Name _

Fractions and Properties of Addition

Essential Question How can you add fractions with like denominators using the properties of addition?

CONNECT The Associative and Commutative Properties of Addition can help you group and order addends to find sums mentally. You can use mental math to combine fractions that have a sum of 1.

- The Commutative Property of Addition states that when the order of two addends is changed, the sum is the same. For example, 4 + 5 = 5 + 4.
- The Associative Property of Addition states that when the grouping of addends is changed, the sum is the same. For example, (5 + 8) + 4 = 5 + (8 + 4).

Unlock the Problem

The map shows four lighthouses in the Florida Keys and their distances apart in miles. The Dry Tortugas Lighthouse is the farthest west, and the Alligator Reef Lighthouse is the farthest east.

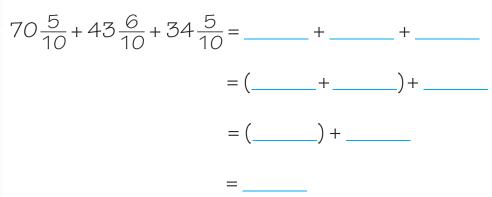
What is the distance from the Dry Tortugas Lighthouse to the Alligator Reef Lighthouse, traveling between the four lighthouses?



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Use the properties to order and group.

Add. $70\frac{5}{10} + 43\frac{6}{10} + 34\frac{5}{10}$



So, the distance from the Dry Tortugas Lighthouse to the Alligator Reef Lighthouse, traveling between the four lighthouses,

miles. is



Commor Numbers and Operations— Core Fractions—4.NF.B.3c **MATHEMATICAL PRACTICES MP2, MP7**



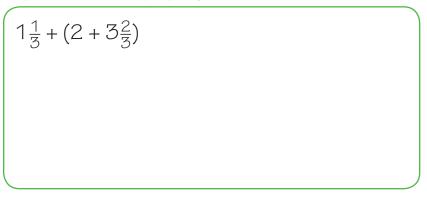
Use the Commutative Property to order the addends so that the fractions with a sum of 1 are together.

Use the Associative Property to group the addends that you can add mentally.

Add the grouped numbers, and then add the other mixed number.

Write the sum.

Try This! Use the properties and mental math to solve. Show each step, and name the property used.





1. Complete. Name the property used.

$$\left(3\frac{4}{10} + 5\frac{2}{10}\right) + \frac{6}{10} = \left(5\frac{2}{10} + 3\frac{4}{10}\right) + ___= 5\frac{2}{10} + \left(3\frac{4}{10} + __\right)$$
$$= 5\frac{2}{10} + __= 5\frac{2}{10} + _= 5\frac{$$

Use the properties and mental math to find the sum.

2.
$$\left(2\frac{7}{8}+3\frac{2}{8}\right)+1\frac{1}{8}$$

3. $1\frac{2}{5}+\left(1+\frac{3}{5}\right)$
4. $5\frac{3}{6}+(5\frac{5}{6}+4\frac{3}{6})$
5. $\left(1\frac{1}{4}+1\frac{1}{4}\right)+2\frac{3}{4}$
6. $\left(12\frac{4}{9}+1\frac{2}{9}\right)+3\frac{5}{9}$
6. $\left(12\frac{4}{9}+1\frac{2}{9}\right)+3\frac{5}{9}$
6. $\left(12\frac{4}{9}+1\frac{2}{9}\right)+3\frac{5}{9}$

On Your Own

Use the properties and mental math to find the sum.

8. $\left(45\frac{1}{3}+6\frac{1}{3}\right)+38\frac{2}{3}$

9. $\frac{1}{2} + \left(103\frac{1}{2} + 12\right)$

10.
$$\left(3\frac{5}{10}+10\right)+11\frac{5}{10}$$

- **11.** CODEEPER Pablo is training for a marathon. He ran $5\frac{4}{8}$ miles on Friday, $6\frac{5}{8}$ miles on Saturday, and $7\frac{4}{8}$ miles on Sunday. How many miles did he run on all three days?
- **12. CODEEPER** At lunchtime, Dale's Diner served a total of $2\frac{2}{6}$ pots of vegetable soup, $3\frac{5}{6}$ pots of chicken soup, and $4\frac{3}{6}$ pots of tomato soup. How many pots of soup were served in all?

Problem Solving • Applications Real

Use the expressions in the box for 13-14.

- **13.** Which property of addition would you use to regroup the addends in Expression A?
- **14. THINK SMARTER** Which two expressions have the same value?



