Chapter 9

Name _____

Add and Subtract Fractions and Mixed Numbers with Unlike Denominators

Show What You Know

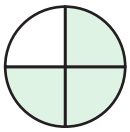
Part of a Whole Write a fraction to name the shaded part.

1. 

number of shaded parts _____

number of total parts _____

fraction _____

2. 

number of shaded parts _____

number of total parts _____

fraction _____

Add and Subtract Fractions Write the sum or difference.

3. $\frac{2}{4} + \frac{1}{6} =$ _____

4. $\frac{2}{5} + \frac{3}{10} =$ _____

5. $\frac{7}{8} - \frac{3}{4} =$ _____

6. $\frac{3}{4} - \frac{1}{6} =$ _____

Multiples Write the first six nonzero multiples.

7. 6 _____

8. 8 _____

9. 4 _____

MATH in the Real World

A Merchant Grain Beetle is about $\frac{1}{8}$ of an inch long. A a carpet beetle is about $\frac{1}{16}$ of an inch long. How much longer is the grain beetle than the carpet beetle?

Vocabulary Builder

Go Online For more help

Visualize It

Use the ✓ words to complete the H-diagram.

Add and Subtract Mixed Numbers with Like		Add and Subtract Mixed Numbers with Unlike
_____		_____

Connect to Vocabulary

Review Words

benchmark
✓common multiple
✓denominators
✓difference
✓equivalent fractions
mixed number
✓numerators
✓simplest form
✓sum
✓common denominator

Understand Vocabulary

Complete each sentence.

1. _____ are located at the same point on a number line.

2. A number that has both a fraction and a whole number part is called a _____.

3. When two fractions have the same number on the bottom, they are said to have a _____.

Name _____

Add and Subtract Mixed Numbers with Unlike Denominators

Florida's B.E.S.T.

- **Fractions** 5.FR.2.1
- **Algebraic Reasoning** 5.AR.1.2
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.3.1, MTR.6.1

I Can add and subtract mixed numbers with unlike denominators.

UNLOCK the Problem

Real World

Denise mixed $1\frac{4}{5}$ ounces of blue paint with $2\frac{1}{10}$ ounces of yellow paint. How many ounces of paint did Denise mix?

- What operation should you use to solve the problem?

_____

- Do the fractions have the same denominator?

_____

Add. $1\frac{4}{5} + 2\frac{1}{10}$

To find the sum of mixed numbers with unlike denominators, you can use a common denominator.

STEP 1 Estimate the sum. _____

STEP 2 Find a common denominator. Use the common denominator to write equivalent fractions with like denominators.

STEP 3 Add the fractions. Then add the whole numbers.

$$1\frac{4}{5} = \square$$
$$+\ 2\frac{1}{10} = +\ \square$$
$$\square$$

So, Denise mixed _____ ounces of paint.

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

How did you find the common denominator?

1. MTR Explain how you know whether your answer is reasonable.

_____

_____

2. What other common denominator could you have used? _____

_____

Examples

Subtract. $4\frac{5}{6} - 2\frac{3}{4}$

You can also use a common denominator to find the difference of mixed numbers with unlike denominators.

STEP 1 Estimate the difference. _____

STEP 2 Find a common denominator. Use the common denominator to write equivalent fractions with like denominators.

STEP 3 Subtract the fractions. Subtract the whole numbers.

$$4\frac{5}{6} = \square$$
$$-2\frac{3}{4} = -\square$$
$$\square$$

3. MTR Explain how you know whether your answer is reasonable.

_____

_____

Share and Show

Math Board

1. Use a common denominator to write equivalent fractions with like denominators and then find the sum.

$$7\frac{2}{5} = \square$$
$$+4\frac{3}{4} = +\square$$
$$\square$$

Find the sum.

2. $2\frac{3}{4} + 3\frac{3}{10}$

3. $5\frac{3}{4} + 1\frac{1}{3}$

4. $3\frac{4}{5} + 2\frac{3}{10}$

Name _____

Find the difference.

5. $9\frac{5}{6} - 2\frac{1}{3}$

6. $10\frac{5}{9} - 9\frac{1}{6}$

7. $7\frac{2}{3} - 3\frac{1}{6}$

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

Explain why you need to write equivalent fractions with common denominators to add $4\frac{5}{6}$ and $1\frac{1}{8}$.

On Your Own

Find the sum or difference.

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

9. $8\frac{1}{6} + 7\frac{3}{8}$

10. $2\frac{1}{2} + 2\frac{1}{3}$

11. $12\frac{3}{4} - 6\frac{1}{6}$

12. $2\frac{5}{8} - 1\frac{1}{4}$

13. $14\frac{7}{12} - 5\frac{1}{4}$

Find the sum or difference.

14. $1\frac{5}{12} + 4\frac{1}{6}$

15. $8\frac{1}{2} + 6\frac{3}{5}$

16. $2\frac{1}{6} + 4\frac{5}{9}$

17. $3\frac{5}{8} + \frac{5}{12}$

18. $3\frac{2}{3} - 1\frac{1}{6}$

19. $5\frac{6}{7} - 1\frac{2}{3}$

20. $2\frac{7}{8} - \frac{1}{2}$

21. $4\frac{7}{12} - 1\frac{2}{9}$

22. Dakota makes a salad dressing by combining $6\frac{1}{3}$ fluid ounces of oil and $2\frac{3}{8}$ fluid ounces of vinegar in a jar. She then pours $2\frac{1}{4}$ fluid ounces of the dressing onto her salad. How much dressing remains in the jar?

