



Math: Standards Follow-Up Training Grades 3-5

Introductions

- Turn to your table groups and introduce yourself, highlighting the following:
 - Your name, school, and position/subject area/grade level
 - Your goals for today's workshop

Session Norms

- Maintain focus on student outcomes
- Be present and engaged
- Be respectful with your use of technology
- Be reflective and solutions oriented
- Be mindful of the time and respectful of transitions

Background

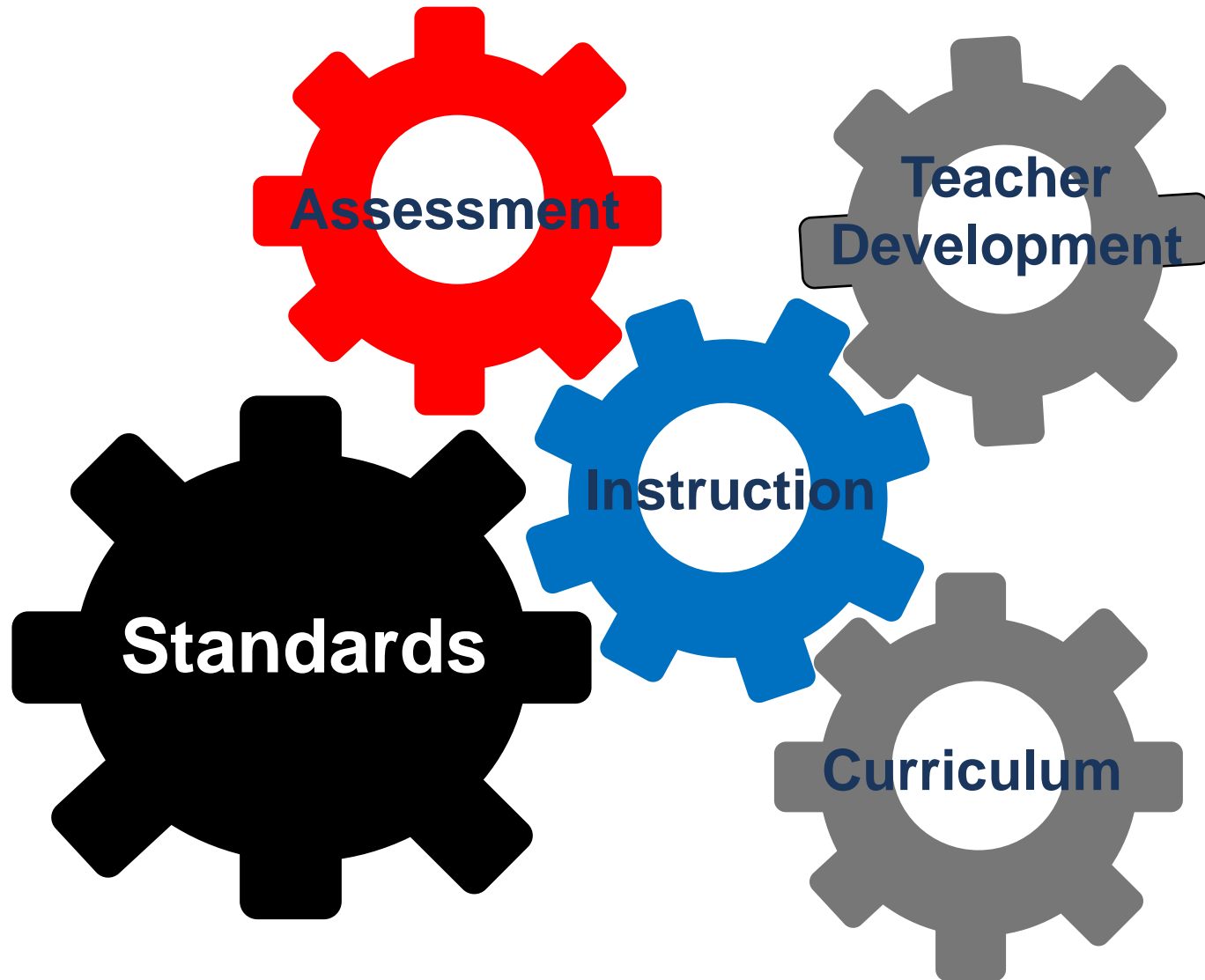
Through communications with districts, teachers, and through CORE, the following areas have been identified as areas of challenge for grades 3-5:

- Fractions
- Measurement and Data (Area and Volume)
- Developing an understanding of Fluency-Procedural and Computational

Objectives

- Connect Standards, Assessment and Instruction
- Discuss Aligned Systems of Assessments
- Develop Mathematical Learning Goals
- Develop Mathematical Performance Goals
- Evaluating and Selecting Assessment Items
- Practice Writing Assessment Items

Connecting Standards and Assessment



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**Connecting Standards,
Assessment, and
Instruction**

Instructional Focus Document

The purpose of this document is to provide teachers a resource which contains:

- The Tennessee grade level mathematics standards
- Evidence of Learning Statements for each standard
- Instructional Focus Statements for each standard

Instructional Focus Document

Numbers and Operations-Fractions (NF)

Standard 3.NF.A.1

Major Work of the Grade

Understand a fraction, $\frac{1}{b}$, as the quantity formed by 1 part when a whole is partitioned into b equal parts (unit fraction); understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$. For example, $\frac{3}{4}$ represents a quantity formed by 3 parts of size $\frac{1}{4}$.

