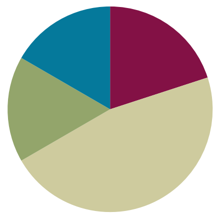
# Lesson 5

## Objective: Subtract fractions with unlike units using the strategy of creating equivalent fractions.

### Suggested Lesson Structure

| | |
|---|---|
| Fluency Practice | (12 minutes) |
| Application Problem | (10 minutes) |
| Concept Development | (28 minutes) |
| Student Debrief | (10 minutes) |
| **Total Time** | **(60 minutes)** |



## Fluency Practice (12 minutes)

- Sprint: Subtracting Fractions from a Whole Number **4.NF.3a** (12 minutes)

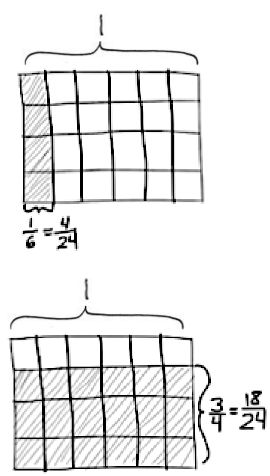
### Sprint: Subtracting Fractions from a Whole Number (12 minutes)

Materials: (S) Subtracting Fractions from a Whole Number Sprint

Note: This Sprint is a quick mental exercise of part–part–whole understanding as it relates to fractions. (Between correcting Sprint A and giving Sprint B, have students share their strategies for quickly solving the problems. This very brief discussion may help some students catch on to a more efficient approach for Sprint B.)

## Application Problem (10 minutes)

A farmer uses $\frac{3}{4}$ of his field to plant corn, $\frac{1}{6}$ of his field to plant beans, and the rest to plant wheat. What fraction of his field is used for wheat?




$\frac{1}{6}+\frac{3}{4}=$

$\frac{4}{24}+\frac{18}{24}=\frac{22}{24}$

$\frac{24}{24}-\frac{22}{24}=\frac{2}{24}$

$\frac{2}{24}=\frac{1}{12}$

The farmer uses $\frac{1}{12}$ of his land to plant wheat.

You might at times simply remind the students of their RDW process in order to solve a problem independently. It is desired that students will internalize the simple set of questions as well as the systematic approach of read, draw, write an equation, and write a statement:

- What do I see?
- What can I draw?



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- What conclusions can I make from my drawing?

Note: Students solve this Application Problem involving addition and subtraction of fractions with unlike denominators, using visual models as learned in Lessons 3 and 4.

## Concept Development (28 minutes)

Materials: (S) Personal white board

T: (Write 3 boys – 1 girl = _____.) Turn and talk to your partner about the answer.

S: You can't subtract 1 girl from 3 boys. You don't have any girls. → The answer is 2 students if you rename them as students. → The units are not the same, but we can rename them as students.

T: Yes. 3 students – 1 student = 2 students. (Write 1 half – 1 third.) What about 1 half minus 1 third? How is this problem the same as the one before? Turn and talk.

S: The units are not the same. → We have to change the units to find the difference.

> **NOTES ON MULTIPLE MEANS OF ENGAGEMENT:**
>
> If this problem is acted out, it can clarify confusion about units. Students will see that the group can be renamed *students* to encompass everyone and have like units.
>
> Repeat the process with Problem 1 using pattern blocks. If the hexagon is the whole, the yellow trapezoid is $\frac{1}{2}$, the blue rhombus is $\frac{1}{3}$, and the green triangle is $\frac{1}{6}$.

**Problem 1: $\frac{1}{2} - \frac{1}{3}$**

T: (Write $\frac{1}{2} - \frac{1}{3}$.) We'll need to change both units.

T: I'll draw one fraction model and partition it into 2 equal units. Then I'll write 1 half below one part, and shade it to make it easier to see what 1 half is after I change the units. (Model.)

T: On the second fraction model, I'll make thirds with horizontal lines and write 1 third next to it after shading it. (Model.)

T: Now, let's make equivalent units. (Model.) How many new units do we have?

S: 6 units.

T: 1 half is how many sixths?

S: 1 half is 3 sixths.

T: 1 third is how many sixths?

