# Reducing Fractions to Lowest Terms

## Transcript

**Instructor: Iain Pardoe**

00:00:00:00 - 00:00:57:35
**Instructor:** Hello, and welcome to video number three in this series. In this video, I'll demonstrate how properties of fractions or quotients lead to a rationale for simplifying fractions or reducing them to lowest terms. The first property is that two fractions, A over B and C over D are equivalent if A times D is equal to B times C. For example, three quarters is equivalent to 6/8 because three times eight is equal to four times six. Three times eight is 24, four times six is 24.

00:00:57:35 - 00:02:26:24
**Instructor:** Next, if we have two numbers, A and B, and we take the negative of A and divide that by B, that's the same as if we take the positive of A and divide it by the negative of B and both of those are equal to the negative of the fraction A over B. By contrast, if I take the negative of A and divide it by the negative of B, I get the positive of A over B. So for example, -3/4 is the same as three divided by minus four, and they're both equal to minus three quarters, whereas minus three divided by minus four is equal to plus three quarters. Finally, if I have a fraction, A over B and I multiply the numerator, which is A and the denominator, which is B by the same number, I get an equivalent fraction. For example, if I write that number then I'm multiplying by as C, we've got A over B is equal to AC over B, C.

00:02:26:24 - 00:03:23:97
**Instructor:** For example, I could have 3/4 and then I could multiply three by six and four by six, I'll have 18/24 and three quarters and 18/24 are equivalent fractions. This last property here means that any fraction has an infinite number of equivalent fractions because I can multiply by any number C in the numerator and the denominator. So we have an infinite number of equivalent fractions. There's only one of those fractions though that is said to be in lowest terms. The fraction that's in lowest terms is the one where the numerator and the denominator have no common factor other than the number one.

00:03:23:97 - 00:04:13:27
**Instructor:** For these fractions here, 3/4 and 18/24, it's 3/4 that is in lowest terms because there's no common factor for three and four other than the number one. So this begs the question, how do I reduce a fraction to lowest terms? One way we could think about that is use one of the fraction properties that we discussed earlier. I I divide now the numerator and the denominator by a common factor, then I'll get an equivalent fraction. Let's say a divide it by D and B divided by D.

00:04:13:27 - 00:04:49:54
**Instructor:** If I repeatedly divide the numerator and the denominator by common factors, eventually, I have to end up with the fraction in lowest terms. To demonstrate that, let's start with 18/24 and get it down to lowest terms, 3/4. We'll start with 18/24, first of all, let's divide by a common factor for 18 and 24. Both of these numbers are divisible by three. Let's start there.

00:04:50:97 - 00:05:19:60
**Instructor:** So 18/3 is six, 24/3 is eight. Is it in lowest terms yet? It's not because there's a common factor other than one for six and eight, which is the number two. So now I can divide by two. Numerator and denominator, 6/2 is 3 and 8/2 is four.

00:05:19:60 - 00:05:56:24
**Instructor:** Now we're finally in lowest terms because there's no common factor for three and four other than the number one. Often we can go from a fraction like 18/24, reduce it to lowest terms in a single step. Here I did two steps. But if we recognize a different common factor, we can sometimes get there a little bit quicker. Let's do that here. I could

00:05:56:24 - 00:06:17:86
**Instructor:** also recognize that six is a common factor of 18 and 24. Sometimes there's a shortcut instead of doing all these divisions and writing it out long hand. One way to make this a little bit quicker is to say, six is a common factor. How many times does six go into 18? It goes three times.

00:06:17:86 - 00:06:41:16
**Instructor:** Then how many times does six go into 24? It goes four times, so we've got 18/24. It's the same as 3/4. Another question that arises when we're going through this is, uh, why do we care? Why not just use 18/24?

00:06:41:20 - 00:07:22:85
**Instructor:** The reason we like to have fractions in lowest terms is because these two numbers are smaller. That's essentially the reason. It's easier to deal with the numbers three and four than it is to deal with the numbers 18 and 24, because it's easier to deal with, it's common practice to reduce fractions to lowest terms. This will become even more evident later when we're talking about more complicated quotients, where we're not dealing with numbers anymore, but we're dealing with algebraic expressions in the numerator and the denominator. Again, this idea of lowest terms will come up then.

