Which is Closer? Estimating and Finding the Sum of Fractions

Strand: Computation and Estimation

Topic: Estimating and calculating the sum of proper and improper fractions with unlike denominators

Primary SOL: 4.5   The student will
> b) add and subtract fractions and mixed numbers having like and unlike denominators.*
>> * On the state assessment, items measuring this objective are assessed without the use of a calculator.

Related SOL: 4.2a, 4.2b, 4.3d, 4.5a, 4.5d

Materials

- Fraction Strips (attached)
- Fraction Circles (attached)
- Which is Closer? Game Calculation Sheet (attached)
- Fraction Cards (attached)
- Sum Cards (attached)
- Scissors

Vocabulary

common factors, common multiples, difference, estimate, estimation, factor, fraction, greatest common factor (GCF), improper fraction, least common denominator, least common multiple (LCM), like denominators, mixed number, simplest form, simplify, sum, unlike denominators

Student/Teacher Actions: What should students be doing? What should teachers be doing?

1. Ask, "Is the sum of $\frac{1}{4}$ and $\frac{1}{2}$ greater than 1 or less than 1?" Have students estimate their answer.   Remind students that only an estimate is wanted now, not an exact answer. Ask students to share their strategy for how they determined whether the answer was greater than 1 or less than 1. Do not introduce rules or algorithms; you are trying to get students to make these discoveries on their own. If children struggle to arrive at an estimate, encourage them to use fraction manipulatives, number lines, common benchmarks (0, $\frac{1}{2}$, or 1), a measuring cup, and/or drawings to explore and reason.

2. Review the benchmark fractions as needed by drawing a number line on the board with each benchmark noted by a tick mark. These are to represent 0, $\frac{1}{2}$ and 1. Ask students to show where $\frac{1}{2}$ would be on this number line. Then, ask students to recall how they would move on the number line when adding. Ask students to explain how they could show moving a distance of $\frac{1}{4}$ of a unit, starting at $\frac{1}{2}$ on this number line. Ask students

whether this sum is greater than 1 or less than 1, and have them explain how they know.

3. Review adding unlike fractions using $\frac{3}{4}$ and $\frac{2}{5}$, including simplifying the answer. Clarify for the students ways to record their work to prepare them for the game they will play.

4. To play the game, put students into pairs. Distribute the Sum Cards and scissors to each student. Distribute one copy of the Fraction Cards and the Which is Closer Game Calculation Recording Sheet to each team. Ask students to cut out each of their Sum Cards and keep them in a pile in front of them. They should also cut out the Fraction Cards and put them face down in the middle of the table. The game is played in rounds, and partners will alternate responsibilities of being the calculator and being the writer when play begins.

5. Have students play the Which Is Closer? game according to the following rules:
   ● One player draws two cards from the Fraction Cards pile and turns them face-up in the center of the table. Each player estimates the sum of the two fractions shown on these cards and decides whether the sum is closer to 0, 1, or 2. Each player then places their corresponding Sum Card face down on the table.
   ● The player who did not draw the Fraction Cards is the Calculator for the round and determines the sum. He/she announces whether the sum is closer to 0, 1, or 2. Fraction Strips can be available if a team needs them.
   ● Players then turn their Sum Cards face-up. If only one player put down the correct Sum Card, he/she collects the two Fraction Cards that are face-up. If two players put down the correct Sum Card, each player gets one Fraction Card. If three players put down the correct Sum Cards, the third player takes a Fraction Card from the pile, and so forth.
   ● Each player who puts down an incorrect Sum Card must return one of his/her Fraction Cards to the bottom of the pile if he/she has any Fraction Cards.
   ● Play continues with another player turning over two more Fraction Cards from the pile. Alternatively, the teacher may predetermine the number of rounds each team is to play.
   ● When all Fraction Cards have been used, or there is only one left, the game ends. The player with the most Fraction Cards wins.

6. After the game, have each player describe the estimation strategy that worked best. Consider having each group confer first and then share one of their strategies.

7. Invite each team to show their work for a problem from the game on an individual whiteboard or on the classroom board. Use this work to facilitate a discussion about adding unlike fractions and simplifying answers as necessary.

Assessment

● **Questions**
   o How would creating and using a number line with the benchmarks of 0, 1, and 2 be helpful when estimating the sums/differences of fractions and/or decimals?
   o How could you change the Which is Closer? game to make it more challenging?
   o Why do you need to find common denominators when adding fractions?

