

Unit 4: Test 2: MCC5.NF.2: StudyGuide/Homework Sheet

Problem Solving: Adding and Subtracting Fractions and Mixed Numbers.

Add Fractions:

Getting the Idea: To find the sum of fractions that have **like denominators**, add the numerators. The denominator remains the same. Write the **sum** in simplest form.

Example 1: Add. $\frac{5}{12} + \frac{9}{12} = \bigcirc$

Strategy: Use fraction strips to find the sum.

Step 1: Shade fraction strips to show $\frac{5}{12}$ and $\frac{9}{12}$.

1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12
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1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12	1/12
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Step 2: Count the total number of shaded parts. Write 14 as the numerator. The denominator stays the same.

$$\frac{5}{12} + \frac{9}{12} = \frac{5+9}{12} = \frac{14}{12}$$

Step 3: Convert the improper fraction to a mixed number. $\frac{14}{12} = \frac{12}{12} + \frac{2}{12} = 1\frac{2}{12}$

Step 4: Write the mixed number in simplest form. $\frac{2}{12} = \frac{2 \div 2}{12 \div 2} = \frac{1}{6}$ So, $1\frac{2}{12} = 1\frac{1}{6}$

Solution: $\frac{5}{12} + \frac{9}{12} = 1\frac{1}{6}$

To add fractions with **unlike denominators**, you will need to find **equivalent fractions** for one or both fractions, so that they have a common denominators. One way to find a **common denominator** is to multiply the denominators of the fractions.

Example 2: In a science experiment, a plant grew $\frac{3}{4}$ inch one week and another $\frac{2}{3}$ inch the following week. How many inches did it grow during the two weeks?

Strategy: Write equivalent fractions with a common denominator. Then add.

Step 1: Write an equation for the problem. Let i represent the total number of inches. $\frac{3}{4} + \frac{2}{3} = i$

Step 2: Find a common denominator. Multiply the two denominators. $4 \times 3 = 12$

Step 3: Write equivalent fractions with 12 as the denominator. $\frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$ and $\frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12}$

Step 4: Add. $\frac{9}{12} + \frac{8}{12} = \frac{17}{12}$

Step 5: Convert the improper fraction to a mixed number in simplest form.

$$\frac{17}{12} = 17 \div 12 = 1 \text{ R } 5 \quad \frac{3}{4} + \frac{2}{3} = \frac{17}{12} = 1\frac{5}{12}$$

Solution: The plant grew $1\frac{5}{12}$ inches.

When the denominator of one fraction is a factor of the other fraction, use the greater number as the common denominator.

Example 3: Robert hiked $3\frac{1}{5}$ miles on Saturday and $4\frac{3}{10}$ miles on Sunday. How many miles did he hike in all?

Strategy: Add the whole numbers and then add the fractions.

Step 1: Write an equation for the problem. Let m represent the total number of miles. $3\frac{1}{5} + 4\frac{3}{10} = m$

Step 2: Find a common denominator. Since 5 is a factor of 10, a common denominator is 10.

Step 3: Find the fraction equivalent to $\frac{1}{5}$ with a denominator of 10. $\frac{1 \times 2}{5 \times 2} = \frac{2}{10}$ $3\frac{1}{5} = 3\frac{2}{10}$

Step 4: Rewrite the problem by lining up the whole numbers and fractions. Add the fraction parts first.

$$\begin{array}{r} 3 \frac{2}{10} \\ + 4 \frac{3}{10} \\ \hline 7 \frac{5}{10} \end{array}$$

Step 5: Add the whole numbers.

$$\begin{array}{r} 3 \frac{2}{10} \\ + 4 \frac{3}{10} \\ \hline 7 \frac{5}{10} \end{array}$$

Step 6: Write the sum in simplest form. Divide the numerator and denominator by 5.

$$\frac{5}{10} = \frac{5 \div 5}{10 \div 5} = \frac{1}{2} \text{ and } 3\frac{1}{5} + 4\frac{3}{10} = 7\frac{5}{10} = 7\frac{1}{2}$$

Solution: Robert hiked $7\frac{1}{2}$ miles in all.

An **estimate** is a number that is close to the exact amount. Some problems ask for an estimate instead of an exact answer. Estimates are also helpful when you want to check whether your answer is reasonable. You can use **benchmarks** to estimate. A benchmark is a common number that can be compared to another number.

