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# Lessons Learned from the Disorder of Operations

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**Synopsis**

The purpose of this article, in general, is to explore certain possible outcomes associated with an underaged gambler attempting to collect his rightful winnings. More specifically, this article is a thought experiment investigating the union of (1) skill testing questions, (2) the equation that recently broke/divided the internet, and (3) how different outcomes render different elements of the thought experiment moot. For example, when the final arbiter has total dominion over a particular outcome, the mathematics of a skill testing question is rendered moot. The article concludes with a discussion revealing how disorder of operations could be considered the teaching and learning of mathematics version of other famous controversial issues (e.g., gun control, animal rights, welfare, etc.) found in society.

**Keywords:** *Equation that broke/divided the Internet; Gambling; Order of Operations; Pull Tabs; Skill Testing Questions; Truthiness.*

I was in Veregin, Saskatchewan, Canada the very first time that I won money gambling. To this day, the details are clear. Me and my family, who lived in Kamloops, British Columbia, were on our annual summer vacation to visit my grandparents on my Dad's side. While there, the family attended the annual Shishliki BBQ that is held in Veregin proper. As she did every time we visited, our Baba would give me and my brother some spending money. She would joke, given how very young we were, to make sure to spend the money on either ice cream, booze or cigarettes. Typically, we would save our money to help purchase a fastball glove at the 50% off end-of-season sale at the Sas-Kam Sportsman. This particular year, though, not all my money made it into the till at Sas-Kam Sportsman. Hold on, I'm not done with the details.

Trying to remember rite of passage details is always tricky. Intense feelings and emotions often screw up the exact details. And every time you remember something, which creates another memory of that memory doesn't really help either. In other words, some of the details of what happened next are kinda fuzzy. I'm not entirely sure how my brother, my cousins and I, all of different ages, were involved, but, somehow, each and every one of us had a mittful of pull tabs (a gambling ticket where you peel back or break open a window to reveal three characters, e.g., ♠ ♣ ♣, looking for specific winning arrangements) at the BBQ. I really don't think that I was the one who purchased all the pull tabs because I was way under the legal gambling age at the time. Way under. With that said, I do remember making my way up to the counter at least once while to cash my winning ticket. Man, was I nervous.

I suspect all these details are severely cemented for me because I was extremely nervous taking my winning pull tab to the large, adult person behind the makeshift counter, a rickety folding table. As I was told by my cousins, I just hand them the winning ticket and they hand me back two Queen Sheets and a Ten-Spot. Wow! I was nervous, of course, because I was too young to buy the ticket, which meant that I was really too young to play the ticket, which meant that I was, yup, too young to cash the ticket. Being too young wasn't the only reason for my frayed nerves. Rather, I was at my wit's end at this point because I wasn't sure whether or not I had answered the skill testing question correctly or not!

## Canada and Skill Testing Questions

The phrase, "for advancing, lending, giving, selling or in any way disposing of any property by lots, cards, tickets or any mode of chance whatever" appears a number of times in the Canada Criminal Code.[1] Keeping in mind that I'm definitely not a legal scholar, I can still tell that this phrase establishes, essentially, no gambling, lotteries, etc. in Canada. Two years in the slammer should you not comply. At the same time, games involving skill are permitted. The issue arose, though, as to what constituted a game of skill

[1] See Criminal Code, RSC 1985, c C-46, available at https://www.canlii.org/en/ca/laws/stat/rsc-1985-c-c-46/latest/rsc-1985-c-c-46.html, last accessed on January 30, 2022.

and what did not. As a result, Canada implemented a small test of skill, a math question, in order to claim a prize resulting from lotteries or gambling because, then, the award was not, technically, from a game of chance. There was a specific math question that was first introduced; however, the question has morphed in subsequent years. The long and the short of it, Canadians must answer a math question in order to claim a prize from gambling or the lottery.

