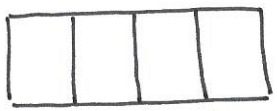
Add and Subtract Fractions with Like Denominators

C. Elkins 2018

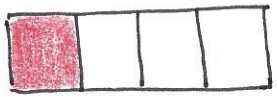
Add

$\frac{1}{4} + \frac{1}{4} = \square$

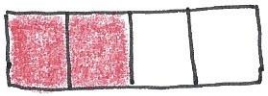
- Partition a whole into fourths



- Shade one fourth



- Shade another one fourth

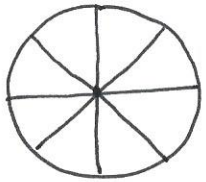


The total: $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$

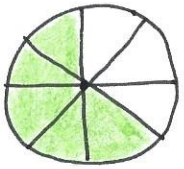
Subtract

$\frac{5}{8} - \frac{2}{8} = \square$

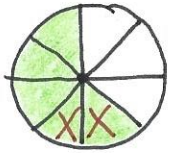
- Partition a whole into eighths.



- Shade $\frac{5}{8}$ →



- Cross out or erase $\frac{2}{8}$ →



- Count what's left
- Check with addition: $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$

When adding or subtracting fractions with <u>like</u> denominators, the <u>size of the parts</u> remain the same. It's the <u>number of parts</u> that changes.

$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$ ← $\frac{1}{4} + \frac{1}{4}$ →

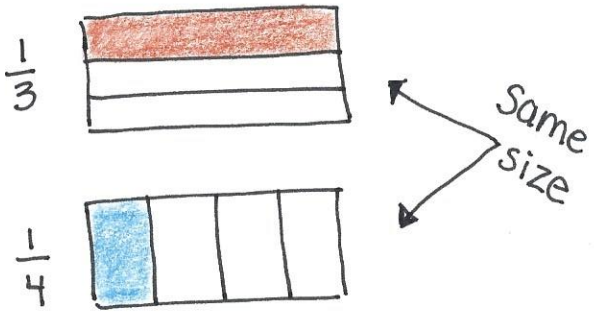
Add and Subtract Fractions With Unlike Denominators

C. Elkins 2018

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

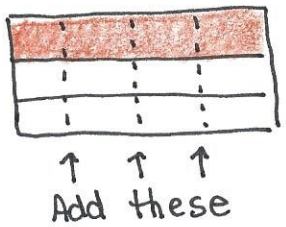
① Partition a whole into thirds.
Use horizontal lines. Shade 1/3.

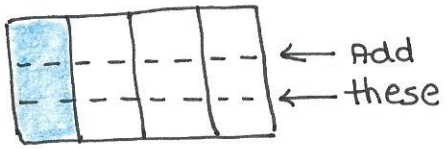
② Partition a whole into fourths.
Use vertical lines. Shade 1/4.



③ Create equivalent fractions by taking the lines from one shape and adding them to the other shape (superimposing).

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





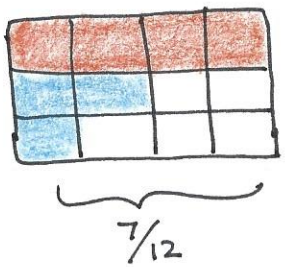
$\frac{1}{4} = \frac{3}{12}$

④ Now each shape (box) is partitioned into twelfths. This is the least common denominator (LCD).

⑤ Notice that $\frac{1}{3} = \frac{4}{12}$ and that $\frac{1}{4} = \frac{3}{12}$

⑥ Add: $\frac{4}{12} + \frac{3}{12} = \frac{7}{12}$

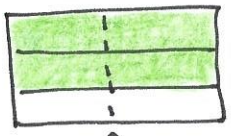
OR $\frac{1}{3} + \frac{1}{4} = \frac{7}{12}$



Add and Subtract Fractions With Unlike Denominators

C. Elkins 2018

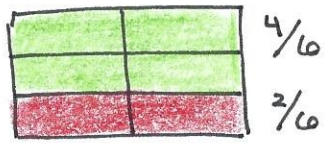
$$\frac{2}{3} + \frac{2}{6} = \square$$



Add line to show $2/3 = 4/6$

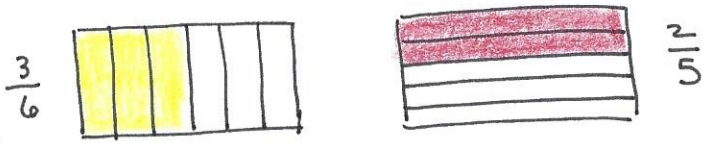
→ Since 3 is a factor of 6, just create an equivalent fraction for $2/3$.

