Constructing Task: Fraction Field Event

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NF.3 Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.

a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.

b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*

c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and 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.

BACKGROUND KNOWLEDGE

The boys' and girls' long jump event total scores are shown below. Mary was the winner for the girls with a total score of $24\frac{3}{12}$, Bob was the winner for the boys with a total score of $26\frac{10}{12}$.

1.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Kim	$7\frac{3}{12}$ feet	$6\frac{11}{12}$ feet	$6\frac{5}{12}$ feet	$20\frac{7}{12}$ feet
Amanda	$5\frac{9}{12}$ feet	$6\frac{1}{12}$ feet	$6\frac{4}{12}$ feet	$18\frac{2}{12}$ feet
Malaika	$7\frac{9}{12}$ feet	$6\frac{2}{12}$ feet	$7\frac{11}{12}$ feet	$21\frac{10}{12}$ feet
Mary	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	$24\frac{3}{12}$ feet
Freida	$7\frac{10}{12}$ feet	$7\frac{10}{12}$ feet	$8\frac{2}{12}$ feet	$23\frac{10}{12}$ feet

3.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Carlos	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{6}{12}$ feet	$24\frac{6}{12}$ feet
Emmett	$7\frac{7}{12}$ feet	$6\frac{10}{12}$ feet	$8\frac{4}{12}$ feet	$22\frac{9}{12}$ feet
Bob	$8\frac{9}{12}$ feet	$9\frac{2}{12}$ feet	$8\frac{11}{12}$ feet	$26\frac{10}{12}$ feet
Thomas	$6\frac{7}{12}$ feet	$8\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	$23\frac{9}{12}$ feet
Gene	$7\frac{10}{12}$ feet	$7\frac{3}{12}$ feet	$8\frac{5}{12}$ feet	$23\frac{6}{12}$ feet

To find the distance Carlos would need to jump on his second jump to win the event, students would first need to determine how far he was from first place. To compare Carlos' and Bob's scores, subtract $26\frac{10}{12} - 24\frac{6}{12} = 2\frac{4}{12}$.

- This can be done easily by subtracting the whole numbers, 26 – 24 = 2 and subtracting the fractions $\frac{10}{12} - \frac{6}{12} = \frac{4}{12}$.
- To use a counting up strategy, students may add $\frac{6}{12}$ to $24\frac{6}{12}$ to get $24\frac{6}{12} + \frac{6}{12} = 24\frac{12}{12} = 25$. To get to $26\frac{10}{12}$ students would need to add $1\frac{10}{12}$ to the 25 giving $25 + 1\frac{10}{12} = 26\frac{10}{12}$. Since students added $\frac{6}{12}$ and $1\frac{10}{12}$ to count up to $26\frac{10}{12}$ the difference of $26\frac{10}{12} - 24\frac{6}{12}$ is the sum of $\frac{6}{12}$ and $1\frac{10}{12}$ which is $2\frac{4}{12}$ $\left(\text{i.e. } \frac{6}{12} + 1\frac{10}{12} = 1\frac{16}{12} = 1 + \frac{12}{12} + \frac{4}{12} = 2\frac{4}{12}\right)$.

The difference of the two scores needs to be added to Carlos' second score of $7\frac{11}{12}$. Therefore, students should add $7\frac{11}{12} + 2\frac{4}{12} = 9\frac{15}{12} = 9 + 1\frac{3}{12} = 10\frac{3}{12}$. Carlos needed a second jump of $10\frac{3}{12}$ to tie with Bob. To win, he needed to jump a distance greater than $10\frac{3}{12}$.

To find the distance Frieda would need to jump on her second jump to win the event, students would first need to determine how far she was from first place. To compare Mary's and Frieda's scores, subtract $24\frac{3}{12} - 23\frac{10}{12} = \frac{5}{12}$.

- To use a counting up strategy, students may add $\frac{2}{12}$ to $23\frac{10}{12}$ to get $23\frac{10}{12} + \frac{2}{12} = 23\frac{12}{12} = 24$. To get to $24\frac{3}{12}$ students would need to add $\frac{3}{12}$ to the 24 giving $24 + \frac{3}{12} = 24\frac{3}{12}$. Since students added $\frac{2}{12}$ and $\frac{3}{12}$ to count up to $24\frac{3}{12}$ the difference of $24\frac{3}{12} - 23\frac{10}{12}$ is the sum of $\frac{2}{12}$ and $\frac{3}{12}$ which is $\frac{5}{12}$.
- To use a regrouping strategy, students may rewrite $24\frac{3}{12}$ as follows: $24\frac{3}{12} = 23 + 1\frac{12}{12} + \frac{3}{12} = 23\frac{15}{12}$. Then students can subtract $23\frac{10}{12}$ from $23\frac{15}{12}$ leaving $\frac{5}{12}$. $23\frac{15}{12} - 23\frac{10}{12} = \frac{5}{12}$.

The difference of the two scores needs to be added to Frieda's second score of $7\frac{10}{12}$. Therefore, students should add $7\frac{10}{12} + \frac{5}{12} = 7\frac{15}{12} = 7 + 1\frac{3}{12} = 8\frac{3}{12}$. Frieda needed a second jump of $8\frac{3}{12}$ to tie with Mary. To win, she needed to jump a distance greater than $8\frac{3}{12}$.