- **Journal/writing prompts**
    - Draw a picture to explain the answer to the following problem: Marcia baked 2 pans of brownies. She and her friends ate $\frac{9}{8}$ of the brownies. What part of the brownies were left?
    - Draw a number line in your journal, and draw tick marks at 0 and 2. Then, select two fraction cards, determine their sum, and explain the position of the sum on the number line. Justify your answer.

- **Other Assessments**
    - Have students draw two or three Fraction Cards and create a word problem using those fractions. Then, have students exchange word problems and solve them, using a variety of strategies.

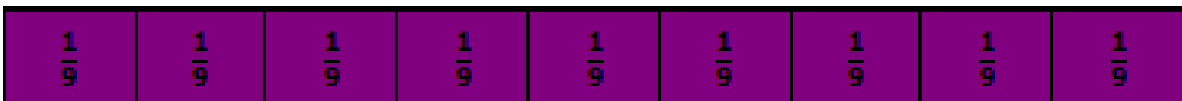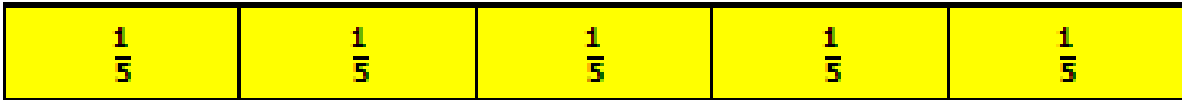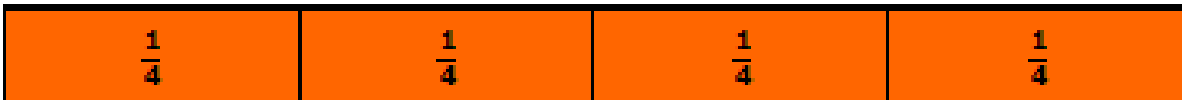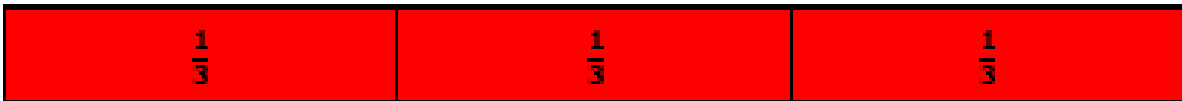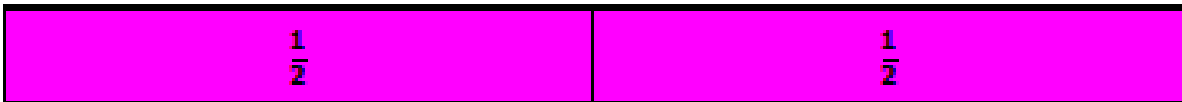## Extensions and Connections (for all students)