Standard

Evidence of Learning Statements

Instructional Focus Statements

Instructional Focus Document-Evidence of Learning Statements

Numbers and Operations-Fractions (NF)

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Understand a fraction, $\frac{1}{b}$, as the quantity formed by 1 part when a whole is partitioned into b equal parts (unit fraction); understand a fraction $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$. For example, $\frac{3}{4}$ represents a quantity formed by 3 parts of size $\frac{1}{4}$.

Evidence of Learning Statements

Evidence of Learning Statements

Students with a level 1 understanding of this standard will most likely be able to:

Recognize when a whole is partitioned into 2,3,4,6, or 8 equal shares and use appropriate vocabulary to describe one of the shares.

Recognize that equal shares of identical wholes need not have the same shape.

Students with a level 2 understanding of this standard will most likely be able to:

Identify $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts when provided a visual representation.

Identify $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$ when provided a visual representation.

Students with a level 3 understanding of this standard will most likely be able to:

Identify $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts.

Create visual fraction models to represent a given unit fraction.

Identify $\frac{1}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$.

Students with a level 4 understanding of this standard will most likely be able to:

Create a variety of visual fraction models to represent the same given unit fraction.

Create visual fraction models to represent a fraction $\frac{a}{b}$ accurately.

Instructional Focus Statements

Instructional Focus Document-Evidence of Learning Statements

The four levels of the state assessment are as follows:

Level 1: Performance at this level demonstrates that the student has a minimal understanding and has a nominal ability to apply the grade/course level knowledge and skills defined by the Tennessee academic standards.

Level 2: Performance at this level demonstrates that the student is approaching understanding and has a partial ability to apply the grade/course level knowledge and skills defined by the Tennessee academic standards.

Level 3: Performance at this level demonstrates that the student has a comprehensive understanding and thorough ability to apply the grade/course level knowledge and skills defined by the Tennessee academic standards.

Level 4: Performance at this level demonstrates that the student has an extensive understanding and expert ability to apply the grade/course level knowledge and skills defined by the Tennessee academic standards.

Instructional Focus Document-Evidence of Learning Statements

The evidence of learning statements are guidance to help teachers connect the Tennessee mathematics standards with evidence of learning that can be collected through classroom assessments to provide an indication of how students are tracking towards grade-level conceptual understanding of the Tennessee mathematics standards.

The evidence of learning statements are categorized into four categories to provide examples of what a student who has a particular level of conceptual understanding of the Tennessee mathematics standards will most likely be able to do in a classroom setting. The provided evidence of learning statements are examples of what students will most likely be able to do and do not represent an exhaustive list.

Instructional Focus Document-Evidence of Learning Statements

Numbers and Operations-Fractions (NF)

Standard 3.NF.A.1

Major Work of the Grade

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Evidence of Learning Statements

Students with a level 1 understanding of this standard will most likely be able to:	Students with a level 2 understanding of this standard will most likely be able to:	Students with a level 3 understanding of this standard will most likely be able to:	Students with a level 4 understanding of this standard will most likely be able to:
<p>Recognize when a whole is partitioned into 2,3,4,6, or 8 equal shares and use appropriate vocabulary to describe one of the shares.</p> <p>Recognize that equal shares of identical wholes need not have the same shape.</p>	<p>Identify $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts when provided a visual representation.</p> <p>Identify $\frac{a}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$ when provided a visual representation.</p>	<p>Identify $\frac{1}{b}$ as the quantity formed by 1 part when a whole is partitioned into b equal parts.</p> <p>Create visual fraction models to represent a given unit fraction.</p> <p>Identify $\frac{1}{b}$ as the quantity formed by a parts of size $\frac{1}{b}$.</p>	<p>Create a variety of visual fraction models to represent the same given unit fraction.</p> <p>Create visual fraction models to represent a fraction $\frac{a}{b}$ accurately.</p>

Instructional Focus Statements

Level 3:

The primary focus of fraction instruction in grade 3 should be centered on two things: 1) developing the sense of fractions as numbers and 2) developing the idea of fractional amounts as equal parts of the same whole. Thus, collections of objects (set models) should not be a focus of grade 3 instruction. Additionally, in developing the concept that fractions are numeric values, there is not a need to distinguish between "proper" and "improper" fractions. Students should be able to verbalize that equal parts are parts with equal measure. That measure may be area or length, depending upon the visual fraction model. When describing a fraction, focus on using correct language. Consider the fraction $\frac{5}{4}$; this is described as 5 pieces that are $\frac{1}{4}$ in size. The most common error is to discuss the fraction as 5 out of 4 which is more of a ratio understanding. The ultimate goal is for students to see unit fractions as the basic building block for all fractions in the same sense that 1 is the basic building block for whole numbers.

Level 4:

Students should be encouraged to not only use provided visual fraction models to represent fractions, but to also create their own representations providing a justification as to why/how their model works and specifically identifying the whole and the equal parts.

**Instructional
Focus
Statements**

Instructional Focus Instructional Focus Statements

Instructional focus statements provide guidance to clarify the types of instruction that will help a student progress along a continuum of learning. These statements are written to provide strong guidance around Tier I, on-grade level instruction. Thus, the instructional focus statements are written for level 3 and 4.

Examining a Standard

- With a partner, find standard 3.NF.A.2
- Read the standards, the evidence of learning statements, and the instructional focus for 3.NF.A.2, 3.NF.A.2a, and 3.NF.2b.
- What was your biggest ah-ha moment?
- How might you use this document in your classroom?