That's right, back in the day, in order to claim my cash that auspicious afternoon, I had to write down the correct answer to a mathematically based skill testing question in order to receive my $50. All my young person brain could recognize at the time was two outcomes. On the one hand, I could answer the question correctly and I would receive the money that I had "rightfully" won. On the other hand, I could get the question wrong, which meant that I would not get the money — money I deserved — in order to fund my burgeoning underage gambling empire. Actually, connected to the latter outcome, my young brain tried to process, to no avail, who would actually get the money, if anyone at all, had I gotten the question wrong?! Would they just throw the winning ticket away? Trying not to get distracted with thoughts of getting the math wrong and losing 50 bucks, I proceeded to recall, with all my might, what my teachers had taught me about the order of operations.

### That Equation that Broke the Internet

With thoughts of Skill Testing Questions, Canada, and the order of operations running in my head, I started wondering: What if, on that fateful day in Veregin, the day I won my first ever $50 playing pull tabs, I had to answer the following skill testing question to claim my prize money: 8/2(2+2).

Those of you already a step ahead of me know that 8/2(2+2) is not just any equation. Infamously, 8/2(2+2) is the math equation that either "broke" or "divided" (nice play on words here) the Internet. If you're not familiar with this equation, or if you just don't believe me, take a minute and plug the equation into your favourite internet browser. I'll wait...

Welcome back... I hope you not only noticed the sheer number of articles that were written about this equation, but also the particular publications that ran the story. We're talking *The Conversation*, *EdWeek*, *Mashable*, *Mirror*,

*BuzzFeed*, *Daily Mail*, *New Zealand Herald*, *CBC News*, *The Huffington Post*, *Fox News*, *Today*, *Popular Mechanics*, *People Magazine*, *Slate Magazine*, and on and on and on. The equation was even twice written about by famed applied mathematician and popularizer of mathematics, Steven Strogatz, for *The New York Times*. It's fair to say this particular version of the equation went viral.

If you dug into any of the above articles, or tried things for yourself, you'll notice that there is some debate as to whether the correct answer is 16 or 1. There is no shortage of coverage when it comes to explanations for an answer of 1 versus 16. There is also no shortage of coverage as to why the answer is 16 or 1. In other words, there are a number of articles that dig into the math of the answer and why people are doing the math the way that they are doing the math. Spoiler Alert: the culprit behind the different answers, it appears, boils down to what is considered the conventional order of operations, which most of us were taught in school. In particular, ambiguities associated with division and multiplication, and which comes first, garner the most attention. In what follows, I will not be rehashing or repackaging the explanations found in any of the articles that have come before me; rather, I'd like to present something slightly different.

Just before I veered off into Canada and skill testing questions, and then onto the equation that broke the internet, I was recalling a personal rite of passage moment at the Veregin BBQ. Recall, as an under-aged gambler, in order to collect the $50 that I had won on a pull tab, I had to take my winning ticket up to an adult, situated behind a counter, where they would establish whether or not I had correctly answered the skill testing question. Second spoiler alert: I correctly answered the skill testing question, received my $50 and got the hell out there as fast as I could. Looking back on the whole moment, I now realize that many lessons were lost because of how things played out, which got me to thinking, as a thought experiment, what might have been had the equation that broke/divided the internet, that is, 8/2(2+2), been the skill testing question on my winning pull tab.

## Possible Outcomes

There are a number of possible outcomes at play here. In order to organize them better, it's important to look at, if you will, all the actors in this particular play. First, there's me, Little Egan. Little Egan can, of course,

get the skill testing question correct or incorrect. Next, there's what we'll call Egan's Support System (e.g., brother, cousins, etc.). In what follows, Egan's Support System can either agree or disagree, which, in different instances, means they get the skill testing question correct or incorrect. Lastly, there's, what we'll call, The Counter Person. This person is the adult at the BBQ who stands between me and my 50 bucks. Like Little Egan and Egan's Support System, the Counter Person is either correct or incorrect when it comes to the skill testing question. Considering the people involved, considering the possible outcomes, eight particular outcomes, organized according to getting or not getting the 50 bucks are now discussed.

*The Happy Outcomes*

There are two outcomes that I'll deem Happy Outcomes (HOs). In these outcomes, The Counter Person (TCP) thinks that I, Little Egan (LE), have answered the Skill Testing Question (STQ) correctly and hands me 50 bucks.