- Give students pattern blocks. Label the hexagon as 1. Have students name the fractional parts of each piece of the pattern block set. Have students show different ways to add fractional parts to make a whole and record their answer pictorially and numerically. That is, label these parts and then write a number sentence.
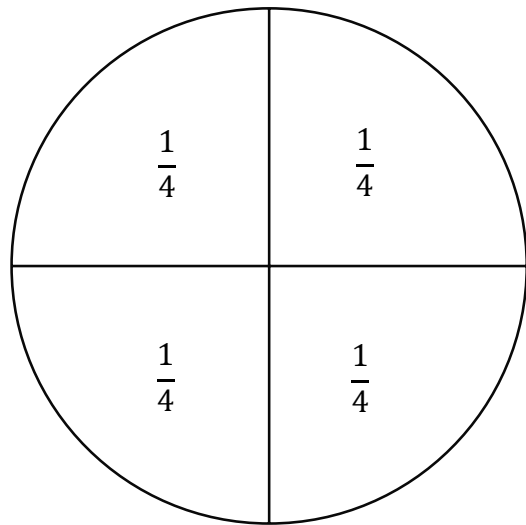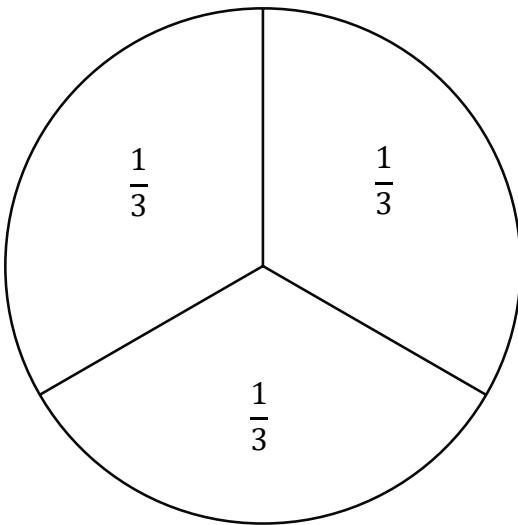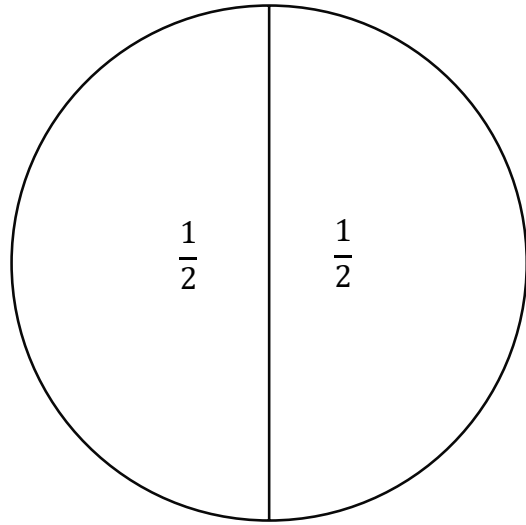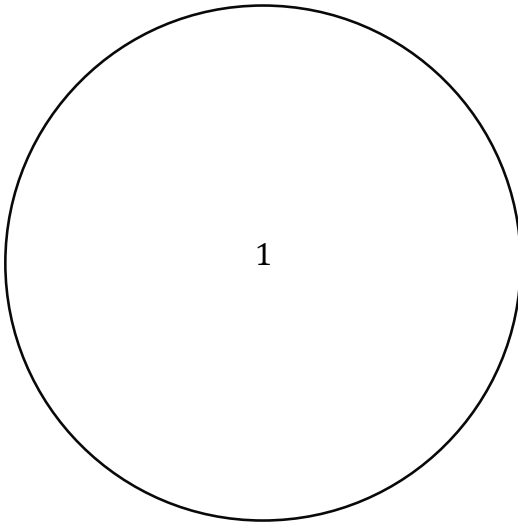
Strategies for Differentiation

- Give students who need a challenge a number line that is not numbered. Have students make the end tick mark at 2. They should then number the number line with the benchmark fractions of 0, $\frac{1}{2}$, 1, $1\frac{1}{2}$. Give them other fractions and have them place them on the number line.
- Let students model their problems with Fraction Circles or Fraction Strips.
- Students can create their own Fraction Strips.
- Ask students to create different strategies to find the estimate to the sum of $\frac{1}{4}$ and $\frac{1}{2}$. Have students share their strategies. Provide different fraction manipulatives for students to use, such as Fraction Strips, a number line, or fraction squares.

**Note: The following pages are intended for classroom use for students as a visual aid to learning.**
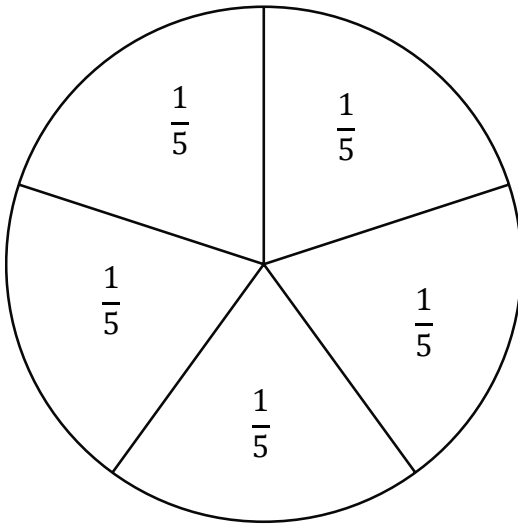
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Fraction Strips

One Whole

$\frac{1}{2}$	$\frac{1}{2}$

$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$

$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$

$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$

$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$
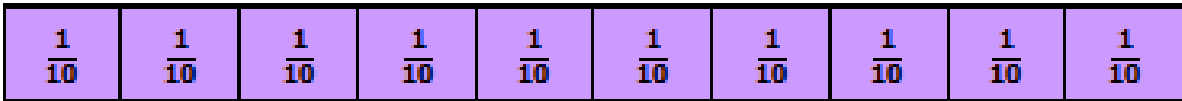
Fraction Circles (To Fourths)

