



KENTUCKY CENTER
FOR MATHEMATICS

Let's Do Math with KCM High School Algebra 1

Rich Mathematics Tasks

Welcome!

Your host

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Kentucky Center for Mathematics

- KCM seeks to advance the knowledge and practice of effective mathematics teaching and learning, encompassing early childhood through adult education.
- KCM provides and develops statewide leadership, facilitate professional learning experiences, and cultivate innovation with the aim of improving mathematics education, practice and policy.

KCM Yearly Numbers

29 math courses taught

73 cohorts of teachers

Over 1000 KY teachers
attending

Over 182 days of
math professional learning

Over \$150,000 of math
materials directly in the hands
of teachers

109 school districts

300 KY schools

100 principals trained

>5000 students impacted

KCM Annual Math Conference
national prominence

Closing the achievement gap
for our KY math students.

Math Achievement Fund
intervention students (3000)
had an average of 10 percentile
points gained as a direct result
of KCM trained math
interventionists.

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HOME

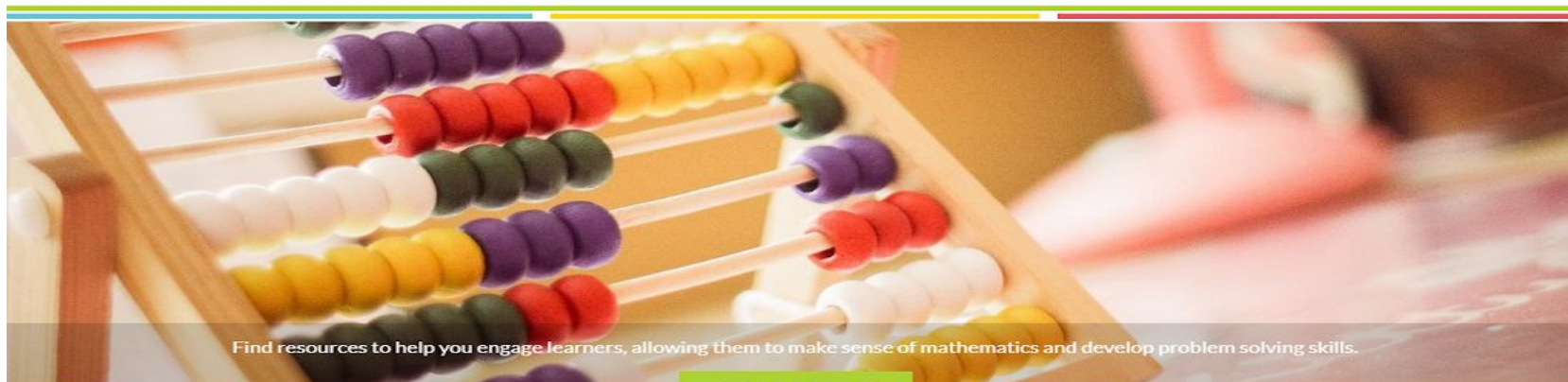
MAF

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Session Agenda

- Research
- Standards
- Let's Do the Math: Understanding Exponential Growth in Context of Covid-19 Pandemic
- Extensions and References
- Virtual Manipulatives

Research

Effective Mathematics Teaching Practices

1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning and problem solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding.
7. Support productive struggle in learning mathematics.
8. Elicit and use evidence of student thinking.



National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author.

We need to develop ways to **digitally** contextualize grade-aligned academic instruction that promotes personal relevance for all students.

Trela & Jimenez, 2013.

Standards

KY.HS.F.14 Interpret the parameters in a linear or exponential function in terms of a context. MP.1 (make sense and persevere), MP.2 (reason abstractly and quantitatively).

KY.HS.F.4 Graph functions expressed symbolically and show key features of the graph, with and without using technology (computer, graphing calculator). ★

d. Graph exponential and logarithmic functions, showing intercepts and end behavior.

Given 3 different representations of C-19 growth, interpret the parameters, particularly the rate, of the exponential model(s) in context. Graph exponential equations and model exponential regression with Desmos.

Let's Do the Math...