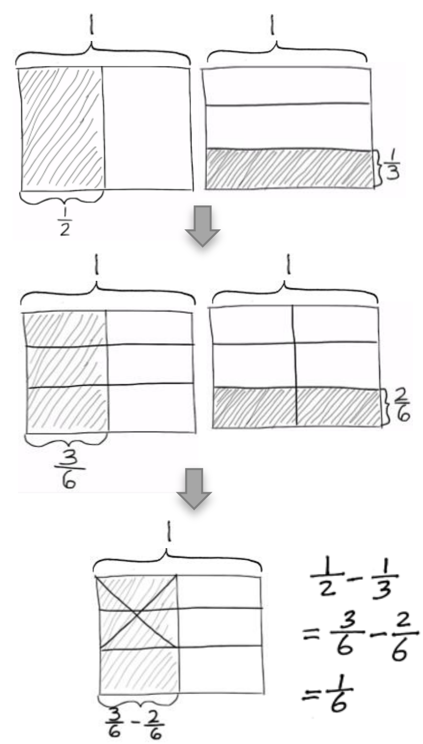
S: 1 third is 2 sixths.

T: (Write $\frac{1}{2} - \frac{1}{3} = \frac{3}{6} - \frac{2}{6}$.) Cross out 2 of 3 shaded sixths.) Say the subtraction sentence with like units.

S: 3 sixths – 2 sixths = 1 sixth.

T: With unlike units?

S: 1 half – 1 third = 1 sixth.



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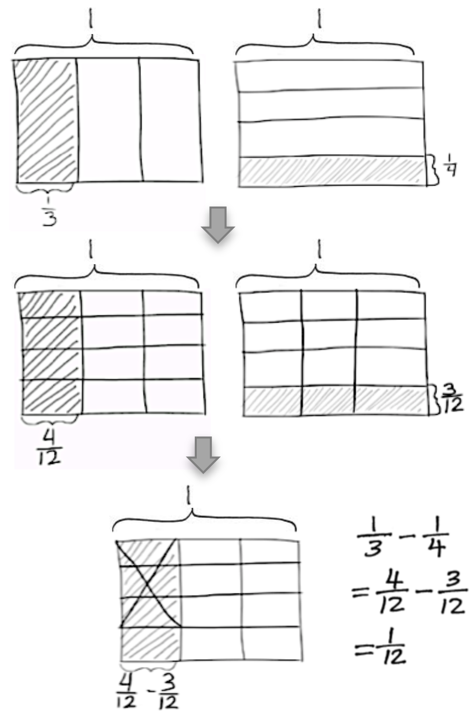
**Problem 2: a.** $\frac{1}{3} - \frac{1}{4}$ **b.** $\frac{1}{2} - \frac{1}{5}$




This next set of problems presents the additional complexity of partitioning a greater number of units.

T: (Write $\frac{1}{3} - \frac{1}{4}$.) Find the difference. Then, explain to your partner your strategy for solving.

S: To create like units, we can do exactly as we did when adding. We have to make smaller units. → First, we draw parts in one direction. Then, we partition in the other direction to find like units. → The only thing we have to remember is that we are subtracting the units, not adding.

T: What is our new smaller unit or common denominator?

S: Twelfths.

T: 1 third is…?

S: 4 twelfths.

T: 1 fourth is…?

S: 3 twelfths.

T: (Write $\frac{1}{3} - \frac{1}{4} = \frac{4}{12} - \frac{3}{12}$. Cross out three of the four twelfths.)

T: Say the subtraction sentence with like units.

S: 4 twelfths – 3 twelfths = 1 twelfth.

T: With unlike units?

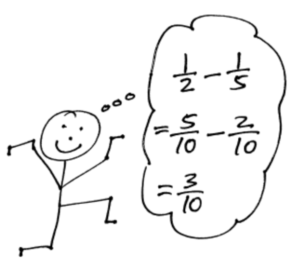
S: 1 third – 1 fourth = 1 twelfth.

Repeat the process with the following suggested problem:

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

T: (Write $\frac{1}{2} - \frac{1}{5}$.) Solve this problem with a partner.

S: (Solve.)




T: What do you notice about all the problems we've solved?

