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## How to subtract mixed numbers with regrouping

Subtracting Fractions and Mixed Numbers Learning Objectives . Subtract fractions with like and unlike denominators. . Subtract mixed numbers without regrouping. . Subtract mixed numbers with regrouping. . Solve application problems that require the subtraction of fractions or mixed numbers. Sometimes subtraction, rather than addition, is required to solve problems that involve fractions. Suppose you are making pancakes and need cups of flour but you only have cups. How many additional cups will you have to get to make the pancakes? You can solve this problem by subtracting the mixed numbers. The most simple fraction subtraction problems are those that have two proper fractions with a common denominator. That is, each denominator is the same. The process is just as it is for addition of fractions with like denominators, except you subtract! You subtract the second numerator from the first and keep the denominator the same. Imagine that you have a cake with equal-sized pieces. Some of the cake has already been eaten, so you have a fraction of the cake remaining. You could represent the cake pieces with the picture below. The cake is cut into 12 equal pieces to start. Two are eaten, so the remaining cake can be represented with the fraction . If three more pieces of cake are eaten, what fraction of the cake is left? You can represent that problem with the expression . If you subtract 3 pieces, you can see below that of the cake remains. You can solve this problem without the picture by subtracting the numerators and keeping the denominator the same; Subtracting Fractions with Like Denominators If the denominators (bottoms) of the fractions are the same, subtract the numerators (tops) and keep the denominator the same. Remember to simplify the resulting fraction, if possible. Example Problem Subtract. = Both fractions have a denominator of 7, so subtract the numerators and keep the same denominator. Answer Example Problem Subtract. Simplify the answer. The fractions have a like denominator, also known as a common denominator, so subtract the numerators. Simplify the fraction. Answer If the denominators are not the same (they have unlike denominators), you must first rewrite the fractions with a common denominator. The least common denominator, which is the least common multiple of the denominators, is the most efficient choice, but any common denominator will do. Be sure to check your answer to be sure that it is in simplest form. You can use prime factorization to find the least common multiple (LCM), which will be the least common denominator (LCD). See the example below. Example Problem Subtract. Simplify the answer.  $5 \cdot 6 = 30$  The fractions have unlike denominators, so you need to find a common denominator. Recall that a common denominator can be found by multiplying the two denominators together. Rewrite each fraction as an equivalent fraction with a denominator of 30. Subtract the numerators. Simplify the answer if needed. Answer The example below shows using multiples to find the least common multiple, which will be the least common denominator. Example Problem Subtract. Simplify the answer. Multiples of 6: 6, 12, 18, 24 Multiples of 4: 4, 8, 12, 16, 20, 24 Multiples of 6 and 4: 24 The least common multiple of 6 and 4 is 24. Find the least common multiple of the denominators - this is the least common denominator. Rewrite each fraction with a denominator of 24. Subtract the fractions. Simplify the answer if needed. Answer Subtract and simplify the answer. A) B) C) D) Show/Hide Answer A) Incorrect. Find a least common denominator and subtract; then simplify. The correct answer is . B) Incorrect. Simplify the fraction. The correct answer is . C) Incorrect. Subtract, don't add, the fractions. The correct answer is . D) Correct. Subtracting Mixed Numbers Subtracting mixed numbers works much the same way as adding mixed numbers. To subtract mixed numbers, subtract the whole number parts of the mixed numbers and then subtract the fraction parts in the mixed numbers. Finally, combine the whole number answer and the fraction answer to express the answer as a mixed number. Example Problem Subtract. Simplify the answer and write as a mixed number.  $6 - 3 = 3$  Subtract the whole numbers and subtract the fractions. Combine the fraction and the whole number. Make sure the fraction in the mixed number is simplified. Answer = Sometimes it might be easier to express the mixed number as an improper fraction first and then solve. Consider the example below. Example Problem Subtract. Simplify the answer and write as a mixed number. Write each mixed number as an improper fraction. Since the fractions have a like denominator, subtract the numerators. Write the answer as a mixed number. Divide 11 by 3 to get 3 with a remainder of 2. Answer Since addition is the inverse operation of subtraction, you can check your answer to a subtraction problem with addition. In the example above, if you add to your answer of , you should get . Sometimes you have to find a common denominator in order to solve a mixed number subtraction problem. Example Problem Subtract. Simplify the answer and write as a mixed number.  $2 \cdot 3 = 6$  Recall that a common denominator can easily be found by multiplying the denominators together. Rewrite each fraction using the common denominator 6. Subtract the fractions.  $7 - 2 = 5$  Subtract the whole numbers. Combine the whole number and the fraction. Answer Subtract. Simplify the answer and write it as a mixed number. A) B) C) D) 5 Show/Hide Answer A) Incorrect. Subtract the whole numbers, too. The correct answer is . B) Correct.  $9 - 4 = 5$  . Combining them gives . C) Incorrect. Subtract, don't add, the fractions. The correct answer is . D) 5 Incorrect. Subtract the fractions as well as the whole numbers. The correct answer is . Subtracting Mixed Numbers with Regrouping Sometimes when subtracting mixed numbers, the fraction part of the second mixed number is larger than the fraction part of the first number. Consider the problem: . The standard procedure would be to subtract the fractions, but would result in a negative number. You don't want that! You can regroup one of the whole numbers from the first number, writing the first mixed number in a different way. Now, you can write an equivalent problem to the original: Then, you just subtract like you normally subtract mixed numbers:  $6 - 3 = 3$  So, the answer is . As with many fraction problems, you may need to find a common denominator. Remember that a key part of adding and subtracting fractions and mixed numbers is making sure to have a common denominator as a first step! In the example below, the original fractions do not have a like denominator. You need to find one before proceeding with the next steps. Example Problem Subtract. Simplify the answer and write as a mixed number. Multiples of 5: 5, 10, 15, 20, 25 Multiples of 4: 4, 8, 12, 16, 20, 24 Find a least common denominator. 20 is the least common multiple, so use it for the least common denominator. Rewrite each fraction using the common denominator. Write the expression using the mixed numbers with the like denominator. Since the second fraction part, , is larger than the first fraction part, regroup one of the whole numbers and write it as . Rewrite the subtraction expression using the equivalent fractions. Subtract the whole numbers, subtract the fractions. Combine the whole number and the fraction. Answer Subtracting Mixed Numbers If the fractional part of the mixed number being subtracted is larger than the fractional part of the mixed number from which it is being subtracted, or if a mixed number is being subtracted from a whole number, follow these steps: 1. Subtract 1 from the whole number part of the mixed number being subtracted. 2. Add that 1 to the fraction part to make an improper fraction. For example, . 3. Then, subtract as with any other mixed numbers. Alternatively, you can change both numbers to improper fractions and then subtract. Subtract. Simplify the answer and write as a mixed number. A) B) C) D) Show/Hide Answer A) Incorrect. This is the answer to . The fraction has to be subtracted from the 15. The correct answer is . B) Incorrect. Subtract, don't add, the quantities. The correct answer is . C) Correct. D) Incorrect. Subtract 1 from the whole number when rewriting it as a mixed number. The correct answer is . Subtracting Fractions and Mixed Numbers to Solve Problems Knowing how to subtract fractions and mixed numbers is useful in a variety of situations. When reading problems, look for key words that indicate that the problem can be solved using subtraction. Example Problem Sherry loves to quilt, and she frequently buys fabric she likes when she sees it. She purchased 5 yards of blue print fabric and decided to use yards of it in a quilt. How much of the blue print fabric will she have left over after making the quilt? Write an expression using subtraction to describe the situation. Rewrite the whole number as a mixed number. Subtract. Check that the mixed number is simplified. Answer Sherry has yards of blue print fabric left over. Example Problem Pilar and Farouk are training for a marathon. On a recent Sunday, they both completed a run. Farouk ran miles and Pilar ran miles. How many more miles did Pilar run than Farouk? Write an expression using subtraction to describe the situation. Rewrite the mixed numbers using the least common denominator. Since the fraction part of the second mixed number is larger than the fraction part of the first mixed number, regroup one as a fraction and rewrite the first mixed number. Write the subtraction expression in its new form. Subtract. Answer Pilar ran miles more than Farouk. Problem Mike and Jose are painting a room. Jose used of a can of paint and Mike used of a can of paint. How much more paint did Jose use? Write the answer as a fraction of a can. Write an expression using subtraction to describe the situation. Rewrite the fractions using a common denominator. Subtract. Check that the fraction is simplified. Answer Jose used of a can more paint than Mike. Mariah's sunflower plant grew inches in one week. Her tulip plant grew inches in one week. How many more inches did the sunflower grow in a week than the tulip? A) inches B) inches C) 15 inches D) inches Show/Hide Answer A) inches Incorrect. Subtract, don't add, the fractions. The correct answer is inches. B) inches Incorrect. Subtract, not. The correct answer is inches. C) 15 inches Incorrect. Subtract the fractions as well as the whole numbers in the mixed numbers. The correct answer is inches. D) inches Correct. Subtracting fractions and mixed numbers combines some of the same skills as adding whole numbers and adding fractions and mixed numbers. When subtracting fractions and mixed numbers, first find a common denominator if the denominators are not alike, rewrite each fraction using the common denominator, and then subtract the numerators. When subtracting mixed numbers, if the fraction in the second mixed number is