1

$\frac{1}{2}$ $\frac{1}{2}$

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$

$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$
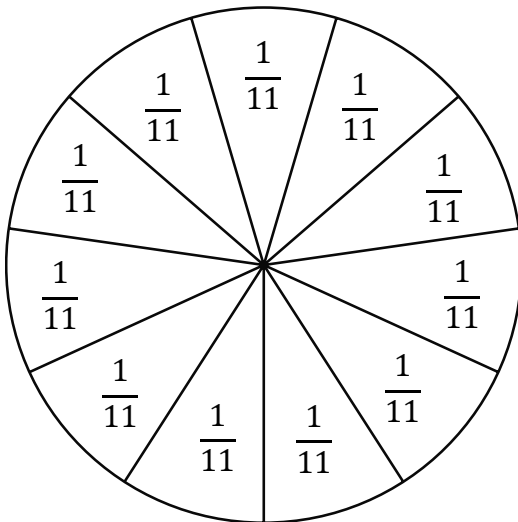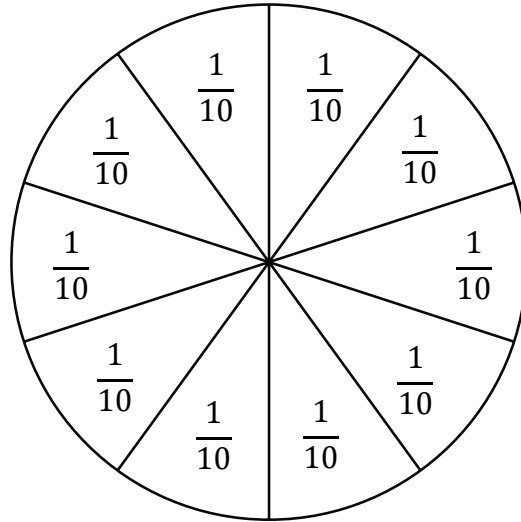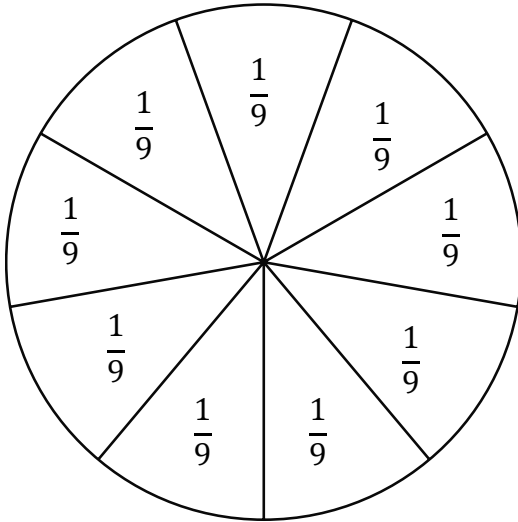
Fraction Circles (Fifths to Eighths)
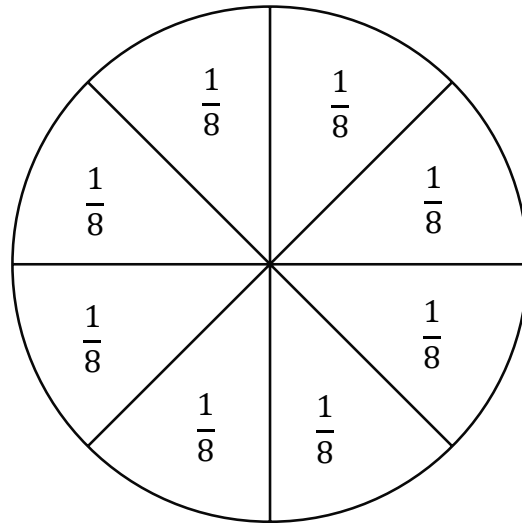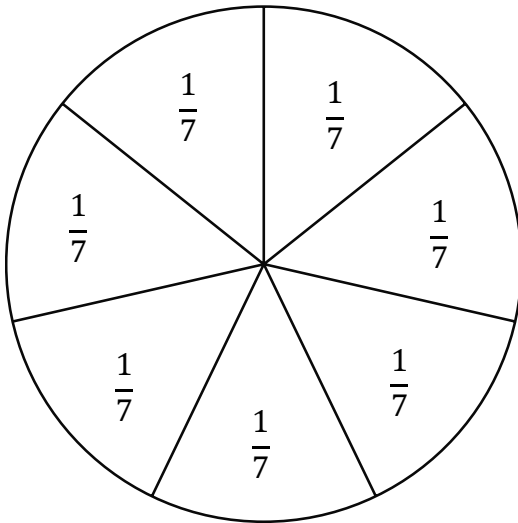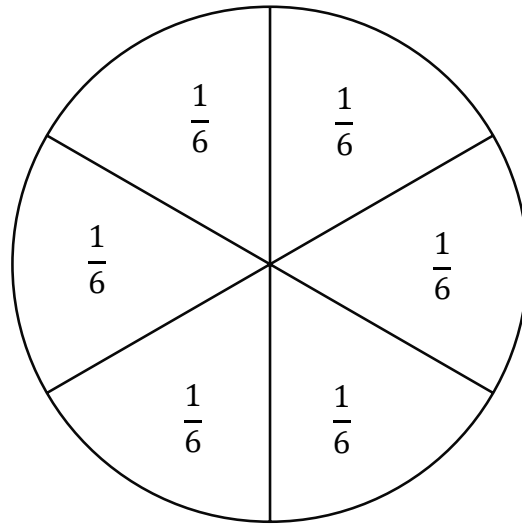
Fraction Circles (Ninths to Twelfths)
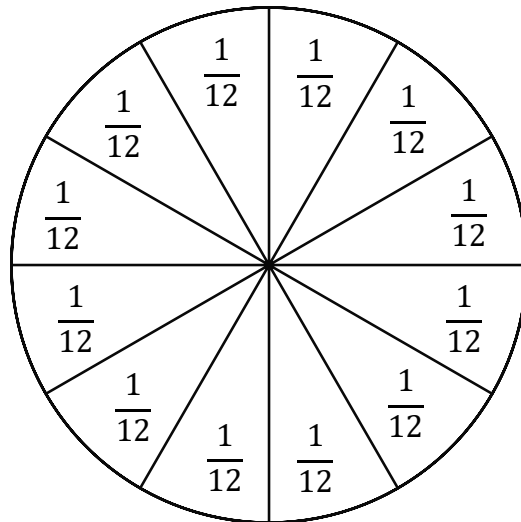
Which is Closer? Game Directions