S: All the fractions have a numerator of 1. → The denominator of the whole amount is smaller than of the part we are subtracting. → It's like that because when the denominator is smaller, the fraction is larger. → Yeah, and we aren't doing negative numbers until sixth grade. → The first two problems had a numerator of 1 in the difference, too.

**NOTES ON MULTIPLE MEANS OF ENGAGEMENT:**

Offering additional problems such as Problem 2 will allow students to obtain more practice if needed. If students are working above grade level, then prepare additional problems that challenge, but stay within the level standards.
For example, make a list of problems subtracting consecutive denominators.

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

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

$\frac{1}{7} - \frac{1}{8}$

Students working above grade level can look for patterns. Ask, "What pattern do you notice?"



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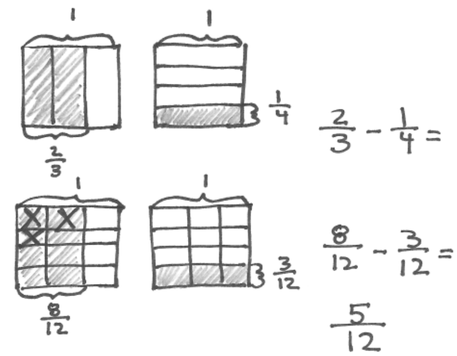
T: I chose those problems for exactly that reason. Fractions with a numerator of 1 are called unit fractions. Let's try this next problem subtracting from a non-unit fraction.

**Problem 3: $\frac{2}{3} - \frac{1}{4}$**



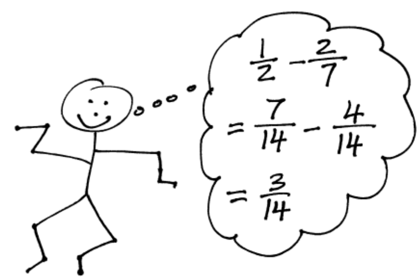

T: (Write $\frac{2}{3} - \frac{1}{4}$.) Discuss with your partner how you would solve this problem. Explain the difference in solving a problem when there is a non-unit fraction such as $\frac{2}{3}$ rather than $\frac{1}{3}$.

S: (Discuss.)

T: Work with a partner to solve.

S: (Solve.)

**Problem 4: $\frac{1}{2} - \frac{2}{7}$**




T: (Write $\frac{1}{2} - \frac{2}{7}$.) What is different about this problem?

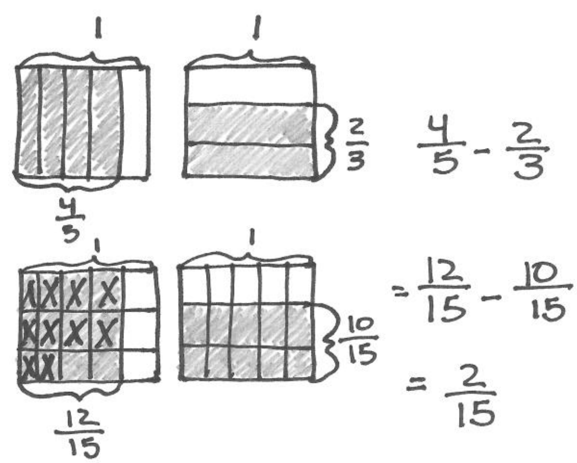
S: It has a non-unit fraction being subtracted.

T: Very observant. Be careful when subtracting so that you take away the correct amount of units. Solve this problem with your partner.

S: (Solve.)

**Problem 5: $\frac{4}{5} - \frac{2}{3}$**

Here, students encounter both a whole and subtracted part, which are non-unit fractions.




T: (Write $\frac{4}{5} - \frac{2}{3}$.) Solve this problem.

S: (Solve).

T: Turn and tell your partner how you labeled your rectangular fraction model. Compare your labeling of non-unit fractions with your labeling of unit fractions.

