NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS
CELEBRATING 100 YEARS

Middle Grades/High School
Exploring Change in the Number of Cases

A Pandemic Notice and Wonder

The Center for Disease Control (CDC) tracks the cumulative number of COVID-19 cases* in the United States. The first case in the United States occurred on January 22, 2020. On the last day of February, there were 24 reported cases in the United States. However, in early March, the number of cases began to increase more rapidly, as shown in the data table and graphs below.

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Reported COVID-19 Cases in the United States
March 2020

Date	Cumulative Total Cases	Number of New Cases
1	30	6
2	53	23
3	80	27
4	98	18
5	164	66
6	214	50
7	279	65
8	423	144
9	647	224
10	937	290
11	1215	278
12	1629	414
13	1896	267
14	2234	338
15	3487	1253
16	4226	739
17	7038	2812
18	10442	3404
19	15219	4777
20	18747	3528
21	24583	5836
22	33404	8821
23	44183	10779
24	54453	10270
25	68440	13987
26	85356	16916
27	103321	17965
28	122653	19332
29	140904	18251
30	163539	22635
31	186101	22562

*Described by the CDC as including both confirmed and presumptive positive cases reported to the CDC or tested at CDC since January 21, 2020. Reference: Information for the table and paragraph above obtained from CDC website at Cases in US.

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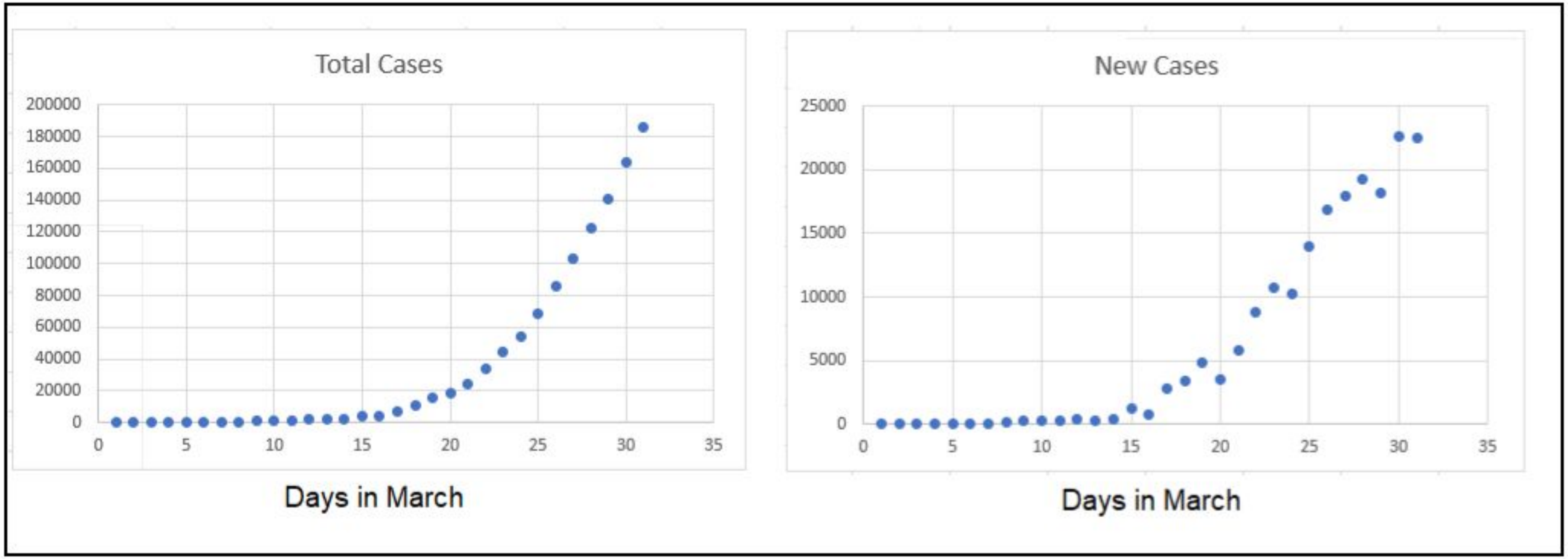

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1. Take a few minutes to examine the data table and graphs. What do you notice? What do you wonder? Reflect on the differences in your perceptions of the data before and after seeing it graphically. Record your thoughts and be ready to share with the class.

2. On what date do you start to see an emerging pattern regarding the Cumulative Total Cases or Number of New Cases? How many and which data points are you using to identify this pattern? Describe any pattern(s) you notice.

3. Real data is messy and almost never models strictly one function type. In fact, natural phenomena often take a piecewise approach due to contextual factors. However, given what you know about linear, quadratic, and exponential growth, can you identify time intervals that tend to represent a more linear, more quadratic, and/or more exponential pattern? Describe the date ranges, rate of growth (linear, quadratic, or exponential), and justify your reasoning.

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4. Towards the end of March, the number of reported cases started increasing much more rapidly. In fact, we are at a point where it doesn't take long for the number of cases to double. Given this information, **if other factors remain unchanged**, how would you go about anticipating and modeling the number of cases we might expect in the U.S. by April 5? April 10? April 15? April 20? Show your mathematical thinking and share your predictions and reasoning.

5. As the growth in cases continues at this rapid pace, what are some different ways that this epidemic will impact our society? How **has it** and how **will it** continue to affect the physical, mental, and emotional health of individuals, different age groups, and communities? How will this be different for communities with fewer access to resources? Use mathematical reasoning to support your ideas.

6. Now, take your predictions from question 4 and consider how they might need to be adjusted if physical distancing and other restrictive measures in the United States have started to work. How and why might this impact the growth? How soon do you anticipate resulting changes to show in the number of reported cases? Explain your reasoning.

7. During the pandemic, our way of life has been altered. How might this further perpetuate or be a catalyst to resolve limited access and inequities in our society? Discuss the role of mathematics in acknowledging, analyzing, and addressing the variety of needs (such as social, emotional, physical/medical, economic, political) of communities.

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Additional idea:

Consider exploring the following graph (and others!) with your students:
Daily new confirmed cases of COVID-19 (rolling 3-day average)