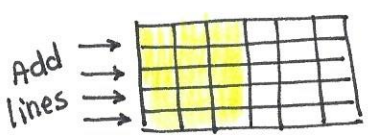
Then add:

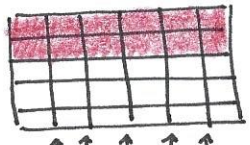


$$\frac{4}{6} + \frac{2}{6} = \frac{6}{6} \text{ OR } 1 \text{ whole}$$

$$\frac{3}{6} + \frac{2}{5} = \square$$





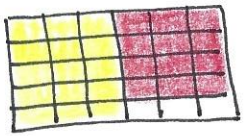


Add lines

$\frac{3}{6} = \frac{15}{30}$

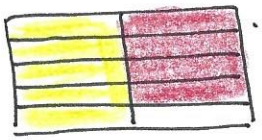
$\frac{2}{5} = \frac{12}{30}$

Add:



$$\frac{15}{30} + \frac{12}{30} = \frac{27}{30}$$

To simplify: Remove lines...



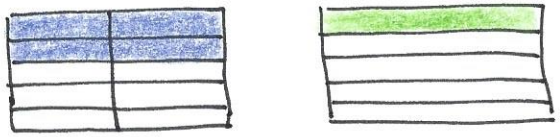
...Can you visualize the tenths?

$$\frac{27}{30} \div \frac{3}{3} = \frac{9}{10}$$

Add and Subtract Fractions With Unlike Denominators

C. Elkins 2018

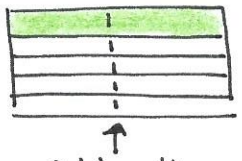
$\frac{4}{10} - \frac{1}{5} = \square$



4/10 1/5

Since 5 is a factor of 10 just create an equivalent fraction for 1/5

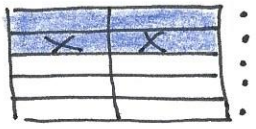
$\frac{1}{5} = \frac{2}{10}$



Add a line

Subtract:

Cross out 2/10 →



} can you visualize the fifths?

$\frac{4}{10} - \frac{2}{10} = \frac{2}{10}$ OR $\frac{1}{5}$

$\frac{2}{3} + \frac{2}{6} = \square$

LCD

skip count til you find a common multiple

① Find the LCD to make equiv. fractions in which each has the same denominator.

② Each fraction needs a denominator of 6.

---

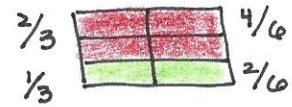
③ $\frac{2}{3} \times \frac{\square}{\square} = \frac{\square}{6}$

Since 3 x 2 = 6, I will multiply 2/3 times 2/2 which is another way to say 1.

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

2/3 = 4/6

④ Add $\frac{4}{6} + \frac{2}{6} = \frac{6}{6}$ which = 1 whole



More Examples
Add / Subtract Fractions

C. Elkins 2018

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

① Find the LCD to make equiv. fractions. Each will have the same denominator.

② Each fraction needs a denom. of 12

③ $\frac{3}{4} \times \frac{\square}{\square} = \frac{\square}{12}$

Since $4 \times \underline{3} = 12$, then multiply $3/4 \times 3/3$ which is a form of 1.

$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12} \longrightarrow$ so... $\frac{3}{4} = \frac{9}{12}$

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

Since $3 \times \underline{4} = 12$, then multiply $\frac{1}{3} \times 4/4$ which is a form of 1.

$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12} \longrightarrow$ so $\frac{1}{3} = \frac{4}{12}$

Denom. ↓

3	4
6	8
9	12
12	

skip count til you find a common multiple.

$\frac{3}{5} + \frac{1}{4} = \square$

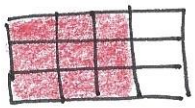
① Find LCD

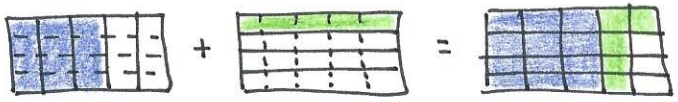
4	5
8	10
12	15
16	20
20	

② $\frac{3}{5} \times \frac{\square}{\square} = \frac{\square}{20} \longrightarrow \frac{3}{5} \times \frac{4}{4} = \frac{12}{20}$

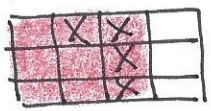
③ $\frac{1}{4} \times \frac{\square}{\square} = \frac{\square}{20} \longrightarrow \frac{1}{4} \times \frac{5}{5} = \frac{5}{20}$

④ Add: $\frac{12}{20} + \frac{5}{20} = \frac{17}{20}$





$3/5 = 12/20$ $\quad$ $1/4 = 5/20$

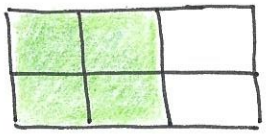


$9/12 - 4/12 = 5/12$

Simplify Fractions

C. Elkins, 2018

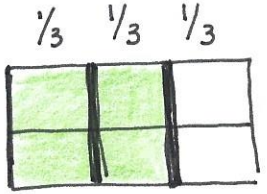
① With models, look for other ways to rename the fraction.



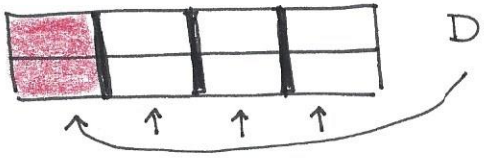
Can $\frac{4}{6}$ be simplified?