*Happy Outcome 1*

Happy Outcome 1 (HO1), where I correctly answer the STQ and TCP thinks I'm correct, I'll admit, is rather boring. Other than me sweating out the fact that I'm an underage gambler when I go to collect my earnings, there isn't really much going on. And, things aren't that much different if we add my support to the mix.

The above outcome, HO1, when Egan's Support System (ESS) is taken into consideration is, actually, two outcomes. In HO1, LE's correct, but ESS could think that I'm either correct (which we'll call HO1a) or incorrect (HO1b), but TCP thinks I'm correct. Either way, the key to these outcomes is that I'm getting my money. (I agreed, I could change my answer based on what ESS says to me before I head up to the counter, but that would add more cases to a rather large number of cases already and, as such, will be addressed only later.) Now, the most boring of all scenarios would be HO1a, where LE, ESS and TCP all agree on the correct answer. It is worth pointing out, here, as long as TCP agrees with LE, the support of ESS is a moot point. I would, of course, relish the opportunity to make jabs such as, "Great support everybody... you almost cost me 50 bucks. I told you my answer was correct." What emerges from HO1a and HO1b, then, is that the correctness of the STQ gets usurped by what the TCP thinks is the correct answer to the STQ.

In other words, from the perspective of claiming my prize, the correct answer to the STQ is less important than what TCP deems correct, whether that's correct or not.

In HO1 we've established that whether or not ESS is correct (denoted HO1a and HO1b) is rather a moot point. This notion of rendered mootness can be extended even further, to Happy Outcome 2 (HO2), where LE incorrectly answers the STQ but — big but here — TCP thinks I'm correct and I get my money. The fact that I got my money, I know, would cloud any wondering as to whether or not I truly answered the STQ correctly. Being told I was correct by the TCP would have, for me, stopped any further thinking about the correctness of my answer to the STQ. Being rewarded with $50 at such a young age may have even cemented, for usage later in school, the manner in which I completed questions concerning the order of operations. "Excuse me, Mr. Brown [my grade 7 math teacher], you've marked this question wrong on my homework, but are you sure you're right?! Let me tell you about what happened in Veregin, SK this summer..." Alternatively stated, whether or not I correctly answered the STQ could also be considered a moot point based on the TCP. Similarly when taking ESS into consideration.

*Happy Outcome 2*

Let's analyze HO2 further. As with HO1, HO2 is also two different outcomes when considering ESS. In these outcomes, I'm incorrect, my support thinks I'm either correct (which we'll call HO2a) or incorrect (HO2b), and TCP thinks my answer is correct. For HO2, let's take, more closely, the STQ into consideration. For the sake of argument, I incorrectly conclude that 8/2(2+2) is 1 for HO2. Having read all the articles on the Internet, this is definitely not out of the realm of possibility. Also, not out of the realm of possibility, a member or members of my support, the ESS, are also incorrect, that is, they think that my answer is correct. The key to HO2, no doubt, is that TCP deems my incorrect answer as correct; and, in doing so, whether or not LE and ESS are correct is immaterial. For example, should I answer the STQ with 1, my support agree with my answer of 1 and the TCP agree with my answer (HO2a), I would leave the BBQ, most likely, thinking that I had definitely answered the question correctly. And, I would have 50 dollars to support my correctness contention. The other outcome, HO2b, the case where I'm incorrect, my support thinks my incorrect answer is incorrect, but TCP thinks my incorrect answer is correct is where things start to get interesting.

"I could see how you get that answer, Egan, but the correct answer to the skill testing question is, actually, 16," I could hear (especially) one of my older, smarter cousins, part of the ESS, saying to me at the BBQ. Having heard them but not listening, truly listening to them, I would have headed to TCP with my incorrect answer, come back with my 50 bucks, and an I told you so smile on my face.