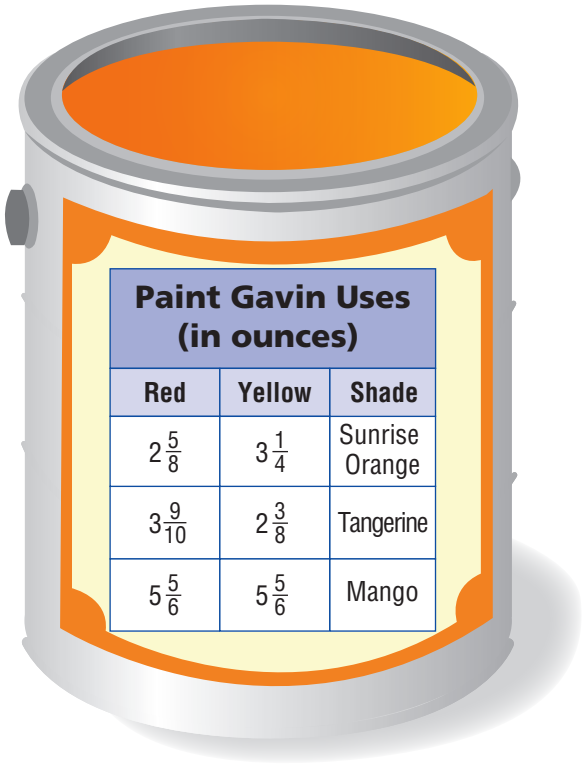
_____

23. This week, Talulla worked $2\frac{1}{2}$ hours on Monday, $2\frac{2}{3}$ hours on Tuesday, and $3\frac{1}{4}$ hours on Wednesday. How many more hours will Talulla need to work this week to make her goal of $10\frac{1}{2}$ hours a week?

_____

Problem Solving · Applications

Use the table to solve Problems 24 and 25.



Paint Gavin Uses (in ounces)

Red	Yellow	Shade
$2\frac{5}{8}$	$3\frac{1}{4}$	Sunrise Orange
$3\frac{9}{10}$	$2\frac{3}{8}$	Tangerine
$5\frac{5}{6}$	$5\frac{5}{6}$	Mango

24. MTR Gavin plans to mix a batch of Tangerine paint. He expects to have a total of $5\frac{3}{10}$ ounces of paint after he mixes the amounts of red and yellow. Explain how you can tell if Gavin's expectation is reasonable.

25. Gavin mixes the amount of red from one shade of paint with the amount of yellow from a different shade of paint. He mixes the batch so he will have the greatest possible amount of paint. What amounts of red and yellow from which shades are used in the mixture? Explain your answer.

MATH on the Spot

26. Martin won first place in the 100-meter dash with a time of $14\frac{23}{100}$ seconds. Samuel came in second place with a time of $15\frac{7}{10}$ seconds. For 26a–26d, select True or False for each statement.

26a. A common denominator of the mixed numbers is 100. ○ True ○ False

26b. To find the difference between the runners' times, Samuel's time needs to be rewritten. ○ True ○ False

26c. Samuel's time written with a denominator of 100 is $15\frac{70}{100}$. ○ True ○ False

26d. Martin beat Samuel by $\frac{21}{25}$ second. ○ True ○ False

Name _____

Add and Subtract Mixed Numbers with Unlike Denominators

Go Online
Interactive Examples

Find the sum or difference.

1. $3\frac{1}{2} - 1\frac{1}{5}$

$3\frac{1}{2} \rightarrow 3\frac{5}{10}$

$-1\frac{1}{5} \rightarrow -1\frac{2}{10}$

$2\frac{3}{10}$

2. $2\frac{1}{3} + 1\frac{3}{4}$

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

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

5. $2\frac{1}{4} + 1\frac{2}{5}$

6. $5\frac{17}{18} - 2\frac{2}{3}$

7. $6\frac{3}{4} - 1\frac{5}{8}$

8. $5\frac{3}{7} - 2\frac{1}{5}$

Problem Solving Real World

9. Jacobi bought $7\frac{1}{2}$ pounds of meatballs. He decided to cook $1\frac{1}{4}$ pounds and freeze the rest. How many pounds did he freeze?

10. Ms. Roth walked $8\frac{1}{8}$ miles to a park and then $7\frac{2}{5}$ miles home. How many miles did she walk?

11. WRITE Math Write your own story problem using mixed numbers. Show the solution.

Lesson Check

12. Mrs. Rhein has a goal to jog $4\frac{1}{2}$ miles each day. On Monday she jogged $5\frac{9}{16}$ miles. By how much did she exceed her goal for that day?

13. At the deli, Ricardo ordered $3\frac{1}{5}$ pounds of cheddar cheese and $2\frac{3}{4}$ pounds of mozzarella cheese. How many pounds of cheese did he order all together?

Spiral Review

14. The theater has 175 seats. There are 7 seats in each row. How many rows are there?

15. During the first 14 days, 2,744 people visited a new store. The same number of people visited the store each day. About how many people visited the store each day?

16. What number is 100 times as great as 0.3?

17. Mark said that the product of 0.02 and 0.7 is 14. Mark is wrong. What is the product?

Name _____

Rename Mixed Numbers to Subtract

I Can use renaming to find the difference of two mixed numbers.

Florida's B.E.S.T.

- **Fractions** 5.FR.2.1
- **Algebraic Reasoning** 5.AR.1.2
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.3.1

UNLOCK the Problem

Real World

To practice for a race, Kara is running $2\frac{1}{2}$ miles. When she reaches the end of her street, she knows that she has already run $1\frac{5}{6}$ miles. How many miles does Kara have left to run?

- Underline the sentence that tells you what you need to find.
- What operation should you use to solve the problem?

_____

One Way Rename the first mixed number.

Subtract. $2\frac{1}{2} - 1\frac{5}{6}$

STEP 1 Estimate the difference. _____

STEP 2 Find a common denominator. Use the common denominator to write equivalent fractions with like denominators.

STEP 3 Since $\frac{6}{12}$ is less than $\frac{10}{12}$, rename $2\frac{6}{12}$ as a mixed number with a fraction greater than 1.

Think: $2\frac{6}{12} = 1 + 1 + \frac{6}{12} = 1 + \frac{12}{12} + \frac{6}{12} = 1\frac{18}{12}$

$2\frac{6}{12} =$ _____

STEP 4 Find the difference of the fractions. Then find the difference of the whole numbers. Check to make sure your answer is reasonable.

$2\frac{1}{2} = 2\frac{6}{12} =$

$-1\frac{5}{6} = -1\frac{10}{12} = -1\frac{10}{12}$

So, Kara has _____ mile left to run.