Can you see the <u>thirds</u>?

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



② Can $\frac{2}{8}$ be simplified?



Do you see the <u>fourths</u>?

$\frac{2}{8} = \frac{1}{4}$

③ ☐ Is the numerator a 1? Stop! It's already in simplest form. $\frac{1}{5}$ Stop!

☐ Are both numerator and denominator even numbers? Then try dividing both by $\frac{2}{2}$ (or $\frac{4}{4}$, $\frac{8}{8}$, etc.). $\frac{8}{12} \div \frac{2}{2} = \frac{4}{6}$ then $\frac{4}{6} \div \frac{2}{2} = \frac{2}{3}$ Stop!

☐ Is the numerator a factor of the denominator? Then divide by the numerator. $\frac{5}{15}$ ... 5 is a factor of 15 → $\frac{5}{15} \div \frac{5}{5} = \frac{1}{3}$ Stop!

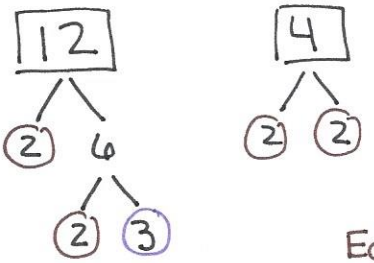
☐ The numerator is a prime number and is <u>not</u> a factor of the denominator. $\frac{7}{10}$ ... 7 is prime and is not a factor of 10. $\frac{7}{10}$ Stop!

Using Prime Factorization to help find GCF and LCD LCM

C. Elkins 2018

$\frac{5}{12} + \frac{3}{4} = \square$

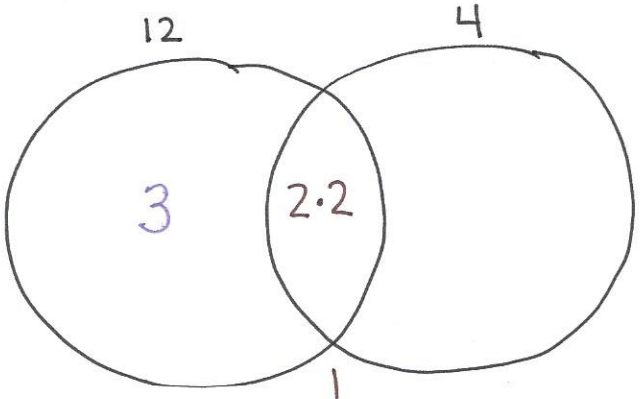
① Find prime factors of each denom.



Each have 2·2 as factors, so this goes in the center.

② Make a Venn Diagram

What is different?
12 has a factor of 3.
It goes in 12's circle.



→ Multiply across to find LCM (LCD)

$3 \cdot 2 \cdot 2 = 12$

↓ GCF
Greatest common Factor
$2 \cdot 2 = 4$

③ $\frac{5}{12}$ is ok

④ $\frac{3}{4} \cdot \frac{3}{3} = \frac{9}{12}$

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

⑥ Simplify $\frac{14}{12} \div \frac{2}{2} = \frac{7}{6}$

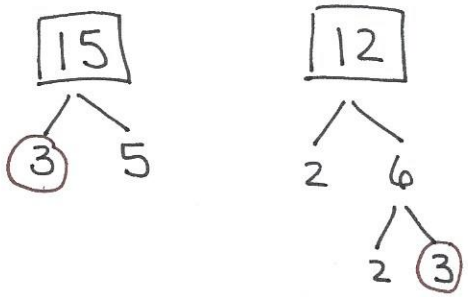
and $\frac{7}{6} - \frac{6}{6} = \frac{1}{6}$ → $1\frac{1}{6}$

Using Prime Factorization to help find GCF and LCD/LCM

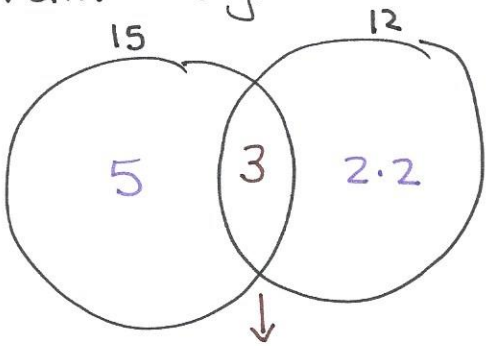
C. Elkins 2018

$\frac{4}{15} + \frac{5}{12} = \square$

① Find prime factors of each denom.



② Make a Venn Diagram



→ Multiply across to find LCM/LCD.

$5 \cdot 3 \cdot 2 \cdot 2$

$15 \cdot 2 \cdot 2$

$30 \cdot 2 = 60$

GCF Greatest Common Factor (3)

③ solve: $\frac{4}{15} \times \frac{4}{4} = \frac{16}{60}$

$\frac{5}{12} \times \frac{5}{5} = \frac{25}{60}$

④ $\frac{16}{60} + \frac{25}{60} = \frac{41}{60}$

Since 41 is a prime # and not a factor of 60, this fraction is in its simplest form.