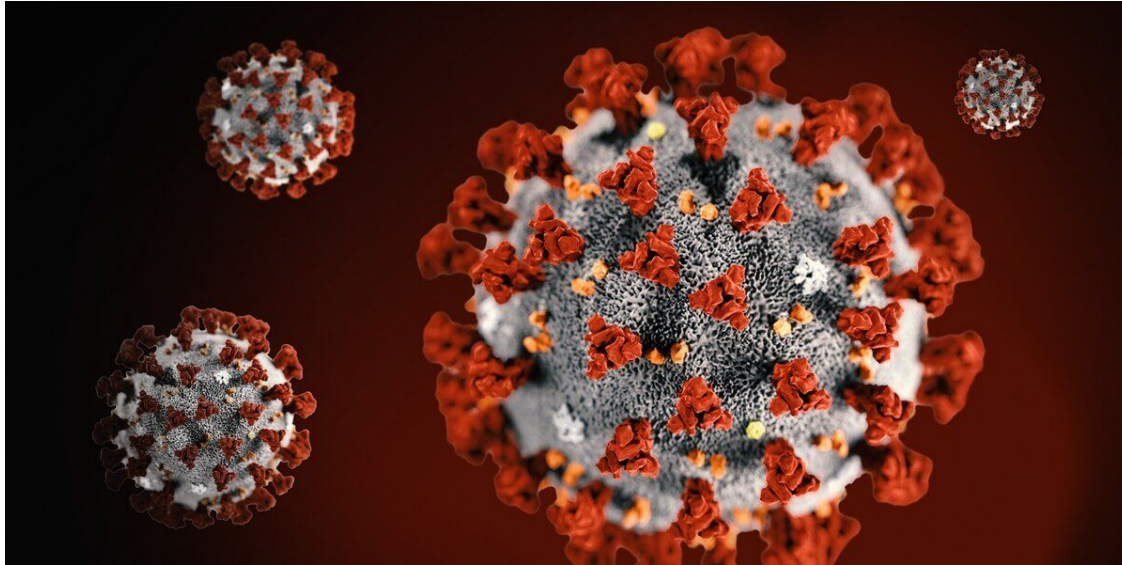
Using the current case counts from the U.S. as of Friday morning, she calculated what the epidemic would look like if cases grew by 30 percent every day for a month — they have been growing by 30 to 40 percent every day for a week — then looked at what would happen if just one of those infections were prevented tomorrow instead of a week from now.



Britta Jewell, an infectious disease epidemiologist at the Imperial College, London, at home. Jane Stockdale for The New York Times

How does it grow...

Check out these students model [linear and exponential growth](#).



Task 1

Pick One

A

If there was one initial case in US, how many cases will there be a month later if Covid-19 spread consistently with no intervention 30 percent every day? Organize your information and be prepared to share your strategy.

Student Hints : Can you organize the information in another way? Are there any trends that you notice?

B

On Tuesday, they noticed a [tweet by Mike Baker](#) of The New York Times, in which he noted the cumulative number of coronavirus cases in the U.S. by date:

Jan. 14 — 0

Jan. 21 — 1

Jan. 28 — 5

Feb. 4 — 11

Feb. 11 — 14

Feb. 18 — 25

Feb. 25 — 59

Mar. 3 — 125

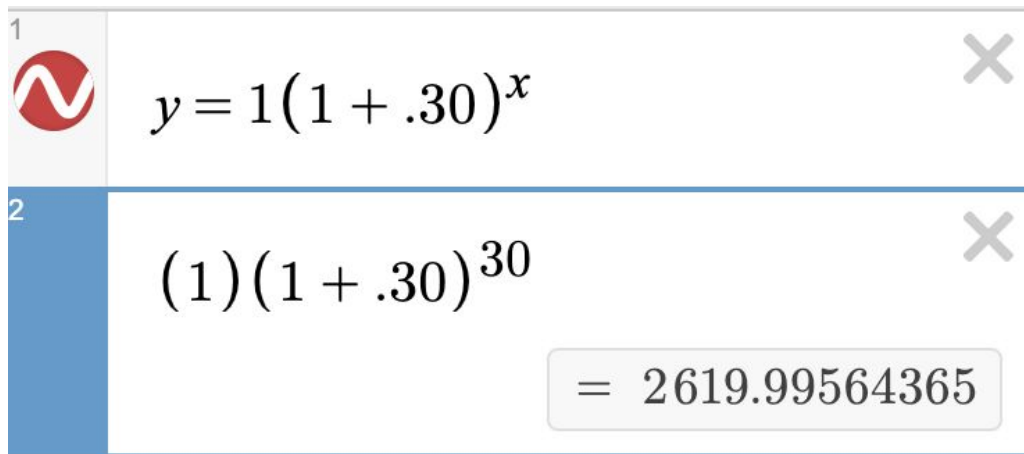
Mar. 10 — 1,004

Use the information from Baker's tweet to accurately describe the rate of Covid-19 spread in the US.