Use the benchmarks 0, $\frac{1}{2}$, and 1 to estimate.

- If the fraction is close to $\frac{1}{2}$, round the fraction to $\frac{1}{2}$.
- If the fraction is greater than or equal to $\frac{1}{2}$, round up to 1.
- If the fraction is less than $\frac{1}{2}$, round down to 0.

Example 4: Patricia spent $\frac{3}{5}$ hour on her math homework, and $\frac{5}{6}$ hour on her science homework. How long did Patricia spend on her math and science homework?

Strategy: Estimate the number of hours. Then find the actual number of hours.

Step 1: Write an equation for the problem. Let t represent the total time spent on homework. $\frac{3}{5} + \frac{5}{6} = t$

Step 2: Estimate the sum. Use the number line and the benchmarks 0, $\frac{1}{2}$, and 1.

$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{5}{5} = 1 \text{ whole}$
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$\frac{1}{6}$	$\frac{2}{6}$	$\frac{3}{6}$	$\frac{4}{6}$	$\frac{5}{6}$	$\frac{6}{6} = 1 \text{ whole}$
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$\frac{3}{5}$ is closest to $\frac{1}{2}$, so round $\frac{3}{5}$ to $\frac{1}{2}$. $\frac{5}{6}$ is closest to 1, so round $\frac{5}{6}$ to 1.

Step 3: Add the rounded numbers. $\frac{3}{5} + \frac{5}{6} \rightarrow \frac{1}{2} + 1 = 1\frac{1}{2}$ The estimate is $1\frac{1}{2}$ hours.

Step 4: Find the actual sum. Write equivalent fractions with 30 as the denominator.

$$\frac{3}{5} = \frac{3 \times 6}{5 \times 6} = \frac{18}{30} \text{ and } \frac{5}{6} = \frac{5 \times 5}{6 \times 5} = \frac{25}{30} \text{ Add. Then write the answer in simplest form. } \frac{18}{30} + \frac{25}{30} = \frac{43}{30} = 1\frac{13}{30}$$

Step 5: Compare the actual answer to the estimate. $1^{13}/_{30}$ is close to $1^{15}/_{30}$, or $1\frac{1}{2}$. $1^{13}/_{30}$ is a reasonable answer.

Solution: Patricia spent $1^{13}/_{30}$ hours on her math and science homework.

The properties of operations can be applied to fractions.

Additive identity property of 0 The sum of any number and 0 is that number.	$a + 0 = 0 + a = a$
Commutative property of addition The order of addends can be changed. The sum does not change.	$a + b = b + a$
Associative property of addition Addends can be grouped in different ways. The sum will be the same.	$(a + b) + c = a + (b + c)$

Example 5: What is the missing number in this sentence? $\frac{1}{8} + \frac{1}{4} = \bigcirc + \frac{1}{8}$

Strategy: Use the commutative property of addition.

Step 1: Look at the addends in the sentence. The left side shows $\frac{1}{8} + \frac{1}{4}$. The right side shows $\bigcirc + \frac{1}{8}$. Both sides are equal. That means the sums are the same.

Step 2: Think about the commutative property of addition. It says that the order of the addends does not change the sum.

Step 3: Use a number line to add $\frac{1}{8} + \frac{1}{4}$. Then add $\frac{1}{4} + \frac{1}{8}$. Start at $\frac{1}{8}$. An equivalent fraction for $\frac{1}{4}$ is $\frac{2}{8}$. So move $\frac{2}{8}$ to the right.

1/8	2/8	3/8	4/8	5/8	6/8	7/8	8/8
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Remember that $\frac{1}{4} = \frac{2}{8}$, so start at $\frac{2}{8}$. Then move $\frac{1}{8}$ to the right.

$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{4}{4}$
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The sums on both sides are the same. The missing number is $\frac{1}{4}$.

Solution: The missing number is $\frac{1}{4}$.

Another way to add fractions with unlike denominators is to write equivalent fractions with the **least common denominator (LCD)**. You can find the least common denominator by listing multiples of the denominators and finding the least number that is a common multiple.

