

MeTEOR Performance Task

Fifth Grade

Mathematics
To the Moon and Back

Performance Task Item: To the Moon and Back

Grade Level: Fifth Grade

Focus Area: Operations and Algebraic Thinking

Essential Questions:

- How do I use concrete materials and drawings to increase my understanding of numbers, distance and time?
- How do I decide which unit of measurement to use?

Core Ideas:

- Understands how to make connections regarding spatial distance.
- Understands how to use strategies, tools and computation to solve problems.
- Understands how to think critically and read closely to solve problems.

Learning Targets:

- Students will use estimation.
- Students will compare numbers using symbols.
- Students will find mean, median, and mode of data.
- Students will create visual representations.
- Students will use computation to solve multi-step problems.
- Students will attend to precision while measuring.
- Students will read and analyze text.
- Students will communicate mathematical understanding through small group discussions and writing opportunities.

STANDARDS

Domain: Operations and Algebraic Thinking

Content Standards:

- Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

Domain: Numbers and Operations-Fractions

Content Standards:

- Solve real world problems involving multiplication of fractions and mixed numbers.

Domain: Numbers and Operations-Base Ten

Content Standards:

- Fluently multiply multi-digit whole numbers using the standard algorithm.

Supporting Standards:

Informational Text:

- Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
- Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.

Writing:

- Introduce a topic or text clearly, state an opinion, and create an organizational structure in which ideas are logically grouped to support the writer's purpose.
- Provide logically ordered reasons that are supported by facts and details.
- Link opinion and reasons using words, phrases, and clauses (e.g., *consequently*, *specifically*).
- Provide a concluding statement or section related to the opinion presented.

Speaking and Listening:

- Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.
- Follow agreed-upon rules for discussions and carry out assigned roles.
- Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.
- Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

Math Practice Standards:

MP 1: Make sense of problems and persevere in solving them.

MP 2: Reason abstractly and quantitatively.

MP 4: Model with mathematics.

MP 5: Use appropriate tools strategically.

MP 6: Attend to precision.

Materials:

- Performance Task
- Pencil
- Paper
- Notecard
- Basketball, measuring tape, tennis ball
- NASA article - print article or read online <http://observer.com/2016/02/nasa-will-return-to-the-moon-in-preparation-for-human-mars-mission/>
- Camera

Task/Question 1:

DOK Level 2: Basic Application of Skills and Concepts

Math Practice Standard:

- MP 1: Make sense of problems and persevere in solving them.
- MP 2: Reason abstractly and quantitatively.
- MP 4: Model with mathematics.

Scenario: You might have heard or read the expression “I love you to the moon and back”. What do you think that means? Can you really love someone to the moon and back? Let’s find out.

- A.** Write a paragraph explaining what you think the expression “I love you to the moon and back means”. Give examples of when you have heard or read the expression.
- B.** On a notecard write an estimation for how many miles you think it is from earth to the moon and back, explain your estimation.
- C.** Form a class number line to visually represent the smallest estimated number to the greatest estimated number.
- D.** Record on the back of your notecard the class estimations from smallest to largest. Record the mean, median and mode using the class estimations.

Task/Question 2:

DOK Level 2: Basic Application of Skills and Concepts

Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 2: Reason abstractly and quantitatively.
- MP 5: Use appropriate tools strategically.

In pictures the moon appears to be close to Earth, however it is very far away. According to NASA the moon is 238,855 miles or 384,400 km. from Earth.

- A.** How do you decide which unit of measurement to use (miles or kilometers)?
- B.** How many miles is it to the moon and back? Show your work.
- C.** With your math triangle partners compare your estimation from Task 1 with the total number of miles provided by NASA.
- D.** Using your estimation and the actual miles to the moon and back write a number comparison statement using $<$, $>$, $=$.

Task/Question 3:

DOK Level 2: Basic Application of Skills and Concepts

Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 4: Model with mathematics.
- MP 5: Use appropriate tools strategically.
- MP 6: Attend to precision.

Your group task is to make a visual representation to give you an idea of how far apart the moon and earth are. You will need extra space to complete this task. A suggestion would be to go outside or into the gym.

- A.** Your group task is to make a visual representation to give you an idea of how far apart the moon and earth are. Place a basketball on the ground-this represents **Earth**. Use a measuring tape to find a spot **23 feet 7 inches** away from the middle of the basketball. Place a tennis ball at that spot. The tennis ball is **the moon**. Attending to precision is important when measuring, therefore have another member of the group re-measure to see if they agree or disagree with your measurement.
- B.** Are the **basketball Earth** and **tennis ball moon** farther apart than you expected? Do you think this scale is accurate? Discuss your mathematical thinking with your group members. Have your teacher take a picture to show others how far apart the moon and Earth are.