Solutions:

Use Desmos to input values into equation from context.

$$y = a(1 + r)^t$$



The image shows a screenshot of the Desmos online graphing calculator interface. It features two input fields, labeled 1 and 2. Field 1 contains the equation $y = 1(1 + .30)^x$ and has a red icon with a white sine wave. Field 2 contains the expression $(1)(1 + .30)^{30}$ and has a blue icon. Below field 2, the calculated result $= 2619.99564365$ is displayed in a light gray box. Each input field has a gray 'X' icon in its top right corner for deletion.

1 $y = 1(1 + .30)^x$

2 $(1)(1 + .30)^{30}$

$= 2619.99564365$

Solutions:

Input table into Desmos then compute exponential regression

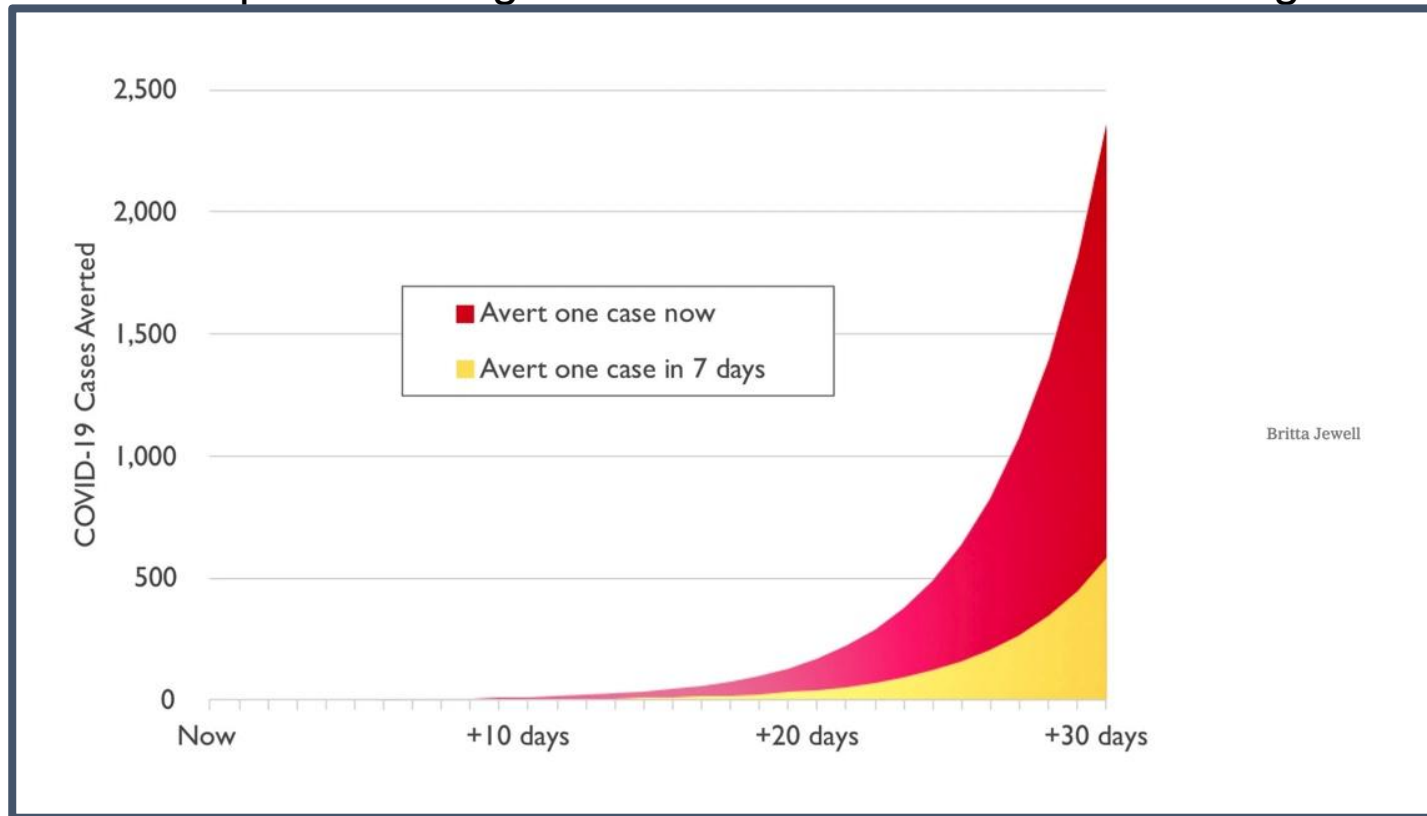