00:07:22:85 - 00:08:15:80
**Instructor:** So we typically want to reduce fractions to lowest terms. Occasionally, we don't are some circumstances when we don't and one example would be if we're trying to express a fraction as a decimal. For example, three quarters and if we're trying to express that as a decimal, To express a number as a decimal, if it's a terminating decimal, which it is in this case, we actually want the denominator to be 100, so we want an equivalent fraction with 100 in the denominator. We have to think about what do we need to multiply four by to get 100? So we would need to multiply by 25.

00:08:16:70 - 00:08:38:70
**Instructor:** And then we'll do the same to the numerator. We'll get 75/100. 0.75. Sometimes we don't want to end up with lowest terms, but usually we do.

00:08:38:74 - 00:09:01:99
**Instructor:** Let's run through a few more examples of reducing fractions to lowest terms. 10/15. So first, we ask ourselves, is it in lowest terms? Are there any common factors for ten and 15 other than one? In this case, there are, so it's not yet in lowest terms.

00:09:01:99 - 00:09:31:64
**Instructor:** A common factor for ten and 15 is five. I do 10/5 and 15/5, I'll have two in the numerator and three in the denominator. 9/36. Again, is it in lowest terms yet? Are there any common factors for nine and 36?

00:09:31:64 - 00:10:01:58
**Instructor:** Well, three, both nine and 36 are divisible by three. Let's divide numerator and denominator by three. 9/3 is three, 36/3 is 12, is 3/12 in lowest terms. Not yet because we have another common factor, three again. I divide by three again.

00:10:01:58 - 00:10:52:00
**Instructor:** But I'll end up with 3/3, one in the numerator, and 12/3 is four, four in the denominator. I took two steps here, but I could have actually got there a little quicker just by doing one step. I'd recognized initially that a common factor for nine and 36 is the number nine itself. 9/9, 36/9, 9/9 is 1 36/9 is four. 1/4. And one more example, 16/12.

00:10:52:00 - 00:11:30:98
**Instructor:** Think about the common factors for 16 and for 12. Four, I think works in this case, 16/4, 12/4. 16/4 is 4 and 12/4 is three. This is known as an improper fraction because the numerator is greater than the denominator and sometimes, not always, but sometimes we want to express that as a mixed number. In this case, four thirds.

00:11:30:98 - 00:12:06:69
**Instructor:** Three thirds would be one and then would be one third left over. This is the same as one and one third. You can see as we go through these examples that knowing your times tables helps a lot here and knowing when you've got common factors, and you can save yourself a bit of time if you try and find the greatest common factor for the numerator

and the denominator. But if you can't think of that greatest common factor, it doesn't matter. You'll get there in the end.

00:12:06:69 - 00:12:48:80
**Instructor:** It just might take a little bit longer. So I'll finish up with two more examples and I'd like you to pause the video at this point and see if you can reduce these next two fractions, two lowest terms. The first one will be 18/30, and then the second one is 77/42. And you really ought to be able to do these without a calculator. If your instinct is to go to the calculator right away, try and resist that instinct because it really is going to help the way you work and the speed at which you work.

00:12:48:80 - 00:13:27:80
**Instructor:** If you can start to do these calculations just with a pen and paper and work them through knowing your times tables and figuring out the answers without immediately going to the calculator. It will save you a lot of time in the long run. Both of these are very possible to solve without a calculator with just basic times tables. Pause the video now and see if you can do these two and then we'll see how you do. So for this first one, we need to find a common factor for 18 and 30.

00:13:28:28 - 00:14:14:66
**Instructor:** They're both even numbers, two is a common factor, they're both divisible by three. Three is a common factor, but six is actually a better common factor to work with here because that's the greatest common factor in this case. Let's divide numerator and denominator by six. 18/6 is 3 and 30/6 is five. 18/30 is equivalent to three fifths and three fifths is this fraction, 18/30 expressed in lowest terms.

00:14:14:86 - 00:15:04:90
**Instructor:** 77/42, maybe a slightly more challenging example because people often don't like their seven times table, but seven is the common factor in this case. 77/7 is 11 and 42/7 is six. This is an improper fraction, the numerator is greater than the denominator, so we might want to go one more step and express this as a mixed number. We'll have 6/6 will be one and then we'll have 5/6 leftover, so one and five sixths. That's all for this video.

00:15:04:90 - 00:15:12:40
**Instructor:** In the next video, I'll stay with fractions and we'll discuss multiplying and dividing fractions.