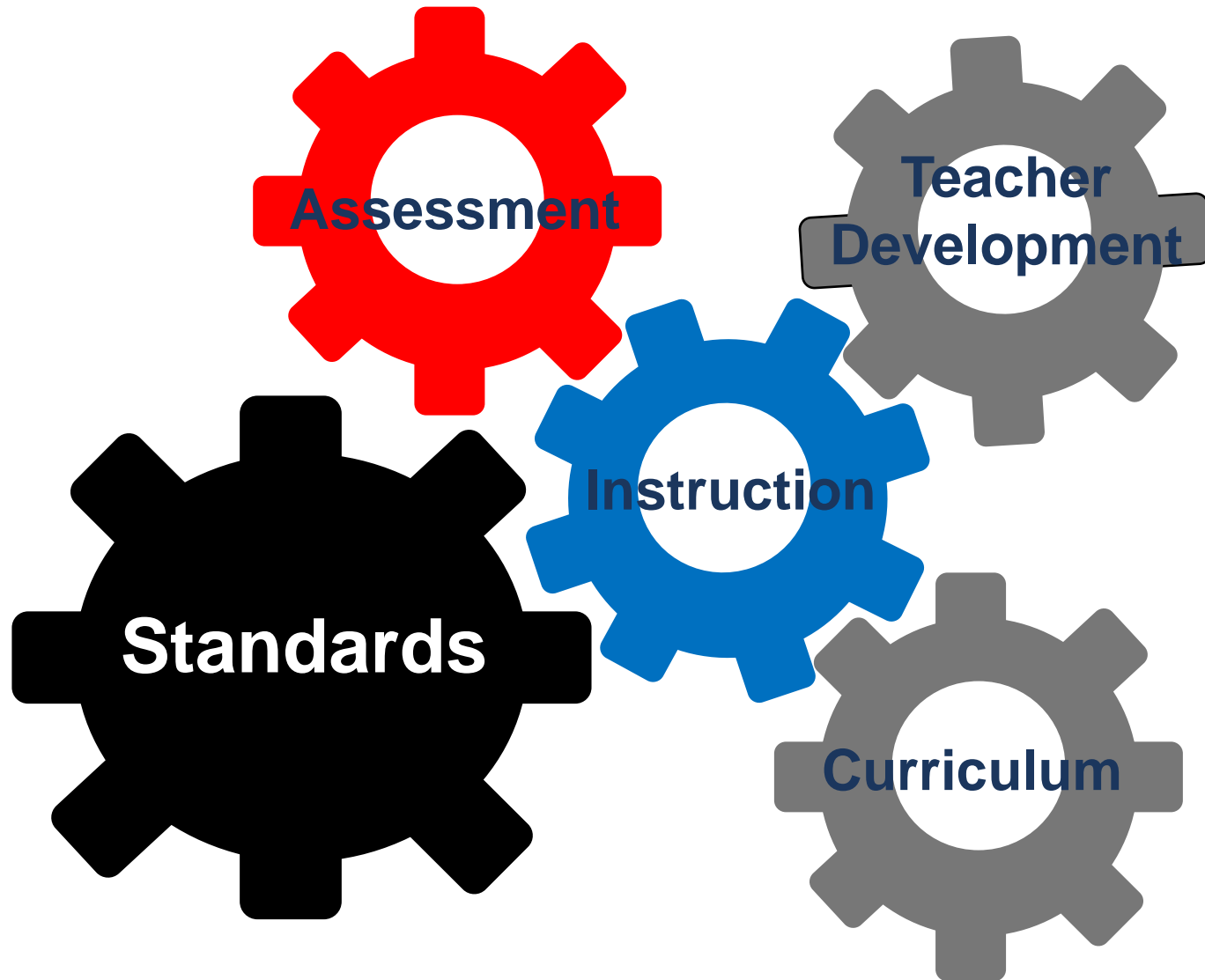
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Assessments

Connecting Standards and Assessment



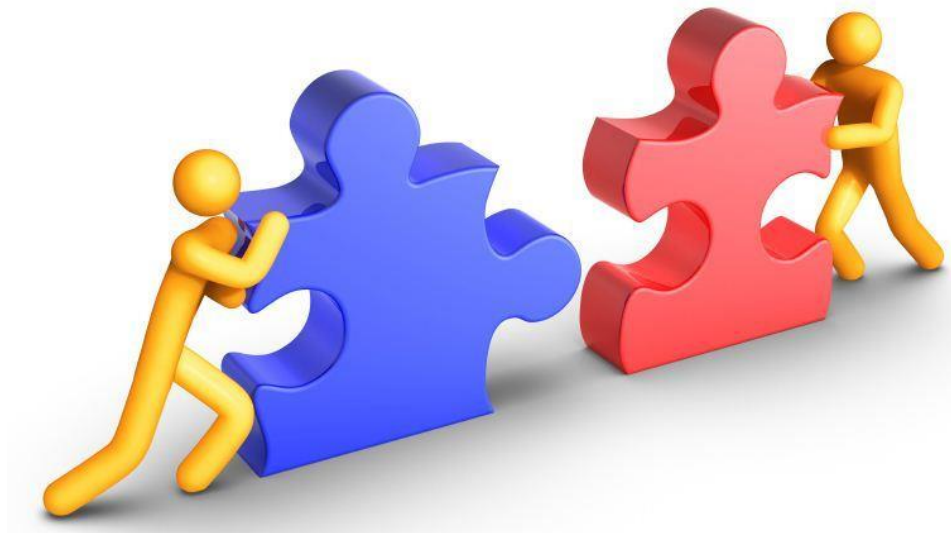
Aligned System of Assessments

Turn and Talk

How would you define an “aligned system of assessments”?

