2/26 HW: pages 6-15 all in 6B Textbook

Dividing Fractions

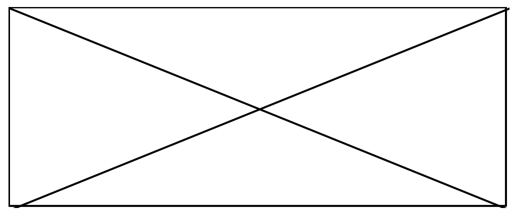
Turn the second fraction upside down, then just multiply.

There are 3 Simple Steps to Divide Fractions:

Step 1. Turn the second fraction *(the one you want to divide by)* upside-down (this is now a reciprocal).

Step 2. Multiply the first fraction by that reciprocal

Step 3. Simplify the fraction (if needed)



Example 1

$$\frac{1}{2} \div \frac{1}{6}$$

Step 1. Turn the second fraction upside-down (it becomes a **reciprocal**):

$$\frac{1}{6} \text{ becomes } \frac{6}{1}$$

Step 2. Multiply the first fraction by that **reciprocal**:

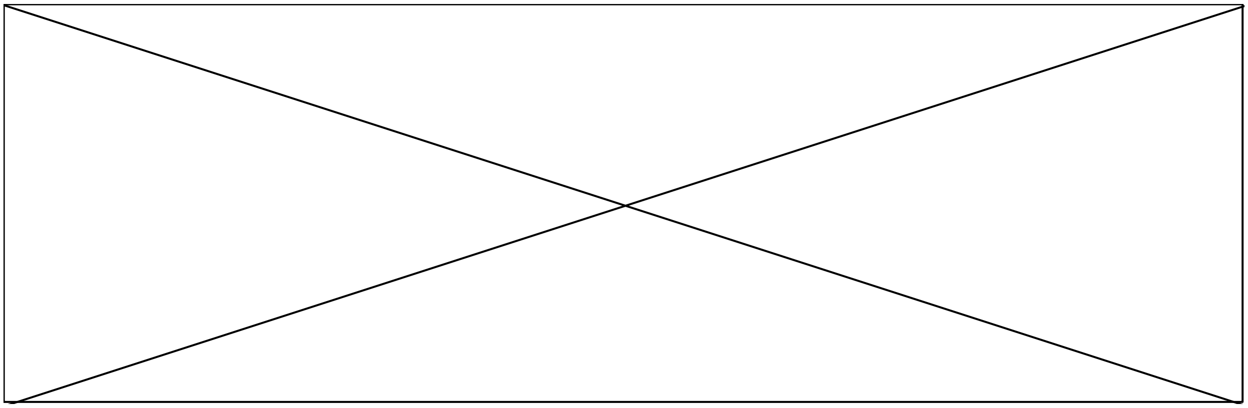
$$\frac{1}{2} \times \frac{6}{1} = \frac{1 \times 6}{2 \times 1} = \frac{6}{2}$$

Step 3. Simplify the fraction:

$$\frac{6}{2} = \mathbf{3}$$

With Pen and Paper

And here is how to do it with a pen and paper (press the play button):



Does it make sense?

Does $\frac{1}{2} \div \frac{1}{6}$ really equal **3** ?

You can change a question like "What is 20 divided by 5?" into "How many 5s fit into 20?"

In the same way our fraction question can become:

$\frac{1}{2} \div \frac{1}{6}$  How many $\frac{1}{6}$ in $\frac{1}{2}$?

Now look at the pizzas below ... how many "1/6th slices" fit into a "1/2 slice"?

How many  in  ? **Answer: 3**

So now you can see that $\frac{1}{2} \div \frac{1}{6}$ = **3** really does makes sense!

Example 2

1 ÷ 1

8 4

Step 1. Turn the second fraction upside-down (the **reciprocal**):

$$\frac{1}{4} \text{ becomes } \frac{4}{1}$$

Step 2. Multiply the first fraction by that **reciprocal**:

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

Step 3. Simplify the fraction:

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

And that is all you have to do.

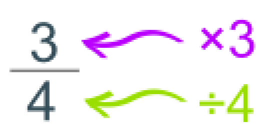
But maybe you want to know **why** we do it this way ...

Why Turn the Fraction Upside Down?

Well ... what Does a Fraction Do?

A fraction says to:

- multiply by the top number
- divide by the bottom number



Example: $^3/_4$ means to cut into 4 pieces, and then take 3 of those.

So you:

- divide by 4
- multiply by 3

Example: $^3/_4$ of 20 is:

20 divided by 4, then times 3 = (20/4) × 3 = 5 × 3 = **15**

Or you could multiply before dividing:

20 times 3, then divide by 4 = (20 × 3) / 4 = 60/4 = **15**

Either way gets the same result

Dividing

But when you **DIVIDE** by a fraction, you are asked to do the **opposite of multiply** ...

