Adding and Subtracting Fractions

VANCOUVER COMMUNITY COLLEGE

To add or subtract fractions, the bottom numbers (denominators) of the fractions must be the **same**.

If the bottom numbers don't match, find the smallest number that is a multiple of the two bottom numbers in the fractions. This is called the least common denominator.

Multiply the top and bottom of each fraction by the factor needed to get the least common denominator.

When you do this you are making an equivalent fraction. The value of the new fraction is the same as the value of the old one, but the numbers in the top and bottom are larger.

Then, add or subtract the top numbers of the new fractions and keep the bottom number the same.

Remember to reduce your answer by dividing the top and the bottom by any number that divides evenly into both numbers.

Example 1:   What is $\frac{1}{4} + \frac{1}{4}$?

Answer: Do the bottom numbers match?   Yes

Add the fractions together.
The top numbers are added together. The bottom number stays the same. $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$

Is there a number other than 1 that divides into both 2 and 4?   Yes. 2.

Perform the divisions and write the answer as a fraction. $2 \div 2 = 1$
                                                                                      $4 \div 2 = 2$

$\frac{1}{2}$ is the final answer.

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Example 2:	What is $\dfrac{1}{2} + \dfrac{3}{8}$?	
Answer:	Do the bottom numbers match?	No

	Find the smallest multiple of the two bottom numbers. 2 × 4 = 8 and 8 × 1 = 8, so the smallest multiple is 8. Multiply the top and bottom of each fraction by the number needed to get 8 in the bottom of the fraction.	$\dfrac{1}{2} \times \dfrac{4}{4} = \dfrac{4}{8}$ $\dfrac{3}{8} \times \dfrac{1}{1} = \dfrac{3}{8}$
	Now both fractions have the same bottom number.	
	Add the fractions together. The top numbers are added together. The bottom number stays the same.	$\dfrac{4}{8} + \dfrac{3}{8} = \dfrac{7}{8}$
	Is there a number other than 1 that divides into both 7 and 8?	No.
	$\dfrac{7}{8}$ is the final answer.	

Subtraction

The rules for subtraction are identical to those for addition.

First, make sure the bottom numbers of the fractions you are subtracting match. Then, subtract the top numbers (numerators) and leave the bottom the same.

Example 3:	What is $\dfrac{3}{4} - \dfrac{3}{10}$?	
Answer:	Do the bottom numbers match?	No
	Find the smallest number that is a multiple of both 4 and 10. 4 × 5 = 20 10 × 2 = 20 Multiply the top and bottom of each fraction by the number needed to get 20 in the bottom of the fraction.	$\dfrac{3}{4} \times \dfrac{5}{5} = \dfrac{15}{20}$ $\dfrac{3}{10} \times \dfrac{2}{2} = \dfrac{6}{20}$
	Now both fractions have the same bottom number.	

Subtract the fractions. The top numbers subtract, the bottom numbers stay the same.	$\dfrac{15}{20} - \dfrac{6}{20} = \dfrac{9}{20}$
Is there a number other than 1 that divides into both 9 and 20?	No
$\dfrac{9}{20}$ is the final answer.	

If the problem involves a mixed fraction (e.g. 2 ½) add or subtract the whole numbers in the problem separately from the fractions in the problem, then add the two results in the end.

Example 4:	What is $2\dfrac{3}{4} - \dfrac{1}{3}$?	
Answer:	Take the whole numbers separately.	$2 - 0 = 2$
	Now look at the fractions - do the bottom numbers match?	No
	Find the smallest number that is a multiple of both 4 and 3. 4 × 3 = 12 3 × 4 = 12 Multiply the top and bottom of each fraction by the number needed to get 12 in the bottom of the fraction.	$\dfrac{3}{4} \times \dfrac{3}{3} = \dfrac{9}{12}$ $\dfrac{1}{3} \times \dfrac{4}{4} = \dfrac{4}{12}$
	Now both fractions have the same bottom number. Subtract the fractions. The top numbers subtract, the bottom numbers stay the same.	$\dfrac{9}{12} - \dfrac{4}{12} = \dfrac{5}{12}$
	Is there a number other than 1 that divides into both 5 and 12?	No
	Add the whole number to the fraction to get the final answer.	$2 + {}^{5}\!/_{12} =$ $2\,{}^{5}\!/_{12}$

If you get an improper fraction (the top number is larger than the bottom number) when adding or subtracting, convert it to a mixed fraction. You do this by subtracting the bottom number from the top number (for every time you can do this, add another "1" to the whole number in front). Whatever the remainder is stays on top of the fraction and the number in the bottom of the fraction stays the same.