S: We have to label two rows if we want to show $\frac{2}{3}$. → Nothing really changes; we just bracket more parts.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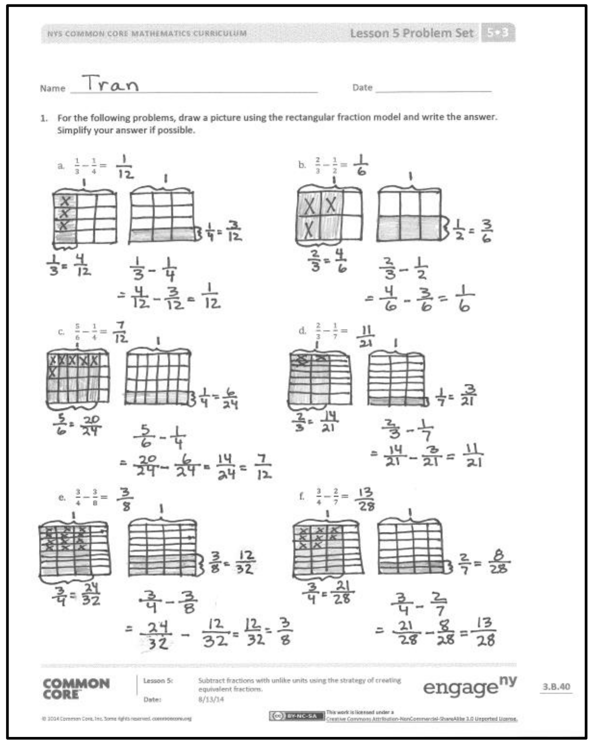
## Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

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1. For the following problems, draw a picture using the rectangular fraction model and write the answer. Simplify your answer if possible.

a. $\frac{1}{3} - \frac{1}{4} = \frac{1}{12}$

$\frac{1}{3} = \frac{4}{12}$ $\frac{1}{4} = \frac{3}{12}$

$\frac{1}{3} - \frac{1}{4} = \frac{4}{12} - \frac{3}{12} = \frac{1}{12}$

b. $\frac{2}{3} - \frac{1}{2} = \frac{1}{6}$

$\frac{2}{3} = \frac{4}{6}$ $\frac{1}{2} = \frac{3}{6}$

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

c. $\frac{5}{6} - \frac{1}{4} = \frac{7}{12}$

$\frac{5}{6} = \frac{20}{24}$ $\frac{1}{4} = \frac{6}{24}$

$\frac{5}{6} - \frac{1}{4} = \frac{20}{24} - \frac{6}{24} = \frac{14}{24} = \frac{7}{12}$

d. $\frac{2}{3} - \frac{1}{7} = \frac{11}{21}$

$\frac{2}{3} = \frac{14}{21}$ $\frac{1}{7} = \frac{3}{21}$

$\frac{2}{3} - \frac{1}{7} = \frac{14}{21} - \frac{3}{21} = \frac{11}{21}$

e. $\frac{3}{4} - \frac{3}{8} = \frac{3}{8}$

$\frac{3}{4} = \frac{24}{32}$ $\frac{3}{8} = \frac{12}{32}$

$\frac{3}{4} - \frac{3}{8} = \frac{24}{32} - \frac{12}{32} = \frac{12}{32} = \frac{3}{8}$

f. $\frac{3}{4} - \frac{2}{7} = \frac{13}{28}$

$\frac{3}{4} = \frac{21}{28}$ $\frac{2}{7} = \frac{8}{28}$

$\frac{3}{4} - \frac{2}{7} = \frac{21}{28} - \frac{8}{28} = \frac{13}{28}$

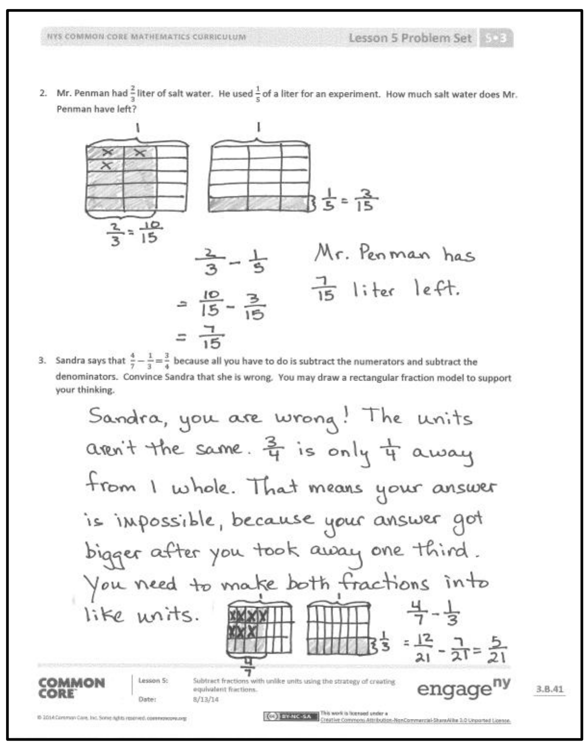


## Student Debrief (10 minutes)

**Lesson Objective:** Subtract fractions with unlike units using the strategy of creating equivalent fractions.

The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner before going over answers as a class. Look for misconceptions or misunderstandings that can be addressed in the Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.




