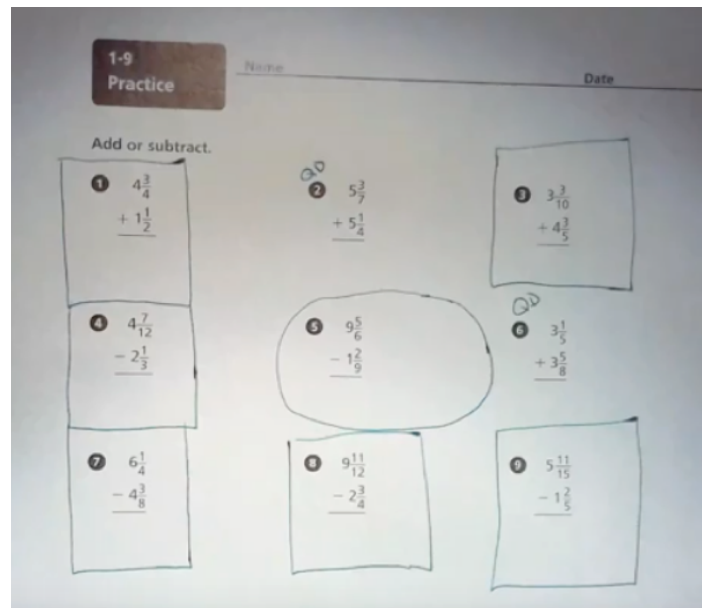
The instruction that has happened prior to this assessment happened last year in my students' fifth grade classrooms. In some ways, that makes planning for this assessment tricky to navigate. For example, I know one fifth grade teacher taught a strategy that she called “quick denominators,” but I don't know if the nine or so other fifth grade teachers talked about this strategy or called it the same thing. “Quick denominators” is not mentioned in the curriculum. Therefore, I will not use any strategy titles on my assessment. I did look at the fifth grade curriculum's lessons. The curriculum, Math Expressions (2013), accepts different common denominators; it does mention the term “least common denominator,” but does not require that students use it. Therefore, I will not be looking for least common denominators; instead, I will evaluate students' understanding on finding any common denominator. The curriculum also doesn't explicitly teach common denominators; finding common denominators is always in the context of adding, subtracting, or comparing fractions. My assessment will keep finding common denominators in the context of adding, subtracting, or comparing fractions so as to not confuse the students.

Here are a couple of examples of practice sheets and homework from the fifth grade curriculum. The first example is a video in which the teacher talks the students through two homework problems and talks about strategies for finding common denominators for the rest of the problems.

[Click here to see the video.](#)

The second example is a worksheet to be completed in class. The teacher directs students toward which strategies they can use to find common denominators. For each problem, the teacher has indicated the best strategy. The problems in boxes have one denominator that goes into the other, so the students can scale up just one fraction. The circled problem is an example in which neither denominator goes into the other,

but there is a common multiple before the “quick denominator.” The two problems with “QD” written next to them are problems that the teacher is pushing the students to use the “quick denominator,” or just multiplying the denominators together to find the least common multiple.



Because students learn these three strategies in fifth grade, my assessment will assess all three strategies. By doing this, I will be able to see which of the three strategies my students can recall and with which strategies my students may need some additional practice.

### Assessment

My final version of the assessment is on the next page. The last problem has been updated to include a problem in which the least common denominator is not found by “quick denominators” and is not one of the denominators already. I will give this assessment with the iPad application [Educreations](#).

## Finding Common Denominators

1. Add the following fractions, showing all of your work.

$$\frac{1}{4} + \frac{3}{8}$$

$$\frac{\square}{\square} + \frac{\square}{\square}$$

$$\frac{\square}{\square}$$

2. Subtract the following fractions, showing all of your work.

$$\frac{3}{5} - \frac{1}{3}$$

$$\frac{\square}{\square} - \frac{\square}{\square}$$

$$\frac{\square}{\square}$$

3. Compare this pair of fractions by finding common denominators. Insert the correct sign: < (less than), > (greater than), or = (equal to).

$$\frac{7}{9}, \frac{5}{6}$$

$$\frac{7}{9} \square \frac{5}{6}$$

### **Assessment instructions**

When I give this assessment in class, I will say, “Last year, you learned to add, subtract, and compare fractions with unlike denominators. One of the steps you need to follow in order to successfully do this is to find common denominators. This year, we will continue working on adding and subtracting fractions. We will also be learning how to divide fractions, in which one of the steps is finding common denominators. It is really important to be able to find common denominators! I am going to have you show me what you already know about finding common denominators so I can give you feedback and help you work towards understanding how to do this if you don’t already understand it.”

“We are going to use an iPad app called Educreations. I have created a video tutorial so that you can see how it works. Let’s watch it together now.”

### [Video tutorial](#)

“At the beginning of the video, I said the first thing you will want to do is to save the picture I sent you in your email this morning. Please log into your email, click on the email from me, click on the picture file, click and hold on the picture, and press ‘Save Image’.”

I will give students a little bit of time to do this. I will have the instructions for retrieving the image on the whiteboard so that students can look back to the steps if they need to.

“Now go back into the Educreations app, click that plus sign, click on the picture, click on ‘Camera Roll’, and select the picture you just saved from your email.”