Aligned System of Assessments

An **aligned** system of assessments is designed to address grade-level appropriate, subject-specific concepts and skills as outlined in the Tennessee Academic Standards.



Aligned System of Assessments

An aligned **system** of assessments is an assessment system comprised of formative (classroom, benchmark, exit tickets, etc...) and summative assessments to support and extend learning.



Aligned System of Assessments

An aligned system of **assessments**...

Assessment is the action or an instance of making a judgment about something.

Considering this definition of assessment, what are educators “making a judgement about” when assessing students?

Turn and Talk to your Neighbor.

Aligned System of Assessments

Characteristics of a strong assessment system are that they:

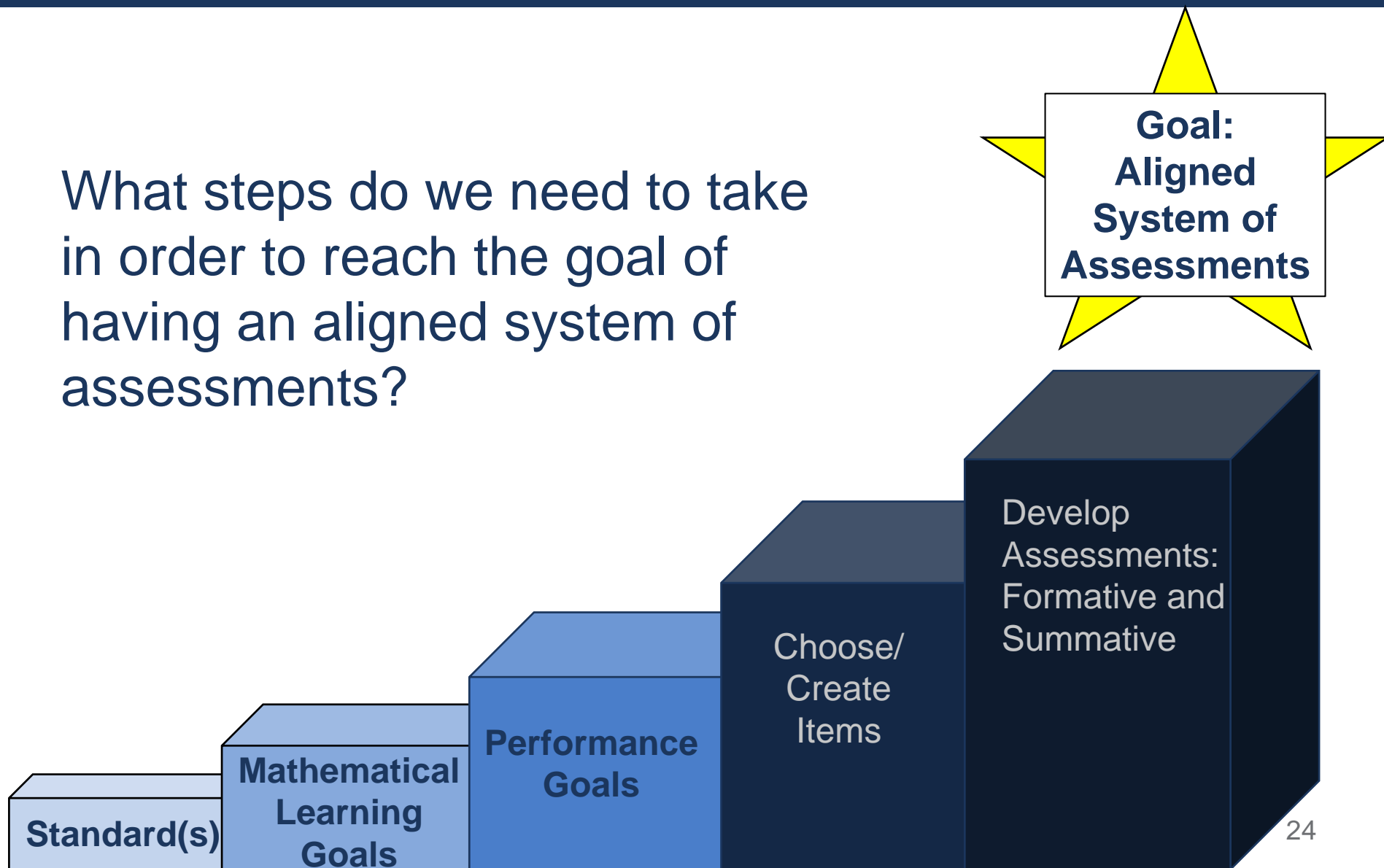
- provide information to drive instruction,
- scaffold and differentiate to drill down to skills mastered and skill deficits, and
- are utilized to give feedback to students, teachers, and parents in a timely manner.

Aligned System of Assessments

Intentional tracking of students' progress over time in order to elicit evidence that students are developing true conceptual understanding of grade level mathematics

How do we get there?

What steps do we need to take in order to reach the goal of having an aligned system of assessments?