HOW TO: GIVEN A SET OF DATA, PERFORM EXPONENTIAL REGRESSION USING DESMOS

1. Create a table by clicking on the + in the upper left and selecting the table icon.
2. Enter your data into the table.
3. Enter $y_1 \sim ab^{x_1}$ in the next line.
4. You can check the quality of the fit by looking at the R^2 value provided by the calculator. The closer it is to 1, the better the model fits the data.

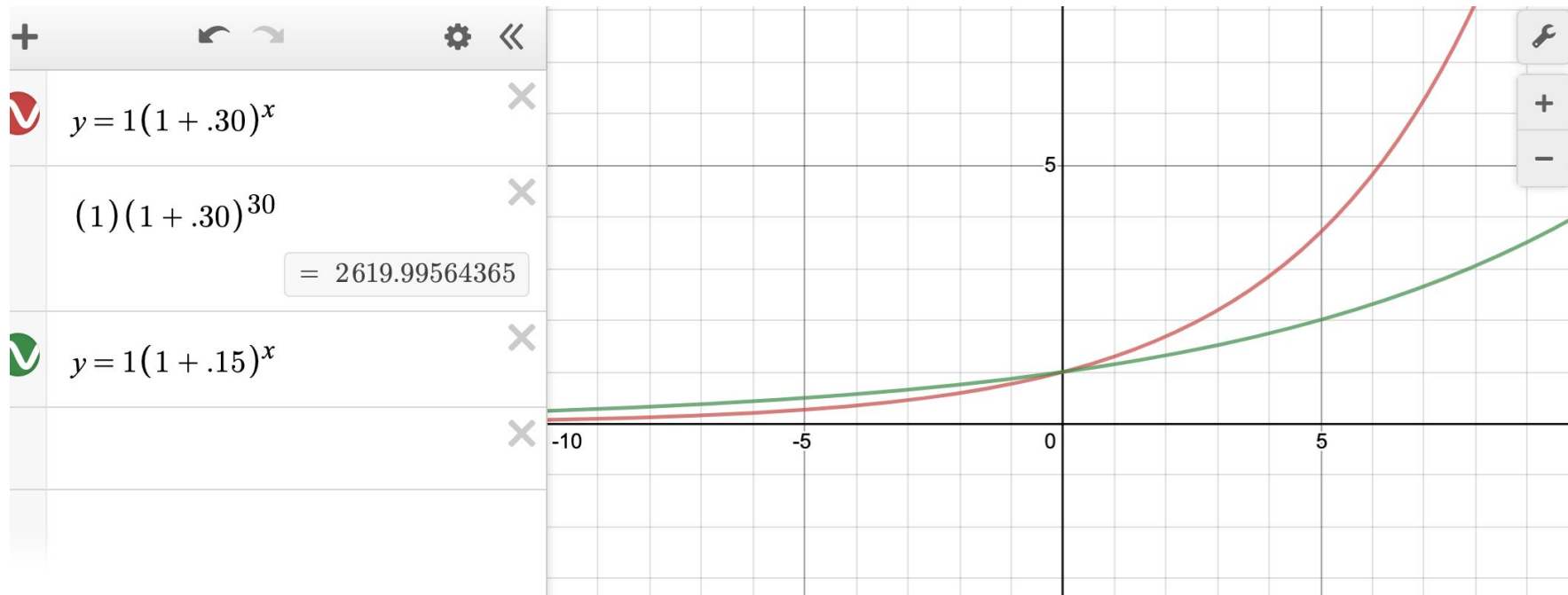
Task 2

What do you notice or wonder from the graph? What are the parameters? Can you describe rates that could represent the growth in Covid-19 cases for each region?

What is the difference in growth rates and how can we all influence this change?

