00:00:08.160 --> 00:00:11.316
Today we're going to talk about

00:00:11.316 --> 00:00:15.010
negative and 0 exponents. Wow.

00:00:15.010 --> 00:00:20.299
Negative. And zero. Exponents.

00:00:26.260 --> 00:00:27.030
And so to do this,

00:00:27.030 --> 00:00:27.870
we're actually going to 1st.

00:00:27.870 --> 00:00:30.340
Just think about regular numbers.

00:00:30.340 --> 00:00:31.372
So for instance,

00:00:31.372 --> 00:00:34.350
if I have two to the first power,

00:00:34.350 --> 00:00:37.608
right two to the first power is just two.

00:00:37.610 --> 00:00:42.076
And two to the second power. Is 4.

00:00:42.076 --> 00:00:47.435
And two to the third power is 8 and if we

00:00:47.435 --> 00:00:51.276
went even one more 2 to the 4th power is 16.

00:00:51.280 --> 00:00:53.365
And we're pretty used to

00:00:53.365 --> 00:00:55.450
doing these types of things,

00:00:55.450 --> 00:00:57.043
but this time I want us to kind of

00:00:57.043 --> 00:00:58.680
look at it a little bit differently.

00:00:58.680 --> 00:01:02.216
So if we look at these numbers here,

00:01:02.220 --> 00:01:04.852
if you think about it as I go

00:01:04.852 --> 00:01:06.915
down this list here, right?

00:01:06.915 --> 00:01:08.775
What's happening is I'm

00:01:08.775 --> 00:01:11.100
dividing each number by two.

00:01:11.100 --> 00:01:18.080
So 16 / 2 is eight 8 / 2 is four 4 /, 2 is 2,

00:01:18.080 --> 00:01:20.040
and so I could continue that pattern down,

00:01:20.040 --> 00:01:22.448
right? If I kept dividing by two.

00:01:22.450 --> 00:01:25.906
So 2 / 2 is 1.

00:01:25.910 --> 00:01:31.118
Two 1 / 2 is 1/2.

00:01:31.120 --> 00:01:35.780
1/2 / 2 is 1/4.

00:01:35.780 --> 00:01:38.156
So as I move down the list this way,

00:01:38.160 --> 00:01:39.048
I divide by two.

00:01:41.080 --> 00:01:45.190
Divide by two. So now let's

00:01:45.190 --> 00:01:46.870
think about what happens if I

00:01:46.870 --> 00:01:48.825
move down the list on this side,

00:01:48.830 --> 00:01:50.729
and in this case I want to look at

00:01:50.729 --> 00:01:53.750
the exponents. So I went from 4.

00:01:53.750 --> 00:01:56.186
I went down one to three.

00:01:56.190 --> 00:02:00.014
Down one to two. Down one to one,

00:02:00.020 --> 00:02:02.624
and so if I continue this pattern,

00:02:02.630 --> 00:02:07.086
so 4 - 1 is three, 3 - 2 is 1/3 minus

00:02:07.086 --> 00:02:11.301
one is 2/2 minus one is one 1 - 1 is 0.

00:02:11.301 --> 00:02:13.840
So this would be 2 to the zero.

00:02:13.840 --> 00:02:17.892
0 - 1 is 2 to the negative one and

00:02:17.892 --> 00:02:20.871
negative 1 - 1 is negative two.

00:02:20.871 --> 00:02:23.560
So this will be 2 to the negative two.

00:02:23.560 --> 00:02:26.070
So as I move down the list on the left

00:02:26.142 --> 00:02:28.788
side I'm subtracting one from the power.

00:02:34.990 --> 00:02:38.146
So we can use this to come up with our rule

00:02:38.146 --> 00:02:41.238
of what we're going to do to try to come

00:02:41.238 --> 00:02:44.238
up with a general rule for our exponents.

00:02:44.240 --> 00:02:47.054
So this idea that as I move down here, I

00:02:47.054 --> 00:02:49.610
divide, and when you do this for any number,

00:02:49.610 --> 00:02:51.766
it will always workout that that number

00:02:51.766 --> 00:02:54.329
to the zero power turns out to be one.

00:02:54.330 --> 00:02:56.584
Another thing here is this negative exponent.

