It’s time again for another GMAT challenge question, and this one focuses on one of the quantitative section’s favorite themes: prime factors.

Please submit your answers in the comments field, and check back later today for the solution and a more-thorough explanation of prime factors!

What is the greatest prime factor of 12!11! + 11!10!?

(A) 7

(B) 11

(C) 13

(D) 17

(E) 19

UPDATE: Solution!

While it’s quite common for students to simply look at the numbers 12!, 11!, and 10! and recognize that the highest naturally-occurring prime number is 11, it’s important to recognize that this is an addition problem – the numbers 12!11! and 11!10! are combined to create a new number that may well have a higher prime factor than its factorial components. When adding large numbers like factorials and exponents, as we discussed in this space last week, it’s often quite helpful to factor out common terms. In this case, it’s particularly important, because our entire goal is to break out the large sum into prime factors so that we can determine which is biggest. Each term has a common 11!, so by factoring that out we can get from:

12!11! + 11!10!

to

11! (12! + 10!)

Now, 12! includes a 10! – it’s essentially 12 * 11 * 10!, so we have a common 10! within the parentheses that can also be factored out, going from:

11! (12*11*10! + 10!)

to

11!10! (12*11 + 1)

At this point, the largest prime factor must be either the 11 outside the parentheses or a factor of the number within it, so it’s necessary to check the number within. 12*11 + 1 = 132 + 1 = 133. 133 is the product of 7*19, so 19 is a prime factor of 12!11! + 11!10!, and therefore the largest prime factor. Accordingly, E is the correct answer.