



Pearson

Kentucky Spring 2020 Item Review Committee

Mathematics

15 October 2019

Kentucky Academic Standards



Mathematics

Introductions – KDE staff

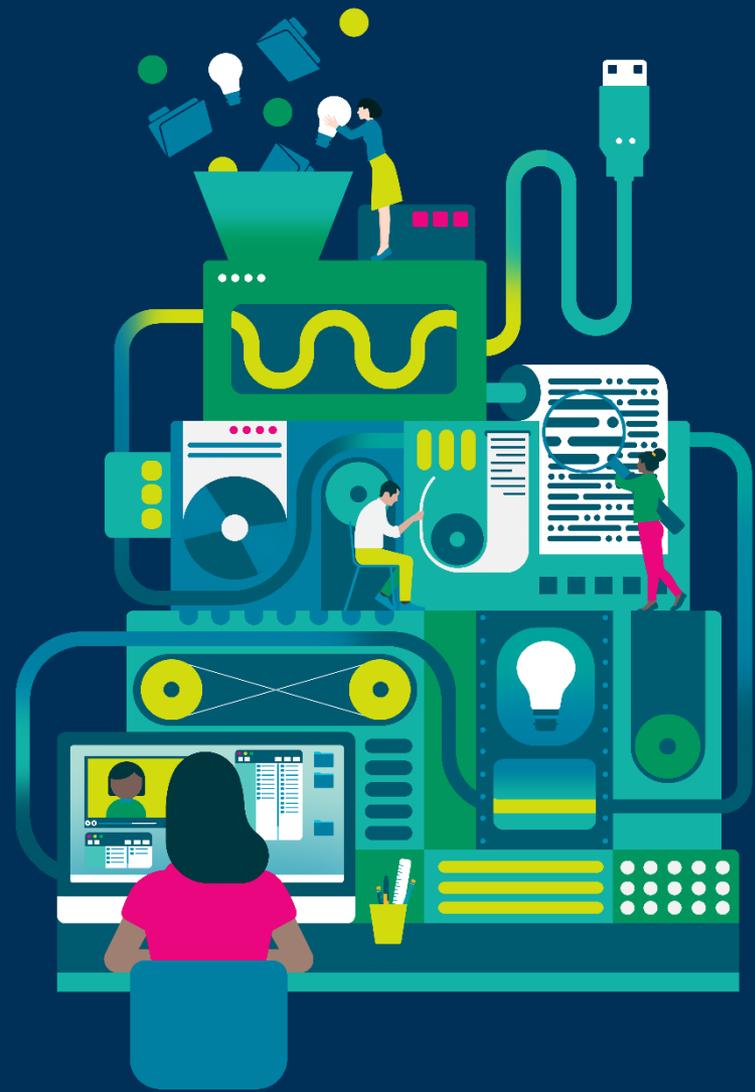
- **Rhonda Sims**, Associate Commissioner, Office of Standards, Assessment and Accountability
- **Roger Ervin**, Systems Administrator IT, Office of Standards, Assessment and Accountability
- **Krista Hall**, Director, Division of Program Standards
- **Thomas Clouse**, Education Academic Program Manager, Division of Program Standards
- **Erin Chavez**, Academic Consultant, Division of Program Standards
- **Maggie Doyle**, Academic Consultant, Division of Program Standards



Introductions – Content Development staff

- **Adrian Rivera**, Pearson, Test Development Manager
- **Jennifer Novak**, Pearson, Math Content Lead
- **Jiselle Jones**, Pearson, Math Content
- **Katherine Grice**, Measurement Inc, Project Manager
- **Trina Allen**, Measurement Inc, G3 Content Lead
- **Peg Burkman**, Measurement Inc, G4 Content Lead
- **Nicole Allen**, Measurement Inc, G5 Content Lead
- *Robyn Lockett*, Measurement Inc, G6 Content Lead
- **Lisa Reid**, Measurement Inc, G7 Content Lead
- **Johannah Maynor**, Measurement Inc, G8 Content Lead
- **Maud Eno**, Measurement Inc, G10 Content Lead





Kentucky's Vision for Students

“Each and every student is empowered and equipped to pursue a successful future.”