00:02:56.590 --> 00:02:58.456
You see, it took the two

00:02:58.456 --> 00:03:00.540
and it pushed it down here.

00:03:00.540 --> 00:03:01.916
And you might say, well, it doesn't

00:03:01.916 --> 00:03:03.564
look like that happened here, it did.

00:03:03.564 --> 00:03:05.860
We just have to rewrite this a little bit.

00:03:05.860 --> 00:03:10.054
So this is really just one over 2 squared,

00:03:10.060 --> 00:03:11.818
so the negative exponent actually took

00:03:11.818 --> 00:03:14.030
this and pushed it down to the bottom.

00:03:14.030 --> 00:03:15.896
And that is the general rule.

00:03:15.900 --> 00:03:20.945
So the general rule is that if we have.

00:03:20.945 --> 00:03:23.365
For the zero exponent.

00:03:27.340 --> 00:03:30.900
If we have some number A to the zero power,

00:03:30.900 --> 00:03:32.615
it's going to be equal to 1,

00:03:32.620 --> 00:03:35.779
so the same way that this here was equal

00:03:35.779 --> 00:03:38.570
to 1 and for the negative exponent.

00:03:44.940 --> 00:03:49.016
If we have A to the negative P power,

00:03:49.016 --> 00:03:51.907
that's going to end up being 1

00:03:51.907 --> 00:03:56.580
/ A to the positive P power.

00:03:56.580 --> 00:03:58.659
This works even if you have variables.

00:03:58.660 --> 00:04:03.735
So for example, if I had this.

00:04:03.740 --> 00:04:06.180
X to the negative three.

00:04:06.180 --> 00:04:11.860
That's really the same as 1 / X to the third.

00:04:11.860 --> 00:04:13.772
Another way I like to think about it

00:04:13.772 --> 00:04:15.959
is if you have a negative exponent,

00:04:15.960 --> 00:04:16.788
your exponents unhappy,

00:04:16.788 --> 00:04:19.569
and so to be happy it wants to change to

00:04:19.569 --> 00:04:21.393
the other side of the fraction, right?

00:04:21.393 --> 00:04:23.257
So I need to keep my exponents happy.

00:04:23.260 --> 00:04:25.573
They need to move to the other side of

00:04:25.573 --> 00:04:27.834
the fraction. One final example here.

00:04:27.834 --> 00:04:30.610
So if I had maybe say negative

00:04:30.610 --> 00:04:33.860
2X to the negative 5.

00:04:33.860 --> 00:04:35.039
So couple things.

00:04:35.039 --> 00:04:38.315
The only thing that is going to move

00:04:38.315 --> 00:04:39.638
is this exponent.

00:04:39.640 --> 00:04:41.388
Right this exponent here

00:04:41.388 --> 00:04:43.573
has the negative on it.

00:04:43.580 --> 00:04:45.924
Even though the two here has a negative,

00:04:45.930 --> 00:04:47.617
it's not going to move because the

00:04:47.617 --> 00:04:49.160
negative is not in the exponent.

00:04:49.160 --> 00:04:50.966
So that's a mistake that a lot

00:04:50.966 --> 00:04:52.090
of my students make.

00:04:52.090 --> 00:04:53.656
They try to move the two,

00:04:53.660 --> 00:04:56.820
even though that is not what's being moved,

00:04:56.820 --> 00:04:58.731
so this would be the negative two

00:04:58.731 --> 00:05:00.473
would stay on the top. However,

00:05:00.473 --> 00:05:03.617
on the bottom on this exponent is negative,

00:05:03.620 --> 00:05:05.070
so it's unhappy needs to

00:05:05.070 --> 00:05:06.520
move to the other side.

00:05:06.520 --> 00:05:10.200
It's going to become X to the 5th.

00:05:10.200 --> 00:05:13.806
So that's kind of all about

00:05:13.806 --> 00:05:16.210
zero and negative exponents.

00:05:16.210 --> 00:05:17.870
And same thing here right

00:05:17.870 --> 00:05:19.730
zero anything to zero is 1.

00:05:19.730 --> 00:05:20.480
The negative exponent.

00:05:20.480 --> 00:05:21.980
Move it to the other side.