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**Preparing to
Choose/Create
Assessment Items**

Steps Prior to Choosing/Creating Items

Before you actually start writing or selecting items:

- Read the standards carefully with the assessment purpose in mind. Ask yourself: “What skills/knowledge are the standards asking the student to display?”
- Identify the Mathematical Learning Goals for the standard(s).
- Identify Performance Goals for the standard(s)

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Mathematical Learning Goals and Performance Goals

NCTM Effective Teaching Practices

1. Establish mathematics **goals** to focus learning.
2. Implement **tasks** that promote reasoning and problem solving.
3. Build **procedural fluency** from conceptual understanding.
4. Pose purposeful questions.
5. Use and connect mathematical representations.
6. Facilitate meaningful mathematical **discourse**.
7. **Elicit and use evidence** of student thinking.
8. Support **productive struggle** in learning mathematics.

NCTM, 2014

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NCTM, 2014

Learning Goals and Performance Goals

Mathematical Learning Goals:

Describe what students should understand about a mathematics topic as an outcome of instruction.

Performance Goals:

Describe what we want students to say, write, show, or demonstrate as a result of the lesson. A set of performance goals lead to the overarching mathematical goals.

Characteristics

Mathematical Learning Goals should:

- Clearly state what it is students are to **learn** and **understand** about mathematics as the result of instruction;
- Be situated within learning progressions; and
- Frame the decisions that teachers make during a lesson.

NCTM Taking Action Series 2017

Characteristics

Performance Goals should:

- Describe what counts as **evidence** of student learning. How will they show they've mastered the learning goal?
- Describe how students will say, write, and demonstrate their mastery of the learning goal.
- May be differentiated depending on student needs to ensure multiple entry points to the learning goal but the trajectory of learning should result in the same overall learning goal.

Mathematical Learning Goal and Performance Goal Examples

5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

Learning Goal	Performance Goal
Understand that when adding and subtracting fractions, the fractions must be referring to the same size whole.	Students will be given models of fractions from different size wholes. Students will recognize that the fractions cannot be added or subtracted and explain why.

Turn and Talk

How are Mathematical Learning Goals and Performance Goals the same? How are they different?

Mathematical Learning Goal and Performance Goal Examples-Your Turn

In groups of 2-3, write additional Mathematical Learning Goals and Performance Goals for 5.NF.A.1.

5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

What are some additional Mathematical Learning and Performance Goals?

Small Group Discussion

- Share the created mathematical learning and performance goals at your table
- Choose one to share with the whole group

Identifying Mathematical Learning and Performance Goals-Your Turn

Partner Activity

In groups of 2-3 work together to write mathematical learning goals and performance goals for standard 4.NF.A.1. Use the Instructional Focus Document as a reference.

Record your group work on chart paper. write the learning goals in one column and the performance goal that shows what counts as evidence of mastery of the learning goal in the other column.

4.NF.A.1

Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{a \times n}{b \times n}$ or $\frac{a \div n}{b \div n}$ by using visual fraction models, with attention to how the number and size of the parts differ, even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

For example, $\frac{3}{4} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}$.

Gallery Walk

Walk around and look at the mathematical learning goals and performance goals created by each group. Look for similarities and differences from what your group wrote.

Whole Group Discussion/Activity

- Identify common themes in the created mathematical learning goals
- Record a common set of mathematical learning goals and performance goals as a point of focus for later activities

Think about it...

*Formulating clear, explicit learning goals
sets the stage for everything else.*

Hiebert, Morris, Berk, & Janssen, 2007

Lunch Break!

Welcome Back!



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Choosing and Creating Assessment Items

Preparing to Create an Aligned System of Assessments

- Reviewing mathematical learning goals and performance goals help target assessment items specifically to standards.
- Think about universal design.
- Think about the variety of question formats within the suite of items.
- Think about items that can be on both formative and summative assessments.

Preparing to Create an Aligned System of Assessments

- Reviewing mathematical learning goals and performance goals help target assessment items specifically to standards.
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Continuing with Standard 4.NF.A.1

Let's review the Mathematical Learning Goals and Performance Goals developed before lunch.

Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{a \times n}{b \times n}$ or $\frac{a \div n}{b \div n}$ by using visual fraction models, with attention to how the number and size of the parts differ, even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

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Preparing to Create an Aligned System of Assessments

- Reviewing mathematical learning goals and performance goals help target assessment items specifically to standards.
- **Think about universal design.**
- Think about the variety of question formats within the suite of items.
- Think about items that can be on both formative and summative assessments.

Quality Assessments

Universal Design Principles:

- No barriers
- Accessible for all students
- Upholds the expectations of our state standards

Preparing to Create an Aligned System of Assessments

- Reviewing mathematical learning goals and performance goals help target assessment items specifically to standards.
- Think about universal design.
- Think about the variety of question formats within the suite of items
- Think about items that can be on both formative and summative assessments.

Item Types

Traditional Classroom Formative/Summative Assessment Item Types:

- Multiple Choice
- Multiple Select
- Fill in the Blank
- Matching Items (some are tables)
- Short Constructed Response where students provide a brief explanation
- Open Response

Open Response Items

Open Response: There are a wide variety of open response approaches teachers can use with students. These may include:

- Providing work with a statement of justification
- Creating a contextual problem to represent an equation
- Conceptually explaining a mathematics concept
- Explain why a strategy does or does not work in a given situation
- In EOC courses, proofs
- Explaining the connections that exist between two strategies
- Make viable arguments and justify reasoning when looking at sample student work

Creating an Aligned System of Assessments

- Reviewing mathematical learning goals and performance goals help target assessment items specifically to standards.
- Think about universal design.
- Think about the variety of question formats you want to have within the suite of items.
- Think about items that can be on both formative and summative assessments.

Formative vs Summative

How are the results used?