In these outcomes, the Happy Outcomes, whether I, my support, or I and my support are correct or incorrect in our answer to the skill testing question is somewhat irrelevant. What matters is whether or not the TCP, correct or not, thinks my answer is correct, that is, whether or not they have the same answer as my answer. Once the 50 bucks changes hands, which signals agreement on the correctness of the answer, whether correct or incorrect, everything is over. As we'll now see, the same can't be said in the next set of outcomes.

### Little Egan's Answer: A Quick Aside

I can say, with some confidence, that Little Egan's answer to the STQ would have been 16. To be clear, I'm not making this claim because "apparently" 16 is the right answer. Rather, I know myself quite well. When I was told something, especially in math class, I did what I was told. After all, doing what you were told to do was a key to success in math class back when I was a student.

When I was taught the order of operations, we learned the BEDMAS mnemonic. I thought nothing of ambiguities, I just put my head down and did the Brackets (B), which I would eventually learn meant to do the stuff inside the brackets. Then I'd tackle the Exponents (E) then Division and Multiplication (DM) then addition and subtraction (AS). Sure, there was some little caveat about "Left to Right" when division and multiplication or addition and subtraction came into play at the same time, but the caveat wasn't that hard to remember. No muss, no fuss, put your head down and crank out correct answers.

Little Egan then, when confronted with 8/2(2+2) would have attended to the stuff inside the brackets, making 8/2(4), and, upon seeing both division and multiplication, started working from the Left, making 4(4), to Right 16. Simple really, remember what the teacher told me, repeat what they said to

the best of my ability, and, for the most part, get the right answer. On the off occasions that I did not get the right answer, the culprit, of course, was my fault and stemmed from my deviations from what I was supposed to have done, what I was told to do, in order to get to the right answer or a slip in my calculation.

I'm not trying to toot my own horn here, but, as I've attempted to establish, there was more of a chance that I would get the answer to the STQ correct, that is, 16, than I got it wrong with an answer of 1. Had I gotten the STQ incorrect, a total possibility, there would be some upside in all of the Unhappy Outcomes. In other words, for me, not all Unhappy Outcomes are created equal. I would be resigned to certain outcomes, on the one hand; and, on the other hand, certain outcomes would have driven me mad. Simply put, certain outcomes would sit better with me today, had they played out, compared to others, had I got the STQ wrong.

With that Little Egan tidbit out of the way, let's now address the Unhappy Outcomes that might have happened had the equation that broke/divided the internet been the skill testing question on my winning BBQ pull tab.

*The Unhappy Outcomes*

Like the Happy Outcomes, there are two different Unhappy Outcomes (UOs), which, when you take ESS into consideration, turns into four Unhappy Outcomes. The absolute key to these Unhappy Outcomes is that The Counter Person, which we've been calling TCP, thinks that I'm incorrect with my answer to the Skill Testing Question (STQ). To be absolutely clear, the TCP thinking I'm incorrect does not necessarily mean that the TCP is correct with their answer to the STQ, which is a point that will be picked up throughout what follows.

*Unhappy Outcome 1: The Rockwellian Reality*

Unhappy Outcome 1, which I'll denote UO1, is where I'm incorrect and TCP thinks that I'm incorrect. Alas, I do not get the $50 that I never had. Sure, I would be crestfallen about not getting the money. What I would come away with, as a lesson, in UO1 is that I needed to know my mathematics a bit better; and, all the things that all the people in my life — my parents, my teachers, my coaches — were telling me about mathematics was true. Little Egan was so naïve.

Maybe it's the way I've presented UO1 thus far, but we can't assume that me being incorrect and TCP thinking that I'm incorrect means that I had the incorrect answer of 1 and the TCP correctly thought the answer was 16. As I've alluded to above, this UO1 scenario that I present would have probably sat best with me had I, at this moment, been reflecting on my not getting 50 bucks.

Little Egan, learning his mathematics, is allowed to be incorrect, especially on an equation that broke/divided the internet. The TCP, an adult, an adult behind a cash box employed at a public function involving drinking and pull tabs, the authority figure, the person assessing my answer to the STQ of course would have the correct answer. And, of course, they would inform me that I'm incorrect, I would accept (for various reasons) that I'm incorrect and rightfully walk away without my money. "What can you do," I would say to myself, I was wrong. Based on this description of all the assumptions found in UO1, this particular outcome will be denoted the (Norman) Rockwellian Reality version of UO1, which I'll denote UO1RR. I'm not sure what it says about me, I'll have to think more on that, but UO1RR doesn't really make me that angry, just unhappy that I didn't cash in. With that said, other versions of UO1 would make me furious.