- **MTR** Explain why it is important to write equivalent fractions before renaming. _____

_____

Another Way Rename both mixed numbers as fractions greater than 1.

Subtract. $2\frac{1}{2} - 1\frac{5}{6}$

STEP 1 Write equivalent fractions, using a common denominator.

A common denominator of $\frac{1}{2}$ and $\frac{5}{6}$ is 6.

$2\frac{1}{2} \longrightarrow$ ☐

$1\frac{5}{6} \longrightarrow$ ☐

STEP 2 Rename both mixed numbers as fractions greater than 1.

$2\frac{3}{6} =$ ☐ **Think:** $\frac{6}{6} + \frac{6}{6} + \frac{3}{6}$

$1\frac{5}{6} =$ ☐ **Think:** $\frac{6}{6} + \frac{5}{6}$

STEP 3 Find the difference of the fractions.

☐ $-$ ☐ $=$ ☐ ☐

$2\frac{1}{2} - 1\frac{5}{6} =$ _____

Share and Show Math Board

Estimate. Then find the difference.

1. Estimate: _____

$4\frac{1}{2} - 3\frac{4}{5}$

2. Estimate: _____

$9\frac{1}{6} - 2\frac{3}{4}$

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

Explain the strategy you could use to solve $3\frac{1}{9} - 2\frac{1}{3}$.

Name _____

On Your Own

Estimate. Then find the difference.

3. Estimate: _____

$3\frac{2}{3} - 1\frac{11}{12}$

4. Estimate: _____

$4\frac{1}{4} - 2\frac{1}{3}$

5. Estimate: _____

$5\frac{2}{5} - 1\frac{1}{2}$

Find the difference.

6. $11\frac{1}{9} - 3\frac{2}{3}$

7. $6 - 3\frac{1}{2}$

8. $4\frac{3}{8} - 3\frac{1}{2}$

9. $9\frac{1}{6} - 3\frac{5}{8}$

10. $1\frac{1}{5} - \frac{1}{2}$

11. $13\frac{1}{6} - 3\frac{4}{5}$

12. $12\frac{2}{5} - 5\frac{3}{4}$

13. $7\frac{3}{8} - 2\frac{7}{9}$

14. Three commercials are played in a row between songs on the radio. The three commercials fill exactly 3 minutes of time. If the first commercial uses $1\frac{1}{6}$ minutes, and the second uses $\frac{3}{5}$ minute, how long is the third commercial?

_____

15. Four students made videos for an art project. The table shows the length of each video.

Match each pair of videos with the correct difference between their times.

Video 1 and Video 3 ●	● $1\frac{17}{30}$ hours
Video 2 and Video 3 ●	● $1\frac{9}{10}$ hours
Video 2 and Video 4 ●	● $1\frac{11}{12}$ hours

Art in Nature

Video	Time (in hours)
1	$4\frac{3}{4}$
2	$4\frac{2}{5}$
3	$2\frac{5}{6}$
4	$2\frac{1}{2}$

Connect to Reading

Summarize

An amusement park in Sandusky, Ohio, offers 17 amazing roller coasters for visitors to ride. One of the roller coasters runs at 60 miles per hour and has 3,900 feet of twisting track. This coaster also has 3 trains with 8 rows per train. Riders stand in rows of 4, for a total of 32 riders per train.

The operators of the coaster recorded the number of riders on each train during a run. On the first train, the operators reported that $7\frac{1}{4}$ rows were filled. On the second train, all 8 rows were filled, and on the third train, $5\frac{1}{2}$ rows were filled. How many more rows were filled on the first train than on the third train?

When you *summarize*, you restate the most important information in a shortened form to more easily understand what you have read.

16. MTR Identify and summarize the important information given in the problem.

Use the summary from Problem 16 to solve.

17. Solve the problem.

18. How many rows were empty on the first train? How many additional riders would it take to fill the empty rows? Explain your answer.

MATH on the Spot

Name _____

Rename Mixed Numbers to Subtract

Go Online
Interactive Examples

Estimate. Then find the difference.

1. Estimate: _____

$6\frac{1}{3} - 1\frac{2}{5}$

$6\frac{1}{3} \rightarrow 6\frac{5}{15} \rightarrow 5\frac{20}{15}$

$-1\frac{2}{5} \rightarrow -1\frac{6}{15}$

$4\frac{14}{15}$

2. Estimate: _____

$4\frac{1}{2} - 3\frac{5}{6}$

3. Estimate: _____

$9 - 3\frac{7}{8}$

4. Estimate: _____

$2\frac{1}{6} - 1\frac{2}{7}$

5. Estimate: _____

$8 - 6\frac{1}{9}$

6. Estimate: _____

$9\frac{1}{4} - 3\frac{2}{3}$

Problem Solving Real World

7. Carlene bought $8\frac{1}{16}$ yards of ribbon to decorate a shirt. She only used $5\frac{1}{2}$ yards. How much ribbon does she have left over?

_____

8. During his first vet visit, Pedro's puppy weighed $6\frac{1}{8}$ pounds. On his second visit, he weighed $9\frac{1}{16}$ pounds. How much weight did he gain between visits?

_____

9. WRITE Math Write a subtraction problem that has mixed numbers and requires renaming. Draw a visual model illustrating the steps you take to solve the problem.

_____

_____

Lesson Check

10. Natalia picked $7\frac{1}{6}$ bushels of apples today and $4\frac{5}{8}$ bushels yesterday. How many more bushels did she pick today?

11. Max needs $10\frac{1}{4}$ cups of flour to make a batch of pizza dough for the pizzeria. He only has $4\frac{1}{2}$ cups of flour. How much more flour does he need to make the dough?

Spiral Review

12. The accountant charged $35 for the first hour of work and $23 for each hour after that. He earned a total of $127. How many hours did he work?

13. The soccer league needs to transport all 133 players to the tournament. If 4 players can ride in one car, how many cars are needed?

14. What is five hundred million, one hundred fifteen written in standard form?

15. Find the quotient.

$$6.39 \div 0.3$$

Name _____

Describe and Create Fraction Patterns

Florida's B.E.S.T.

