00:00:08.470 --> 00:00:11.476
So we're going to talk about

00:00:11.476 --> 00:00:16.320
Quotient rule for exponents.

00:00:16.320 --> 00:00:20.710
Quotient rule. Exponents.

00:00:25.410 --> 00:00:27.279
And So what the quotient rule is

00:00:27.279 --> 00:00:29.848
going to do is we're basically looking

00:00:29.848 --> 00:00:31.973
at dividing expressions that have

00:00:31.973 --> 00:00:34.046
exponents in the top and the bottom.

00:00:34.050 --> 00:00:36.006
So, for instance, something like this.

00:00:36.010 --> 00:00:38.858
If you have like X to the 7th

00:00:38.860 --> 00:00:42.970
divided by X to the third.

00:00:42.970 --> 00:00:45.133
So the thing we want to remember

00:00:45.133 --> 00:00:47.368
is what does X to the 7th mean?

00:00:47.370 --> 00:00:49.650
So X to the 7th means 7 copies

00:00:49.650 --> 00:00:52.436
of X multiplied together, right?

00:00:52.436 --> 00:00:58.490
So 1 * 2 * 3 * 4 * 5.

00:00:58.490 --> 00:01:00.658
Times 6 * 7.

00:01:02.800 --> 00:01:06.706
And then X ^3 means 3 copies of X,

00:01:06.710 --> 00:01:11.468
so 1 * 2. Times 3.

00:01:11.470 --> 00:01:12.926
And so if I write them out,

00:01:12.930 --> 00:01:14.510
then that's what it means, right?

00:01:14.510 --> 00:01:17.810
So that's all X 7 / X to the third means.

00:01:17.810 --> 00:01:21.200
And So what we can do now is we can

00:01:21.304 --> 00:01:25.058
look here and I can see that X / X this

00:01:25.058 --> 00:01:27.536
is really just the same as one right.

00:01:27.536 --> 00:01:31.354
It's just like 2 / 2 or 3 / 3 it's a one.

00:01:31.360 --> 00:01:35.398
Same thing here X / X is a one.

00:01:35.400 --> 00:01:38.160
X / X is a one,

00:01:38.160 --> 00:01:41.076
and So what I have left with at this

00:01:41.076 --> 00:01:49.284
point is I really have 3 ones times 1234X is.

00:01:49.284 --> 00:01:54.340
So these 4X is I could write as X to the 4th.

00:01:54.340 --> 00:01:58.342
So altogether this is X to the 4th and this

00:01:58.342 --> 00:02:00.880
is a totally OK way to do these problems.

00:02:00.880 --> 00:02:02.272
To write them out.

00:02:02.272 --> 00:02:04.908
However, if I made this X to the 17th,

00:02:04.910 --> 00:02:05.982
you probably don't really

00:02:05.982 --> 00:02:07.880
want to write out 17X is,

00:02:07.880 --> 00:02:10.750
so we would like a more general

00:02:10.750 --> 00:02:12.518
rule if we try to figure out how.

00:02:12.520 --> 00:02:15.000
Maybe seven and three and

00:02:15.000 --> 00:02:16.984
four are all related.

00:02:16.990 --> 00:02:18.160
If you think about it,

00:02:18.160 --> 00:02:20.590
hopefully you might realize that.

00:02:20.590 --> 00:02:24.136
7 - 3 does in fact give us four,

00:02:24.140 --> 00:02:26.289
and that is actually the general rule.

00:02:26.290 --> 00:02:28.290
So the general rule is.

00:02:30.520 --> 00:02:35.335
That if we have X to the a power.

00:02:35.340 --> 00:02:38.268
Divided by X to the B power that

00:02:38.268 --> 00:02:43.950
ends up being X to the a - B power.

00:02:43.950 --> 00:02:46.792
So let's use our rule to do

00:02:46.792 --> 00:02:50.620
a couple examples then. So.

00:02:50.620 --> 00:02:54.295
Let's say that I had X to

00:02:54.295 --> 00:02:58.846
the 6 / X to the second.

00:02:58.850 --> 00:03:00.914
So all this is going to

00:03:00.914 --> 00:03:03.526

become is X to the 6 - 2.

00:03:03.526 --> 00:03:07.574
Which would be X to the 4th power.

00:03:09.750 --> 00:03:13.958
And we'll do a second example here too.

00:03:13.960 --> 00:03:15.370
I'll do it in another color.

00:03:15.370 --> 00:03:17.764
How about we do it over here?

00:03:17.770 --> 00:03:23.940
So what about if we had X to the 5th?

00:03:23.940 --> 00:03:28.530
Divided by X to the 11th.

00:03:28.530 --> 00:03:31.120
So again, if I use our rule

00:03:31.120 --> 00:03:33.583
that we're going to take a - B,

00:03:33.583 --> 00:03:36.670
this is going to become X to the 5

00:03:36.767 --> 00:03:42.788
- 11 and so 5 - 11 is negative 6.

00:03:42.790 --> 00:03:44.314
Now there's sometimes in math that

00:03:44.314 --> 00:03:46.220
we're fine leaving a negative exponent,

00:03:46.220 --> 00:03:47.680
but a lot of times,

00:03:47.680 --> 00:03:48.675
especially when we first starting

00:03:48.675 --> 00:03:50.020
out with these types of problems,

00:03:50.020 --> 00:03:51.895
we like to rewrite this

00:03:51.895 --> 00:03:53.395
without the negative exponent,

00:03:53.400 --> 00:03:56.096

so we have a whole video on negative

00:03:56.096 --> 00:03:57.500
exponents that you can go watch,

00:03:57.500 --> 00:03:59.414
but if you remember this negative

00:03:59.414 --> 00:04:01.737
here means we need to drop it down

00:04:01.737 --> 00:04:03.830
to the other side of the fraction.

00:04:03.830 --> 00:04:05.494
So this is going to give us an

00:04:05.494 --> 00:04:07.511
X to the 6th on the bottom and

00:04:07.511 --> 00:04:08.966
remember to have a fraction.

00:04:08.970 --> 00:04:10.895
You can't have nothing on the top,

00:04:10.900 --> 00:04:14.030
so what's left here on the top is a one.

00:04:14.030 --> 00:04:16.816
Right, so you can always think about.

00:04:16.820 --> 00:04:20.092
I really have an imaginary 1 here being

00:04:20.092 --> 00:04:22.900
multiplied times this so the X6 goes down,

00:04:22.900 --> 00:04:26.264
but that one is what stays there on the

00:04:26.264 --> 00:04:29.032
top and so this is that final answer

00:04:29.112 --> 00:04:32.247
written without the negative exponents.

00:04:32.250 --> 00:04:34.868
So that's pretty much the quotient rule.

00:04:34.870 --> 00:04:36.459
All you want to remember is you're

00:04:36.459 --> 00:04:38.251

going to do the power on the top

00:04:38.251 --> 00:04:39.710
minus the power on the bottom,

00:04:39.710 --> 00:04:42.078
and that's how we can simplify these things.