Up until now, as I've presented, ESS has really been a moot point. After all, I received the money in all the Happy Outcomes. As a result, there would really be no reason for me or my support to argue with TCP other than to make some bizarre point, but that's not really me or my support's style. The ESS is also moot when it comes to, what I'll call, UO1a, which is where I'm incorrect on the STQ, my support thinks that I'm correct, that is, they too are incorrect, but TCP thought that I was incorrect. Having my support agree with me on my incorrect answer, only to be told that we're all incorrect, isn't really a rally the troops type of moment. And, to be clear, my support, in UO1a, that is, young cousins, would also fall prey to many of the same Rockwellian assumptions about adults, authority, etc. that existed at the time. If, as a group, we were told that we were incorrect, then, by and large, we would have taken our lumps, and, at the very least, I wouldn't have to have worried about everybody asking to borrow a few bucks during the remainder of the visit.

I also would have been ok with what would have played out in a slightly different version of UO1. In what I'll call UO1b, I'm incorrect with, for the

sake of argument, an answer of 1; my support thinks that I'm incorrect, that is, they think the answer is 16; and, TCP thinks that I'm incorrect because they think the answer is the correct answer of 16. I guess I would not have been ok with not getting 50 bucks, but the reason I was incorrect, that is, not listening to my cousins who told me that I was incorrect with my answer, is a reason that I could live. With the vacation soon to be over anyways, I wouldn't have to see or hear from them — except for a Christmas phone call — until the next year. Out of sight out of mind, I guess. I should point out, though, had UO1a or UO1b contained an answer other than 1 or 16 to the STQ, then the group could have, potentially, created quite a bit or an uproar.

*Unhappy Outcome 1: An Alternate Reality*

As you've read, I've been a bit reserved in my response to not getting 50 bucks in UO1a and UO1b in the Rockwellian Reality because, honestly, I can really see those outcomes playing out in my head. I get an answer of 1, but my cousins and the TCP think the answer is 16, which results in not only no money but also comments like, "I can see that" (if ESS agreed with me) or "I told you so" (if ESS disagreed with me). Follow-up conversations would include comments like, "Don't feel bad, Egan, that was a pretty tricky skill testing question, in our opinion," and, "You're not supposed to be gambling anyways." Let's now ramp up the rage factor by looking at what happens when we add a wildly unexpected and wrong answer from the TCP for UO1a and UO1b.

Moving away from UO1RR in this new, alternate reality, we introduce a wildly unexpected and wrong answer from the TCP and call this new Unhappy Outcome, UO1AR, for Alternate Reality. Here's the new situation: I'm incorrect with an answer of 1; my cousins are waffling between answers of 1 and 16; and, lastly, TCP thinks that I'm incorrect because... the correct answer to the STQ is 6. Now, before you start getting angry with and for me, 6 might not be that wildly off. Hold that thought.

As is discussed in countless articles, an answer of 1, especially in the United States of America, stems from the use of mnemonic, Please Excuse My Dear Aunt Sally or PEMDAS. Individuals take 8/2(2+2) and conduct the work in brackets to become 8/2(4) at which point the keep following PEMDAS, that is, they do multiplication before division (MD) as in the mnemonic,

for 8/(8) to get their answer 1. With this approach and this explanation, maybe I get some of my support on my side, but other members of ESS are still skeptical. Wanting to get all of ESS on my side before I head to TCP, I decide to try and convince those that are still pushing for an answer of 16 with an alternative explanation.

