MATH DOESN'T SUCK

Solution Guide – Chapter 7

Comparing Fractions

Doing the Math from p. 77-8

2) $\frac{3}{4} \bigcirc \frac{4}{5}$

Since there's no copycat fraction that would take the denominator from 4 to 5, or from 5 to 4, we'll get both denominators the same by using two copycat fractions:

$$\frac{3}{4} = \frac{3}{4} \times \frac{\mathbf{5}}{\mathbf{5}} = \frac{3 \times \mathbf{5}}{4 \times \mathbf{5}} = \frac{15}{20}$$

and

$$\frac{4}{5} = \frac{4}{5} \times \frac{\mathbf{4}}{\mathbf{4}} = \frac{4 \times \mathbf{4}}{5 \times \mathbf{4}} = \frac{16}{20}$$

It's much easier to compare the two fractions, now that we've rewritten them.

Since: $\frac{15}{20} < \frac{16}{20}$

Answer: $\mathbf{\frac{3}{4} < \frac{4}{5}}$

3) $2\frac{1}{3} \bigcirc \frac{21}{9}$

First, we need to convert the mixed number into an improper fraction. Let's use the MAD face method on $2\frac{1}{3}$:

M: Multiply $3 \times 2 = 6$
A: add 6 + 1 = 7, and put the 7 over the
D: denominator, which is 3.

So, $2\frac{1}{3} = \frac{7}{3}$

Now we need to compare $\frac{7}{3} \bigcirc \frac{21}{9}$. To get the denominators the same, let's use the copycat fraction $\frac{\mathbf{3}}{\mathbf{3}}$ on the first fraction:

$\frac{7}{3} = \frac{7}{3} \times \frac{\mathbf{3}}{\mathbf{3}} = \frac{7 \times \mathbf{3}}{3 \times \mathbf{3}} = \frac{21}{9}$. Hey, it turns out they're equal!

(we also could have reduced $\frac{21}{9}$ and discovered that it equals $\frac{7}{3}$)

Answer: $\mathbf{2\frac{1}{3} = \frac{21}{9}}$

4) $\frac{5}{11} \bigcirc \frac{1}{2}$

To get the denominators the same, let's use two copycat fractions, $\frac{\mathbf{2}}{\mathbf{2}}$ and $\frac{\mathbf{11}}{\mathbf{11}}$.

$\frac{5}{11} = \frac{5}{11} \times \frac{\mathbf{2}}{\mathbf{2}} = \frac{5 \times \mathbf{2}}{11 \times \mathbf{2}} = \frac{10}{22}$

And

$\frac{1}{2} = \frac{1}{2} \times \frac{\mathbf{11}}{\mathbf{11}} = \frac{1 \times \mathbf{11}}{2 \times \mathbf{11}} = \frac{11}{22}$

It's clear that $\frac{10}{22} < \frac{11}{22}$, so we know that

Answer: $\mathbf{\frac{5}{11} < \frac{1}{2}}$

Doing the Math from p. 81-2

2) $\frac{20}{14} \bigcirc \frac{90}{60}$

Let's reduce first, so we don't have to multiply big numbers!

For $\frac{20}{14}$, we could notice that top and bottom are even, so 2 divides into both:

$$\frac{20}{14} = \frac{20 \div \mathbf{2}}{14 \div \mathbf{2}} = \frac{10}{7}$$

And for $\frac{90}{60}$, we could notice that top and bottom are both divisible by 10, and also by 3, which means that they are both divisible by 30 (you could also divide top and bottom by 10, and then by 3, in two separate steps if you prefer): $\frac{90}{60} = \frac{90 \div \mathbf{30}}{60 \div \mathbf{30}} = \frac{3}{2}$.

So now our problem reduces to: $\frac{10}{7} \bigcirc \frac{3}{2}$. With smaller numbers, it's much easier to cross multiply:

$$\frac{10}{7} \overset{20}{\otimes} \frac{3}{2} \overset{21}{}$$

and since 20 is smaller than 21, we know that $\frac{10}{7} < \frac{3}{2}$, or in other words,

Answer: $\frac{\mathbf{20}}{\mathbf{14}} < \frac{\mathbf{90}}{\mathbf{60}}$

3) $\frac{1}{21} \bigcirc \frac{1}{22}$

Nothing to reduce here; just cross multiply up:

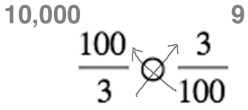
$$\frac{1}{21} \overset{22}{\otimes} \frac{1}{22} \overset{21}{}$$

and since 22 is bigger than 21:

Answer: $\frac{\mathbf{1}}{\mathbf{21}} > \frac{\mathbf{1}}{\mathbf{22}}$

4) $\frac{100}{3} \bigcirc \frac{3}{100}$

Since 100 isn't divisible by 3, we can't reduce either fraction. So let's cross multiply up, and see what happens:

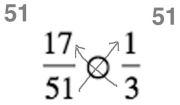


Since 10000 > 9,

Answer: $\mathbf{\frac{100}{3} > \frac{3}{100}}$

5) $\frac{17}{51} \bigcirc \frac{1}{3}$

Can we reduce the fraction on the left? Maybe, but this cross multiplication doesn't look so bad, so let's multiply up:

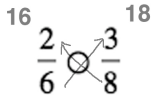


Hm, since 51 = 51, these two fractions are equal! And we could have noticed that 51 is divisible by 3 since 5 + 1 = 6, which is divisible by 3. (see p.9 in the book for the divisibility tricks)

Answer: $\mathbf{\frac{17}{51} = \frac{1}{3}}$

6) $\frac{2}{6} \bigcirc \frac{3}{8}$

We could reduce the fraction on the left, but these numbers are pretty small, so let's just cross multiply up – it's faster.



Since 16 is smaller than 18, we know that $\frac{2}{6} < \frac{3}{8}$.

Answer: $\mathbf{\frac{2}{6} < \frac{3}{8}}$