- **Fractions** 5.FR.2.1
- **Algebraic Reasoning** 5.AR.3.1
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.3.1

I Can use addition and subtraction to describe a pattern or create a sequence with fractions.

UNLOCK the Problem Real World

Mr. Patrick wants to develop a new chili recipe for his restaurant. Each batch he makes uses a different amount of chili powder. The first batch uses $3\frac{1}{2}$ ounces, the second batch uses $4\frac{5}{6}$ ounces, the third uses $6\frac{1}{6}$ ounces, and the fourth uses $7\frac{1}{2}$ ounces. If this pattern continues, how much chili powder will he use in the sixth batch?

You can find the pattern in a sequence by comparing one term with the next term.

STEP 1 Write the terms in the sequence as equivalent fractions with a common denominator. Then examine the sequence and compare the consecutive terms to find the rule used to make the sequence of fractions.

$3\frac{1}{2}, 4\frac{5}{6}, 6\frac{1}{6}, 7\frac{1}{2}, \ldots \rightarrow$ ____ oz, ____ oz, ____ oz, ____ oz

$+1\frac{2}{6}$ — difference between terms

terms with common denominator

batch 1 batch 2 batch 3 batch 4

STEP 2 Write a rule that describes the pattern in the sequence.

- Is the sequence increasing or decreasing from one term to the next? Explain.

_____

_____

Rule: _____

STEP 3 Extend the sequence to solve the problem.

$3\frac{1}{2}, 4\frac{5}{6}, 6\frac{1}{6}, 7\frac{1}{2},$ _____, _____

So, Mr. Patrick will use _____ ounces of chili powder in the sixth batch.

Examples Find the unknown terms in the sequence.

$1\frac{3}{4}, 1\frac{9}{16}, 1\frac{3}{8}, 1\frac{3}{16}, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \frac{7}{16}, \frac{1}{4}$

STEP 1 Write the terms in the sequence as equivalent fractions with a common denominator.

_____ , _____ , _____ , _____ , ? , ? , ? , _____ , _____

STEP 2 Write a rule describing the pattern in the sequence.

- What operation can be used to describe a sequence that increases?

_____

- What operation can be used to describe a sequence that decreases?

_____

Rule: _____

STEP 3 Use your rule to find the unknown terms. Then complete the sequence.

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

How do you know whether your rule for a sequence would involve addition or subtraction?

Try This!

A **Write a rule for the sequence. Then find the unknown term.**

$1\frac{1}{12}, \frac{5}{6}, \_\_\_\_\_, \frac{1}{3}, \frac{1}{12}$

Rule: _____

B **Write the first four terms of the sequence.**

Rule: start at $\frac{1}{4}$, add $\frac{3}{8}$

_____ , _____ , _____ , _____

Name _____

Share and Show

Write a rule for the sequence.

1. $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, \ldots$

Think: Is the sequence increasing or decreasing?

Rule: _____

2. $\frac{1}{9}, \frac{1}{3}, \frac{5}{9}, \ldots$

Rule: _____

Write a rule for the sequence. Then find the unknown term.

3. $\frac{3}{10}, \frac{2}{5}, \_\_\_\_\_, \frac{3}{5}, \frac{7}{10}$

Rule: _____

4. $10\frac{2}{3}, 9\frac{11}{18}, 8\frac{5}{9}, \_\_\_\_\_, 6\frac{4}{9}$

Rule: _____

On Your Own

Write the first four terms of the sequence.

5. **Rule:** start at $5\frac{3}{4}$, subtract $\frac{5}{8}$

_____, _____, _____, _____

6. **Rule:** start at $\frac{3}{8}$, add $\frac{3}{16}$

_____, _____, _____, _____

7. **Rule:** start at $2\frac{1}{3}$, add $2\frac{1}{4}$

_____, _____, _____, _____

8. **Rule:** start at $\frac{8}{9}$, subtract $\frac{1}{18}$

_____, _____, _____, _____

9. MTR Vicki started jogging. The first time she ran, she ran $\frac{3}{16}$ mile. The second time, she ran $\frac{3}{8}$ mile, and the third time, she ran $\frac{9}{16}$ mile. If she continued this pattern, when was the first time she ran more than 1 mile? Explain.

_____

_____

_____

10. Mr. Kuri drove $78\frac{1}{3}$ miles on Monday, $77\frac{1}{12}$ miles on Tuesday, and $75\frac{5}{6}$ miles on Wednesday. If he continues this pattern on Thursday and Friday, how many fewer miles will he drive on Friday than on Tuesday?

_____

Problem Solving · Applications

11. When Bill bought a marigold plant, it was $\frac{1}{4}$ inch tall. After the first week, it measured $1\frac{1}{12}$ inches tall. After the second week, it was $1\frac{11}{12}$ inches. After week 3, it was $2\frac{3}{4}$ inches tall. Assuming the growth of the plant was constant, what was the height of the plant at the end of week 4?

12. What if Bill's plant grew at the same rate but was $1\frac{1}{2}$ inches when he bought it? How tall would the plant be after 3 weeks?

MATH on the Spot

13. Kendra hiked each day for a week. The first day she hiked $\frac{1}{8}$ mile, the second day she hiked $\frac{3}{8}$ mile, and the third day she hiked $\frac{5}{8}$ mile.

What is the rule for the distance Kendra hikes each day? Show how you can check your answer.

If the pattern continues, how many miles will Kendra hike on day 7? Explain how you found your answer.

Name _____

Describe and Create Fraction Patterns

Go Online
Interactive Examples

Write a rule for the sequence. Then, find the unknown term.

1. $\frac{1}{2}, \frac{2}{3}, \underline{\frac{5}{6}}, 1, 1\frac{1}{6}$

Think: The pattern is increasing. Add $\frac{1}{6}$ to find the next term.