Immediately out of his depth, Little Egan begins looking for an alternative explanation. Scrambling, and forever unsure what the "brackets" for the B truly meant, he begins his attempt to convince others of the incorrect answer of 1. "Brackets has another meaning," I hear Little Egan begin. At this point I dig into some version about how the B in brackets means to complete the brackets portion of the question. So, I show my cousins that 8/2(2+2) becomes 8/(2x2+2x2) which then becomes 8/(4+4) which is 8/(8)=1. At this point, good news, my distribution alternative has convinced any hold outs that the answer is not 16, it's 1. At this point, with all ESS behind me, I head to TCP only to come back empty handed.

"Where's your money?" To which I respond, "They didn't give it to me. They said my answer was wrong." At this point, just as certain members of my support, those that "knew the answer was 16," are about to pounce on me (I can just see it in their eyes), I continue, "They said the correct answer is 6." Still a little dumbfounded, I proceed to explain what the TCP took time out of their busy schedule to show me what they thought was the correct answer. Let's now let go of that thought you were holding.

Utilizing the very same approach that I used to convince the rest of the crew that the answer was not 16 but 1, I show my support how 8/2(2+2) becomes 8/2x2+2x2, just as I had done, but which then becomes 8/4+4, and then 2+4 for an answer of 6. "I guess I was correct about the distribution angle but how could I have not done multiplication or division before addition or subtraction," I hear myself thinking. And, although I wouldn't know what the term meant at the time, "Hoist by my own petard, I guess." At this point, my head would be spinning. "I knew that I didn't know enough about distribution, and I guess I still don't really know what the B in Brackets really means, which means I better pay more attention in math class next year." In this alternate reality, and the actual BBQ for that matter, at times like these, there was nowhere to turn. At best, you could hope to run into an adult that was extremely adept at explaining mathematics and hope they had a pen or a pencil, a napkin or something to write on, and some free time

that they were willing to give up. There was no external fact checker, such as the Internet just sitting in your pocket. I would just have to wait until the new school year when I could ask the teacher about what just happened. On that note, back then, things just happened, said things either went your way or they did not, and you either picked things up later or just moved on. Simpler times, I guess.

UO1AR would have been like a roller coaster. The high-high of coming up with an alternative explanation to getting an answer of 1 that involved distribution and, even better, convincing those that formerly had the answer of 16. All the way to the low-low of TCP using what I just stumbled upon to tell me that I was, in fact, incorrect in my answer for the STQ. As I alluded to earlier, UO1RR did not really result in too much anger on my end. Like I said, I was incorrect. Having examined an alternate reality, I now see that didn't really matter whether or not ESS and TCP thought, correctly, the answer was 16. Case in point, even though TCP had a different incorrect answer to the STQ, an answer of 6, any investigation that I would have later conducted would have shown that the answer I had, an answer of 1, was also incorrect.

Sure, I could have been mad that TCP didn't have the right answer, I guess, but it's not like I had the right answer anyways. That is not to say that two wrongs make a right; rather, me being one of the two wrong answers means that, in the end, it didn't matter what the TCP thought of my answer; it was wrong. In line with this reasoning, then, it could be argued, in these particular outcomes, TCP is the one deemed moot. On the other hand, had the TCP had a wildly incorrect answer to the STQ, like he did with 6, but I had gotten the correct answer of 16, this is where I would have been furious, which brings me to the second of the Unhappy Outcomes.

*Unhappy Outcome 2*

These last two scenarios are the ones that would have made me the most angry of all the scenarios, for sure. I can actually feel the anger rising in me as I begin to type out these outcomes. I guess I should keep in mind, these scenarios never took place. The key issue isn't even really about not getting the money. The simple fact is that in these last two scenarios, I was correct. Period.

A quick note just so we remember, Unhappy Outcome 2 (UO2) is where I'm correct, but The Counter Person thinks I'm incorrect, which means no money, even though I was correct. I would like to think, in this scenario, that I would have asked for an explanation as to why I was incorrect. The idea, though, of Little Egan asking TCP to, essentially, "Show me your work," is probably a bridge too far. Given the scene: underage gambler, long lineup, adult authority behind a counter, I probably would have just accepted that I was wrong and turned around and walked away. I don't even want to get into the notion that TCP could have acted nefariously. For example, they could have just said I was wrong in order to collect the money for themselves. I mean, sure, that's a total possibility, but I'll leave that whole blood boiling outcome for a moment. After all, I had support. Like in all previous outcomes, UO2 can be parsed: I get the right answer of 16, but my support could think I'm correct or incorrect, which I'll respectively denote as UO2a and UO2b.