Monday, December 10, 2012 (1-5): Parent Signature: _____

1. Paulo shaded $\frac{1}{3}$ of a grid. Then he shaded another $\frac{2}{5}$ of the grid. What fraction of the grid did he shade? (Work Space)

- (A) $\frac{1}{5}$
- (B) $\frac{3}{10}$
- (C) $\frac{3}{5}$
- (D) $\frac{11}{15}$

2. Sophie takes tap and ballet. Today she practiced tap for $\frac{3}{4}$ hour and ballet for $\frac{1}{2}$ hour. How many hours did Sophie spend practicing dance? (Work Space)

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

3. Frances has $5\frac{1}{6}$ yards of red yarn and $2\frac{5}{6}$ yards of blue yarn. How many yards of yarn does she have in all? (Work Space)

- (A) $3\frac{2}{3}$ yards
- (B) $7\frac{2}{3}$ yards
- (C) $7\frac{5}{6}$ yards
- (D) 8 yards

4. Blake bought $\frac{3}{8}$ pound of cashew nuts, $\frac{1}{8}$ pound of almonds, and $\frac{5}{6}$ pounds of walnuts.

(A) What is the total weight of the nuts that Blake bought? Write the answer in simplest form. Show your work.

(B) Explain how you found your answer to Part A.

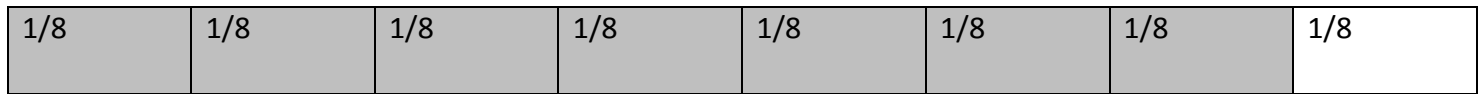
Subtract Fractions.

Getting the Idea. To subtract fractions that have **like denominators**, subtract the numerators. The denominator remains the same. Write the **difference** in simplest form.

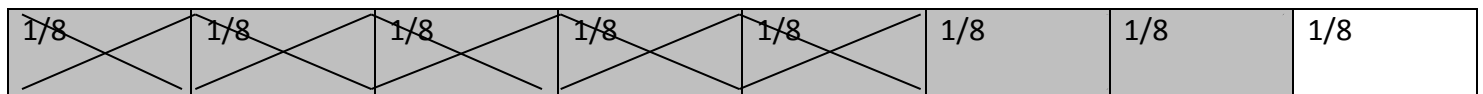
Example 1: Subtract. $\frac{7}{8} - \frac{5}{8} = \bigcirc$

Strategy: Use fraction strips to find the difference.

Step 1: Shade fraction strips to show $\frac{7}{8}$.



Step 2: Cross out $\frac{5}{8}$ of the shaded parts.



Step 3: Count the remaining shaded parts. There are 2 shaded parts. Write 2 as the numerator. The denominator stays the same. $\frac{7}{8} - \frac{5}{8} = \frac{2}{8}$

Step 4: Write the fraction in simplest form. $\frac{2}{8} = \frac{2 \div 2}{8 \div 2} = \frac{1}{4}$

Solution: $\frac{7}{8} - \frac{5}{8} = \frac{1}{4}$

To subtract fractions with unlike denominators, rename one or both fractions so that they have like denominators.

Example 2: Patel needs a piece of wood for a shelf. From a piece of wood that is $\frac{5}{9}$ yard long, he cuts off a piece that is about $\frac{1}{6}$ yard long and uses the piece that is left for the shelf. How long is the shelf?

Strategy: Write equivalent fractions using a common denominator. Then subtract.

Step 1: Write an equation for the problem. Let l represent the length of the shelf. $\frac{5}{9} - \frac{1}{6} = l$

Step 2: Find a common denominator of $\frac{5}{9}$ and $\frac{1}{6}$. $9 \times 6 = 54$. A common denominator is 54.

Step 3: Write equivalent fractions with 54 as the denominator. $\frac{5}{9} = \frac{5}{9} \times \frac{6}{6} = \frac{30}{54}$ and $\frac{1}{6} = \frac{1}{6} \times \frac{9}{9} = \frac{9}{54}$

Step 4: Subtract. $\frac{30}{54} - \frac{9}{54} = \frac{21}{54}$

Step 5: Rewrite the fraction in simplest form. $\frac{21}{54} = \frac{21 \div 3}{54 \div 3} = \frac{7}{18}$

Solution: the shelf is $\frac{7}{18}$ yard long.

