

00:00:07.240 --> 00:00:09.646

Alright, this video is about multiplying

00:00:09.646 --> 00:00:11.054

rational expressions, and remember

00:00:11.054 --> 00:00:13.168

that a rational expression is just a

00:00:13.168 --> 00:00:15.028

polynomial divided by another polynomial.

00:00:15.030 --> 00:00:16.810

So here's a rational expression,

00:00:16.810 --> 00:00:18.394

and here's a rational expression and

00:00:18.394 --> 00:00:20.468

what we need to do is multiply them

00:00:20.470 --> 00:00:22.450

and the worst thing to do would be to

00:00:22.450 --> 00:00:24.210

actually just multiply everything out.

00:00:24.210 --> 00:00:26.826

That's just going to be a huge, awful mess.

00:00:26.826 --> 00:00:29.586

So instead what we're going to do is

00:00:29.586 --> 00:00:31.360

factor and then cancel common factors,

00:00:31.360 --> 00:00:33.250

and that's that's going to simplify things.

00:00:33.250 --> 00:00:34.930

It's going to make things a lot easier,

00:00:34.930 --> 00:00:37.242

and what I want to do at the

00:00:37.242 --> 00:00:38.670

beginning is talk about.

00:00:38.670 --> 00:00:40.750

The same type of problem,

00:00:40.750 --> 00:00:42.770

but but just with fractions.

00:00:42.770 --> 00:00:46.876

So we could multiply for example 22.

00:00:46.876 --> 00:00:50.674

Over 105 against 7.

00:00:50.674 --> 00:00:53.924

Over 11 and it's similar, right?

00:00:53.924 --> 00:00:55.912

So like it's similar in the sense

00:00:55.912 --> 00:00:57.877

that right we have we have these

00:00:57.877 --> 00:00:59.728

ratios just like over here and what

00:00:59.728 --> 00:01:01.760

we don't want to do here is really

00:01:01.819 --> 00:01:05.265

workout what is $11 * 105$ and $7 * 22$,

00:01:05.265 --> 00:01:07.190

because then what we're going to want

00:01:07.251 --> 00:01:09.092

to do is reduce this giant fraction,

00:01:09.092 --> 00:01:11.510

which is going to have a bottom

00:01:11.510 --> 00:01:12.810

of more than 1000.

00:01:12.810 --> 00:01:15.070

So instead what we can do is we can say,

00:01:15.070 --> 00:01:18.070

OK, let's let's factor the top.

00:01:18.070 --> 00:01:19.900

This 22 is just $2 * 11$.

00:01:23.360 --> 00:01:25.358

Right, and then it's going to be time 7.

00:01:25.360 --> 00:01:26.720

And then we're going to

00:01:26.720 --> 00:01:29.300

factor the bottom and.

00:01:29.300 --> 00:01:31.764

You could pause the video and find find

00:01:31.764 --> 00:01:33.957

the prime factorization of 105 and

00:01:33.960 --> 00:01:37.642

you should find that it's $3 * 5 * 7$,

00:01:37.642 --> 00:01:42.890

so this was our 105. And then times 11.

00:01:42.890 --> 00:01:45.172

So when you multiply, it's great.

00:01:45.172 --> 00:01:47.327

You just kind of smash

00:01:47.327 --> 00:01:48.990

everything together into one.

00:01:48.990 --> 00:01:50.856

One big fraction and then OK.

00:01:50.860 --> 00:01:52.610

Here we can cancel, right?

00:01:52.610 --> 00:01:54.488

We can we can cancel any

00:01:54.488 --> 00:01:56.198

common factors like the sevens,

00:01:56.198 --> 00:02:00.830

the elevens, and then we just get 2.

00:02:00.830 --> 00:02:03.370

And in the bottom 15.

00:02:03.370 --> 00:02:04.784

Right, and we never had to figure

00:02:04.784 --> 00:02:07.197

out what's $105 * 11$ or $7 * 22$.

00:02:07.197 --> 00:02:08.585

We just factored cancelled

00:02:08.585 --> 00:02:10.690

common factors and we were done,

00:02:10.690 --> 00:02:13.154

and it's exactly the same over here.

00:02:13.160 --> 00:02:17.452

So you should pause the video and factor

00:02:17.452 --> 00:02:21.130

factor this guy. Factor this guy.

