00:00:05.200 --> 00:00:07.776

Alright, this video is on solving polynomial

00:00:07.776 --> 00:00:09.470

equations and polynomial equations.

00:00:09.470 --> 00:00:12.254

Really for us pretty much gonna

00:00:12.254 --> 00:00:16.290

mean quadratic equations. And.

00:00:16.290 --> 00:00:18.410

I'm going to solve quadratic

00:00:18.410 --> 00:00:20.106

equation here through factoring,

00:00:20.110 --> 00:00:22.270

so I'm going to put all the factoring

00:00:22.270 --> 00:00:24.670

kind of stuff that we've done to work,

00:00:24.670 --> 00:00:26.630

and I want to solve this equation,

00:00:26.630 --> 00:00:29.648

so I want a number X.

00:00:29.650 --> 00:00:33.088
Where if I square that number?

00:00:33.090 --> 00:00:34.394
And multiply by two.

00:00:34.394 --> 00:00:36.350
I get the same thing as

00:00:36.432 --> 00:00:38.140
five times that number.

00:00:40.950 --> 00:00:44.860
Plus 12. Well, it's going to be hard

00:00:44.860 --> 00:00:47.118
to guess you know what that number is,

00:00:47.120 --> 00:00:50.165
and they're going to typically be 2

00:00:50.165 --> 00:00:52.640
numbers that satisfy this equation.

00:00:52.640 --> 00:00:55.269
It really because of the fact that we

00:00:55.269 --> 00:00:57.180

have an X squared there, and so the

00:00:57.180 --> 00:00:59.720

trick is put everything on one side.

00:00:59.720 --> 00:01:00.770

So what does that mean?

00:01:00.770 --> 00:01:02.436

That means you know, just subtract here.

00:01:02.440 --> 00:01:04.318

So I'm now going to have.

00:01:04.320 --> 00:01:11.810

2. X ^2 minus 5X. Minus 12.

00:01:11.810 --> 00:01:15.274

Is equal to 0. And then factor this.

00:01:15.274 --> 00:01:17.350

So how do I factor that?

00:01:17.350 --> 00:01:19.446

If there's a 2 on the X squared,

00:01:19.450 --> 00:01:20.990

I need the AC method,

00:01:20.990 --> 00:01:22.570

so sort of over here I can do a little

00:01:22.615 --> 00:01:24.340

bit of scratch work and think OK, so.

00:01:28.120 --> 00:01:30.220

Right, two times negative 12.

00:01:30.220 --> 00:01:32.389

That's a negative.

00:01:32.390 --> 00:01:36.646

24 and then, here's my minus 5.

00:01:36.650 --> 00:01:40.286

So I want numbers that so here and here

00:01:40.286 --> 00:01:44.334

that multiply to negative 24 and add 2 - 5.

00:01:44.334 --> 00:01:47.250

And of course what I need to do is

00:01:47.338 --> 00:01:49.981

go through the factors of 24 and

00:01:49.981 --> 00:01:51.706

think OK can I get them, you know,

00:01:51.706 --> 00:01:54.901

so that two factors of 24 R 5 apart, right?

00:01:54.901 --> 00:01:58.584

So like one and 24, No 2 and 12?

00:01:58.584 --> 00:02:02.394

No those are 10 apart, three and eight.

00:02:02.394 --> 00:02:06.760

Those are five apart, so OK.

00:02:06.760 --> 00:02:08.792

One of those needs to be negative 'cause

00:02:08.792 --> 00:02:09.980

they're multiplying to negative 24,

00:02:09.980 --> 00:02:12.760

and when I add I need to get negative 5,

00:02:12.760 --> 00:02:15.208

so I put here a minus.

00:02:15.210 --> 00:02:17.127

And then what do I do with those numbers

00:02:17.127 --> 00:02:19.370

with a three in the negative 8I rewrite

00:02:19.370 --> 00:02:22.010
that minus 5X using those numbers?

00:02:22.010 --> 00:02:23.996
So this is 2 X squared.

00:02:26.250 --> 00:02:31.988
Minus. 8X plus. 3X.