So you:

- **divide** by the top number
- **multiply** by the bottom number

Example: dividing by $^{5}/_{2}$ is the same as multiplying by $^{2}/_{5}$

Because:

Dividing by 5, then Multiplying by 2

is the same as

Multiplying by 2, then Dividing by 5

So instead of dividing by a fraction, it is easier to turn that fraction upside down, then do a multiply.

Orders of Operation: http://www.youtube.com/watch?v=ro6yRADn3Mw

http://www.youtube.com/watch?v=ro6yRADn3Mw

http://www.youtube.com/watch?v=Y3CZ_JBQ0do&feature=relmfu

http://www.youtube.com/watch?v=2VLYwNGcERc

Order of Operations

1. First compute all parentheses.
2. Compute all exponents next.
3. Compute all multiplications and divisions (working left to right).
4. Compute all additions and subtractions (working left to right).

Except for the fact that the steps in each problem may take a little longer, the problems are generally of the same form.

Example 3 Compute the following expressions.

a. $\frac{1}{4}-\frac{1}{2}\bullet\frac{2}{3}$

b. $\left(\frac{1}{4}-\frac{1}{2}\right)\bullet\frac{2}{3}$

c. $\frac{5}{6}-\left(\frac{2}{3}\right)^2$

d. $\frac{1}{12}-\left(\frac{1}{6}-\frac{1}{2}\right)^2$

Solution a. First compute the multiplication:

$$\frac{1}{2}\bullet\frac{2}{3}=\frac{1\bullet\cancel{2}}{\cancel{2}\bullet 3}=\frac{1}{3}$$

The problem then becomes a subtraction:

$$\begin{aligned}\frac{1}{4}-\frac{1}{2}\bullet\frac{2}{3}&=\frac{1}{4}-\frac{1}{3}\\&=\frac{1}{4}\bullet\frac{3}{3}-\frac{1}{3}\bullet\frac{4}{4}\\&=\frac{3}{12}-\frac{4}{12}\\&=-\frac{1}{12}\end{aligned}$$

b. First compute the subtraction within the parentheses:

$$
\begin{aligned}
\frac{1}{4}-\frac{1}{2} &= \frac{1}{4}-\frac{1}{2}\bullet\frac{2}{2} \\
&= \frac{1}{4}-\frac{2}{4} \\
&= -\frac{1}{4}
\end{aligned}
$$

The problem then becomes a multiplication:

$$\left(\frac{1}{4}-\frac{1}{2}\right)\bullet\frac{2}{3}=-\frac{1}{4}\bullet\frac{2}{3}$$
$$=-\frac{1}{2\bullet 2}\bullet\frac{2}{3}$$
$$=-\frac{1\bullet 2}{2\bullet 2\bullet 3}$$
$$=-\frac{1}{2\bullet 3}$$
$$=-\frac{1}{6}$$

c. First compute the exponent:

$$\left(\frac{2}{3}\right)^2=\frac{2}{3}\bullet\frac{2}{3}=\frac{4}{9}$$

The problem then becomes a subtraction:

$$\frac{5}{6}-\left(\frac{2}{3}\right)^2=\frac{5}{6}-\frac{4}{9}$$
$$=\frac{5}{6}\bullet\frac{3}{3}-\frac{4}{9}\bullet\frac{2}{2}$$
$$=\frac{15}{18}-\frac{8}{18}$$
$$=\frac{7}{18}$$

d. First compute the subtraction within the parentheses:

$$\frac{1}{6}-\frac{1}{2}=\frac{1}{6}-\frac{1}{2}\bullet\frac{3}{3}$$
$$=\frac{1}{6}-\frac{3}{6}$$
$$=-\frac{2}{6}$$
$$=-\frac{1\bullet 2}{2\bullet 3}$$
$$=-\frac{1}{3}$$

Thus the problem becomes:

$$\frac{1}{12}-\left(\frac{1}{6}-\frac{1}{2}\right)^2=\frac{1}{12}-\left(-\frac{1}{3}\right)^2$$

Now computing the exponent:

$$\left(-\frac{1}{3}\right)^2=\left(-\frac{1}{3}\right)\bullet\left(-\frac{1}{3}\right)=\frac{1}{9}$$

Now computing the subtraction:

$$\begin{aligned}\frac{1}{12}-\left(-\frac{1}{3}\right)^2&=\frac{1}{12}-\frac{1}{9}\\&=\frac{1}{12}\bullet\frac{3}{3}-\frac{1}{9}\bullet\frac{4}{4}\\&=\frac{3}{36}-\frac{4}{36}\\&=-\frac{1}{36}\end{aligned}$$