CCSS-M

FRACTIONS ON A NUMBER LINE MODULE 5

CCSS-M Task Force: CaMTE, CDE, CISC, CMC, CMP

Module 5: Lining Up Assessments

Assessments to change instruction.

SMARTER Balanced Assessments

Examine assessment options for diagnosing student understandings and leading to instructional improvements.

Agenda for Module 5

Activity 1: Opening for Module 5

Activity 2: SMARTER Balanced Assessments

Activity 3: Multiple Choice Items

Activity 4: Selected Response Items

Activity 5: Open Response (short)

Activity 6: Third Grade Open Response (long)

Activity 7: Fifth Grade Open Response (long)

Activity 8: Re engagement Lesson

Activity 9: Summarize Learning

Activity 10: Textbook Connection

SMARTER Balanced Assessment Consortium

CCSS Assessments

- Multiple Choice
- Selected Response
- Open Response

To keep updated:

CMC-Math

SMARTER Balanced Assessment
www.smarterbalanced.org/

WestEd

Ca Dept. of Ed www.cde.ca.gov

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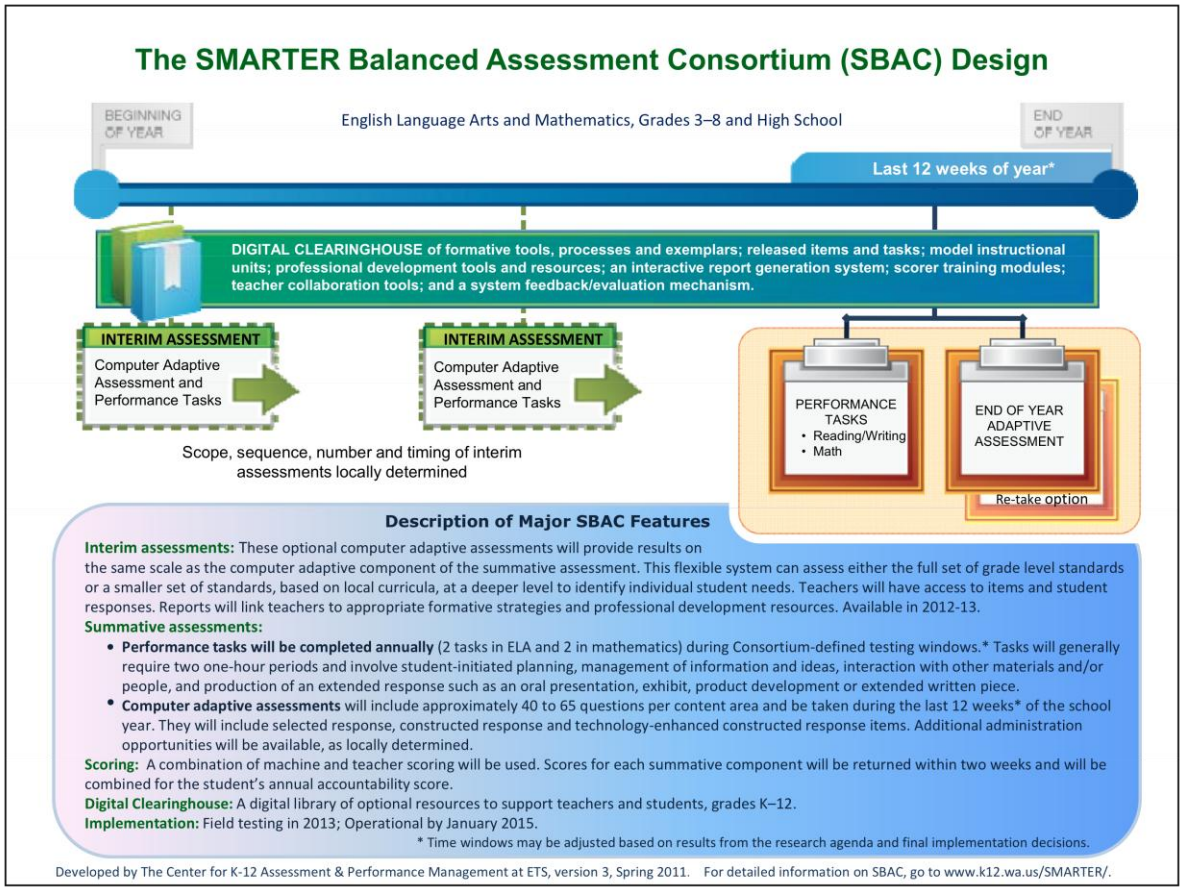
CCSS Assessment System