2. Mr. Penman had $\frac{2}{3}$ liter of salt water. He used $\frac{1}{5}$ of a liter for an experiment. How much salt water does Mr. Penman have left?

$\frac{2}{3} = \frac{10}{15}$ $\frac{1}{5} = \frac{3}{15}$

$\frac{2}{3} - \frac{1}{5} = \frac{10}{15} - \frac{3}{15} = \frac{7}{15}$

Mr. Penman has $\frac{7}{15}$ liter left.

3. Sandra says that $\frac{4}{7} - \frac{1}{3} = \frac{3}{4}$ because all you have to do is subtract the numerators and subtract the denominators. Convince Sandra that she is wrong. You may draw a rectangular fraction model to support your thinking.

Sandra, you are wrong! The units aren't the same. $\frac{3}{4}$ is only $\frac{1}{4}$ away from 1 whole. That means your answer is impossible, because your answer got bigger after you took away one third. You need to make both fractions into like units.

$\frac{4}{7} - \frac{1}{3} = \frac{12}{21} - \frac{7}{21} = \frac{5}{21}$



T: Bring your Problem Set to the Debrief. Take one minute to check your answers on Problems 1 and 2 with your partner. Do not change your answers, however. If you have a different answer, try to figure out why.

S: (Work.)

T: (Circulate. Look for common errors to guide your questioning during the next phase of the Debrief.)

T: I'll read the answers to Problems 1 and 2 now. (Read answers aloud.)

T: Review and correct your mistakes for two minutes. If you had no errors, please raise your hand. I will assign you to support a peer.

T: Compare with your partner. How do these problems relate to each other?

- 1(a) and 1(b)
- 1(b) and 1(d)
- 1(e) and 1(f)



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Suggestions for facilitating the Debrief are as follows:

- Have students write about one relationship in their math journal.
- Have students do a pair—share.
- Meet with a small group of English language learners or students working below grade level while others do one of the above.
- Debrief the whole class after partner sharing.
- Circulate, and ask the following questions.
- Post the questions, and have student leaders facilitate small group discussions.

T: What do you notice about Problems 1 (a) and (b)?

S: $\frac{2}{3}$ is double $\frac{1}{3}$. → $\frac{1}{2}$ is double $\frac{1}{4}$, and $\frac{1}{6}$ is double $\frac{1}{12}$.

T: What do you notice about Problems 1 (b) and (d)?

S: Both problems start with $\frac{2}{3}$. → $\frac{2}{3}$ is the whole in both, but in one problem, you are taking away $\frac{1}{2}$ renamed as 3 sixths. → When you are subtracting $\frac{3}{21}$, you are taking away 3 much smaller units. → That means the answer to 1(b) is greater. → $\frac{1}{6}$ is less than $\frac{11}{21}$. → Yeah, $\frac{11}{21}$ is a little more than a half. Half of 21 is 10.5. Eleven is greater than that. → $\frac{1}{6}$ is closer to zero.

T: What do you notice about Problems 1 (e) and (f)?

S: Both problems start with $\frac{3}{4}$. But in one, you are taking away $\frac{3}{8}$, and in the other, you are taking away $\frac{2}{7}$. → $\frac{3}{8}$ is half of $\frac{3}{4}$. → Yeah, $\frac{3}{8}$ doubled is $\frac{3}{4}$. → $\frac{13}{28}$ is $\frac{1}{28}$ away from a half, but $\frac{3}{8}$ is $\frac{1}{8}$ less than a half. $\frac{13}{28}$ is a greater answer, so $\frac{2}{7}$ must be less than $\frac{3}{8}$.