Group Norms

- ▶ Assume best intentions.
- ▶ Listen carefully to one another.
- ▶ Be open to new ideas.
- ▶ Be open to working outside your comfort zone.
- ▶ Ask questions.
- ▶ Allow a chance for everyone to participate.





Setup for Success: Brainwriting

Hearts:

What is something you've tried in your classroom this year for the first time? How did it go?

Spades:

What is one way you've grown professionally this year?

Clubs:

Who amongst your colleagues has been the most helpful to you? Why?

Diamonds:

In what ways were you helpful to your colleagues this year?





Kentucky Academic Standards for Mathematics



Statistics and Probability	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them.	MP.5. Use appropriate tools strategically.
MP.2. Reason abstractly and quantitatively.	MP.6. Attend to precision.
MP.3. Construct viable arguments and critique the reasoning of others.	MP.7. Look for and make use of structure.
MP.4. Model with mathematics.	MP.8. Look for and express regularity in repeated reasoning.

Cluster: Develop understanding of statistical variability.

Standards	Clarifications
KY.6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. MP.1, MP.3, MP.6	For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates a variety of values with associated variability in students’ ages. Coherence KY.5.MD.2→KY.6.SP.1→KY.7.SP.1
KY.6.SP.2 Understand that a set of numerical data collected to answer a statistical question has a distribution which can be described by its center, spread and overall shape. MP.2, MP.6, MP.7	Students distinguish between graphical representations which are skewed or approximately symmetric; use a measure of center to describe a set of data. Coherence KY.5.MD.2→KY.6.SP.2→KY.7.SP.3
KY.6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number to describe a typical value, while a measure of variation describes how the values in the distribution vary. MP.2, MP.5, MP.6	Emphasis is on the sensitivity of measures of center to changes in the data, such as mean is generally much more likely to be pulled towards an extreme value than the median. Additionally, measures of variation (range, interquartile range) describe the data by giving a sense of the spread of data points. Coherence KY.6.SP.3→KY.7.SP.4

Attending to the Standards for Mathematical Practice

Students recognize a question such as “What did I eat for breakfast?” is not a statistical question, whereas “What is the most popular breakfast in my school?” will elicit data they can measure precisely (**MP.6**) and draw conclusions based on that data (**MP.3**). After collecting data, by creating a distribution of that data, students recognize data generally follows a structure and can be described in terms of that structure (**MP.7**). By accurately calculating the mean (or any other statistical measure), students are now more precise in describing data, going from, for example, describe the rainfall for the month as “about average” to “the rainfall this month is slightly higher than the mean of the last 10 years and within the interquartile range for that data.” (**MP.6**)