Formative	Summative
<ul style="list-style-type: none">• During the instructional process• Teachers use to make decisions• Students use to make decisions• Ongoing process• Assessment for Learning	<ul style="list-style-type: none">• At the conclusion of an instructional process• Used to make a judgement of some sort• Used to evaluate program effectiveness• Assessment of Learning



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Choosing Assessment Items

Activity

You will be given some items/sets of items found online that were aligned to 4.NF.A.1.

Working in groups of 2-3, for each item/set of items give the following:

- Label each item/set of items as formative, summative, or both.
- Which Mathematical Learning Goal does each align to?
- Which Performance Goal does each align to?
- Which level from the Evidence of Learning Statements (1-4) on the Instructional Focus Document best matches each?
- Would you modify the item(s) in any way? If so how?

Whole Group Discussion

- Which items did your group classify as formative only? Why?
- Which Items did your group classify as summative only? Why?
- Which items did your group classify as both?
- How did the Mathematical Learning Goals and Performance Goals help when looking at the items?
- How did the Evidence of Learning Statements help?
- Did your group have any ah-ha moments?
- Did we cover all aspects of the Mathematical Learning Goals and Performance Goals with these items?

Choosing good Items: 9 Essential Questions

What is the question actually asking?

Across all items, are there questions aligned to the depth of the standard?

Are the answers precise?

Is the wording grade appropriate?

Is the question aligned to the standard?

Do the distractors give insight into student thinking?

Is the entire standard assessed in the suite of items?

Is the question precise?

Is there a better way to assess the standard?

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Assessment Item Writing

Activity

- In your groups, write items to address the mathematical learning goals and/or performance goals that were not assessed with the items we previously reviewed.
- Remember to:
 - Think about universal design.
 - Think about the variety of question formats within the suite of items.
 - Think about items that can be on both formative and summative assessments.

4.NF.A.1

Explain why a fraction $\frac{a}{b}$ is equivalent to a fraction $\frac{a \times n}{b \times n}$ or $\frac{a \div n}{b \div n}$ by using visual fraction models, with attention to how the number and size of the parts differ, even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

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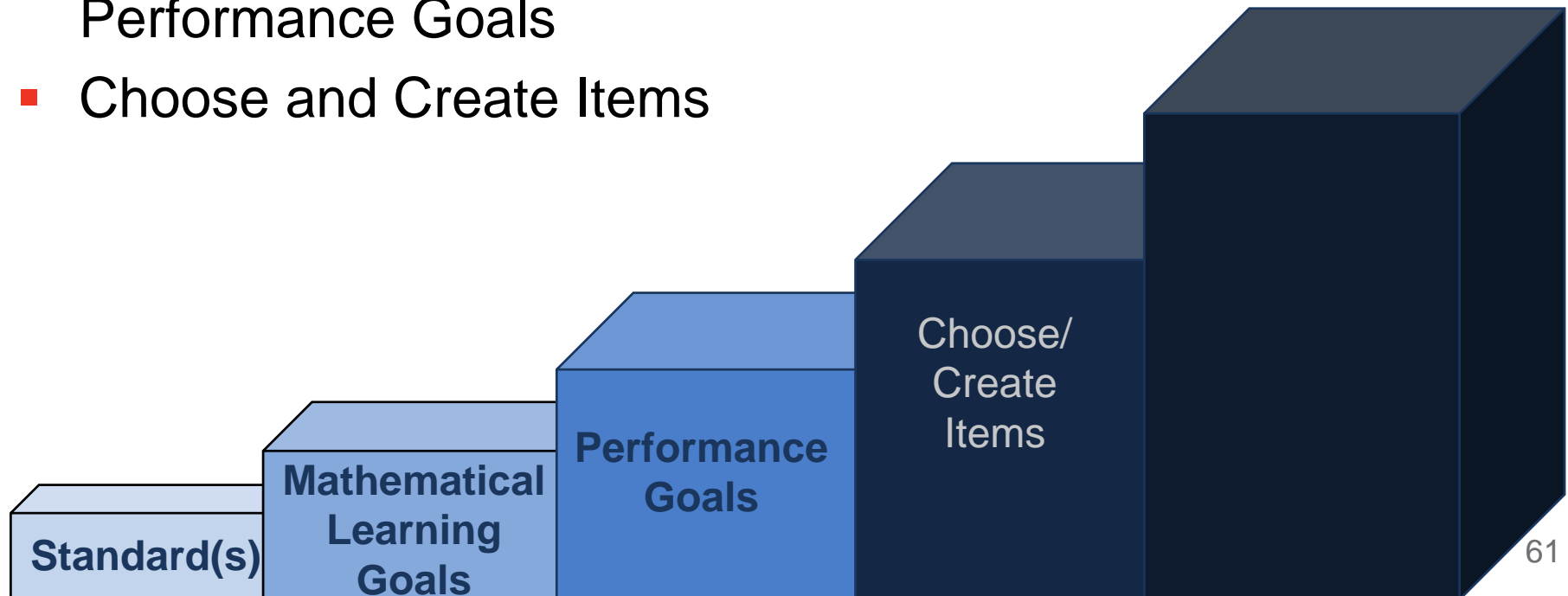
Chart and post your tables favorite 3 items.

Group Discussion

- What was your favorite item? Why?
- What evidence did you see of an items assessing mathematical learning goals?
- What evidence did you see of items assessing performance goals?