Rule: _____

2. $1\frac{3}{8}, 1\frac{3}{4}, 2\frac{1}{8}, \_\_\_\_, 2\frac{7}{8}$

Rule: _____

3. $1\frac{9}{10}, 1\frac{7}{10}, \_\_\_\_, 1\frac{3}{10}, 1\frac{1}{10}$

Rule: _____

4. $2\frac{5}{12}, 2\frac{1}{6}, 1\frac{11}{12}, \_\_\_\_, 1\frac{5}{12}$

Rule: _____

Write the first four terms of the sequence.

5. Rule: start at $\frac{1}{2}$, add $\frac{1}{3}$

_____

6. Rule: start at $3\frac{1}{8}$, subtract $\frac{3}{4}$

_____

Problem Solving Real World

7. Jarett's puppy weighed $3\frac{3}{4}$ ounces at birth. At one week old, the puppy weighed $5\frac{1}{8}$ ounces. At two weeks old, the puppy weighed $6\frac{1}{2}$ ounces. If the weight gain continues in this pattern, how much will the puppy weigh at three weeks old?

_____

8. A baker started out with 12 cups of flour. She had $9\frac{1}{4}$ cups of flour left after the first batch of batter she made. She had $6\frac{1}{2}$ cups of flour left after the second batch of batter she made. If she makes two more batches of batter, how many cups of flour will be left?

_____

9. WRITE Math Make up your own sequence of 5 fractions or mixed numbers. Offer the sequence to another student to try to find the next fraction in the sequence.

_____

Lesson Check

10. What is a rule for the sequence?

$\frac{5}{6}, 1\frac{1}{2}, 2\frac{1}{6}, 2\frac{5}{6}, \ldots$

11. Jaime biked $5\frac{1}{4}$ miles on Monday, $6\frac{7}{8}$ miles on Tuesday, and $8\frac{1}{2}$ miles on Wednesday. If he continues the pattern, how many miles will he bike on Friday?

Spiral Review

12. Jaylyn rode her bicycle in a bike-a-thon. She rode 33.48 miles in 2.7 hours. If she rode at the same speed, what was her speed in miles per hour?

13. One week a company filled 546 boxes with widgets. Each box held 38 widgets. How many widgets did the company pack in boxes that week?

14. Write an expression that represents the statement "Add 9 and 3, then multiply by 6."

15. Mason took 9.4 minutes to complete the first challenge in the Champs Challenge. He completed the second challenge 2.65 minutes faster than the first challenge. How long did it take Mason to complete the second challenge?

Name _____

Apply Properties of Addition

I Can use properties to help add fractions with unlike denominators.

Florida's B.E.S.T.

- **Fractions** 5.FR.2.1
- **Algebraic Reasoning** 5.AR.1.2
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1, MTR.6.1

CONNECT You can use properties of addition to help you add fractions with unlike denominators.

Commutative Property: $\frac{1}{2} + \frac{3}{5} = \frac{3}{5} + \frac{1}{2}$

Associative Property: $\left(\frac{2}{9} + \frac{1}{8}\right) + \frac{3}{8} = \frac{2}{9} + \left(\frac{1}{8} + \frac{3}{8}\right)$

Remember

Parentheses ( ) tell which operation to do first.

UNLOCK the Problem Real World

Jane and her family are driving to Big Lagoon State Park. On the first day, they travel $\frac{1}{3}$ of the total distance. On the second day, they travel $\frac{1}{3}$ of the total distance in the morning and then $\frac{1}{6}$ of the total distance in the afternoon. How much of the total distance has Jane's family driven by the end of the second day?

Use the Associative Property.

Day 1 + Day 2

$$\frac{1}{3} + \left(\frac{1}{3} + \frac{1}{6}\right) = \left(\square + \square\right) + \square$$

Write the number sentence to represent the problem. Use the Associative Property to group fractions with like denominators together.

$$= \square + \square$$

Use mental math to add the fractions with like denominators.

$$= \square + \square$$

Write equivalent fractions with like denominators. Then add.

$$= \square$$

So, Jane's family has driven _____ of the total distance by the end of the second day.

Math Talk

MTR 4.1 Engage in discussions on mathematical thinking.

Explain why grouping the fractions differently makes it easier to find the sum.

Examples

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

Use the Commutative Property and the Associative Property.

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

Use the Commutative Property to put fractions with like denominators next to each other.

$$= \quad + \left(\quad + \quad\right)$$

Use the Associative Property to group fractions with like denominators together.

$$= \quad + \quad$$

Use mental math to add the fractions with like denominators.

$$= \quad + \quad$$

Write equivalent fractions with like denominators. Then add.

$$= \quad \quad$$

Rename and simplify.

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

A $5\frac{1}{4} + \left(\frac{3}{4} + 1\frac{5}{12}\right)$

B $\left(\frac{1}{5} + \frac{3}{10}\right) + \frac{2}{5}$

Name _____

Share and Show

Math Board

Use the properties and mental math to solve.

1. $\left(2\frac{5}{8} + \frac{5}{6}\right) + 1\frac{1}{8}$

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

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

Math Talk

MTR 2.1 Demonstrate understanding in multiple ways.

How is solving Problem 3 different from solving Problem 1?

On Your Own

Use the properties and mental math to solve.

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

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

6. $\left(\frac{1}{6} + \frac{3}{7}\right) + \frac{2}{7}$

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

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

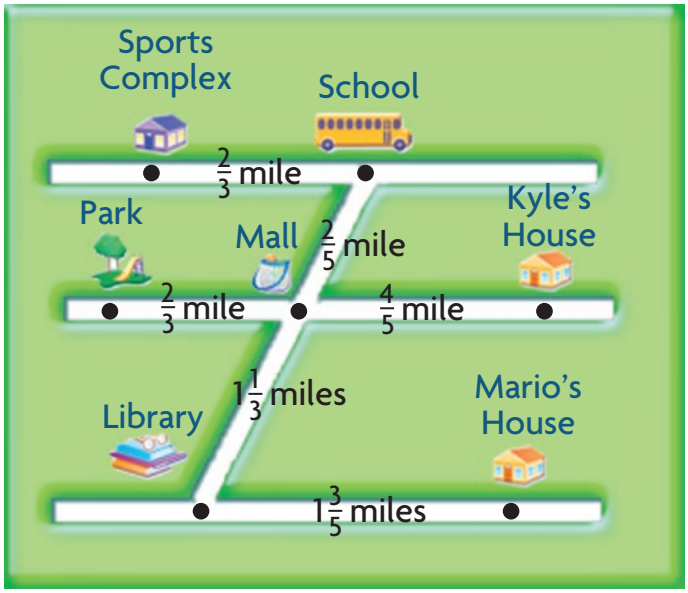
9. $\frac{5}{9} + \left(\frac{1}{9} + \frac{4}{5}\right)$

10. Tina used $10\frac{1}{2}$ yards of yarn to make three yarn dolls. She used $4\frac{1}{2}$ yards of yarn for the first doll and $2\frac{1}{5}$ yards for the second doll. How much yarn did Tina use for the third doll?