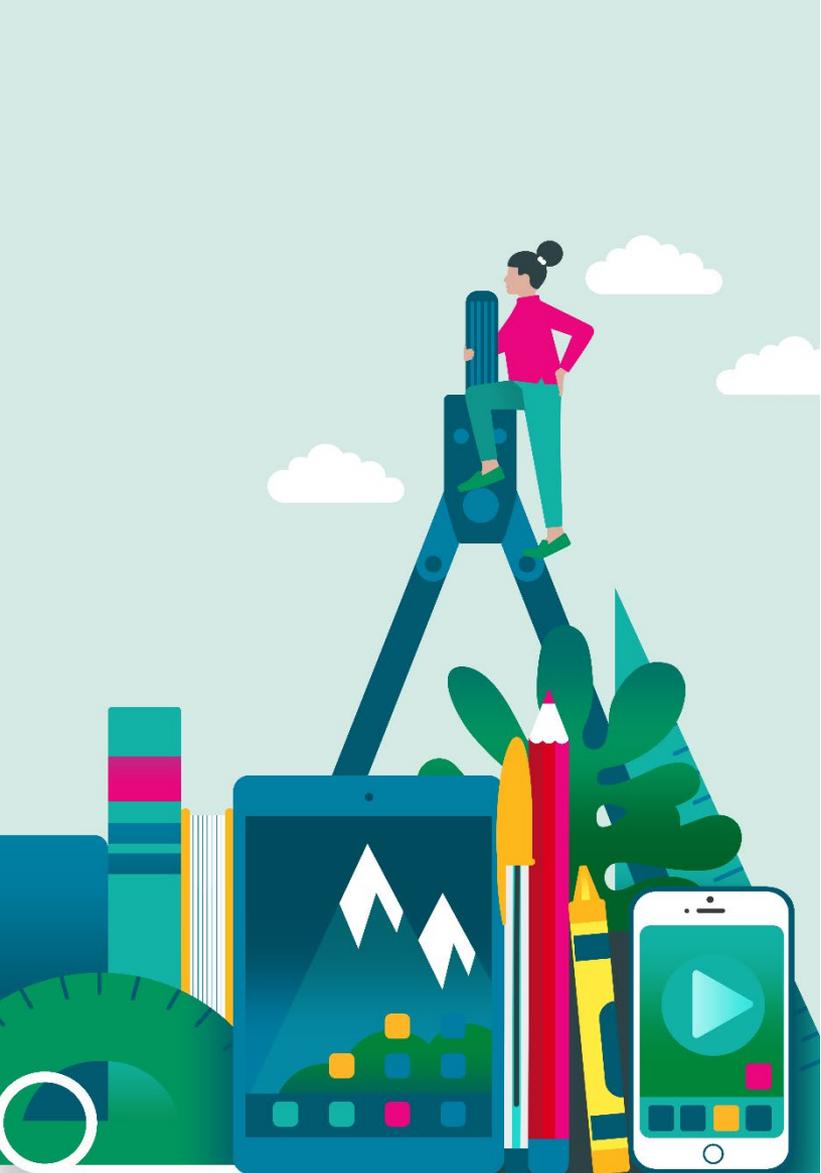


Table of Contents

01 Item Development

02 Item Banking System - ABBI

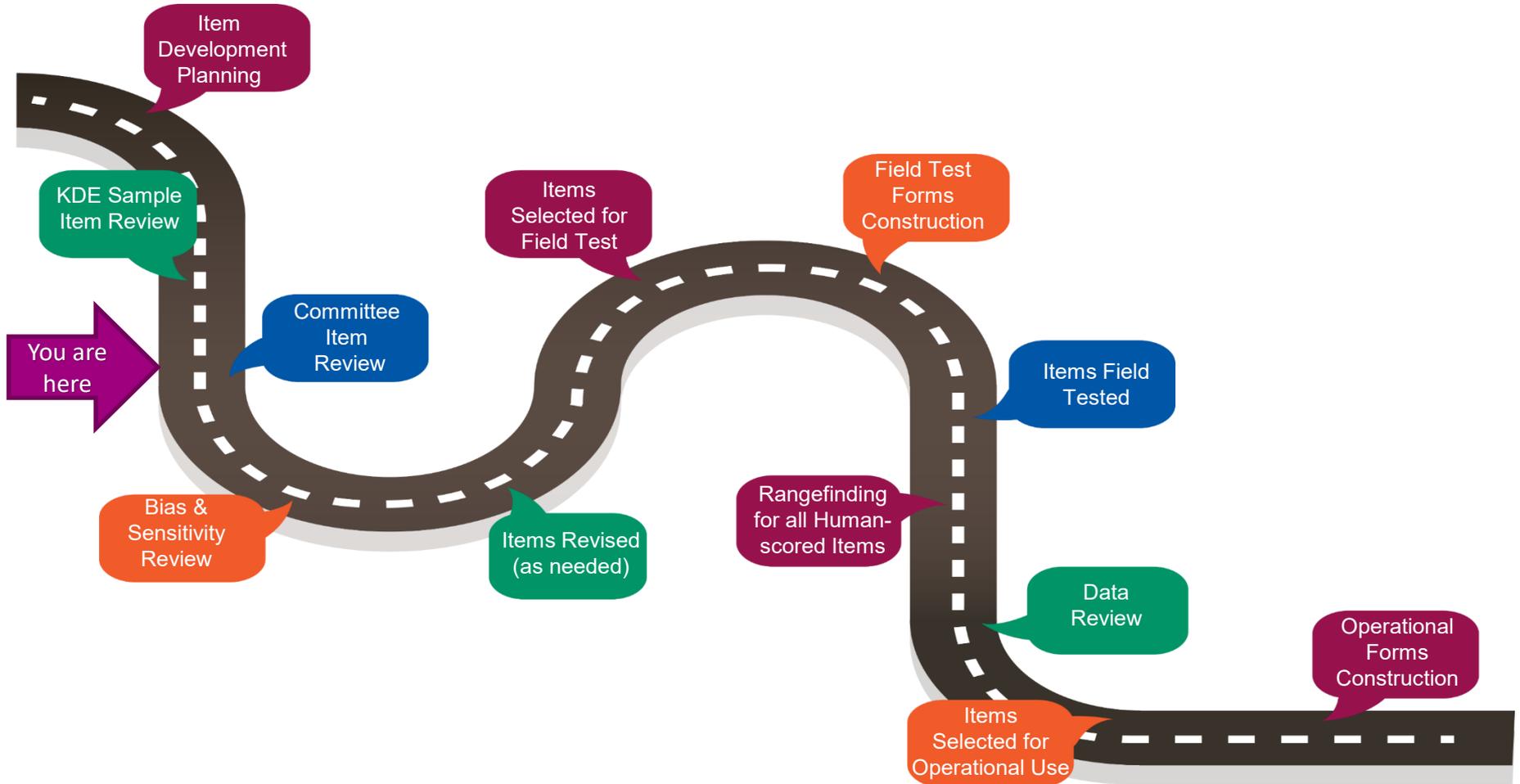
03 Committee Item Review Steps

04 Questions

The image features a white circle centered on a blue background. The background is filled with a repeating pattern of dark blue, wavy, irregular lines that resemble stylized waves or a topographical map. The white circle is perfectly circular and contains the text "Item Development" in a bold, dark blue, serif font.

Item Development

The Journey of an Item



Math Item Types

Item Type	Point Values	ABBI Element	Scoring Method
Multiple choice (MC)	0 or 1	<ul style="list-style-type: none"> Choice 	<ul style="list-style-type: none"> Machine scored
Technology Enhanced (TE) or Fill-in-the-blank (FIB)	0 or 1	<ul style="list-style-type: none"> Variety of Elements 	<ul style="list-style-type: none"> Machine scored
Multiple Select (MS)	0, 1, or 2	<ul style="list-style-type: none"> Choice 	<ul style="list-style-type: none"> Machine scored
Short Answer (SA)	0, 1, or 2	<ul style="list-style-type: none"> Technology Enhanced Parts Equation Editor 	<ul style="list-style-type: none"> Machine scored AI scored Human scored
Extended Response (ER)	0, 1, 2, 3, or 4	<ul style="list-style-type: none"> Technology Enhanced Parts Equation Editor 	<ul style="list-style-type: none"> Machine scored AI scored Human scored

Cluster Sets

- Allows for multiple item types (assessing different standards) to share a common context.
- Each item part is independent of the other item part(s).
- A variety of item types can be used in the cluster set.
 - Examples:
 - MC, MC, MC
 - MC, MS, SA
 - MS, MC, ER
- Cluster items can be identified by their UINs.