00:02:21.130 --> 00:02:24.310

Right factor all four of those.

00:02:24.310 --> 00:02:26.746

And I'll talk about the technique

00:02:26.746 --> 00:02:29.830

for each one, but you should do it.

00:02:29.830 --> 00:02:33.686

So this one here is a C method

00:02:33.690 --> 00:02:35.080

and it factors like this.

00:02:35.080 --> 00:02:38.068

So this is going to be.

00:02:38.070 --> 00:02:40.658

Two $X - 1$.

00:02:40.660 --> 00:02:41.748

Times are.

00:02:41.748 --> 00:02:43.380

$X + 4$.

00:02:46.050 --> 00:02:47.996

And then this is a perfect square, right?

00:02:47.996 --> 00:02:50.284

So this is X squared and two squared

00:02:50.290 --> 00:02:54.204

and this middle thing is $2 * X * 2$,

00:02:54.204 --> 00:02:59.148

so this is $X + 2^2$.

00:02:59.150 --> 00:03:00.907

This is the difference of two squares,

00:03:00.910 --> 00:03:05.120

right? So this is $X - 2 * X + 2$.

00:03:12.640 --> 00:03:14.236

And this also is a perfect square.

00:03:14.240 --> 00:03:16.550

So this also you could do this with a C

00:03:16.614 --> 00:03:18.906

method. But this is this is let's just

00:03:18.906 --> 00:03:22.728

fit it in here real quick. This is like.

00:03:22.730 --> 00:03:27.350

Two X squared and at the end is 1^2 .

00:03:27.350 --> 00:03:29.897

Right and $2 * 2 X$ times one is

00:03:29.897 --> 00:03:32.667

$4X$ and we just need that minus.

00:03:32.670 --> 00:03:38.654

So this guy is. Two $X - 1$.

00:03:38.654 --> 00:03:40.796

Squared and then just like over there.

00:03:40.800 --> 00:03:43.824

Cancel common factors so we can cancel

00:03:43.824 --> 00:03:47.136

this two $X - 1$ with one of these right.

00:03:47.140 --> 00:03:50.620

This means two $X - 1 * 2 X$ minus one,

00:03:50.620 --> 00:03:51.463

so that's gone.

00:03:51.463 --> 00:03:53.149

And then here we can cancel

00:03:53.149 --> 00:03:54.788

this guy with one of those.

00:03:57.200 --> 00:03:58.148

And that's it, right?

00:03:58.148 --> 00:03:59.333

There's nothing more to do,

00:03:59.340 --> 00:04:02.154

so we just have on top this

00:04:02.154 --> 00:04:04.849

factor of $X + 4$. $X - 2$.

00:04:07.620 --> 00:04:10.374

And then this is over this

00:04:10.374 --> 00:04:14.948

factor right $X + 2$? $2X - 1$.

00:04:14.950 --> 00:04:16.546

And then I would say we're done.

00:04:16.550 --> 00:04:19.090

I would stop there.

00:04:19.090 --> 00:04:22.247

You could you could multiply everything out.

00:04:22.250 --> 00:04:23.636

But then you know later what you

00:04:23.636 --> 00:04:25.400

might want to do is multiply this by

00:04:25.400 --> 00:04:26.774

something and your first step would

00:04:26.774 --> 00:04:28.209

be well now I have factor again,

00:04:28.210 --> 00:04:29.946

so if it's factored, leave it factored.

00:04:29.950 --> 00:04:31.486

Factored form is great,

00:04:31.486 --> 00:04:33.400

so that's it you want to

00:04:33.400 --> 00:04:34.318

multiply rational expressions.

00:04:34.320 --> 00:04:36.546

What you do is factor all

00:04:36.546 --> 00:04:38.030

the tops and bottoms.

00:04:38.030 --> 00:04:39.530

Cancel common factors again,

00:04:39.530 --> 00:04:41.405

just like with regular fractions,

00:04:41.410 --> 00:04:43.390

everything sort of gets just you

00:04:43.390 --> 00:04:45.180

just multiply across and across.

00:04:45.180 --> 00:04:46.776

Multiply across the top and bottom right.

00:04:46.780 --> 00:04:48.104

It's like everything just

00:04:48.104 --> 00:04:49.097

get smashed together.

00:04:49.100 --> 00:04:50.690

Cancel common factors and you're done.