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Multiple Choice Items

Multiple choice prompts consist of a stem question and choice of several responses

Advantages:

- Reliability
- Less time to administer
- Efficiency
- Affordable

Disadvantages:

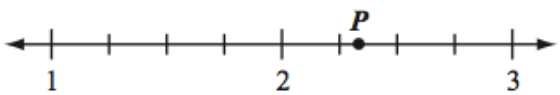
- Limited type of knowledge that can be assessed
- Multiple guess rather than determining correct answer
- No partial knowledge

"Not so much an issue
of multiple choice questions,
but an issue of what the questions are."

Adding It Up

Massachusetts, 5th and 6th grade items

6 The location of point P is shown on the number line below.



Which of the following numbers is best represented by point P?

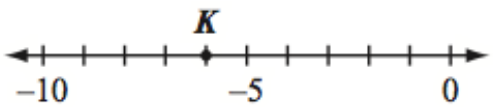
A. $2\frac{1}{3}$

B. $2\frac{1}{2}$

C. $2\frac{2}{3}$

D. $3\frac{2}{3}$

39 Which of the following best represents the location of point K on the number line below?



A. -1

B. -4

C. -6

D. -7

Selected Response Items

Selected response items consist of a stem, and students need to fill in the blank or complete the computation.

Advantages:

- Up to 5 minutes to respond.
- Efficient – assess & score great deal of content quickly.
- Affordable.

Disadvantages:

- Does not allow for opportunity to provide evidence.
- Does not allow to apply content.

Organize the following fractions according to these benchmarks:

0 to ½, ½ to 1, Greater than 1

$\frac{4}{7}$ $\frac{25}{23}$ $\frac{17}{35}$ $\frac{2}{9}$ $\frac{14}{15}$

What knowledge was needed to respond to this prompt?

Which is closer to 1:

$$\frac{7}{8} \qquad \frac{8}{7}$$

Why?

What knowledge was needed to respond to this prompt?

How did “Why?” affect the task?

Open Response

An open response item is a question that requires students to both demonstrate content knowledge and to apply that knowledge in some way. Both short (5-15 mins.) and long formats (30 mins.).

Advantages

- Allows for more depth of knowledge to be demonstrated.
- More complex cognitive behaviors: comparing, inferring, concluding, analyzing, generalizing, solving.
- Teacher scoring is professional development.

Disadvantages

- More difficult and time consuming to score.
- Because of time needed to take test, fewer items assessed.
- Effectiveness dependent on scoring guide.

Open Response

Answer the questions on the assessment.

What did you need to know to respond to the prompts?

How was this knowledge the same or different from knowledge needed to respond to previous prompts?

A Question of Numbers

1. Complete the assessment.
2. Look at the core idea and rubric.
3. Divide the anchor papers, study, explain to group. (Appendix)
4. Score your own student papers using rubric.
5. Synthesize results.
6. Read conclusions and next steps for instruction.

What knowledge was needed to respond to this prompt?

How does the scoring using rubric and anchor papers demonstrate difference in understanding content? Explanation?

A Question of Numbers

Task 5: A Question of Numbers	Rubric	
• The core elements of performance required by this task are: • • show you can compare and order numbers • Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Gives correct answer: **655** Draws an **X** in the correct place on the number line.	1 1	2
2. Gives correct answer such as: 380 pounds.	1	1
3 Gives correct answer: such as 1,920 gallons.	1	1
4. Gives correct answers such as: $2955 $3000 $3053	1	1
5 Gives correct answer: **1779 and** Marks the correct year on the number line.	1	1
6. Gives correct answer: **1040 and** Shows 1000 + 40 Gives correct answer: **960 and** Shows 1000 - 40	1 1	2
Total Points		**8**

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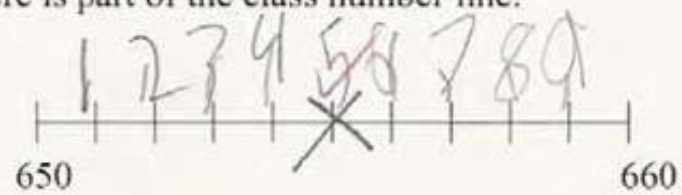
A Question of Numbers

Draws an X in correct place on number line - 1 point

Holly's class is learning about big numbers.