Clusters	Grade 6
Stimulus	MA0620C1_00
Item 1	MA0620C1_01
Item 2	MA0620C1_02
Item 3	MA0620C1_03
Item X	MA0620C1_XX

The background is a solid blue color with a repeating pattern of dark blue, wavy, irregular lines that resemble stylized waves or a topographical map. In the center of the image is a large, white, solid circle. Inside this circle, the text "Committee Item Review Steps" is written in a dark blue, serif font, centered horizontally and vertically.

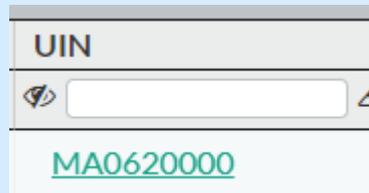
**Committee Item
Review Steps**

Step 1 - Work Item Independently

The items for your review are located in the ABBI system.

Each participant will be assigned a group of items to review.

- The items are sequenced in ABBI.
- Your room facilitators will guide you on how to login to access your items.
- Select the UIN of the item you wish to review.



A screenshot of a web form. The form has a header section with the text "UIN". Below this is a search input field with a magnifying glass icon on the left and a clear icon on the right. The input field contains the text "MA0620000".

- Select TN8 Preview.



- Work the item.

Note: All scratch paper will be collected at the end of each day.

Step 2 – Score the Item

- Select your answer in TN8 Preview.
- Select Score Responses.

<input type="checkbox"/> Get Responses:	Variable RESPONSE = ["B_PNMdm"]
<input checked="" type="checkbox"/> Score Responses:	MAXSCORE = 1.0 SCORE = 1

- MAXSCORE reflects the total number of points possible.
- Score reflects the total number of points scored as correct.
- Only machine-scored items will reflect a number other than “0” for the SCORE.
 - Example (human-scored SA)

<input checked="" type="checkbox"/> Score Responses:	MAXSCORE = 2.0 SCORE = 0
--	-----------------------------

- Verify that the key or rubric(s) is correct for the item.

Step 3 – Verify Alignment to KAS

Use the online version of the Kentucky Academic Standards to verify the following:

- Item aligns to the targeted KAS.
- Item is not written above or below the grade level for which it is intended.
- Is there a coherent connection to the same topic in a previous grade?
 - If so, is the task crafted to elicit a more sophisticated level of understanding than would have been acceptable in the previous grade?
- Has answer choices that are plausible and attractive to the student who has not mastered the objective or skill.
- Is conceptually, grammatically, and syntactically consistent between the stem and all answer choices.
- The numbers/number types and types of representation (whether the area model, shapes, graphs, functions, etc.) match those called for by the targeted standard and those appropriate for the grade level.
- Item does not provide cues (intentionally or unintentionally) for how to approach finding a solution.

Step 3 – Verify Alignment to KAS (cont.)

- Unlike classroom assessment items, items used on the Kentucky State Assessment can only report out (align) to one Kentucky grade level mathematics standard.
- Skills and concepts from previous grade level standards can be used in an item that is assessing a grade level appropriate standard.

Standard of Mathematical Content

- Defines what students should understand and be able to do.
- When possible, the full intent of a standard is assessed.
- For the more robust standards, the items aligned to the standard collectively meet the full intent of the standard.
- Look to see if there is a coherent connection to the same topic in a previous grade or to another grade-level standard.

Clarifications & Coherence

- Communicates the expectations more clearly and concisely to teachers, parents, students and stakeholders through examples and illustrations
- Provides guidance on how that content standard connects to others within and across grade levels

Attending to the Standards for Mathematical Practice

- Defines how students engage in mathematical thinking.
- Items provide meaningful opportunities for students to engage in the standards for mathematical practices

Step 4 – Verify Mathematical Practices Alignment

- Does the item give the student an opportunity to engage with at least one mathematical practice at the appropriate level of depth required by the standard?