Steps for Preparing to Develop an Aligned System of Assessments

- Analyze the standard (instructional focus document)
- Write Mathematical Learning Goals
- Write Performance Goals
- Find or write items that address the depth and breadth of both the Mathematical Learning Goals and the Performance Goals
- Choose and Create Items



Activity

- Work in groups of 2-3
- Choose a standard that is included in the Instructional Focus Documents that we have not yet worked with
- Analyze the standard (instructional focus document)
- Write Mathematical Learning Goals
- Write Performance Goals
- Find aligned items online or in your instructional materials
- Write any items that are needed to fill the gaps so that all of the goals you have written have been addressed with the suite of items.

Chart and post your groups favorite items.

Gallery Walk

Walk around and look at the items created for each standard.

Think about the following:

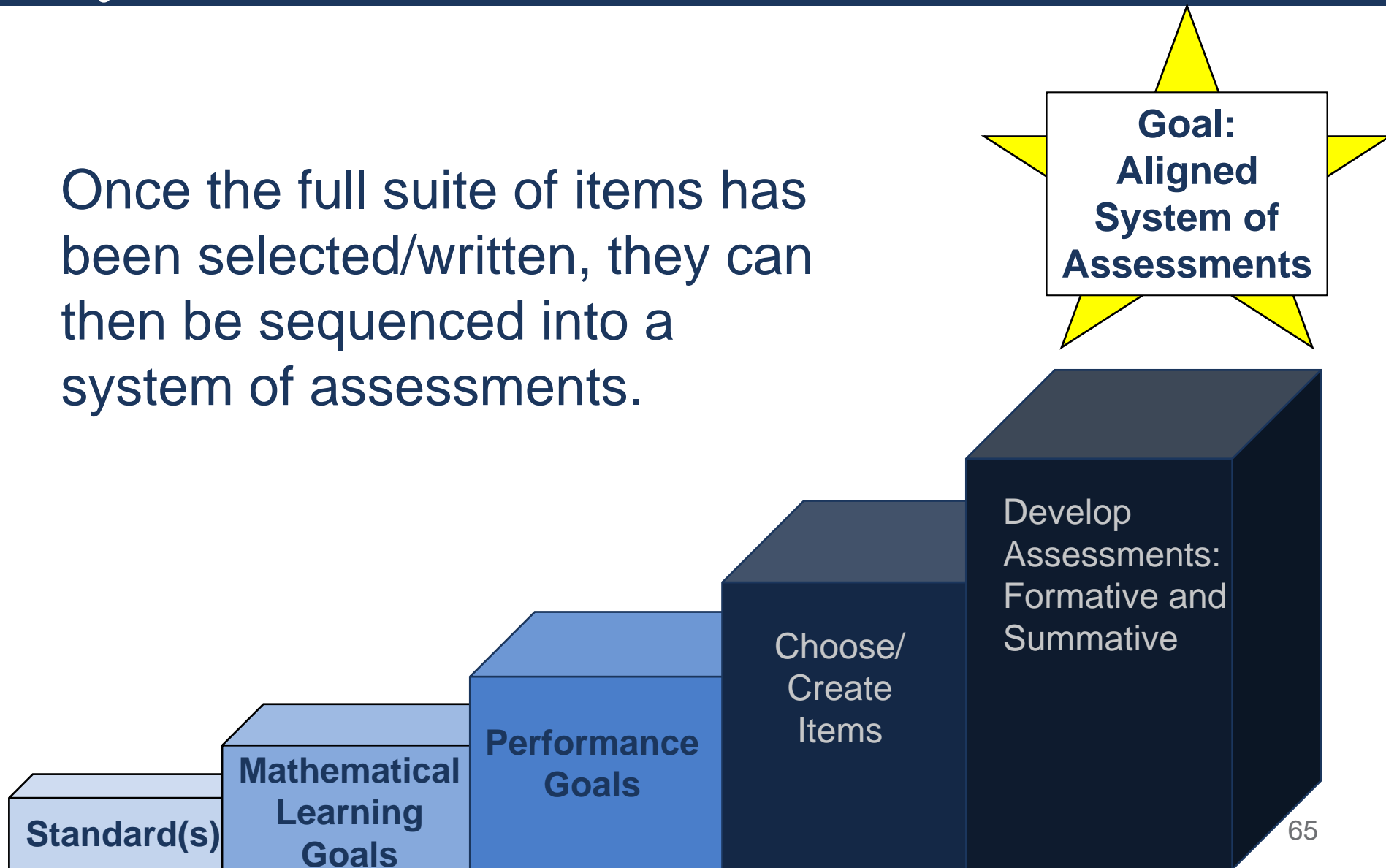
- Are there a variety of item types?
- Are some of the items more formative in nature?
- Are some of the items more summative in nature?
- Are there items that assess the conceptual pieces as well as the procedural pieces of the standards?

Group Discussion

- What was your favorite item? Why?
- What evidence did you see of a progression of items across all 4 levels in the Instructional Focus Documents?
- What evidence did you see of a variety of item types?
- What was the most difficult part of this process?

Turning a set of items into an Aligned System of Assessments

Once the full suite of items has been selected/written, they can then be sequenced into a system of assessments.