_____

Problem Solving · Applications

Use the map to solve Problems 11 and 12.



11. Jules rides a bike from the sports complex to the school. Then Jules rides from the school to the mall, and then on to the library. Kyle rides his bike from his house to the mall, and then to the library. Who rides farther? How many miles farther?

12. On one afternoon, Mario walks from his house to the library. That evening, Mario walks from the library to the mall, and then to Kyle's house. Describe how you can use the properties to find how far Mario walks.

MATH on the Spot

13. MTR Kyle is adding the distances between the school and the mall, the mall and the park, and the mall and his house. He writes $\frac{2}{5} + \frac{2}{3} + \frac{4}{5}$. Rewrite Kyle's expression using properties so the fractions are easier to add.

14. For 14a–14c, tell whether the Commutative Property or the Associative Property can be used to show that each equation is true without calculating. Choose the correct property of addition.

14a. $\frac{9}{10} + (\frac{3}{10} + \frac{5}{6}) = (\frac{9}{10} + \frac{3}{10}) + \frac{5}{6}$

Associative Property
Commutative Property

14b. $(\frac{3}{4} + \frac{1}{5}) + \frac{1}{4} = (\frac{1}{5} + \frac{3}{4}) + \frac{1}{4}$

Associative Property
Commutative Property

14c. $(3\frac{1}{2} + 2\frac{1}{8}) + 1\frac{5}{8} = 3\frac{1}{2} + (2\frac{1}{8} + 1\frac{5}{8})$

Associative Property
Commutative Property

Name _____

Apply Properties of Addition

Go Online
Interactive Examples

Use the properties and mental math to solve.

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

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

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

$= 1\frac{2}{5} + 6$

$= 7\frac{2}{5}$

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

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

4. $2\frac{1}{10} + \left(1\frac{2}{7} + 4\frac{9}{10}\right)$

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

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

Problem Solving Real World

7. Eliza rode her bike $6\frac{1}{2}$ miles from her house to the library and then another $2\frac{2}{5}$ miles to her friend Milo's house. If Carson's house is $2\frac{1}{2}$ miles beyond Milo's house, how far would she travel from her house to Carson's house?

8. Hassan made a vegetable salad with $2\frac{3}{8}$ pounds of tomatoes, $1\frac{1}{4}$ pounds of asparagus, and $2\frac{7}{8}$ pounds of potatoes. How many pounds of vegetables did he use altogether?

9. WRITE Math Write the definitions for the Commutative Property and Associative Property. Give an example for each property.

Lesson Check

10. What is the sum of $2\frac{1}{3}$, $3\frac{5}{6}$, and $6\frac{2}{3}$?

11. Letitia has $7\frac{1}{6}$ yards of yellow ribbon, $5\frac{1}{4}$ yards of orange ribbon, and $5\frac{1}{6}$ yards of brown ribbon. How much ribbon does she have altogether?

Spiral Review

12. Juanita wrote 3×47 as $3 \times 40 + 3 \times 7$. What property did she use to rewrite the expression?

13. What is the value of the expression?

$$18 - 2 \times (4 + 3)$$

14. Evan spent $15.89 on 7 pounds of birdseed. How much did the birdseed cost per pound?

15. Cade rode $1\frac{3}{5}$ miles on Saturday and $1\frac{3}{4}$ miles on Sunday. How far did he ride on the two days?

Name _____

Practice Addition and Subtraction Using Equations

Florida's B.E.S.T.
- **Fractions** 5.FR.2.1
- **Algebraic Reasoning** 5.AR.1.2
- **Mathematical Thinking & Reasoning** MTR.1.1, MTR.2.1, MTR.3.1, MTR.4.1

I Can use the strategy *work backward* to help solve a problem with fractions that involves addition and subtraction.

UNLOCK the Problem

Real World

The Diaz family is cross-country skiing the Big Tree trails, which have a total length of 4 miles. Yesterday, they skied the $\frac{7}{10}$-mile Oak Trail. Today, they skied the $\frac{3}{5}$-mile Pine Trail. If they plan to ski all the Big Tree trails, how many more miles do they have left to ski?

Use the graphic organizer to help you solve the problem.

Read the Problem

What do I need to find?

I need to find the distance _____.

What information do I need to use?

I need to use the distance _____

and the total distance _____.

How will I use the information?

I can work backward by starting with the _____

and _____ each distance they have already skied to find the distance they have left.

Solve the Problem

Addition and subtraction are inverse operations. By working backward and using the same numbers, one operation undoes the other.

- Write an equation.

miles skied yesterday	+	miles skied today	+	miles they need to ski	=	total distance
↓		↓		↓		↓
_____	+	_____	+	m	=	4

- Then work backward to find m.

_____ − _____ − _____ = m

_____ = m

So, the family has _____ miles left to ski.

- **MTR** Explain how you know your answer is reasonable. _____

Try Another Problem

As part of their study of Native American basket weaving, Lia's class is making wicker baskets. Lia starts with a strip of wicker 36 inches long. From the strip, she first cuts one piece but does not know its length, and then cuts a piece that is $6\frac{1}{2}$ inches long. The piece left is $7\frac{3}{4}$ inches long. What is the length of the first piece she cut from the strip?

Read the Problem

What do I need to find?	What information do I need to use?	How will I use the information?

