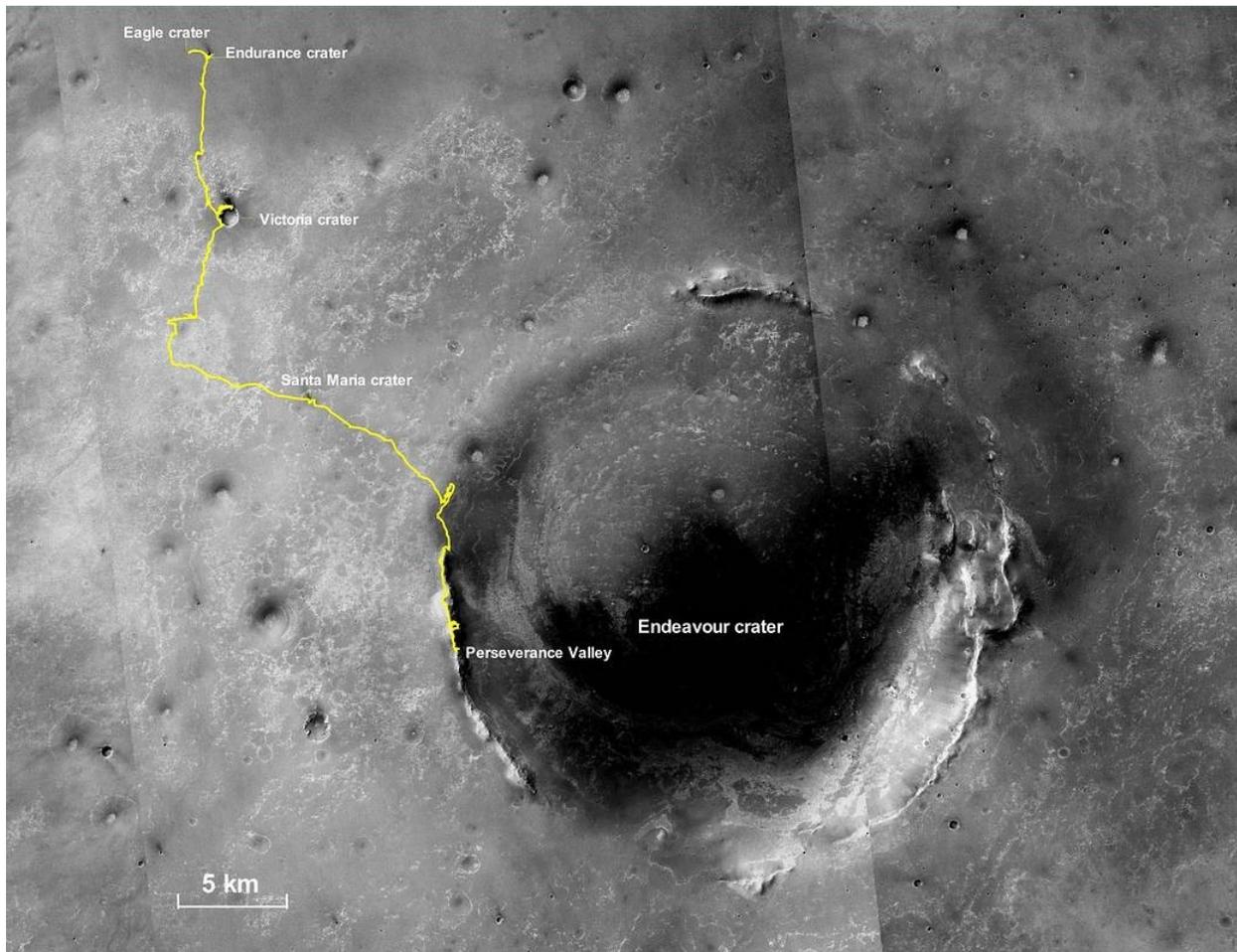


Data... and Math are Everywhere

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Christi Chapman
Math Connections in the STEM Classroom

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Data



The image above was retrieved from <https://www.nasa.gov/image-feature/opportunitys-final-traverse-map> and details the area covered by the Opportunity Rover from the time it landed at Eagle Crater to when it stopped communicating as it entered Perseverance Valley. The yellow line shows the path it took as it traveled over the surface of Mars during its active time, or 'lifespan'.