Note: Each cluster within the KAS for Mathematics has these bookmarked to the descriptions in the front matter of the standards document AND has an Attending to the Standards for Mathematical Practice component.

- Verify that the item assesses the MP practices selected.

Standards for Mathematical Practice

[MP.1.](#) Make sense of problems and persevere in solving them.

[MP.2.](#) Reason abstractly and quantitatively.

[MP.3.](#) Construct viable arguments and critique the reasoning of others.

[MP.4.](#) Model with mathematics.

[MP.5.](#) Use appropriate tools strategically.

[MP.6.](#) Attend to precision.

[MP.7.](#) Look for and make use of structure.

[MP.8.](#) Look for and express regularity in repeated reasoning.

Attending to the Standards for Mathematical Practice

Students compare the value of the digits based on where they are in a number (**MP.7**). They reason 10 tens equal 100, 70 tens equal 700 and this can be illustrated with base 10 blocks or other visuals (**MP.2**). Students look across series of problems to notice a pattern when multiplying by 10, 100 or 1000 (**MP.8**) and justify why patterns exist (why $36 \times 100 = 3600$), rather than superficially noting 'you add zeros,' they explain or show there are actually 36 *hundreds*, so 3600 (**MP.3**). Students use similar reasoning to compare decimal values, explaining tenths are larger than hundredths and therefore, they look to first see which values have more tenths before looking at how many hundredths it has (**MP.2, MP.7**). Students use tools such as number lines and base 10 blocks to see place value relationships with decimals in order to compare and to round (**MP.5**).

Step 5 - Calculator Use

There are three calculator selections available in ABBI.

- Yes – A calculator should be used.
- No – A calculator should not be used.
- Z – Neutral. The calculator use will be based on the section the item is field tested in.

Grades 3-5

Four Function

Grades 6-8

Scientific

Grade 10

Desmos Graphing

Additional Considerations

- Some standards are more robust than other standards, so it may not always be possible to assess all parts of a standard in a single item. As the bank gets healthier, the intent is to have a bundle of items that assess all parts of the standard.
- A variety of items for each of the following:

Target of the Standard	Cognitive Complexity	Relevance
<ul style="list-style-type: none">• Conceptual understanding• Procedural skill & fluency• Application	<ul style="list-style-type: none">• Low• Medium• High	<ul style="list-style-type: none">• Items give students an authentic opportunity to connect content standards to real-world issues and/or contexts.

Step 6 – Verify Alignment to Target of the Standard

- Consider: If the standard is **conceptual understanding**, does the task require more than knowing isolated facts and methods? Are students asked to make sense of why a mathematical idea is important and the kinds of contexts in which it is useful?
- Consider: If the standard is **procedural skill/fluency**, does the task require students to apply procedures accurately, efficiently, flexibly and appropriately? Does the task focus students' attention on the use of procedures for the purpose of developing a deeper level of understanding of mathematical concepts or ideas? If general procedures may be followed, can they be followed mindlessly or are students asked to engage with the conceptual ideas that underlie the procedures to complete the task successfully?
- Consider: If the standard is **application**, does the task offer students the opportunity to solve problems in a relevant and meaningful way? Are students asked to select an efficient method to find a solution and develop critical thinking skills? Are students asked to actively examine task constraints that may limit possible solutions and strategies?

