MATH DOESN'T SUCK

Solution Guide – Chapter 8

Common Denominators… and Adding and Subtracting Fractions

Doing the Math from p. 87

2) $1\frac{1}{3} + \frac{4}{3} = ?$

The first thing we want to do is to convert $1\frac{1}{3}$ into an improper fraction. Use the MAD face method (see p. 45 of the book for a review), and we find out that $1\frac{1}{3} = \frac{4}{3}$, so our new problem looks like:

$\frac{4}{3} + \frac{4}{3} = ?$

And now we can just add across the top, keeping the denominator the same:

$\frac{4}{3} + \frac{4}{3} = \frac{8}{3}$

Answer: $1\frac{1}{3} + \frac{4}{3} = \mathbf{\frac{8}{3}}$

3) $\frac{1}{3} + \frac{1}{7} = ?$

These have two different denominators, 3 and 7, and we haven't learned how to deal with this yet.

Answer: "different denominators."

4) $\frac{7}{8} - \frac{3}{8} = ?$

Since they have the same denominator, we can just subtract across the top, keeping the denominator the same: $\frac{7}{8} - \frac{3}{8} = \frac{4}{8}$

Reducing, we see that $\frac{4}{8} = \frac{4 \div \mathbf{4}}{8 \div \mathbf{4}} = \frac{1}{2}$, so:

Answer: $\frac{7}{8} - \frac{3}{8} = \mathbf{\frac{1}{2}}$

5) $\frac{10}{9} + \frac{8}{9} = ?$

Since they have the same denominator, we can add across the top:

$$\frac{10}{9} + \frac{8}{9} = \frac{18}{9}$$

Reducing, we see that $\frac{18}{9} = \frac{18 \div \mathbf{9}}{9 \div \mathbf{9}} = \frac{2}{1} = 2$

Answer: $\frac{10}{9} + \frac{8}{9} = \mathbf{2}$

Doing the Math from p. 92-3

2) $\frac{7}{15} - \frac{1}{45} = ?$

So, our first goal is to get them to have the same denominator. How do we do this? By finding the LCM, lowest common multiple of the two denominators. You may notice that 15 is actually a factor of 45, when you start to list their multiples:

15: 15, 30, 45… And at this point you could stop – you've found it!

Since $45 = 15 \times 3$, we can use the copycat fraction $\frac{\mathbf{3}}{\mathbf{3}}$ to rewrite $\frac{7}{15}$ with a "45" on the bottom.

$$\frac{7}{15} = \frac{7}{15} \times \frac{\mathbf{3}}{\mathbf{3}} = \frac{7 \times \mathbf{3}}{15 \times \mathbf{3}} = \frac{21}{45}$$

And now we can subtract the two fractions, because they have the same denominator:

$$\frac{21}{45} - \frac{1}{45} = \frac{21-1}{45} = \frac{20}{45}$$

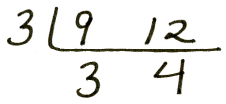
Can we reduce this? One ends in a 0 and the other ends in a 5, which means they are both divisible by 5, so: $\frac{20}{45} = \frac{20 \div \mathbf{5}}{45 \div \mathbf{5}} = \frac{4}{9}$

Since 4 and 9 don't share any common factors, we're done!

Answer: $\frac{7}{15} - \frac{1}{45} = \mathbf{\frac{4}{9}}$

3) $\frac{4}{9} - \frac{5}{12} = ?$

Let's use the birthday cake method to find the LCM for 9 and 12 – it's the fastest way:



Since 3 and 4 don't share any common factors, we're done. So to get the LCM, just multiply the numbers that make up the big "L": $3 \times 3 \times 4 = 36$.
So, now we need to rewrite both fractions so they have a denominator of 36:

$$\frac{4}{9} = \frac{4 \times \mathbf{4}}{9 \times \mathbf{4}} = \frac{16}{36}$$

And:

$$\frac{5}{12} = \frac{5 \times \mathbf{3}}{12 \times \mathbf{3}} = \frac{15}{36}$$

Now our subtraction problem looks like: $\frac{16}{36} - \frac{15}{36}$, which is easy! Just subtract along the top and get $\frac{16}{36} - \frac{15}{36} = \frac{16-15}{36} = \frac{1}{36}$

Answer: $\frac{4}{9} - \frac{5}{12} = \mathbf{\frac{1}{36}}$

4) $\frac{1}{8} + \frac{2}{9} = ?$

Since 8 and 9 don't share any common factors, their LCM will just be 72, so we'll use the copycat fractions $\mathbf{\frac{8}{8}}$ and $\mathbf{\frac{9}{9}}$ to get a common denominator of 72 for both:

$$\frac{1}{8} = \frac{1}{8} \times \frac{\mathbf{9}}{\mathbf{9}} = \frac{1 \times \mathbf{9}}{8 \times \mathbf{9}} = \frac{9}{72}$$

and

$$\frac{2}{9} = \frac{2}{9} \times \frac{\mathbf{8}}{\mathbf{8}} = \frac{2 \times \mathbf{8}}{9 \times \mathbf{8}} = \frac{16}{72}$$

Now our addition problem looks like: $\frac{9}{72} + \frac{16}{72}$. Since their denominators are the same, we can add across the top: $\frac{9}{72} + \frac{16}{72} = \frac{9+16}{72} = \frac{25}{72}$

Can we reduce this? What are the prime factors of 25? 5 and 5, that's it. So, does 5 go into 72? Nope, because 72 doesn't end in a 0 or a 5.

Think about it - no matter what 72's other factors are, we know they aren't 5, and that's the only factor that 25 has… so it's in reduced form!

Answer: $\frac{1}{8} + \frac{2}{9} = \mathbf{\frac{25}{72}}$

5) $\frac{6}{18}+\frac{250}{300}=?$

Let's reduce these fractions, since they are kinda big (especially the second one!)
Notice that 6 is a factor of 18, so:

$$\frac{6}{18}=\frac{6\div\mathbf{6}}{18\div\mathbf{6}}=\frac{1}{3}$$

and:

$$\frac{250}{300}=\frac{250\div\mathbf{10}}{300\div\mathbf{10}}=\frac{25}{30}$$

But since they end in a "0" and a "5", we know they are both divisible by 5 and we can reduce it further: $\frac{25\div\mathbf{5}}{30\div\mathbf{5}}=\frac{5}{6}$

With our fractions in reduced form, our problem now looks like: $\frac{1}{3}+\frac{5}{6}=?$

But if we want to add them together, we'll need a common denominator. The LCM of 3 and 6 is just 6, so let's use the copycat fraction $\frac{\mathbf{2}}{\mathbf{2}}$ on the first fraction to rewrite it and get a "6" on the bottom: $\frac{1}{3}=\frac{1}{3}\times\frac{\mathbf{2}}{\mathbf{2}}=\frac{1\times\mathbf{2}}{3\times\mathbf{2}}=\frac{2}{6}$

Now our problem looks like: $\frac{2}{6}+\frac{5}{6}=?$

Since they have the same denominator, we can add across the top: $\frac{2+5}{6}=\frac{7}{6}$. This is reduced, but since it's an improper fraction, we could also write it as a mixed number for our final answer – your choice!

Answer: $\frac{6}{18}+\frac{250}{300}=\mathbf{\frac{7}{6}}$ or $\mathbf{1\frac{1}{6}}$