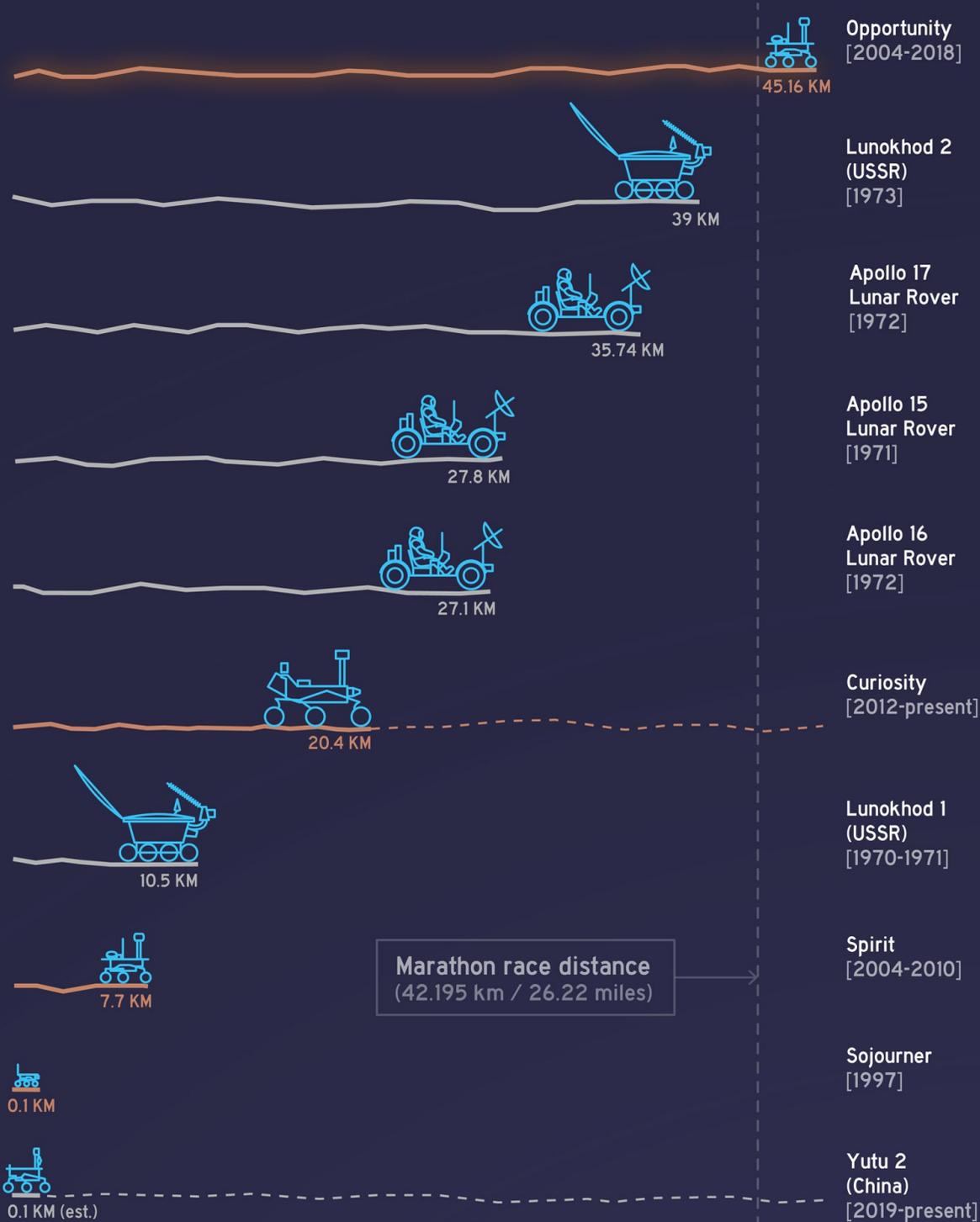
This image below was taken from the Jet Propulsion Lab's infographics page, located at <https://www.jpl.nasa.gov/infographics/>, and shows the total distances traveled by each rover during their listed active times.

OUT-OF-THIS-WORLD RECORDS!

DRIVING DISTANCES ON MARS AND THE MOON

(AS OF FEBRUARY 13, 2019)

MARS — MOON —



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Engaging Context

This image of a planetary body gives students a tangible visual for not only what the surface of Mars looks like, but also craters which can be tied to their previous knowledge of the lunar surface. In respect to math skills, this is engaging because it takes a high-interest topic of Mars and rovers and gives students a reason to practice their measurement and multiplication skills as they examine and read the map. This also ties in social studies concepts of using a scale on a map and measuring distances.