1. Here is part of the class number line.



Total 2 pt

Put an **X** on the number line, on the place that is halfway between 650 and 660.

What is the number that should be there? 655

Gives correct answer 655 - 1 point

Open Response Long

Points	Understandings	Misunderstandings
0	38% of the students attempted the task.	Time may have been an issue for many students. Some students struggled in trying to find the midpoint between 650 and 660 on the number line. 7.5% of the students marked 656. Some students thought the number was 655.5. Students may have been counting lines instead of spaces to count of the distance.
2	Students could mark and name the midpoint between 650 and 660.	Students had difficulty interpreting between in parts 2 and 3. 7.5% gave endpoints instead. 3% added the endpoints.
4	Students find a midpoint on a number line and give values between two endpoints. (parts 2 and 3)	Students had difficulty naming three values between two endpoints. Almost 18% gave at least one value that was above the highest endpoint. 15% gave values that were too low. 5% included one or both endpoints.
6	Students could find midpoints, locate values in between two endpoints (parts 2,3, and 5), and find the most books that could be located in the library.	About 7% gave the correct answer for most, but showed no calculations or explanation. 7% thought the answer for most was 1000 because it was the greatest number in the problem. Some students had difficulty with place value, getting answers like 5000 or 1400. Students had even more difficulty with the subtraction (1000-40). 4% had the correct answer but no work. 6% thought the answer was 40. 6% had place value errors getting either 60 or 600. Others had place value errors like 3000, 996, or 9504.
7	Students could find midpoints, locate values in between two endpoints, and find the most and the least books that could be located in the library.	Students had difficulty using a number line to find a midpoint when there was no scale. They could figure out how to divide the sections into 10 equal parts and may have only put 2 or intervals. 21% picked 1780, the middle of the given number line but not the middle of the war(1775 to 1783). 7.5% knew the midpoint was 1779, but used the number line incorrectly or did not use the number line. 5% thought the midpoint was 1778. 5% thought the midpoint was 1775 (midpoint for left half of the number line). 4% picked one of the endpoints on the given number line.

Fractions

1. Take the assessment. (p.56)
2. Look at the core idea and rubric. (p.57)
3. Divide the anchor papers, study, explain to group. (Appendix)
4. Score your own student papers using rubric.
5. Read conclusions and next steps for instruction.

Open Response Long

Fractions		**Rubric**
The core elements of performance required by this task are: • show the position of fractions on a number line • compare the sizes of fractions Based on these, credit for specific aspects of performance should be assigned as follows	points	section points
1. Fractions correctly marked on the number line: 2/5 to the left of 1/2 2/3 to the right of 1/2	 1 1	2
2. Gives correct explanation such as: 2/5 is less than 1/2 and 2/3 is more than 1/2 Accept explanations based on diagrams.	1	1
3. Gives correct answer: **2/5** dependent on some correct explanation/work Shows work such as: 2/3 = 20/30 2/5 = 12/30 1/2 = 15/30 so 2/5 is nearer to 1/2 **<u>or</u>** Accept diagrams showing the line divided into 5 equal parts, and three equal parts, with 2/3 and 2/5 correctly marked. *Partial credit* Correct reasoning with arithmetical errors.	1 2 2 (1)	3
Total Points		**6**

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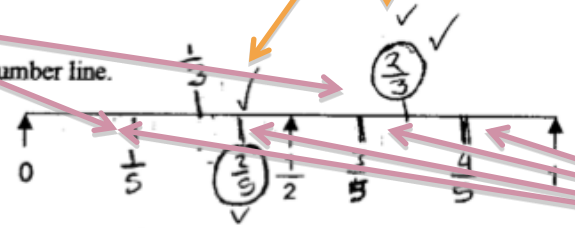
Open Response Long

Problem #1 = 2 points

Divided into thirds
#3 = 1 point

Student D

Here is a number line.



Divided into fifths
#3 = 1 point

1. Mark the position of the two fractions $\frac{2}{3}$ and $\frac{2}{5}$ on the number line.

2. Explain how you decided where to place $\frac{2}{3}$ and $\frac{2}{5}$ on the number line.

I divided the top part of the line into thirds and marked $\frac{2}{3}$ and divided the bottom part of the line into fifths and marked $\frac{2}{5}$.