I will give students a little bit of time to do this. I will have the instructions for inserting the image on the whiteboard so that students can look back to the steps if they need to.

“When you are done, click the button in the upper left corner. Then click on ‘Save Finished Video’.”

I will have the instructions for saving the recording on the whiteboard so that students can look back to the steps if they need to. Then I will spread the students out so that they have some personal space while they record.

### **Rationale for Educreations**

When choosing a way to assess, a teacher must consider the affordances and constraints of different formats. I chose to use Educreations because the affordances greatly outweigh the constraints. The main constraint of using Educreations at this point in my sixth grade math class is that the students have not used it before and therefore must be taught how to use it before I expect them to show me what they know about finding common denominators with it. Of course, if I had my students use this app earlier in the year, I would not have to do this.

One affordance of using this application is that it allows me to hear a student's thinking while they are working on a problem. This is valuable information to me – sixth grade students often are not able to demonstrate their full understanding when solving a problem on paper. If I can hear their thinking as well as see it, it adds another layer of information for me to use when assessing their level of understanding. A second affordance is one recommended by Rob Reetz in his [YouTube video](#) (2012): using different colors to indicate different levels of confidence. In my video tutorial in the Assessment Instructions section, I ask my students to use green if they are confident, yellow if they are sort of confident, and red if they are not at all confident. This adds a third layer of information for me to use when assessing their level of understanding.

### **Feedback plan**

Hattie and Timperley say that good feedback is related to the goals being assessed (2007, p. 84; Nicol & Macfarlane-Dick, 2006, p. 199-218). When I provide my students with feedback on the assessment, I will communicate to students how they are progressing toward the goal of being able to find common denominators. I will also communicate to students a strategy to find common denominators if they are having difficulty with one of the questions, as recommended by Hattie and Timperley (2007, p. 91). I will provide written comments, not grades, because “providing written comments is more effective” and “[grades] do not affect performance” (Hattie & Timperley, 2007, p. 92). I would like to give this assessment using the iPad application Educreations. This will let me hear the students talk about why they are choosing the denominators that they are choosing, which will provide me more insight, and in turn will help me provide my students better feedback. I will email students their feedback in the form of written comments along with a link to their assessment so that they have a visual reference for the feedback.

### **Post-assessment instruction**

Students that demonstrate that they cannot recall how to find common denominators will participate in a mini-lesson with me. Hattie and Timperley said in their article, “Under particular circumstances, instruction is more effective than feedback. Feedback can only build on something; it is of little use when there is no initial learning or surface information” (2007, p. 104). Therefore, students that do not demonstrate understanding will receive more instruction about how to find common denominators. I will pull them as a small group (or groups, depending on how many students need this) to work with them on finding common denominators with models and then through finding equivalent fractions. After receiving this additional instruction and after giving them some time to practice, I will assess them again. This time, I will use [Edmodo](#).

### **Assessment**

Please watch the screencast below to see this assessment.

[Screencast](#)

### **Assessment instructions**

When I give this assessment to the students that received the additional instruction, I will say to them, “Now it is time for you to have another chance to show me what you know about finding common denominators. Think about what you learned when we did our mini-lesson reviewing how to find common denominators so that we can add, subtract, and compare fractions. This time, you will be using Edmodo. Go to [edmodo.com](https://edmodo.com), click on ‘I’m a student,’ click on ‘Continue with Office 365’ at the bottom, and log in with your school email. After you log in, click on the quiz called ‘Finding common denominators’ and get started.”

I will have these same steps written on the whiteboard for students to reference.

### **Rationale for Edmodo**

Edmodo allows for different question formats, which in turn allows for different types of feedback. By using some multiple choice questions, I will get a quick read of which of my students understand now and which are still having trouble. Students will also get feedback on these questions right away, which lets them know immediately how they are doing. By using a short answer question, I will get the chance to see deeper into my students’ thinking and provide them with more personalized feedback.

A constraint about using Edmodo is that it requires only one multiple choice response to be correct. When finding common denominators, technically there is more than one answer possible. There is only one least common multiple, but because I am not requiring that the common denominator be the least common multiple, any common multiple is a correct answer. However, given the options I have created for this assessment, the students should be able to identify which one of the options is a common multiple of the original denominators and which options are not.

### **Feedback plan**

Edmodo will provide the students with feedback on the multiple choice questions immediately. I will need to read through my students’ responses to the short answer question and provide them with personalized feedback, which I can do within Edmodo. As I stated above, in order for my feedback to be valuable, it needs to communicate how the student is progressing towards the goal of finding common denominators. Again, if the students still are not demonstrating understanding, they need more instruction.

### **Post-assessment instruction**

I will refer students that still do not demonstrate understanding of finding common denominators to [Khan Academy](https://www.khanacademy.com). I will require them to complete all modules of this page through Quiz 2. This page will give them additional instruction and practice with finding common denominators, adding fractions, and subtracting fractions.

### **Rationale for Khan Academy**

I chose to use Khan Academy at this point because provides instruction, practice, and feedback. It also allows students to work at their own pace, which is what the students may need if the mini-lesson was ineffective. This will allow students to slow down and review the concepts again.

## References

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