Remember, adding and subtraction are inverse operations, so you can check the answer to a subtraction problem by using addition in the example above, $\frac{7}{18} + \frac{1}{6} = \frac{7}{18} + \frac{3}{18} = \frac{10}{18} = \frac{5}{9}$. Since $\frac{7}{18} + \frac{1}{6} = \frac{5}{9}$, the difference is correct.

To subtract mixed numbers, you can subtract the fraction parts and then the whole number parts.

Example 3: Leo walked a total of $2\frac{3}{4}$ miles before and after school yesterday. He walked $1\frac{1}{2}$ miles before school. How many miles did he walk after school?

Strategy: Use a common denominator to write equivalent mixed numbers. Then subtract.

Step 1: Write an equation for the problem. Let m represent the number of miles he walked after school.

$$2\frac{3}{4} - 1\frac{5}{8} = m$$

Step 2: Find a common denominator for $\frac{3}{4}$ and $\frac{5}{8}$. Since 4 and 8 are both multiples of 8, a common denominator is 8.

Step 3: Rename $2\frac{3}{4}$ so that it has 8 as a denominator. $\frac{3}{4} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}$, so $2\frac{3}{4} = 2\frac{6}{8}$.

Step 4: Rewrite the problem. Subtract the fraction parts and then the whole-number parts.

$$\begin{array}{r} 2\frac{6}{8} \\ - 1\frac{5}{8} \\ \hline 1\frac{1}{8} \end{array}$$

Solution: Lou walked $1\frac{1}{8}$ miles after school.

Example 4: A recipe calls for $\frac{2}{3}$ cup of flour. Martina has only $\frac{1}{8}$ cup of flour. How much more flour does Martina need?

Strategy: Estimate the number of cups. Then find the actual number of cups.

Step 1: Write an equation for the problem. Let c represent the number of cups of flour Martina needs.

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

Step 2: Estimate the difference. Use a number line and the benchmarks 0, $\frac{1}{2}$, and 1.

$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3}$
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$\frac{1}{8}$	$\frac{2}{8}$	$\frac{3}{8}$	$\frac{4}{8}$	$\frac{5}{8}$	$\frac{6}{8}$	$\frac{7}{8}$	$\frac{8}{8}$
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$\frac{2}{3}$ is closest to $\frac{1}{2}$, so round $\frac{2}{3}$ to $\frac{1}{2}$. $\frac{1}{8}$ is closest to 0, so round $\frac{1}{8}$ to 0.

Step 3: Subtract the rounded numbers. $\frac{2}{3} - \frac{1}{8} \rightarrow \frac{1}{2} - 0 = \frac{1}{2}$ The estimated amount is $\frac{1}{2}$ cup.

Step 4: Find the actual difference. Write equivalent fractions with 24 as the denominator.

$$\frac{2}{3} - \frac{2 \times 8}{3 \times 8} = \frac{16}{24} \quad \frac{1}{8} = \frac{1 \times 3}{8 \times 3} = \frac{3}{24} \quad \text{Subtract.} \quad \frac{16}{24} - \frac{3}{24} = \frac{13}{24}$$

Step 5: Compare the actual answer to the estimate. $\frac{13}{24}$ is close to $\frac{12}{24}$, or $\frac{1}{2}$. So, $\frac{13}{24}$ is a reasonable answer.

Solution: Martina needs $\frac{13}{24}$ cup more flour.

Tuesday, December 11, 2012 (5-10): Parent Signature: _____

5. Jessica is typing a report. She typed $\frac{5}{8}$ of the pages in the report in the morning and $\frac{1}{4}$ of the pages in the afternoon. What fraction more of the pages did she type in the morning? (Work Space)

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

6. Wally took $\frac{1}{6}$ of the stickers from the pack. Alex took $\frac{1}{2}$ of the stickers. How much more of the pack did Alex take? (Work Space)

- (A) $\frac{4}{3}$
- (B) $\frac{2}{3}$
- (C) $\frac{1}{3}$
- (D) $\frac{1}{6}$

7. Callie spent $\frac{3}{4}$ hour on a science report and $\frac{1}{3}$ hour on a social studies report. What fraction of an hour longer did she spend on the science report? (Work Space)