Solve the Problem

So, the length of the first piece cut was _____ inches.

Math Talk

MTR 2.1 Demonstrate understanding in multiple ways.

What other strategy could you use to solve the problem?

Name _____

Share and Show

Math Board

1. Caitlin has $4\frac{3}{4}$ pounds of clay. She uses $1\frac{1}{10}$ pounds to make a cup, and another 2 pounds to make a jar. How many pounds are left?

First, write an equation to model the problem.

_____

Next, work backward and rewrite the equation to find x.

_____

Solve.

_____

So, _____ pounds of clay remain.

2. What if Caitlin had used more than 2 pounds of clay to make a jar? Would the amount remaining have been more or less than your answer to Problem 1?

_____

3. A pet store donated 50 pounds of food for adult dogs, puppies, and cats to an animal shelter. $19\frac{3}{4}$ pounds was adult dog food and $18\frac{7}{8}$ pounds was puppy food. How many pounds of cat food did the pet store donate?

_____

4. Thelma spent $\frac{1}{6}$ of her weekly allowance on dog toys, $\frac{1}{4}$ on a dog collar, and $\frac{1}{3}$ on dog food. What fraction of her weekly allowance is left?

_____

Unlock the Problem

- √ Plan your solution by deciding on the steps you will use.
- √ Check your exact answer by comparing it with your estimate.
- √ Check your answer for reasonableness.

Show the Math

Demonstrate Your Thinking

On Your Own

5. Adriel is making a model of a Native American canoe. He has $5\frac{1}{2}$ feet of wood. He uses $2\frac{3}{4}$ feet for the hull and $1\frac{1}{4}$ feet for a paddle. How much wood does he have left?

6. Beth's summer vacation lasted 87 days. At the beginning of her vacation, she spent some time at soccer camp, 5 days at her grandmother's house, and 13 days visiting Glacier National Park with her parents. She then had 48 vacation days remaining. How many weeks did Beth spend at soccer camp?

MATH on the Spot

7. MTR You can buy 2 DVDs for the same price you would pay for 3 CDs selling for $13.20 apiece. Explain how you could find the price of 1 DVD.

8. Julio caught 3 fish weighing a total of $23\frac{1}{2}$ pounds. One fish weighed $9\frac{5}{8}$ pounds and another weighed $6\frac{1}{4}$ pounds. How much did the third fish weigh? Use the numbers and symbols to write an equation that represents the problem. Then solve the equation. Symbols may be used more than once or not at all.

$23\frac{1}{2}$	$9\frac{5}{8}$	$6\frac{1}{4}$	x	$=$	$+$

weight of third fish: _____ pounds

Name _____

Practice Addition and Subtraction Using Equations

Go Online
Interactive Examples

Read each problem and solve.

1. From a board 8 feet in length, Emmet cut two $2\frac{1}{3}$-foot bookshelves. How much of the board remained?

Write an equation: $8 = 2\frac{1}{3} + 2\frac{1}{3} + x$

Rewrite the equation to work backward:

$$8 - 2\frac{1}{3} - 2\frac{1}{3} = x$$

Subtract twice to find the length remaining: $3\frac{1}{3}$ feet

2. Lynne bought a bag of grapefruit, $1\frac{5}{8}$ pounds of apples, and $2\frac{3}{16}$ pounds of bananas. The total weight of her purchases was $7\frac{1}{2}$ pounds. How much did the bag of grapefruit weigh?

_____

3. Mattie's house consists of two stories and an attic. The first floor is $8\frac{5}{6}$ feet tall, the second floor is $8\frac{1}{2}$ feet tall, and the entire house is $24\frac{1}{3}$ feet tall. How tall is the attic?

_____

4. It is $10\frac{3}{5}$ miles from Alston to Barton and $12\frac{1}{2}$ miles from Barton to Chester. The distance from Alston to Durbin, via Barton and Chester, is 35 miles. How far is it from Chester to Durbin?

_____

5. Marcie bought a 50-foot roll of packing tape. She used two $8\frac{5}{6}$-foot lengths. How much tape is left on the roll?

_____

6. WRITE Math Write a word problem involving fractions for which you would use the *work backward* strategy and addition to solve. Include your solution.

_____

_____

Lesson Check

7. Dardby spent $\frac{3}{8}$ of her allowance on clothes and $\frac{1}{6}$ on entertainment. What fraction of her allowance did she spend on other items?

8. Cara bought a tree seedling that was $2\frac{1}{4}$ feet tall. During the first year, it grew $1\frac{1}{6}$ feet. After two years, it was 5 feet tall. How much did the seedling grow during the second year?

Spiral Review

9. Solve for *n*.

$$394 \div n = 0.394$$

n =

10. What expression can be used for estimating $868 \div 28$?

11. Justin gave the clerk $20 to pay a bill of $6.57. How much change should Justin get?

12. What is the value of the following expression?

$$7 + 18 \div (6 \div 3)$$

Name _____

Chapter 9

Chapter Review

1. Sophia babysat for $3\frac{7}{12}$ hours on Friday. She babysat for $2\frac{5}{6}$ hours on Saturday. For numbers 1a–1c, estimate how long Sophia babysat on Friday and Saturday combined. Choose the correct benchmarks and sum.

1a. Sophia babysat for about [2 / 3 / $3\frac{1}{2}$ / 4] hours on Friday.

1b. Sophia babysat for about [1 / 2 / $2\frac{1}{2}$ / 3] hours on Saturday.

1c. Sophia babysat for about [5 / $5\frac{1}{2}$ / 6 / $6\frac{1}{2}$] hours on Friday and Saturday combined.

2. Rodrigo practiced playing the guitar $15\frac{1}{3}$ hours over the past 3 weeks. He practiced for $6\frac{1}{4}$ hours during the first week and $4\frac{2}{3}$ hours during the second week. How much time did Rodrigo spend practicing during the third week? Use the numbers and symbols to write an equation that represents the problem. Then solve the equation. Symbols may be used more than once or not at all.