larger than the fraction in the first mixed number, rewrite the first mixed number by regrouping one whole as a fraction. Alternatively, rewrite all fractions as improper fractions and then subtract. This process is also used when subtracting a mixed number from a whole number. If you're seeing this message, it means we're having trouble loading external resources on our website. If you're behind a web filter, please make sure that the domains \*.kastatic.org and \*.kasandbox.org are unblocked. This fraction worksheet is great for practicing subtracting Mixed Numbers Problems. You may select whether or not the problems require regrouping or not. The problems may be selected for five different degrees of difficulty. The easiest will keep the denominators the same and the numerators between 1 and 9. The hardest will keep the numerators between 1 and 20 and the common denominators under 120. The answer worksheet will show the progression on how to solve the problems. First find the common denominator and adjust the fractions. The next step is to regroup if needed. Then subtract the numerators and whole numbers. Then check to see if we need to simplify or reduce the mixed number. This fraction worksheet will generate 10 or 15 mixed number subtraction problems per worksheet, and remember every time you create a worksheet the problems will change and will not repeat. Click here for More Fractions Worksheets Example 1: As part of his marathon training, Carlos ran three and one-fourth miles yesterday and one and three-fourths miles the day before. How much farther did Carlos run yesterday than the day before? Analysis: This problem is asking us to subtract mixed numbers with like denominators. In the last lesson, we learned that to add mixed numbers, add the whole numbers and add the fractions separately: (whole + whole) + (fraction + fraction). A similar procedure applies to subtracting mixed numbers. However, how do we subtract three-fourths from one-fourth? In order to subtract a larger unit from a smaller, we will need to borrow. For example, if you were subtracting 31-19, you would borrow one ten and then regroup it as 10 ones in order to subtract. Recall that a mixed number consists of a whole-number part and a fractional part. Let's use this fact and fraction circles to help us convert one whole into 4 fourths so we can regroup and borrow. Now that we have rewritten three and one-fourth as two and five-fourths, we can subtract these mixed numbers. Example 1: As part of his marathon training, Carlos ran three and one-fourth miles yesterday and one and three-fourths miles the day before. How much farther did Carlos run yesterday than the day before? Analysis: This problem is asking us to subtract mixed numbers with like denominators. We need to regroup and borrow. Let's look at some more examples. Example 2: Analysis: These mixed numbers have like denominators. In order to subtract a larger unit from a smaller one, we will need to borrow. Solution: Example 3: Analysis: We are subtracting a whole number from a mixed number. Solution: Example 4: Analysis: We are subtracting a mixed number from a whole number. We will need to borrow. Solution: Example 5: Analysis: The fractional parts have unlike denominators. Step 1: We will write equivalent fractions using the LCD, 4. Step 2: We will need to borrow. Example 6: Analysis: The fractional parts have unlike denominators. Step 1: We will write equivalent fractions using the LCD, 21. Step 2: We will need to borrow. Example 7: Analysis: The fractional parts have unlike denominators. Step 1: We will write equivalent fractions using the LCD, 12. Step 2: We will need to borrow. It is important to note that another way to subtract mixed numbers is to convert each mixed number into an improper fraction. For example 7, this would be done as follows: This method is mathematically sound. However, it can lead to careless arithmetic errors, so we do not recommend it. Example 8: At the end of a football game, the head coach noticed that the jug of water, which had initially contained nine and three-eighths liters, was down to three and nine-sixteenths liters. How many liters of water was consumed? Analysis: This problem is asking us to subtract the following mixed numbers: Solution: Five and thirteen-sixteenths liters of water was consumed. Summary: To subtract mixed numbers: If the denominators are unlike, use the LCD to rewrite them as equivalent fractions. If the second fraction is larger than the first, borrow a whole number and convert it to an equivalent fraction using the LCD. Subtract the whole numbers and subtract the fractions separately: (whole - whole) + (fraction - fraction) Simplify the result, if necessary. Exercises Directions: Subtract the mixed numbers in each exercise below. Be sure to simplify your result, if necessary. Click once in an ANSWER BOX and type in your answer; then click ENTER. After you click ENTER, a message will appear in the RESULTS BOX to indicate whether your answer is correct or incorrect. To start over, click CLEAR. Note: To write the mixed number four and two-thirds, enter 4, a space, and then 2/3 into the form. 1. 2. 3. 4. A painter had twenty and one-fourth gallons of paint in her bucket at the beginning of the day, and only nine and three-eighths gallons at the end of the day. How many gallons of paint did she use? 5. A technology stock opened at thirty-one and three-eighths and closed at twenty-seven and nine-sixteenths. What was the net loss for this stock?





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