Step 7 - Verify Cognitive Complexity

Table 2: Levels of Complexity

	Level 1	Level 2	Level 3
Procedural Complexity: ¹³	Solving the problem entails little procedural ¹⁴ demand or procedural demand is below grade level.	Solving the problem entails common or grade-level procedure(s) with friendly numbers.	Solving the problem requires common or grade-level procedure(s) with unfriendly numbers, ¹⁵ an unconventional combination of procedures, or requires unusual perseverance or organizational skills in the execution of the procedure(s).
Conceptual Complexity: ¹⁶	Solving the problem requires students to recall or recognize a grade-level concept. The student does not need to relate concepts or demonstrate a line of reasoning.	Students may need to relate multiple grade-level concepts or different types, create multiple representations or solutions, or connect concepts with procedures or strategies. The student must do some reasoning, but may not need to demonstrate a line of reasoning.	Solving the problem requires students to relate multiple grade-level concepts and to evidence reasoning, planning, analysis, judgment, and/or creative thought OR work with a sophisticated (nontypical) line of reasoning.
Application Complexity:	Solving the problem entails an application of mathematics, but the required mathematics is either directly indicated or obvious.	Solving the problem entails an application of mathematics and requires an interpretation of the context to determine the procedure or concept (may include extraneous information). The mathematics is not immediately obvious. Solving the problem requires students to decide what to do.	In addition to an interpretation of the context, solving the problem requires recognizing important features, and formulating, computing, and interpreting results as part of a modeling process.

Source: achieve.org; table 2

https://www.achieve.org/files/Cognitive%20Complexity%20Mathematics%20Assessment_FINAL_0.pdf

Step 8 – Vote in ABBI

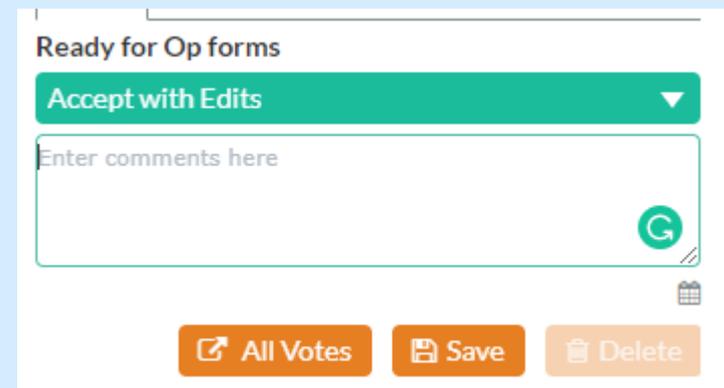
From the drop-down menu select your vote for the item.

- **Accept** – no concerns
- **Accept with edits** – Minor edits required
- **Accept with reconciliation** – Alignment/Scoring/Context Concerns
- **Reject** – A complete rewrite is required.

In the Comment note any of the following concerns:

- Standard of Mathematical Content alignment
- Alignment to the target of the standard
- Cognitive complexity
- Standard for Mathematical Practice alignment
- Keys/Rubrics
- Errors
- Precision
- Grammar
- Use of technology

Select “Save” to submit your vote and comments.



The screenshot shows a web interface for voting on a form. At the top, it says "Ready for Op forms". Below that is a green dropdown menu currently set to "Accept with Edits". Underneath the dropdown is a text input field with the placeholder "Enter comments here". To the right of the input field is a green circular refresh icon. At the bottom of the form are three orange buttons: "All Votes" (with a refresh icon), "Save" (with a save icon), and "Delete" (with a trash icon).

