Adding from 0 to 100

DinglyDo *

Week one

1 Too much of a professional look?

So I was bored, and while I was bored I found this plus button in Google Classroom. Apparently [MATH TEACHER NAME] forgot to disable us from posting. So I thought, what if I post something interesting once every week? [this didn't work out] And that's what I am doing, curious as to anyone would actually read these. But anyway, tell me what you think – if you do read it [No one read it].

2 Once upon a time...

Once upon a time, there was a very mean lazy teacher. The teacher assigned a simple task for all the students to accomplish to keep them busy. The task being, add from 0 to 100. Now this can take a while to do. But if you are smart, you can get the answer in just a couple of seconds. And Gauss, being one of the students, was smart; so he came up with the answer 5050 in almost an instant. How you might ask? By creating an equation of course!

*BetterExplained for the source https://betterexplained.com/articles/techniques-for-adding-the-numbers-1-to-100/

3 What equation?

Well before I write down what equation he used, I would like to actually approach the problem as if we *don't know the equation.* The first question that we have is, what does our equation exactly need to do? Well, what I want it to do is to add a list of consecutive whole numbers that starts with 1. So if I wanted to get know the sum of $1+2+3+4+5$, I would do $f(5)$; which would result in 15. So, $f(n)$ = The sum from 0 to n. Well, can't we just think of n as just length? If n is 5, then the list that we would sum would have 5 items. And n decreases (or increases) through every item. So let's draw a list of 5 items.

```
x
x x
x x x
x x x x
x x x x x
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If you count each dot, you get 15! So we are getting close to getting the equation, we just need to figure out how you can figure out the dots without counting them manually. Now, you might say that you can just calculate the area of the supposed triangle, but this actually isn't a triangle. If this were a triangle, the hypotenuse would be $\sqrt{50}$. You can think of this as just a bunch of rectangles stacked on top of each other. So then you might ask, how else could we find the area? Well we can change it's form into a rectangle!

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x o o o o o
x x o o o o
x x x o o o
x x x x o o
x x x x x o
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All that we have done is just create a mirror of the already existing shape and then merge them together. That on it's own will make it into a rectangle. And look! Doesn't that look really nice? We already know what the area for a rectangle is, it's base * height. Or in this case $n(n+1)$. Now that will give us double the result, since we have just mirrored the shape. To counter act

that, we divide by two. And Voilà! We found the equation! Now of course there are more ways to find the equation, but I like the geometric way (The one we just demonstrated) the most. Since it's very visual and simple, it can be explained to a middle school student. Other proofs will be linked below.

$$\frac{n(n+1)}{2}$$

Figure 1: The equation in it's lovely algebraic form!

4 Sources and other stuff

BetterExplained *Techniques for Adding the Numbers 1 to 100* (BetterExplained also has other articles that are really well written, I would highly check him out)