- One player draws two cards from the Fraction Cards pile and turns them up in the center of the table. Each player estimates the sum of the two fractions shown on these cards and decides whether the sum is closer to 0, 1, or 2. Each player then places the corresponding Sum Card <u>face down</u> on the table.

- The player who did not draw the Fraction Cards is the Calculator for the round and determines the actual sum and announces whether it is closer to 0, 1, or 2.

- Players then turn their Sum Cards face-up. If only one player put down the correct Sum Card, he/she collects the two Fraction Cards that are face-up. If two players put down the correct Sum Card, each player gets one Fraction Card.

- Play continues and the roles of Fraction Card drawer and Calculator reverse. The roles continue to reverse for each round of the game.

- When all Fraction Cards have been used, or there is only one left, the game ends. The player with the most Fraction Cards wins.

Which is Closer? Game Calculation Sheet

Round Number	Calculation The calculator shows all work for finding the sum of the two fractions.
1	
2	
3	
4	
5	
6	
7	

Round Number	Calculation
	The calculator shows all work for finding the sum of the two fractions.
8	
9	
10	
11	
12	

Fraction Cards

$\dfrac{1}{5}$	$\dfrac{2}{3}$	$\dfrac{1}{4}$	$\dfrac{1}{6}$	$\dfrac{2}{5}$
$\dfrac{3}{8}$	$\dfrac{1}{8}$	$\dfrac{3}{10}$	$\dfrac{1}{2}$	$\dfrac{7}{8}$
$\dfrac{7}{10}$	$\dfrac{1}{10}$	$\dfrac{3}{8}$	$\dfrac{9}{10}$	$\dfrac{3}{2}$
$\dfrac{5}{3}$	1	$\dfrac{3}{4}$	$\dfrac{4}{5}$	$\dfrac{5}{8}$
$\dfrac{4}{3}$	$\dfrac{7}{5}$	$\dfrac{3}{5}$	$\dfrac{5}{4}$	$\dfrac{7}{4}$

Sum Cards

0	1	2
0	1	2
0	1	2
0	1	2
0	1	2
0	1	2