00:02:31.988 --> 00:02:35.276
Minus 12. Is equal to 0.

00:02:35.280 --> 00:02:36.798
Now what if you had written

00:02:36.798 --> 00:02:39.460
plus three X - 8 X? No problem,

00:02:39.460 --> 00:02:41.756
everything is going to workout just fine.

00:02:41.760 --> 00:02:43.180
So now remember the plan

00:02:43.180 --> 00:02:44.600
where they see method is.

00:02:44.600 --> 00:02:46.539

I use that little algorithm over there

00:02:46.540 --> 00:02:49.000

to separate this middle term into

00:02:49.000 --> 00:02:50.946

two and then I factor by grouping.

00:02:50.950 --> 00:02:52.784

So I'm first going to factor these

00:02:52.784 --> 00:02:54.740

two so I'm going to have here.

00:02:54.740 --> 00:02:57.548

Let's see the greatest common factor is a 2X.

00:03:02.100 --> 00:03:03.948

Right, and when I pull that 2X

00:03:03.948 --> 00:03:05.748

off of here, it leaves an X.

00:03:05.748 --> 00:03:07.740

When I pull 2X off of there,

00:03:07.740 --> 00:03:10.380

it's leaving this minus 4.

00:03:10.380 --> 00:03:12.480

And then how about here?

00:03:12.480 --> 00:03:14.566

Remember, keep the sign on this term.

00:03:14.570 --> 00:03:17.343

So if we had done minus 8X here,

00:03:17.343 --> 00:03:19.858

I would want a minus.

00:03:19.860 --> 00:03:21.552

OK, what's the greatest

00:03:21.552 --> 00:03:23.667

common factor between 3X and?

00:03:23.670 --> 00:03:28.180

Minus 12 it's going to be. 3.

00:03:28.180 --> 00:03:30.140

And then this leaves me here in X

00:03:30.140 --> 00:03:32.100

and here when I pull a three off,

00:03:32.100 --> 00:03:35.240

it leaves a - 4.

00:03:35.240 --> 00:03:36.507

This is a good sign, right?

00:03:36.507 --> 00:03:38.469

These two things need to agree

00:03:38.469 --> 00:03:40.757

in order for a C method to work.

00:03:40.760 --> 00:03:43.848

So if if indeed you did solve this

00:03:43.848 --> 00:03:46.393

little side problem correctly right,

00:03:46.393 --> 00:03:47.658

they will be the same.

00:03:47.660 --> 00:03:49.100

So if they're not the same,

00:03:49.100 --> 00:03:51.694

something has gone wrong in here and now.

00:03:51.694 --> 00:03:54.670

What we're going to do is factor off.

00:03:54.670 --> 00:03:56.410

Right, so we factored this pair.

00:03:56.410 --> 00:03:57.574

We factored this pair.

00:03:57.574 --> 00:04:00.587

That gave us a new pair and we factor that.

00:04:00.590 --> 00:04:03.820

So the greatest common factor here is X - 4.

00:04:07.410 --> 00:04:09.750

And I'm going to pull that off when I do.

00:04:09.750 --> 00:04:13.830

It leaves here 2X. And here it leaves A3.

00:04:17.450 --> 00:04:19.866

Now, alright, so all we've done all the

00:04:19.866 --> 00:04:22.553

way down we're keeping equal to 0, right?

00:04:22.553 --> 00:04:26.044

And? All of that work is just, well,

00:04:26.044 --> 00:04:29.500

I need to rewrite this side as a product.

00:04:29.500 --> 00:04:32.820

I want to factor 2 X squared minus five X -

00:04:32.820 --> 00:04:36.096

12, which just means write it as a product.

00:04:36.100 --> 00:04:39.373

But I have not solved any equations. However,

00:04:39.373 --> 00:04:41.397

in this form things are a lot easier.

00:04:41.400 --> 00:04:44.858

So if I have here 2 numbers.

00:04:44.860 --> 00:04:48.037

And I multiply those numbers and I get 0.