Sample Review Items

Grades 3-5

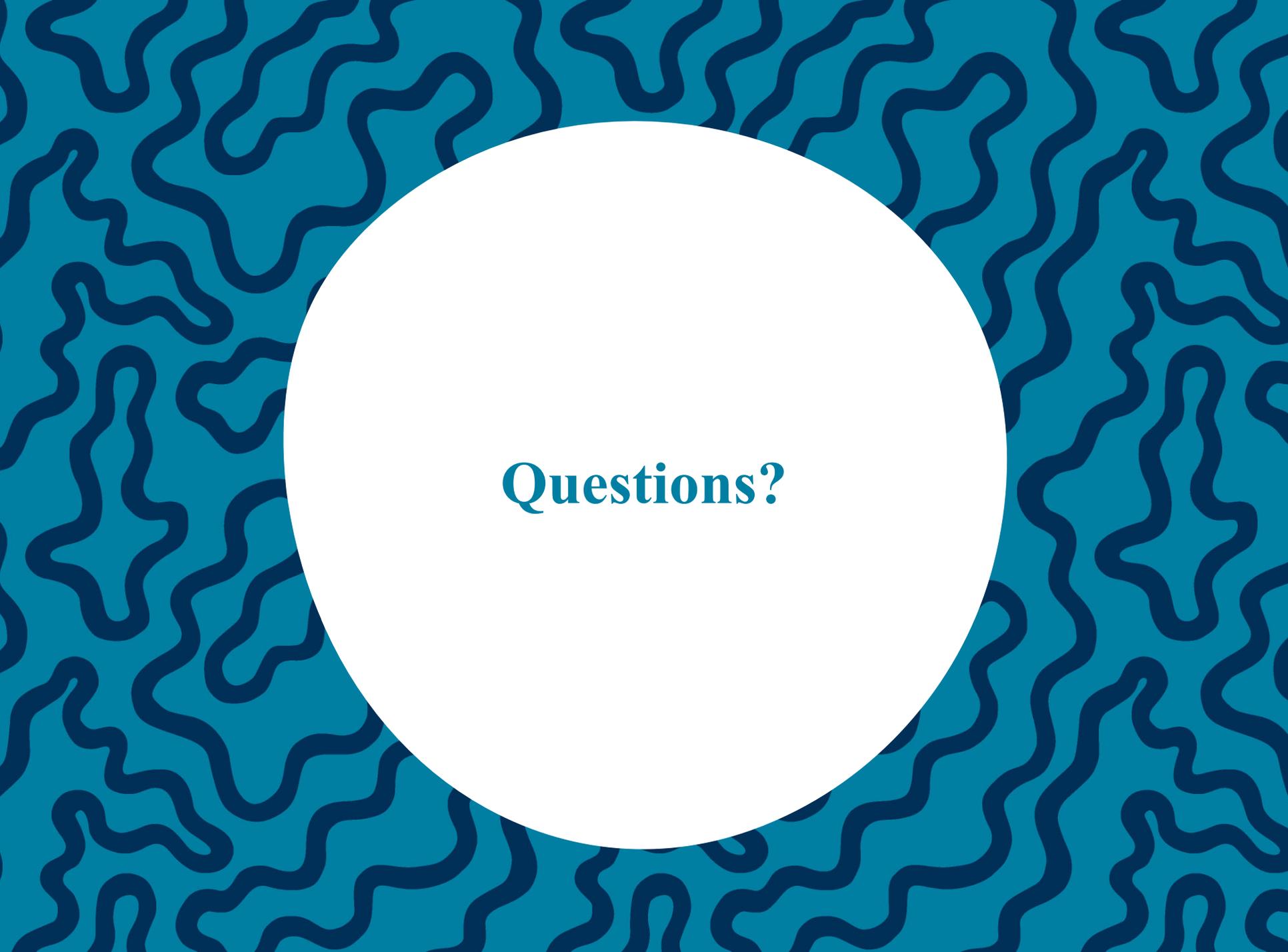
- **Conceptual Understanding**
UIN: MA0520PT_03
- **Procedural Skill/Fluency**
UIN: MA0420123
- **Application**
UIN: MA0520083

Grades 6-8

- **Conceptual Understanding**
UIN: MA0820PT_04
- **Procedural Skill/Fluency**
UIN: MA0820PT_06
- **Application**
UIN: MA0820PT_09

Grade 10

- **Conceptual Understanding**
UIN: MA1020017
- **Procedural Skill/Fluency**
UIN: MA1019PT_06
- **Application**
UIN: MA1019PT_01

The image features a white circle centered on a blue background. The background is filled with a repeating pattern of dark blue, wavy, irregular lines that resemble a stylized, organic texture. The white circle is perfectly circular and contains the text "Questions?".

Questions?

ALWAYS LEARNING