

Name _____

Fractions and Properties of Addition

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



Numbers and Operations—
Fractions—4.NF.B.3c

MATHEMATICAL PRACTICES
MP2, MP7

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?



Use the properties to order and group.

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

$$70\frac{5}{10} + 43\frac{6}{10} + 34\frac{5}{10} = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$

$$= (\underline{\hspace{2cm}} + \underline{\hspace{2cm}}) + \underline{\hspace{2cm}}$$

$$= (\underline{\hspace{2cm}}) + \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

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.

So, the distance from the Dry Tortugas Lighthouse to the Alligator Reef Lighthouse, traveling between the four lighthouses, is _____ miles.

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

$$1\frac{1}{3} + (2 + 3\frac{2}{3})$$

Share and Show



1. Complete. Name the property used.

$$\begin{aligned} \left(3\frac{4}{10} + 5\frac{2}{10}\right) + \frac{6}{10} &= \left(5\frac{2}{10} + 3\frac{4}{10}\right) + \underline{\hspace{2cm}} \\ &= 5\frac{2}{10} + \left(3\frac{4}{10} + \underline{\hspace{2cm}}\right) \\ &= 5\frac{2}{10} + \underline{\hspace{2cm}} \\ &= \underline{\hspace{2cm}} \end{aligned}$$

Math Talk

MATHEMATICAL PRACTICES 2

Reason Abstractly

Describe how you could use the properties to find the sum $1\frac{1}{3} + 2\frac{5}{8} + 1\frac{2}{3}$.

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. $5\frac{3}{6} + \left(5\frac{5}{6} + 4\frac{3}{6}\right)$

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

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

7. $\frac{3}{12} + \left(1\frac{8}{12} + \frac{9}{12}\right)$

On Your Own

Use the properties and mental math to find the sum.

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

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

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

11. **GO DEEPER** 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. **GO DEEPER** 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 World

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?



- A $\frac{1}{8} + (\frac{7}{8} + \frac{4}{8})$
- B $\frac{1}{2} + 2$
- C $\frac{3}{7} + (\frac{1}{2} + \frac{4}{7})$
- D $\frac{1}{3} + \frac{4}{3} + \frac{2}{3}$

15. **THINK SMARTER** Match the equation with the property used.

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

$3\frac{2}{5} + (5\frac{4}{5} + 2\frac{1}{5}) = 3\frac{2}{5} + (2\frac{1}{5} + 5\frac{4}{5})$ •

$(4\frac{1}{6} + 3\frac{5}{6}) + 2\frac{2}{6} = (3\frac{5}{6} + 4\frac{1}{6}) + 2\frac{2}{6}$ •

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

• Commutative Property

• Associative Property

Pose a Problem

16. **GO DEEPER** 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.

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

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.

Material	Female Lead Costume	Male Lead Costume
Silk	$7\frac{3}{8}$	$1\frac{2}{8}$
Felt	$1\frac{5}{8}$	$2\frac{3}{8}$
Cotton	$2\frac{4}{8}$	$5\frac{6}{8}$

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

Pose a Problem

Solve your problem. Check your solution.

- MATHEMATICAL PRACTICE 7
Identify Relationships Explain how using the properties of addition makes both problems easier to solve.

Name _____

Fractions and Properties of Addition



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

Use the properties and mental math to find the sum.

1. $5\frac{1}{3} + (2\frac{2}{3} + 1\frac{1}{3})$

2. $10\frac{1}{8} + (3\frac{5}{8} + 2\frac{7}{8})$

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

$5\frac{1}{3} + (4)$

$9\frac{1}{3}$

4. $6\frac{3}{4} + (4\frac{2}{4} + 5\frac{1}{4})$

5. $(6\frac{3}{6} + 10\frac{4}{6}) + 9\frac{2}{6}$

6. $(6\frac{2}{5} + 1\frac{4}{5}) + 3\frac{1}{5}$

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.

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.OA.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?