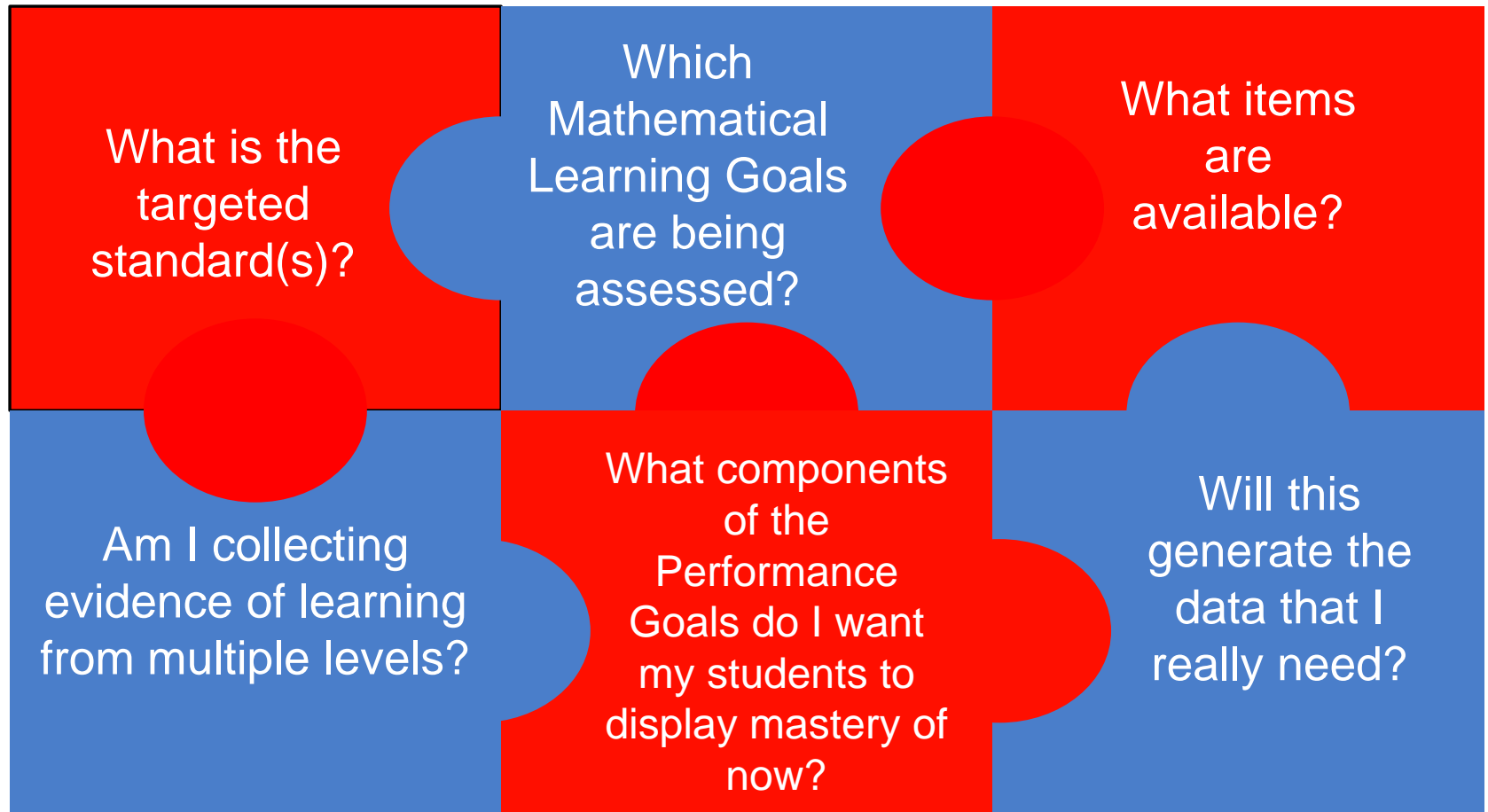


Aligned System of Assessments

For each assessment developed:

1. Think about the intent of each assessment
 - Summative
 - Formative
2. Think about the content and structure of each assessments
3. Choose items for each assessment
4. Think about what analysis you will want following each assessment

Content and Structure of an Assessment



Choosing Items

- Guided by the type of assessment (formative vs summative)
- Guided by the answers to the questions from “content and structure”
 - Which Mathematical Learning Goals are being assessed?
 - What components of the Performance Goals do I want my students to display mastery of now?
 - Am I collecting evidence of learning from multiple levels?

Analysis of Assessment

Is the assessment developed in a way so that the following can be answered?

- What data will the assessment generate? Is this the right data?
- How will it be analyzed?
 - On which questions did students perform well? Why?
 - On which questions did students perform poorly? Why?
 - Were there issues with poorly written questions, questions not really aligned to standards, multiple correct answers, a lack of preparation...
- How will my instruction change as a result of the data?

Result

You will have developed an aligned system of assessments which provides intentional tracking of students progress over time in order to elicit evidence that students are developing true conceptual understanding of grade level mathematics.

They provide information to drive instruction, scaffold and differentiate in order to drill down to concepts mastered and concept deficits, and can be utilized to give feedback to students, teachers, and parents in a timely manner.

Think about it...

“If you don't know where you are going,
you'll end up someplace else.”

Yogi Berra

Closing

Today we have:

- Connected Standards, Assessment and Instruction
- Discussed Aligned Systems of Assessments
- Developed Mathematical Learning Goals
- Developed Mathematical Performance Goals
- Evaluated and Selected Assessment Items
- Practiced Writing Assessment Items

Contact Information

Melissa Haun

Melissa.Haun@tn.gov

615-708-6541



Districts and schools in Tennessee will exemplify excellence and equity such that all students are equipped with the knowledge and skills to successfully embark on their chosen path in life.

Excellence | Optimism | Judgment | Courage | Teamwork