Considering the scene of me coming back to ESS after dealing with TCP in UO2a. "Where's your money?" Little Egan responds, "They didn't give it to me. They said my answer was wrong." Similar to past outcomes, yes, but, this time, ESS is correct and, as such, they think that I'm correct and maybe, just maybe, it's time to get one of our adults involved! Sounds like a great idea. And, for the sake of argument, let's say we're brave enough to try and get one of the adults involved. Sure, the adult initially thinks the answer is 1, which is also what TCP thought, for this scenario, but my support and I take a minute to explain that when you get from 8/2(2+2) to 8/2(4) that the next step is to conduct multiplication and division from "Left to Right." After some quick convincing that, yes, I do remember exactly what my teacher told me, the adult, ESS, and I all make our way back to the counter

I should mention, as the rally-the-troops-we-have-an-adult-now scenario gets considered, the whole scenario is predicated on whether or not I had either the presence of mind or the ability to keep the ticket for our adult to see after my encounter with TCP. I suspect this not to be the case. I hope I would have tried to keep the ticket after being told I got the STQ wrong. I could have cooked up something like, "Well, I'd like to keep it as a reminder of my poor math skills to show my math teacher come the fall." Again, though, that lineup behind me being so long, and everybody wondering what I was doing in the lineup to begin with, would have definitely influenced my actions, my presence of mind to keep the ticket. In that moment, I probably would have turned around and walked away.

What UO2a truly reveals, which, yes, does apply to all past cases as well, TCP was the final arbiter and, thus, had total dominion over whether or not I got my money. Cook up any outcome you want, in the end, it was my word versus TCP, which brings us to the final case to be examined.

I don't want to say that all the different scenarios have been leading up to this last outcome, but, if you read between the lines, how things have been organized, this last outcome is last for a reason. Unhappy Outcome 2b is where I get the answer correct, my support thinks that I'm incorrect, and TCP also thinks that I'm incorrect. Hell, let's make matters even worse. Let's assume that I know, with 100% confidence, that I'm correct. Let's also assume that this scenario is not playing out in real time, it's already happened once before and I'm just replaying the outcomes out in my head while, I don't know, day dreaming. In other words, I know the outcome, I know that I was correct and everybody else was incorrect, and there's nothing I can do to change the outcome of the outcome. It's probably best to picture me, throughout my recollection of this scenario, as dead inside while I recount what happened.

"I'm sorry, Son, but you didn't answer the skill testing correctly. And I'm gonna have to keep this winning pull tab as an official record of what took place here." As I walk back from TCP over to my support, they ask me, "What happened?" I proceed to tell them that TCP told me that my answer to the STQ was incorrect. At this point, still dead inside, I have a bunch of my support members who start in with the, "I told you that the answer wasn't 16, Egan." Without changing the expression on my face (remember: dead inside) I just nod in recognition of what they're saying and the passion with which they're saying it. Even comments made to make me react — for example, "I'll be honest, I know you won the money, technically, but if you can't even get the correct answer to the stupid skill testing question, then you don't really deserve the cash" — bounce off of me with no reaction.

As I recount this horrible outcome, I even consider another scenario where TCP told me I was wrong but had a wildly incorrect answer. I imagine walking up to the counter, the number 16 proudly written in the answer box to the skill testing question, only to have TCP pull out a calculator, push a few buttons and then show me the calculator screen where the number 2 or 10 or some decimal is staring me in my face. Say I even muster the courage to show TCP both correct and also incorrect ways to get the a correct answer

— for example, 8/2(2+2)=8/2(4)=4(4)=16 or 8/2(2+2)=4(2+2)=4(4)=16 or 8/2(2+2)=4(2+2)=(4x2+4x2)=(8+8)=16 — only to be told, "Sorry son, I don't know how to tell you this any other way, your answer to the skill testing question is incorrect." There's nothing, really, I could have done at that point. As I stated in response to UO2a, and is now seen in UO2b, no matter whether TCP was living in a Rockwellian or Alternate Reality, TCP was the final arbiter, and, as such, had total dominion over whether or not I got my money. From this perspective, not only are I and my support rendered moot but, also, the Skill Testing Question can be considered irrelevant.