ESSENTIAL QUESTIONS

- How do we add/subtract fractions?
- What is an improper fraction and how can it be represented?
- What is a mixed number and how can it be represented?

MATERIALS

"Fraction Field Event" student recording sheet

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Comments

Students can be encouraged to participate in field events and add their scores to find the total score as required in this task.

Task Directions

Students will follow the directions below from the "Fraction Field Event" student recording sheet.

Carter Elementary School is having a field day! One of the events is the long jump. Participants of this event take a running start and then jump as far as they can. The winner is determined by adding the distances jumped in three trials. The highest total wins. Using the jump measures below, determine the winner of this year's girls' and boys' long jump. Show all of your work on a separate sheet of paper.

1.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Kim	$7\frac{3}{12}$ feet	$6\frac{11}{12}$ feet	$6\frac{5}{12}$ feet	
Amanda	$5\frac{9}{12}$ feet	$6\frac{1}{12}$ feet	$6\frac{4}{12}$ feet	
Malaika	$7\frac{9}{12}$ feet	$6\frac{2}{12}$ feet	$7\frac{11}{12}$ feet	
Mary	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	
Freida	$7\frac{10}{12}$ feet	$7\frac{10}{12}$ feet	$8\frac{2}{12}$ feet	

2. Who had the highest total score for the girls' long jump?

3.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Carlos	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{6}{12}$ feet	
Emmett	$7\frac{7}{12}$ feet	$6\frac{10}{12}$ feet	$8\frac{4}{12}$ feet	
Bob	$8\frac{9}{12}$ feet	$9\frac{2}{12}$ feet	$8\frac{11}{12}$ feet	
Thomas	$6\frac{7}{12}$ feet	$8\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	
Gene	$7\frac{10}{12}$ feet	$7\frac{3}{12}$ feet	$8\frac{5}{12}$ feet	

4. Who had the highest total score for the boys' long jump?

5. Carlos wants to find how long his 2nd jump needed to be in order to win the event. In order to score higher than the winner, how far did Carlos need to jump? Explain your thinking using words, numbers, and math pictures as needed.

6. Frieda wants to find how long her 2nd jump needed to be in order to win the event. In order to score higher than the winner, how far would Frieda need to jump? Explain your thinking using words, numbers, and math pictures as needed.

FORMATIVE ASSESSMENT QUESTIONS

- How did you find the sum of these mixed numbers?
- Is the fraction a proper or improper fraction? How do you know?
- If the fraction part of the mixed number is improper, what should you do?
- What do you know about the fraction $\frac{12}{12}$?
- How can you rewrite that mixed number?
- Did you add the whole numbers? Did you add the fractions?

DIFFERENTIATION

Extension

- Challenge students to write and solve a problem based on the jumping distances provided. Then ask students to give the problem to a partner to solve.

Intervention

- Allow students to use two or three rulers or a yardstick to work with the fractions in this task. Students can count the number of inches $\left(\frac{1}{12}\right)$ along the ruler to find the sum of the fractional part of the mixed number. This also allows students to recognize that 1 whole (the length of one ruler) is equivalent to $\frac{12}{12}$.

Name_____ Date_____

Fraction Field Event

Carter Elementary School is having a field day! One of the events is the long jump. Participants of this event take a running start and then jump as far as they can. The winner is determined by adding the distances jumped in three trials. The highest total wins. Using the jump measures below, determine the winner of this year's girls' and boys' long jump. Show all of your work on a separate sheet of paper.

1.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Kim	$7\frac{5}{12}$ feet	$6\frac{11}{12}$ feet	$6\frac{5}{12}$ feet	
Amanda	$5\frac{9}{12}$ feet	$6\frac{1}{12}$ feet	$6\frac{4}{12}$ feet	
Malaika	$7\frac{9}{12}$ feet	$6\frac{2}{12}$ feet	$7\frac{11}{12}$ feet	
Mary	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	
Freida	$7\frac{10}{12}$ feet	$7\frac{10}{12}$ feet	$8\frac{2}{12}$ feet	

2. Who had the highest total score for the girls' long jump? _____

3.

Name	1st Jump	2nd Jump	3rd Jump	Total Score
Carlos	$8\frac{1}{12}$ feet	$7\frac{11}{12}$ feet	$8\frac{6}{12}$ feet	
Emmett	$7\frac{7}{12}$ feet	$6\frac{10}{12}$ feet	$8\frac{4}{12}$ feet	
Bob	$8\frac{9}{12}$ feet	$9\frac{2}{12}$ feet	$8\frac{11}{12}$ feet	
Thomas	$6\frac{7}{12}$ feet	$8\frac{11}{12}$ feet	$8\frac{3}{12}$ feet	
Gene	$7\frac{10}{12}$ feet	$7\frac{3}{12}$ feet	$8\frac{5}{12}$ feet	

4. Who had the highest total score for the boys' long jump? _____

Fraction Field Event
Continued

5. Carlos wants to find how long his 2nd jump needed to be in order to win the event. In order to score higher than the winner, how far did Carlos need to jump? Explain your thinking using words, numbers, and math pictures as needed.

6. Frieda wants to find how long her 2nd jump needed to be in order to win the event. In order to score higher than the winner, how far would Frieda need to jump? Explain your thinking using words, numbers, and math pictures as needed.