$15\frac{1}{3}$ $6\frac{1}{4}$ $4\frac{2}{3}$ x $=$ $+$

Practice time during third week: _____ hours

3. Liam bought $5\frac{7}{8}$ pounds of steak. He used $2\frac{1}{16}$ pounds of the steak for a cookout. For numbers 3a–3c, fill in each blank.

3a. Rounded to the closest benchmark, Liam bought about ☐ pounds of steak.

3b. Rounded to the closest benchmark, Liam used about ☐ pounds of steak for the cookout.

3c. Liam has about ☐ pounds of steak remaining after the cookout.

4. Jackson picked apples for his family. He picked a total of $6\frac{1}{2}$ pounds. He took $2\frac{3}{4}$ pounds to his aunt and $1\frac{5}{8}$ pounds to his mother. How many pounds of apples were left to give to his grandmother? Use the numbers and symbols to write an equation that represents the problem, then solve the equation. Symbols may be used more than once or not at all.

$6\frac{1}{2}$	$2\frac{3}{4}$	$1\frac{5}{8}$	x	$=$	$+$

☐

Weight of apples Jackson gave to his grandmother: _____ pounds

5. Write $4\frac{3}{5}$ and $3\frac{2}{4}$ using a common denominator.

☐ and ☐

6. Jill brought $2\frac{1}{3}$ boxes of carrot muffins for a bake sale. Mike brought $1\frac{3}{4}$ boxes of apple muffins. What is the total number of boxes of muffins Jill and Mike brought to the bake sale?

_____ boxes of muffins

Name _____

7. Caymen bought $1\frac{7}{8}$ pounds of ham and $2\frac{1}{4}$ pounds of turkey to make sandwiches for a picnic. He uses $2\frac{1}{3}$ pounds of meat on the sandwiches. How many pounds of meat are left?

7a. Write an equation to model the problem. Let x be the number of pounds of meat that are left.

7b. Work backwards to find x.

$x =$ ☐

7c. Answer the question.

So, ☐ pound of meat is left.

8. For numbers 8a–8c, tell whether the Commutative Property or the Associative Property can be used to show each equation is true without calculating. Choose the correct property of addition.

8a. $\frac{1}{6} + \left(\frac{7}{8} + \frac{5}{6}\right) = \frac{1}{6} + \left(\frac{5}{6} + \frac{7}{8}\right)$

☐ Associative Property ☐ Commutative Property

8b. $\left(\frac{7}{10} + \frac{1}{3}\right) + \frac{1}{10} = \left(\frac{1}{3} + \frac{7}{10}\right) + \frac{1}{10}$

☐ Associative Property ☐ Commutative Property

8c. $\left(6\frac{2}{5} + \frac{4}{9}\right) + 3\frac{2}{9} = 6\frac{2}{5} + \left(\frac{4}{9} + 3\frac{2}{9}\right)$

☐ Associative Property ☐ Commutative Property

9. Joshua uses a rule to write the following sequence of numbers.

$$\frac{1}{6}, \frac{1}{2}, \frac{5}{6}, \square, 1\frac{1}{2}$$

What rule did Joshua use? ☐

What is the missing number in the sequence? ☐

10. Alexis has a puppy that weighed $5\frac{3}{5}$ pounds when she got it. The puppy gained $\frac{2}{10}$ pounds each week for 4 weeks. How much did the puppy weigh at the end of the fourth week?

_____ pounds

11. Mr. Cohen drives $84\frac{2}{10}$ miles on Tuesday, $84\frac{6}{10}$ miles on Wednesday, and 85 miles on Thursday.

Part A

What is the rule for the distance Mr. Cohen drives each day? Show how you can check your answer.

Part B

If the pattern continues, how many miles will Mr. Cohen drive on Sunday? Explain how you found your answer.

Name _____

12. Write a rule for the sequence. Then find the unknown term.

$3\frac{7}{12}, 3\frac{1}{4}, \_\_\_\_\_, 2\frac{7}{12}, 2\frac{1}{4}$

Rule: _____

13. Four students spent time volunteering last weekend. The table shows how much time each student spent volunteering.

Volunteering	
Student	**Time (in hours)**
Amy	$4\frac{5}{6}$
Beth	$6\frac{1}{2}$
Victor	$5\frac{3}{4}$
Cal	$5\frac{2}{3}$

Match each pair of students with the difference between how much time they spent volunteering.

Amy and Victor ●	● $\frac{3}{4}$ hour
Cal and Beth ●	● $\frac{11}{12}$ hour
Beth and Victor ●	● $\frac{5}{6}$ hour

14. For 14a–14d, tell which expressions require you to rename mixed numbers before you can subtract. Find each difference. Write each expression and the difference as an equation in the correct box.

14a. $2\frac{1}{3} - 1\frac{3}{4}$

14b. $1\frac{3}{4} - \frac{7}{8}$

14c. $5\frac{2}{3} - 2\frac{5}{8}$

14d. $6\frac{1}{5} - 2\frac{1}{3}$

Requires Renaming	Does Not Require Renaming

15. Mr. Clements painted his barn for $3\frac{3}{5}$ hours in the morning. He painted the barn for $5\frac{3}{4}$ hours in the afternoon. For numbers 15a–15c, select True or False for each statement.

15a.	A common denominator of the mixed numbers is 20.	○ True	○ False
15b.	The amount of time spent painting in the morning can be rewritten as $3\frac{15}{20}$ hours.	○ True	○ False
15c.	Mr. Clements spent $2\frac{3}{20}$ hours longer painting in the afternoon than the morning.	○ True	○ False

16. Guillermo practiced piano for $2\frac{2}{3}$ hour during the week and $1\frac{3}{4}$ hour on the weekend.

Part A

Complete the calculations below to write equivalent fractions with a common denominator.

$$\frac{2}{3} = \frac{2 \times \square}{3 \times \square} = \frac{\square}{\square} \qquad \frac{3}{4} = \frac{3 \times \square}{4 \times \square} = \frac{\square}{\square}$$

Part B

How much time did Guillermo spend practicing piano in all? Explain how you found your answer.

Part C

How much more time did he spend practicing during the week than on the weekend? Explain how you found your answer.