<table>
<tr><td>Example 5:</td><td>What is $\dfrac{3}{4} + \dfrac{2}{3}$?</td><td></td></tr>
<tr><td>Answer:</td><td>Convert so the bottom numbers match.</td><td>$\dfrac{3}{4} \times \dfrac{3}{3} = \dfrac{9}{12}$
$\dfrac{2}{3} \times \dfrac{4}{4} = \dfrac{8}{12}$</td></tr>
<tr><td></td><td>Add the fractions.</td><td>$\dfrac{9}{12} + \dfrac{8}{12} = \dfrac{17}{12}$</td></tr>
<tr><td></td><td>Improper fraction! How many times can 12 go into 17 and what is the remainder?</td><td>$17 \div 12 = 1$,
Remainder 5</td></tr>
<tr><td></td><td>Rewrite the fraction as a mixed fraction, putting the remainder over the bottom number.</td><td>$1\,{}^{5}\!/_{12}$</td></tr>
</table>

Practice Problems

Fill in the missing column. Reduce fractions when possible.

1. $\frac{1}{3}$ + $\frac{1}{3}$ =
2. $\frac{1}{4}$ + $\frac{1}{4}$ =
3. $\frac{4}{5}$ − $\frac{1}{5}$ =
4. $\frac{4}{6}$ − $\frac{1}{6}$ =
5. $\frac{1}{6}$ + $\frac{1}{2}$ =
6. $\frac{1}{2}$ − $\frac{1}{8}$ =
7. $\frac{1}{2}$ + $\frac{3}{8}$ =
8. $\frac{5}{9}$ − $\frac{1}{3}$ =
9. $\frac{5}{6}$ − $\frac{1}{3}$ =
10. $\frac{5}{12}$ − $\frac{1}{4}$ =
11. $\frac{1}{3}$ + $\frac{1}{5}$ =
12. $\frac{1}{4}$ − $\frac{1}{5}$ =
13. $\frac{2}{3}$ + $\frac{1}{4}$ =
14. $\frac{3}{4}$ − $\frac{1}{5}$ =
15. $\frac{6}{7}$ − $\frac{1}{2}$ =
16. $\frac{4}{9}$ + $\frac{2}{7}$ =
17. $\frac{4}{8}$ − $\frac{1}{2}$ =
18. $1\frac{3}{4}$ − $\frac{1}{4}$ =
19. $1\frac{1}{4}$ + $\frac{1}{3}$ =
20. $1\frac{1}{2}$ + $2\frac{1}{6}$ =
21. $\frac{3}{4}$ + $\frac{4}{5}$ =
22. $\frac{5}{6}$ + $\frac{2}{3}$ =
23. $1\frac{3}{5}$ − $\frac{1}{3}$ =
24. $\frac{5}{6}$ + $\frac{1}{4}$ =
25. $4\frac{6}{7}$ − $2\frac{2}{3}$ =

25. Vivianne bought $^4/_5$ pound of apple and $1^1/_3$ pound of cherries to use for stuffing. How much fruit did she buy in all?

26. A recipe requires $^1/_2$ teaspoon cayenne pepper, $^1/_3$ teaspoon black pepper, and $^1/_6$ teaspoon white pepper. How much pepper does this recipe need in total?

27. A recipe calls for $4\,^2/_3$ c. flour total. One-half a cup is used for a streusel topping and the rest is used in the dough. How much flour will go into the dough?

Answers

1. $^2/_3$
2. $^1/_2$
3. $^3/_5$
4. $^1/_2$
5. $^2/_3$
6. $^3/_8$
7. $^7/_8$
8. $^2/_9$
9. $^1/_2$
10. $^1/_6$
11. $^8/_{15}$
12. $^1/_{20}$
13. $^{11}/_{12}$
14. $^{11}/_{20}$
15. $^5/_{14}$
16. $^{46}/_{63}$
17. 0
18. $1\,^1/_2$
19. $1\,^7/_{12}$
20. $3\,^2/_3$
21. $^{31}/_{20} = 1\,^{11}/_{20}$
22. $^{18}/_{12} = 1\,^1/_2$
23. $1\,^4/_{15}$
24. $^{13}/_{12} = 1\,^1/_{12}$
25. $2\,^4/_{21}$

26. $1\,^2/_{15}$ lb fruit
27. 1 tsp. pepper in total
28. $4\,^1/_6$ c. flour goes in the dough