Mathematical maxima program to show Corona (COVID-19) disease spread over a period.

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Abstract

Whole world is suffering by the disease called Corona(COVID-19) and all the peoples are quarantine in their homes in almost all the countries of the world. In this time I have wrote mathematical program using Maxima software to show how this disease spreading with respect to number of days.

Keywords: Corona, Coronavirus, Corona disease, COVID-19, SARS-CoV-2, Maxima,

Introduction

About Corona(COVID-19) : Coronavirus disease(COVID-19) is an infectious disease caused by a new virus called severe acute respiratory syndrome coronavirus-2(SARS-CoV-2). The disease caused respiratory illness(as like common flu) having symptoms like a cough, fever, tiredness & difficulty in breathing.

WHO announced "COVID-19" as the name of this new disease on 11 February 2020,

Coronavirus disease spreads primarily through contact with an infected person when they sneeze/cough. It also spread when a person touches any substance or surface that has the active virus on it, then by toughing their mouth, eyes or nose. People may sick with the virus for 1 to 14 days before developing the symptoms.

More rarely, the disease can be serious and even fatal. Older people, and people with other medical conditions (such as asthma, diabetes, or heart disease), may be more vulnerable to becoming severely ill. Presently there is no any vaccine to prevent Corona(COVID-19) disease.

About Maxima : Maxima is a *computer algebra system* (CAS) like Maple® and Mathematica®. Thus it is a powerful tool for the manipulation of symbolic and numerical expressions, including differentiation, integration, vectors, matrices, . and so on. It also provides commands for plotting functions, curves and data in two and three dimensions. In opposition to other CAS Maxima has a quite long history and is open source software. From the Maxima manual: Maxima is a descendant of Macsyma, the legendary computer algebra system developed in the late 1960s at the MIT. It is the only system based on that effort still publicly available and with an active user community. Macsyma was revolutionary in its day, and many other systems were inspired by it. In 1998, Professor W. F. Schelter of the University of Texas obtained permission form the Department of Energy to release the Macsyma source code under the GNU Public License, and in 2000 he initiated the Maximaproject at Source Forge to maintain and develop Macsyma, now called Maxima.

Maxima is available on many operating systems including MS Windows®, Mac OSX and Linux. The software can be downloaded from http://maxima.sourceforge.net/. There one can find links to more information as well as to related software. Maxima also allows to define your own commands. Thus it is easy to Maxima's capabilities and adjust it to own's need. Thus you find contributed "packages" that have been developed and made publicly available by users of this CAS.

Here in this article, I have used the mathematical Maxima tool to write this simple program which shows spreading of this infectious fast spreading COVID-19 disease.

Let us assume in the first day of identification of COVID-19 disease in a one person say initial day and it is denoted by a letter 'a'. suppose this first person is able to spread 3 new persons per day in an accrual normal conditions without taking any preventive measures, say it can be represented in the letter 'r'. The number of days on which total number of spread, it is represented by a letter 'n'.

In this program I have used the simple mathematical concept of Sum of Geometric series and able to show how this disease will grow rapidly with respect to the period(number of days) without taking any preventive measures.

By using this program one can also calculate the total number of positive cases with respect to number of days as well as number of possible spread by person in a single day by simple changing the values of r and n.

Program Represent Corona(COVID-19) disease spread over the period

Input

```
(%i10)    kill(all)$
          /· If a person tested Covid−19 positive, he may spread atleast 3 persons a day·/
          a:1$
          r:3$
          n:14$
          /·Where a represents casess in initial or first day·/
          /·r represents number of spread per day ·/
          /· n represents number of days ·/
          /·by using this programe one can find number of casess in any instant of day·/
          TC: a·(r^n−1)/(r−1)$
          print("Number of Casess found in first day, a =",a)$
          print("Total possible number of spread per day by a single person, r =",r)$
          Print("Number of Days, n=",n)$
          print("Total Number of Covid−19 Casess will increase by",n,"days = ",TC)$
          print("Program by Dr. Yogeesh N, HOD & Asst. Prof. of Maths, GFGC Tumkur−572102, India")$
          print("So, STAY @ HOME & ERADICATE COVID−19")$
```

Output

```
Number of Casess found in first day, a =  1
    Total possible number of spread per day by a single person, r =  3
    Total Number of Covid−19 Casess will increase by  14  days =  2391484
    Program by Dr. Yogeesh N, HOD & Asst. Prof. of Maths, GFGC Tumkur−572102, India
    So, STAY @ HOME & ERADICATE COVID−19
```

We may calculate the total number of spread over a different period according to following example by changing the number of days.

Example-1:

If Number of days required to spread the disease that is, n = 8 & possible spread by a single person is 3 persons per day(that is r = 3) then

Total number of positive COVID-19 cases will be equal to **3280**

Example-2:

If Number of days required to spread the disease that is, n = 21 & possible spread by a single person is 3 persons per day (that is r = 3) then

Total number of positive COVID-19 cases will be equal to **5230176601**

Example-3:

If Number of days required to spread the disease that is, n = 15 & possible spread by a single person is 2 persons per day(that is r = 2) then

Total number of positive COVID-19 cases will be equal to **32767**

Like this, this simple program will work for all the cases; see how horrible this disease is.

Conclusion

Knowing these facts by using this program all the citizens of the world should obey the prevention measure given by the competent authority to eradicate this infectious disease Corona(COVID-19). The simple measure is Stay @ Home, maintain social distance, keep hygiene and increase immunity.

Currently there is no vaccine to cure this Corona(COVID-19) disease.

So by following these preventive measures to eradicate the disease.

- Wash your hands regularly for 20 seconds, with soap and water or alcohol-based hand rub.
- Cover your nose and mouth with a disposable tissue or flexed elbow when you cough or sneeze.
- Avoid close contact (1 meter or 3 feet) with people who are unwell.
- Stay home and self-isolate from others in the household if you feel unwell.
- Don't Touch your eyes, nose, or mouth if your hands are not clean.
- Maintain social distance and avoid touching any substances without any protection

Reference

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