T: Share the strategies you use to solve the word problems.

S: (Share.)

T: If you were going to design a Problem Set for this lesson, what would you have done differently? Would you have included as many unit fractions? More word problems?

S: (Share.)

**NOTES ON MULTIPLE MEANS OF ENGAGEMENT:**

Meet with a small group while the rest of the students complete the Debrief activities independently.

## Exit Ticket (3 minutes)

After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help you assess the students' understanding of the concepts that were presented in the lesson today and plan more effectively for future lessons. You may read the questions aloud to the students.



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**A**

# Correct ________

Subtract. Give each answer in its simplest form.

| | | | | | |
|---|---|---|---|---|---|
| 1 | $4 - \frac{1}{2} =$ | | 23 | $3 - \frac{1}{8} =$ | |
| 2 | $3 - \frac{1}{2} =$ | | 24 | $3 - \frac{3}{8} =$ | |
| 3 | $2 - \frac{1}{2} =$ | | 25 | $3 - \frac{5}{8} =$ | |
| 4 | $1 - \frac{1}{2} =$ | | 26 | $3 - \frac{7}{8} =$ | |
| 5 | $1 - \frac{1}{3} =$ | | 27 | $2 - \frac{7}{8} =$ | |
| 6 | $2 - \frac{1}{3} =$ | | 28 | $4 - \frac{1}{7} =$ | |
| 7 | $4 - \frac{1}{3} =$ | | 29 | $3 - \frac{6}{7} =$ | |
| 8 | $4 - \frac{2}{3} =$ | | 30 | $2 - \frac{3}{7} =$ | |
| 9 | $2 - \frac{2}{3} =$ | | 31 | $4 - \frac{4}{7} =$ | |
| 10 | $2 - \frac{1}{4} =$ | | 32 | $3 - \frac{5}{7} =$ | |
| 11 | $2 - \frac{3}{4} =$ | | 33 | $4 - \frac{3}{4} =$ | |
| 12 | $3 - \frac{3}{4} =$ | | 34 | $2 - \frac{5}{8} =$ | |
| 13 | $3 - \frac{1}{4} =$ | | 35 | $3 - \frac{3}{10} =$ | |
| 14 | $4 - \frac{3}{4} =$ | | 36 | $4 - \frac{2}{5} =$ | |
| 15 | $2 - \frac{1}{10} =$ | | 37 | $4 - \frac{3}{7} =$ | |
| 16 | $3 - \frac{9}{10} =$ | | 38 | $3 - \frac{7}{10} =$ | |
| 17 | $2 - \frac{7}{10} =$ | | 39 | $3 - \frac{5}{10} =$ | |
| 18 | $4 - \frac{3}{10} =$ | | 40 | $4 - \frac{2}{8} =$ | |
| 19 | $3 - \frac{1}{5} =$ | | 41 | $2 - \frac{9}{12} =$ | |
| 20 | $3 - \frac{2}{5} =$ | | 42 | $4 - \frac{2}{12} =$ | |
| 21 | $3 - \frac{4}{5} =$ | | 43 | $3 - \frac{2}{6} =$ | |
| 22 | $3 - \frac{3}{5} =$ | | 44 | $2 - \frac{8}{12} =$ | |

subtracting fractions from a whole number



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**B** Improvement ________ # Correct ________

Subtract. Give each answer in its simplest form.