**Facing the Final Arbiter**

The equation that broke/divided the internet revealed, for many, a state of confusion or, what I'll call, disorder of operations. And, yes, there have been recent investigations into disorder of operations in the field of mathematics education (e.g., [4, 2, 3]. In the wild, though, little heed is paid to anything other than the correct answer. And therein lies the rub: the very reason that 8/2(2+2) divided the internet is the very reason that 8/2(2+2) broke the internet. In line with this reasoning, disorder of operations could be considered the teaching and learning of mathematics version of, for example, gun control, abortion, prostitution, gambling, death penalty, animal rights, welfare, and on and on (see, for example, [1]). Adding fuel to the fire, those on both sides of the debate, that is, those who answer 1 and those who answer 16, both think they're correct.

The equation that broke/divided the internet came along at a perfect time, in my opinion. In a world rapidly embracing post-truth politics, 8/2(2+2) gave people the opportunity to hone their skills in a different arena. Any quick visit to Twitter or any other social media platform (e.g., Facebook, Reddit and others), where conversation around 8/2(2+2) is preserved, reveals many of the issues that are making various publication venues (e.g., *Popular Science*) turn off the comments section. We're well past the days of US President George Bush promoting his gut instincts to his country, only to have the Stephen Colbert character stare into a camera and define the word "truthiness" (the quality of seeming or being felt to be true, even if not necessarily true). Smash cut to present today — with Australia burnt, the COVID-19 pandemic causing an unprecedented financial and social disruption, stickers disparaging the Canadian Prime Minister prominently displayed

on the backs of pickup trucks in the prairie provinces, statues being ripped down, race relations issues, and truthiness running rampant — people may start harkening back to simpler times.

I'll admit, it was simpler times back when I first won $50 playing pull tabs. It's important to keep in mind, though, whether or not I collected my winnings was based, simply, on whether or not The Counter Person thought my answer to the government-mandated skill testing question was correct or not. Worthy of note, it did not matter whether The Counter Person had a normal incorrect answer of 1 or a wildly incorrect answer of 6 or 2 or 10 or some decimal answer. All that mattered was what they thought (or were told) was the correct answer to the skill test question. In my scenarios then, Happy or Unhappy, Rockwellian or Alternative, the correct answer, then, lies in the eye of the beholder. We would like to think that my scenarios would not play out in the same manner in today's world. With all of us walking around with little super computers in our pocket, there are so many options to consider. I could have searched, "Correct answer to skill testing question on pull tab" in Google or used the phone's built in calculator. There was no real-time crunch associated with collecting my winnings, which meant I could have outsourced the correct answer on various social media platforms and waited for the correct answer to just come to me. When that failed, I could have even DM'd (direct messaged, that is) Strogatz on Twitter just to make sure. The thing is, no matter how powerful the little supercomputer in our pocket, all the searching, all the Tweeting and what... I get an answer of 16 and we're back to square one.

The main issue in the scenario I encountered as Little Egan, and in all the scenarios I played out as Big Egan, is one and the same: a young person doing something they're not supposed to be doing; looking to get rewarded, financially, for their actions; having to interact with an adult person that, hopefully, has no nefarious intentions; and, establishing whether or not they answered a math question correctly. Look, I didn't really learn a lesson that day because I got my 50 bucks. Had I been incorrect, I would have definitely learned a lesson but not an order of operations lesson. Rather, I would have learned about a lesson about taking someone at their word, my word versus theirs, a Hobbesian lesson. No matter the outcomes presented, I would have come to realize that, in that instance, The Counter Person had total dominion over an outcome of which I had an extreme vested interest, and the math didn't really matter. Should you disagree, I have $50 that says otherwise.

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