- (A) $\frac{1}{12}$ hour
- (B) $\frac{5}{12}$ hour
- (C) $\frac{1}{2}$ hour
- (D) $1\frac{1}{12}$ hours

8. Jordan bought $6\frac{8}{10}$ yards of pink ribbon and $3\frac{1}{4}$ yards of purple ribbon. How much more pink ribbon than purple ribbon did she buy? (Work Space)

- (A) $3\frac{1}{5}$ yards
- (B) $3\frac{11}{20}$ yards
- (C) $4\frac{1}{6}$ yards
- (D) $10\frac{1}{20}$ yards

9. Of the students in Ms. Martinez's class $\frac{11}{24}$ walk to school. Another $\frac{3}{8}$ of the students ride their bikes to school. What fraction more of the students walk than ride their bikes to schools? (Work Space)

- | | |
|--------------------|--------------------|
| (A) $\frac{5}{24}$ | (C) $\frac{1}{8}$ |
| (B) $\frac{1}{6}$ | (D) $\frac{1}{12}$ |

10. Of the pizzas sold at a pizzeria, $\frac{1}{2}$ were cheese, $\frac{1}{4}$ were sausage, and $\frac{1}{6}$ were pepperoni.

(A) What fraction more of the pizzas were cheese than sausage and pepperoni combined?

(B) Explain how you found your answer.

Wednesday, December 12, 2012 (11-15): Parent Signature: _____

11. Aiko and Collette bought $\frac{5}{6}$ pounds of nuts. They ate $\frac{1}{4}$ pound of the nuts. What fraction of a pound of nuts was left? (Show your work and explain your answer.)

12. The map shows the lengths of two trails at a park. Curt and his uncle hiked the green trail ($2\frac{2}{5}$ miles) in the morning and the blue trail ($3\frac{2}{3}$ miles) in the afternoon. How many miles did they hike? (Show your work and explain your answer.)

13. Lucine is making bean and cheese burritos. She needs $2\frac{1}{8}$ cups of grated cheddar cheese. She has grated $1\frac{1}{2}$ cups. How much more cheese must she grate? (Show your work and explain your answer.)

14. At basketball practice, the team works on free throws for $\frac{7}{12}$ hour and runs plays for $1\frac{1}{6}$ hours. How long is the team practice? Write the answer as both an improper fraction and a mixed number. (Show your work and explain your answer.)

15. Kevin used $1\frac{2}{3}$ cups of nuts and $\frac{3}{4}$ cup of raisins to make a trail mix. How many cups of trail mix did Kevin make? Write the answer as both an improper fraction and a mixed number. (Show your work and explain your answer.)

Thursday, December 13, 2012 (16-20): Parent Signature: _____

16. There are $6\frac{3}{8}$ cups of flour in a canister. If $2\frac{1}{4}$ cups are used to make muffins, how much flour will be left? Write the answer as both an improper fraction and a mixed number. (Show your work and explain your answer.)

17. Katie walked her dog $1\frac{3}{10}$ miles on Tuesday and $\frac{4}{5}$ mile on Thursday. How much farther did she walk her dog on Tuesday than on Thursday? (Show your work and explain your answer.)

18. Jay volunteers at a food bank. He volunteered $2\frac{5}{6}$ hours on Sunday and $2\frac{1}{3}$ hours on Wednesday. How many hours did he volunteer in all? Write the answer as both an improper fraction and a mixed number. (Show your work and explain your answer.)

19. Ben has $5\frac{3}{4}$ cups of sugar. He uses $\frac{2}{3}$ cup of sugar to make cookies. Then he uses $2\frac{1}{2}$ cups of sugar to make fresh lemonade. How many cups of sugar does Ben have left? (Show your work and explain your answer.)

20. Cheryl has 5 foot of ribbon. She cuts a $3\frac{3}{4}$ foot strip to make a hair bow. Then she cuts a $\frac{5}{6}$ foot strip of a border on a scrapbook page. Is there enough ribbon for Cheryl to cut two $\frac{1}{3}$ foot pieces to put on a picture frame? (Show your work and explain your answer.)