| | | | | | |
|---|---|---|---|---|---|
| 1 | $1 - \frac{1}{2} =$ | | 23 | $2 - \frac{1}{8} =$ | |
| 2 | $2 - \frac{1}{2} =$ | | 24 | $2 - \frac{3}{8} =$ | |
| 3 | $3 - \frac{1}{2} =$ | | 25 | $2 - \frac{5}{8} =$ | |
| 4 | $4 - \frac{1}{2} =$ | | 26 | $2 - \frac{7}{8} =$ | |
| 5 | $1 - \frac{1}{4} =$ | | 27 | $4 - \frac{7}{8} =$ | |
| 6 | $2 - \frac{1}{4} =$ | | 28 | $3 - \frac{1}{7} =$ | |
| 7 | $4 - \frac{1}{4} =$ | | 29 | $2 - \frac{6}{7} =$ | |
| 8 | $4 - \frac{3}{4} =$ | | 30 | $4 - \frac{3}{7} =$ | |
| 9 | $2 - \frac{3}{4} =$ | | 31 | $3 - \frac{4}{7} =$ | |
| 10 | $2 - \frac{1}{3} =$ | | 32 | $2 - \frac{5}{7} =$ | |
| 11 | $2 - \frac{2}{3} =$ | | 33 | $3 - \frac{3}{4} =$ | |
| 12 | $3 - \frac{2}{3} =$ | | 34 | $4 - \frac{5}{8} =$ | |
| 13 | $3 - \frac{1}{3} =$ | | 35 | $2 - \frac{3}{10} =$ | |
| 14 | $4 - \frac{2}{3} =$ | | 36 | $3 - \frac{2}{5} =$ | |
| 15 | $3 - \frac{1}{10} =$ | | 37 | $3 - \frac{3}{7} =$ | |
| 16 | $2 - \frac{9}{10} =$ | | 38 | $2 - \frac{7}{10} =$ | |
| 17 | $4 - \frac{7}{10} =$ | | 39 | $2 - \frac{5}{10} =$ | |
| 18 | $3 - \frac{3}{10} =$ | | 40 | $3 - \frac{6}{8} =$ | |
| 19 | $2 - \frac{1}{5} =$ | | 41 | $4 - \frac{3}{12} =$ | |
| 20 | $2 - \frac{2}{5} =$ | | 42 | $3 - \frac{10}{12} =$ | |
| 21 | $2 - \frac{4}{5} =$ | | 43 | $2 - \frac{4}{6} =$ | |
| 22 | $3 - \frac{3}{5} =$ | | 44 | $4 - \frac{4}{12} =$ | |

subtracting fractions from a whole number



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Name ______________________________ Date ________________

1. For the following problems, draw a picture using the rectangular fraction model and write the answer. Simplify your answer, if possible.

a. $\frac{1}{3} - \frac{1}{4} =$

b. $\frac{2}{3} - \frac{1}{2} =$

c. $\frac{5}{6} - \frac{1}{4} =$

d. $\frac{2}{3} - \frac{1}{7} =$

e. $\frac{3}{4} - \frac{3}{8} =$

f. $\frac{3}{4} - \frac{2}{7} =$


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2. Mr. Penman had $\frac{2}{3}$ liter of salt water. He used $\frac{1}{5}$ of a liter for an experiment. How much salt water does Mr. Penman have left?

3. Sandra says that $\frac{4}{7} - \frac{1}{3} = \frac{3}{4}$ because all you have to do is subtract the numerators and subtract the denominators. Convince Sandra that she is wrong. You may draw a rectangular fraction model to support your thinking.



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Name ______________________________ Date ________________

For the following problems, draw a picture using the rectangular fraction model and write the answer. Simplify your answer, if possible.

a. $\frac{1}{2} - \frac{1}{7} =$

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



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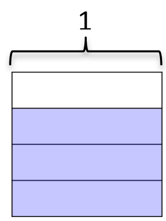
Name ______________________________ Date ________________

1. The picture below shows $\frac{3}{4}$ of the rectangle shaded. Use the picture to show how to create an equivalent fraction for $\frac{3}{4}$, and then subtract $\frac{1}{3}$.




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

2. Find the difference. Use a rectangular fraction model to find common denominators. Simplify your answer, if possible.

a. $\frac{5}{6} - \frac{1}{3} =$

b. $\frac{2}{3} - \frac{1}{2} =$

c. $\frac{5}{6} - \frac{1}{4} =$

d. $\frac{4}{5} - \frac{1}{2} =$

e. $\frac{2}{3} - \frac{2}{5} =$

f. $\frac{5}{7} - \frac{2}{3} =$



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3. Robin used $\frac{1}{4}$ of a pound of butter to make a cake. Before she started, she had $\frac{7}{8}$ of a pound of butter. How much butter did Robin have when she was done baking? Give your answer as a fraction of a pound.

4. Katrina needs $\frac{3}{5}$ kilogram of flour for a recipe. Her mother has $\frac{3}{7}$ kilogram of flour in her pantry. Is this enough flour for the recipe? If not, how much more will she need?



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