00:04:48.040 --> 00:04:49.860

The only way for that to happen

00:04:49.860 --> 00:04:52.099

is if one of those numbers is 0.

00:04:52.100 --> 00:04:56.844

So this equation here gives Me 2 little.

00:04:56.850 --> 00:04:58.230

Sub equations, right?

00:04:58.230 --> 00:05:00.070

Either this number here.

00:05:03.040 --> 00:05:05.890

Right either X - 4.

00:05:05.890 --> 00:05:08.086

Whatever that is, either that's zero,

00:05:08.090 --> 00:05:09.546

in which case you know zero times,

00:05:09.550 --> 00:05:11.146

whatever that is will be 0.

00:05:11.150 --> 00:05:17.510

So I could have X - 4 equal to 0 or.

00:05:17.510 --> 00:05:19.386

This guy is equal to 0 right?

00:05:19.390 --> 00:05:21.070

In which case, like if this is zero,

00:05:21.070 --> 00:05:22.806

who cares what this is this thing?

00:05:22.810 --> 00:05:24.238
Time Zero will be 0 so.

00:05:28.820 --> 00:05:31.439
So. Factoring that thing.

00:05:31.439 --> 00:05:33.980
Allows us to take this kind of

00:05:34.056 --> 00:05:36.011
like complicated equation with X

00:05:36.011 --> 00:05:38.880
squared stuff in it and split it

00:05:38.880 --> 00:05:40.845
into two literal equations, right,

00:05:40.845 --> 00:05:42.840
neither of which have an X squared,

00:05:42.840 --> 00:05:44.940
and these are they maybe not like

00:05:44.940 --> 00:05:46.479
totally easy, but they're easier,

00:05:46.479 --> 00:05:49.400
so this one. This just X must be 4.

00:05:54.500 --> 00:05:55.820

And how about this one?

00:05:55.820 --> 00:05:57.906

Well, if this is right, I'm worried

00:05:57.906 --> 00:05:59.424

about going off the screen here.

00:05:59.430 --> 00:06:00.740

So if this is right,

00:06:00.740 --> 00:06:03.280

it must be that 2.

00:06:03.280 --> 00:06:05.900

X is minus 3, right?

00:06:05.900 --> 00:06:07.853

I just subtract 3 from both sides

00:06:07.853 --> 00:06:09.439

and then divide here by two.

00:06:15.650 --> 00:06:18.300

And that's my other solution.

00:06:18.300 --> 00:06:20.732

Alright, the last thing is I would check

00:06:20.732 --> 00:06:23.570

so I would maybe on your calculator you

00:06:23.570 --> 00:06:26.260

want to treat this as negative 1.5.

00:06:26.260 --> 00:06:29.758

And I would plug that in to this equation

00:06:29.758 --> 00:06:32.480

up here and see did that really work right?

00:06:32.480 --> 00:06:34.776

And likewise I would take four plug

00:06:34.776 --> 00:06:36.256

that into the original equation,

00:06:36.260 --> 00:06:38.636

not one that you got your hands on, right?

00:06:38.636 --> 00:06:40.606

But the original problem and

00:06:40.606 --> 00:06:42.136

Jack did it work right.

00:06:42.140 --> 00:06:43.395
It's very easy somewhere along

00:06:43.395 --> 00:06:44.960
the line in all of this,

00:06:44.960 --> 00:06:47.248
writing all this math to make some little

00:06:47.248 --> 00:06:49.549
mistake and have it show up in your answer.

00:06:49.550 --> 00:06:51.097
So there's a quick way to check.

00:06:51.100 --> 00:06:53.120
And then if your work is laid out in this,

00:06:53.120 --> 00:06:57.660
you know, sort of very linear fashion.

00:06:57.660 --> 00:06:59.358
Then you can find your mistake.

00:06:59.360 --> 00:07:03.110
So that is solving polynomial equations.

00:07:03.110 --> 00:07:05.690
The essential thing is.

00:07:05.690 --> 00:07:07.980

Factor, so all these skills

00:07:07.980 --> 00:07:09.812

we used on factoring.

00:07:09.820 --> 00:07:10.905

Are going to come into play here.