The way this would be used in the classroom is to have students use the scale to figure out how far Opportunity traveled overall by multiplying or using repeated addition, depending on the time of year and skill level of the students as they build to multiplication fluency. Once they have that data, they will be given the infographic with distances from other rovers to examine and draw conclusions from.

Once they have figured out how far Opportunity traveled, they will then use the map of the landing sites found at the following site from NASA:

https://www.nasa.gov/mission_pages/LRO/multimedia/moonimg_07.html to choose locations to find the distance between. They could choose Apollo sites, lunar landing sites, or any of the sites shown on the map. Using the same 5km scale, the students would then map out how far the rover could explore.

Students will then choose one of the rovers from the infographic and use the distance it traveled during its active time to see how long it would take to resupply at the NASA headquarters. (The teacher should choose the nearest NASA base to them for this, ie Austin, Tx and Houston, Tx are 165 miles, or rounded to 270 km apart) To do this, they would need to first round the distance to the nearest 10 km, then use repeated addition or multiplication to figure out how many 'active lifespans' it would take to travel the distance between the current location and the NASA base.

Once complete, the students should have a peer check their math, and explain their calculations to the peer. Students will be assessed based on the rubric below for their calculations and explanation of their work.

Standards Addressed

Texas does not follow common core, but using the Texas Essential Knowledge & Skills, or TEKS. Third grade TEKS for math, science and social studies met by this lesson are as follows:

Science

3.2B collect and record data by observing and measuring using the metric system and recognize differences between observed and measured data

3.2F communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion

Social Studies

3.5B use a scale to determine the distance between places on maps and globes

3.5D create and interpret maps of places and regions that contain map elements, including a title, compass rose, legend, scale, and grid system.

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Math

3.1G display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

3.4B round to the nearest 10 or 100 or use compatible numbers to estimate solutions to addition and subtraction problems

3.4E represent multiplication facts by using a variety of approaches such as repeated addition, equal-sized groups, arrays, area models, equal jumps on a number line, and skip counting

3.8A summarize a data set with multiple categories using a frequency table, dot plot, pictograph, or bar graph with scaled intervals

Measurable Objective

- The student will correctly round to the nearest 10.
- The student will use repeated addition or multiplication to solve a math problem.
- The student will accurately use a scale to calculate distances on a map.

Evidence

For the portion where students are measuring distances between lunar landing sites, they would create a data table in their science notebook and would then compare with another group, partner, etc before being able to check the answer key and check their accuracy with using the map scale.

For their chosen rover and calculating how many active times it would take to reach the NASA base, students will be given the following rubric and asked to write an explanation to go with their work showing how they calculated their answers.

4	<ul style="list-style-type: none">• Uses multiple strategies to accurately calculate the answer• Correct answer is given, with a label for units• Explains all steps using correct math vocabulary, for multiple strategies• Justifies why the answer is reasonable
3* (Mastery)	<ul style="list-style-type: none">• Uses an efficient strategy to accurately calculate the answer• Correct answer is given• Explanation of all steps used to solve, with correct math vocabulary• Justifies why the answer is reasonable
2	<ul style="list-style-type: none">• Uses a strategy but is inefficient or incorrect• Incorrect but reasonable answer• Partial explanation is given• Unable to justify answer or justification is not reasonable
1	<ul style="list-style-type: none">• Does not use an appropriate strategy• Incorrect and unreasonable answer• Unable to explain thinking or how the problem was solved• No attempt made to justify the answer

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References:

Dunbar, B., Garner, R. (2009, May 13). *Lunar reconnaissance orbiter*. Retrieved from https://www.nasa.gov/mission_pages/LRO/multimedia/moonimg_07.html

Hulme, S. (2019). Out-of-this-world records [digital image]. Retrieved from <https://www.jpl.nasa.gov/infographics/infographic.view.php?id=11051>

Smith, Y. (2019, April 29). *Opportunity's final traverse map*. Retrieved from <https://www.nasa.gov/image-feature/opportunity-s-final-traverse-map>

(2012). Texas essential knowledge and skills for kindergarten-grade 12 : 19 TAC Chapter 111, mathematics. Austin, Tex. :Texas Education Agency

(2017). Texas essential knowledge and skills for kindergarten-grade 12 : 19 TAC Chapter 111, science. Austin, Tex. :Texas Education Agency

(2011). Texas essential knowledge and skills for kindergarten-grade 12 : 19 TAC Chapter 111, social studies. Austin, Tex. :Texas Education Agency