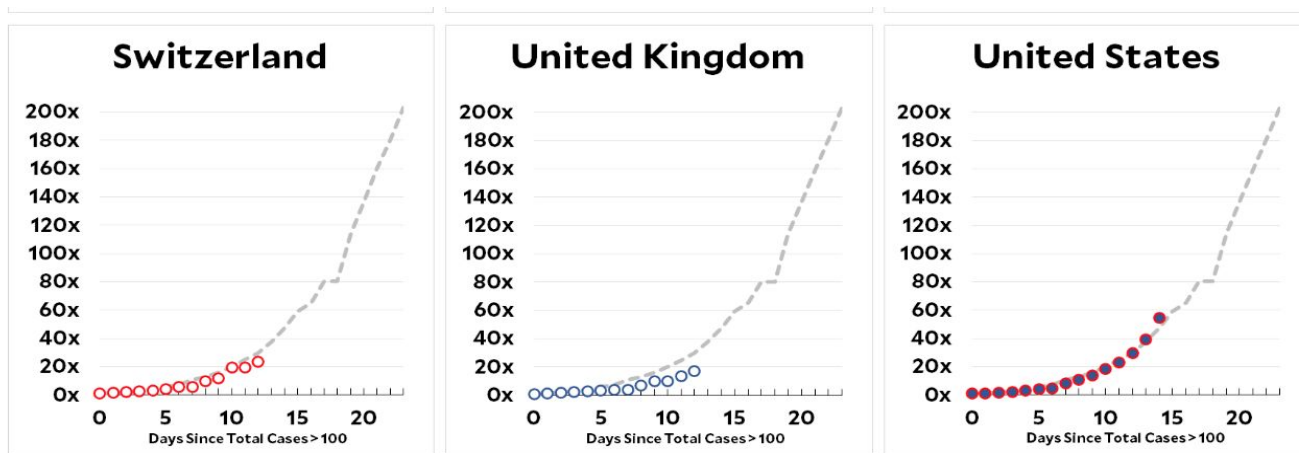


Solutions:



Task 3

List possible rates, r values, to model each growth below?
Explain how you made your decision and check your work in Desmos.



Source: Johns Hopkins COVID-19 dataset as of March 17 at:
<https://github.com/CSSEGISandData/COVID-19/>

Mother Jones

Need more mathematics?

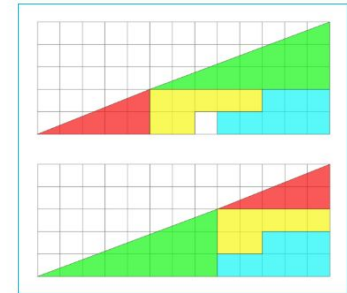
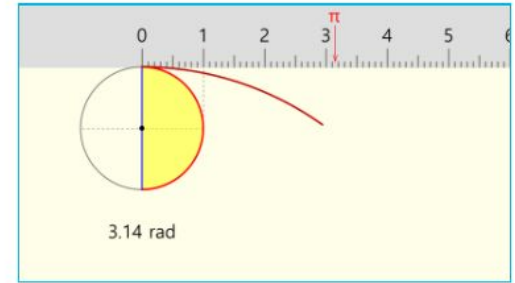


NATIONAL COUNCIL OF
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[Desmos Class Activity: Match My Exponential](#)

[JavaLab Mathematics Simulations](#)

[References and Extensions](#)



Virtual Manipulatives

[Desmos](#)

[Phet Interactive Simulations](#)

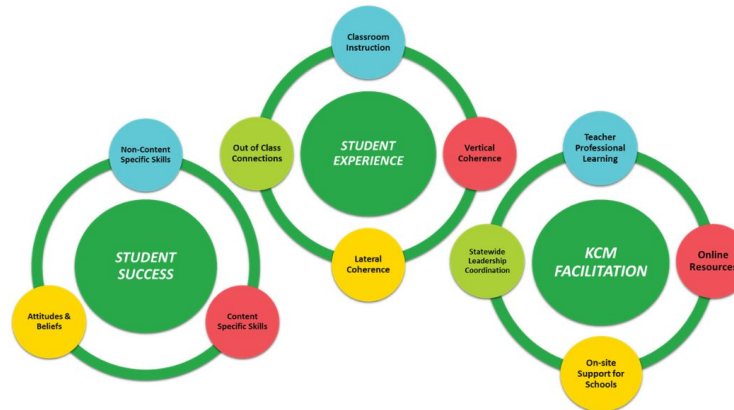
[Geogebra](#)

[Didax Math Virtual Manipulatives](#)



KCM Support for Educators

- Kentucky Center for Mathematics is here to support our KY educators
- We are aspire to be a national leader in mathematics education



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KNP Intervention Guide



KCM-developed repository housing activities designed for math intervention teachers, but usable by any teacher, to support their math instruction. At this time, grade level standards addressed include K-3 with a few for 4.