Task/Question 4:

DOK Level 3: Strategic Thinking and Complex Reasoning

Math Practice Standards:

- MP 1: Make sense of problems and persevere in solving them.
- MP 2: Reason abstractly and quantitatively.
- MP 5: Use appropriate tools strategically.
- MP 6: Attend to precision.

- A.** NASA has started planning for another trip to the moon and further in 2018. Read the following text. <http://observer.com/2016/02/nasa-will-return-to-the-moon-in-preparation-for-human-mars-mission/>

Develop three questions you have for NASA regarding the upcoming mission to the moon and further:

- B.** Previous travels to the moon have varied in the amount of time it took to land on the moon:
- The slowest mission to fly to the Moon was actually one of the most advanced technologies to be sent into space. The ESA's *SMART-1* lunar probe was launched on September 27th, 2003 and used a revolutionary ion engine to propel it to the Moon. *SMART-1* slowly spiraled out from the Earth to arrive at its destination **one year, one month and two weeks** later on November 11th, 2004.
 - The Apollo missions, which were the only manned Lunar missions, were fairly quick in reaching the Moon. Naturally, it was the [Apollo 11](#) mission, where Neil Armstrong and Buzz Aldrin became the first men to walk on the Moon that made the greatest headlines. This mission began on July 16th, 1969, where a Saturn V multi-stage rocket took the astronauts from Kennedy Space Center into orbit. The famous “One small step for man, one giant leap for mankind” speech would not take place until July 21st,

roughly 109 hours and 42 minutes into the mission. After dusting off from the Lunar surface, the Lunar Module **spent another 2 days, 22 hours and 56 minutes getting back to Earth.** In addition to being the first manned mission, Apollo 11 was also the fastest trip to the Moon where astronauts were involved.

Analyze the information above. In your own words describe the difference between the travel time to the moon from the SMART-1 and Apollo 11:

C. Calculate the total time it took Apollo 11 to go to the moon and return to Earth:

D. With advancement in space travel the 2018 trip to the moon will take less time than the Apollo 11 mission. Travel time will decrease by $\frac{1}{10}$ of the time. What will the travel time be?

Task/Question 5:

DOK Level 4: Extended Thinking

Math Practice:

- MP 2: Reason abstractly and quantitatively.

Using the information gained from creating a model of the Earth and Moon, the article you read and the facts about the Apollo and SMART-1 mission do you think someone can you really love someone to the moon and back? Provide evidence to support your opinion. Be prepared to share with your classmates.

Complete Performance Task Scoring Rubric *To the Moon and Back*

42-52 Proficient 31-41 Good 21-30 Satisfactory 10-20 Poor 0-9 Unsatisfactory

	Depth of Knowledge Level	Points	Total Possible Points for Task	Total Points Earned by Student
Task 1:			10	
A. Answers will vary. Student receives full points for creating a paragraph explaining what “I love you to the moon and back” means with examples.	2	3		
B. Answers will vary. Student receives full points for a reasonable explanation.	2	3		
C. Student receives full points for participating in the creation of a class number line to visually represent the smallest estimated number to the greatest number.	1	1		
D. Answers will vary based on the class estimations. Student receives 1 point for each viable answer for mean, median and mode.	1	3		
Task 2:			6	
A. Student receives full points individual responses. Example responses could include: both miles and km. measure length/distance. At school we use the US customary unit of measurement more so I would use miles to measure the distance.	1	2		
B. 477,710 miles or 768,800 km	2	1		

C. Student receives full points for participating in partner discussion.	1	1		
D. Individual responses will vary based on estimation	2	2		
Task 3:			6	
A. Student receives full points for participating in the creation of a scale showing the distance between Earth and the Moon.	2	2		
A. Measurement from basketball Earth and tennis ball Moon are accurate- 23 feet and 7 inches.	1	2		
B. Student receives full points for participating in group discussion on scale model of Earth and Moon.	2	2		
Task 4:			20	
A. Student receives full points for creating 3 questions for NASA (based on information from the text).	2	5		
B. Answers will vary. Full points for a reasonable description.	3	5		
C. 180 hours and 38 minutes (109 hours + 42 minutes + 48 hours + 22 hours + 56 minutes).	2	5		
D. 162 hours and 34.2 minutes ($1/10 \times 180 = 18$, $1/10 \times 38 = 3.8$).	2	5		
Task 5:	4		10	
A. Student receives full points for writing an opinion paper with evidence to support the claim: "Can you love someone to the moon and back?"		10		
TOTAL POINTS:				



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