3. Which of the two fractions, $\frac{2}{3}$ or $\frac{2}{5}$, is nearer to $\frac{1}{2}$? $\frac{2}{5}$

2/5 = 1 point

Explain how you figured it out.

On the number line the dash that marks $\frac{2}{3}$ is farther from $\frac{1}{2}$ then the dash that marks $\frac{2}{5}$.

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Open Response Long

Fractions

Points	Understandings	Misunderstandings
0	82% of the students with this score attempted the problem.	Students tended to think about the whole-number values of the parts rather than fractional values. Some reversed the fractions, some put both fractions larger than 1. Some put marks on the line to indicate the place for the fractions, but with no label to identify what fraction each mark represented.
1	Students could correctly place one of the fractions on the correct side of 1/2.	20% of the students put 1/2, 2/3, 2/5 and then 1. 5% put 1/2, 2/5, 2/3, and then 1. Students seemed to be thinking about the 2's are larger than the 1 in 1/2 or looking at the size of the numbers in the denominator.
2	Students could correctly place both fractions on the proper side of 1/2.	They could not give a complete justification for the placement.
3	Students could correctly place the fractions on the number line and give a mathematical reason for the placement, like using decimals, common denominators, or dividing the line into 3 parts and 5 parts.	Students had difficulty comparing the size of the fractions to 1/2, which is closer. More than 1/2 the students thought 2/3 was closer. Most of the students who picked 2/5 used reasons that showed no mathematical understanding of the size of the fractions. So, they might say 2/3 is more than 1/2 so 2/5 is closer. Some said 2/5 = 1/2, 2/3 looks more like 1/2, and numbers should go 3,4,5. Some attempted to use their diagrams, but the diagrams were not measured accurately enough to make the correct conclusion.
6	Students could locate fractions on a number line and compare fractions to 1/2. They understood the size of the fractions and could explain why the 2/5 was closer to 1/2. About half the students, who could reason about the size, used an argument about dividing the line into 3 and 5 equal parts and compared the distances on their diagrams. About 22% of the students were able to use common denominators to reason about the size. Another 22% used percents or decimals to make the comparison.	

What knowledge was needed to respond to this prompt?

How does the scoring using rubric and anchor papers demonstrate difference in understanding content? Explanation?

Re engagement Lesson

Fractions

Points	Understandings	Misunderstandings
0	82% of the students with this score attempted the problem.	Students tended to think about the whole-number values of the parts rather than fractional values. Some reversed the fractions, some put both fractions larger than 1. Some put marks on the line to indicate the place for the fractions, but with no label to identify what fraction each mark represented.
1	Students could correctly place one of the fractions on the correct side of 1/2.	20% of the students put 1/2, 2/3, 2/5 and then 1. 5% put 1/2, 2/5, 2/3, and then 1. Students seemed to be thinking about the 2's are larger than the 1 in 1/2 or looking at the size of the numbers in the denominator.
2	Students could correctly place both fractions on the proper side of 1/2.	They could not give a complete justification for the placement.
3	Students could correctly place the fractions on the number line and give a mathematical reason for the placement, like using decimals, common denominators, or dividing the line into 3 parts and 5 parts.	Students had difficulty comparing the size of the fractions to 1/2, which is closer. More than 1/2 the students thought 2/3 was closer. Most of the students who picked 2/5 used reasons that showed no mathematical understanding of the size of the fractions. So, they might say 2/3 is more than 1/2 so 2/5 is closer. Some said 2/5 = 1/2, 2/3 looks more like 1/2, and numbers should go 3,4,5. Some attempted to use their diagrams, but the diagrams were not measured accurately enough to make the correct conclusion.

As table group separate papers into score points.

1. Partners study papers with one score point.

2. Regroup with those with same score point from other tables share learning issues.

3. Return to table and everyone discusses.

3. Choose two papers that represent misconceptions.

Number lines are particularly advantageous for assessing knowledge of fractions and for teaching about them.

Developing Effective Fractions Instruction for Kindergarten Through Eighth Grade, Siegler, et al., p.9

Looking at your lesson, how will you know what your students understand?
Are on the edge of understanding or have fragile understanding of?

What information will you be looking for at each stage of the lesson to show that students are on or off the progression of the lesson?