KY Family Math



Website for parents looking for resources to use with their children to make sense of problems and persevere in solving them while having fun.

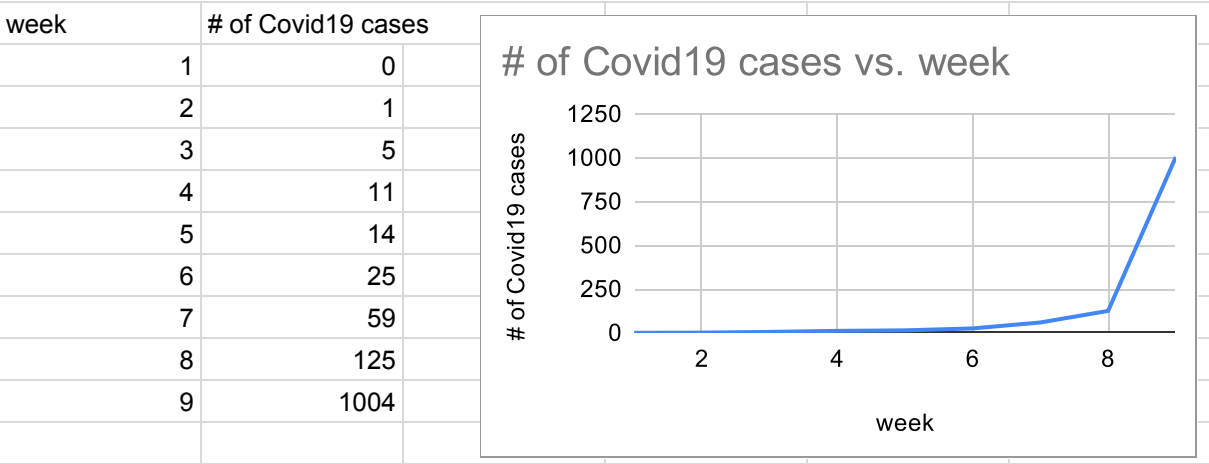


Learning Mathematics through Representations

Math Tools



Page listing resources that can



Extension Questions

1. Is there an exponential model that closely represents the growth of Covid19 in US?
2. How do we make the growth more linear?
3. The growth rate in China was 50% per day prior to intervention. Suppose there were originally 3 persons in China with the disease, determine the growth after 30 days without intervention.
4. How long before 200,000 people in US contract Covid19?
5. What is the total number of people infected in the US today?
6. How does this rate compare to the predicted exponential model?

Exponential Growth Video Link

Professor Matt Yedlin, The University of British Columbia, Canada

https://youtu.be/1_SwKG4Zt60

References

Boston, D.M. (2009). Transforming secondary mathematics teaching: Increasing the cognitive demands of instructional tasks used in teachers' classrooms. *Journal for Research in Mathematics Education* 40(2):119 National Council of Teachers of Mathematics 200903010021-8251

Hwang, C. (2020) Learning Exponential Functions through Experiments. *Mathematics Teacher: Teaching & Learning PK-12*. 113, 01, p.74-78).

Joseph Norman, Yaneer Bar-Yam, and Nassim Nicholas Taleb, Systemic risk of pandemic via novel pathogens – Coronavirus: A note, *New England Complex Systems Institute* (January 26, 2020).

Jenny R. Root, Sarah K. Cox, Nannette Hammons, Alicia F. Saunders, and Deidre Gilley (2018) Contextualizing Mathematics: Teaching Problem Solving to Secondary Students With Intellectual and Developmental Disabilities. *Intellectual and Developmental Disabilities*: December 2018, Vol. 56, No. 6, pp. 442-457.

New York Times article:<https://nyti.ms/3aRzTnO> March 13, 2020

Roberts, S. (2020). Exponential Power of Now. *New York Times*. NY.
<https://nyti.ms/3aRzTnO>

Trela, K., & Jimenez, B. A. (2013). From different to differentiated: Using “ecological framework” to support personally relevant access to general curriculum for students with significant intellectual disabilities. *Research and Practice for Persons with Severe Disabilities*, 38(2), 117-119.