Weekly Challenge #11: Understanding R

JACK PETCHEY FOUNDATION COUNT ON US Secondary Maths Challenge WITH MAYOR'S FUND FOR LONDON

Welcome to the Count on Us Secondary Challenge's eleventh weekly challenge. Here we will look at an important piece of maths in current use in battling the Coronavirus.

READ ALL ABOUT IT!

In the government response to the Coronavirus crisis, they are measuring how fast the virus spreads. The main measure of this is the R value. This tells us, on average, how many new people any one infected person will infect. If the R value is 1, then each person infects, on average, one new person. So, the original person gets better and the new person now has the virus. So, with an R value of 1, the number of people with the virus stays the same. Now, in the UK there were 268,620 confirmed cases of the virus (on 28/05/20). So, you are going to need a calculator!

If the R value was 0.9 then the next round would have $268{,}620 \times 0.9 = 241{,}758$ infections.

If it remained at 0.9 then the next round would have $241{,}758 \times 0.9 = 217{,}582$ infections. (Rounded to the nearest whole person). We could have worked that out in go as $268{,}620 \times 0.9^2 = 217{,}582$ infections.

NOW THE CHALLENGE Always start with today's count of 268,620 and allow 2 weeks for each round of infections (that is the quarantine period that a family must isolate for the virus to pass).

PART 1: Practice

1. If the R value is at 0.8 how many infections will there be after 4 weeks (2 rounds)?
2. If the R value is at 1.2 how many infections will there be after 6 weeks (3 rounds)?
3. If the R value is at 0.6 how many infections will there be after 10 weeks (5 rounds)?
4. If the R value is at 2.4 how many infections will there be after 12 weeks (6 rounds)?

PART 2: Thinking!

1. If the R value is at 1.2 how long (weeks) before the number of infections has more than doubled?
2. If the R value is at 0.8 how long (weeks) before the number of infections is less than halved?
3. If the R value is at 0.4 how long (weeks) for the number of infections to get below 100?
4. If the R value is at 1.4 how long (weeks) before the number of infections is greater than the whole population of the UK … (currently estimated to be 67,886,011)

This is a *mathematical model*. It is not exactly how the virus spreads. But it is useful to get a good idea. It includes *simplifications*. E.g. the virus does not spread on a two-weekly cycle. But this is good enough to get our idea. Watch this video to see how more sophisticated models can be made. The maths is hard, but the ideas are very important! https://www.youtube.com/watch?v=mTvKQYTV0Yw

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