 $\mathbf{A} \quad \frac{1}{8} + \left(\frac{7}{8} + \frac{4}{8}\right)$ **B** $\frac{1}{2} + 2$ **C** $\frac{3}{7} + \left(\frac{1}{2} + \frac{4}{7}\right)$ **D** $\frac{1}{3} + \frac{4}{3} + \frac{2}{3}$

15. HEARTER Match the equation with the property used.

$$\frac{6}{12} + (\frac{6}{12} + \frac{3}{12}) = (\frac{6}{12} + \frac{6}{12}) + \frac{3}{12} \quad \bullet$$

$$3\frac{2}{5} + (5\frac{4}{5} + 2\frac{1}{5}) = 3\frac{2}{5} + (2\frac{1}{5} + 5\frac{4}{5}) \quad \bullet \quad \text{Commutative Property}$$

$$(4\frac{1}{6} + 3\frac{5}{6}) + 2\frac{2}{6} = (3\frac{5}{6} + 4\frac{1}{6}) + 2\frac{2}{6} \quad \bullet \quad \text{Associative Property}$$

$$(1\frac{1}{8} + \frac{5}{8}) + 3\frac{3}{8} = 1\frac{1}{8} + (\frac{5}{8} + 3\frac{3}{8}) \quad \bullet$$

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Common MATHEMATICAL PRACTICES ANALYZE • LOOK FOR STRUCTURE • PRECISION

Pose a Problem

16. Costumes are being made for the high school musical. The table at the right shows the amount of fabric needed for the costumes of the male and female leads. Alice uses the expression $7\frac{3}{8} + 1\frac{5}{8} + 2\frac{4}{8}$ to find the total amount of fabric needed for the costume of the female lead.

To find the value of the expression using mental math, Alice used the properties of addition.

 $7\frac{3}{8} + 1\frac{5}{8} + 2\frac{4}{8} = \left(7\frac{3}{8} + 1\frac{5}{8}\right) + 2\frac{4}{8}$

Alice added 7 + 1 and was able to quickly add $\frac{3}{8}$ and $\frac{5}{8}$ to the sum of 8 to get 9. She added $2\frac{4}{8}$ to 9, so her answer was $11\frac{4}{8}$.

So, the amount of fabric needed for the costume of the female lead actor is $11\frac{4}{8}$ yards.

Write a new problem using the information for the costume for the male lead actor.

| Pose a Problem | | |
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| | Pose a Problem | |

Mathematical O Identify Relationships Explain how using the properties of addition makes both problems easier to solve.

| Costume Fabric (in Yards) | | |
|---------------------------|------------------------|----------------------|
| Material | Female Lead Costume | Male Lead Costume |
| Silk | $7\frac{3}{8}$ | 1 <u>2</u> |
| Felt | 1 <u>5</u> | $2\frac{3}{8}$ |
| Cotton | 2 <u>4</u> 8 | 5 <u>6</u> |

Solve your problem. Check your solution.

Name

Fractions and Properties of Addition

Use the properties and mental math to find the sum.

2. $10\frac{1}{8} + \left(3\frac{5}{8} + 2\frac{7}{8}\right)$ **1.** $5\frac{1}{3} + \left(2\frac{2}{3} + 1\frac{1}{3}\right)$ $5\frac{1}{3} + (4)$ $9\frac{1}{3}$ **4.** $6\frac{3}{4} + \left(4\frac{2}{4} + 5\frac{1}{4}\right)$ 5. $\left(6\frac{3}{6} + 10\frac{4}{6}\right) + 9\frac{2}{6}$ 6. $\left(6\frac{2}{5}+1\frac{4}{5}\right)+3\frac{1}{5}$

Problem Solving

- 7. Nate's classroom has three tables of different lengths. One has a length of $4\frac{1}{2}$ feet, another has a length of 4 feet, and a third has a length of $2\frac{1}{2}$ feet. What is the length of all three tables when pushed end to end?
- **8.** Mr. Warren uses $2\frac{1}{4}$ bags of mulch for his garden and another $4\frac{1}{4}$ bags for his front yard. He also uses $\frac{3}{4}$ bag around a fountain. How many total bags of mulch does Mr. Warren use?

9. **WRITE** Math Describe how the Commutative and Associative Properties of Addition can make adding mixed numbers easier.

Practice and Homework Lesson 7.9



COMMON CORE STANDARD—4.NF.B.3c Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

3.
$$8\frac{1}{5} + \left(3\frac{2}{5} + 5\frac{4}{5}\right)$$

(

Lesson Check (4.NF.B.3c)

- **1.** A carpenter cut a board into three pieces. One piece was $2\frac{5}{6}$ feet long. The second piece was $3\frac{1}{6}$ feet long. The third piece was $1\frac{5}{6}$ feet long. How long was the board?
- 2. Harry works at an apple orchard. He picked $45\frac{7}{8}$ pounds of apples on Monday. He picked $42\frac{3}{8}$ pounds of apples on Wednesday. He picked $54\frac{1}{8}$ pounds of apples on Friday. How many pounds of apples did Harry pick those three days?

Spiral Review (4.0A.B.4, 4.NBT.B.5, 4.NBT.B.6, 4.NF.B.3c)

- **3.** There were 6 oranges in the refrigerator. Joey and his friends ate $3\frac{2}{3}$ oranges. How many oranges were left?
- **4.** Darlene was asked to identify which of the following numbers is prime:

2, 12, 21, 39

Which number should she choose?

- **5.** A teacher has 100 chairs to arrange for an assembly into equal rows. Write one way the chairs could be arranged. Include the number of rows and the number of chairs in each row.
- **6.** Nic bought 28 folding chairs for \$16 each. How much money did Nic spend on chairs?

