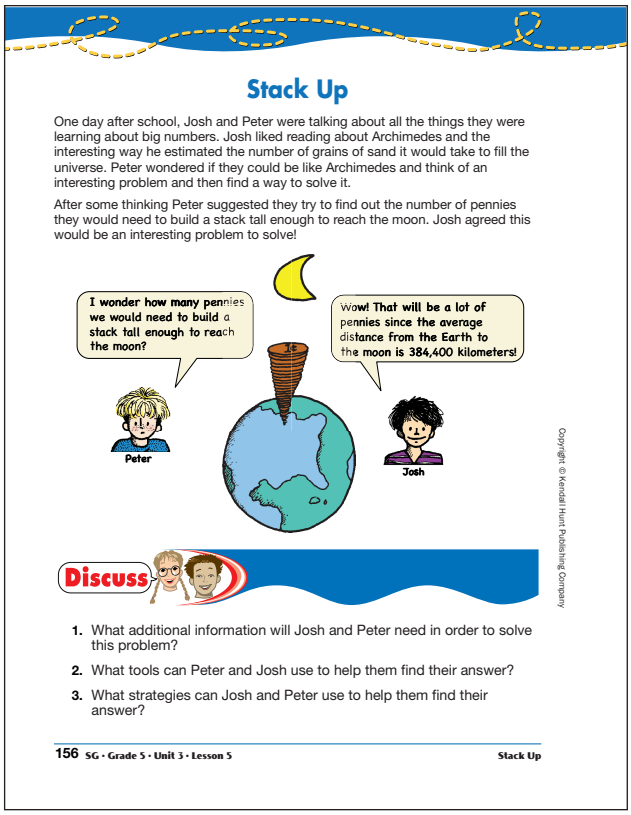


Stack Up

One day after school, Josh and Peter were talking about all the things they were learning about big numbers. Josh liked reading about Archimedes and the interesting way he estimated the number of grains of sand it would take to fill the universe. Peter wondered if they could be like Archimedes and think of an interesting problem and then find a way to solve it.

After some thinking Peter suggested they try to find out the number of pennies they would need to build a stack tall enough to reach the moon. Josh agreed this would be an interesting problem to solve!

Discuss

1. What additional information will Josh and Peter need in order to solve this problem?
2. What tools can Peter and Josh use to help them find their answer?
3. What strategies can Josh and Peter use to help them find their answer?

***Student Guide* - Page 156**

Student Guide

Stack Up (SG p. 156)
Questions 1–3

1.* Possible response: They need to know the thickness of a penny or a stack of pennies. They need to know how many centimeters are in a meter and how many meters are in a kilometer.

2.* Possible response: They will need a centimeter ruler or a meterstick and some pennies to measure. They could use a calculator, a table or chart, and maybe some graph paper.

3.* Possible response: They can begin by measuring a small stack of pennies to see how many it takes to make a 1 centimeter stack. Then they can multiply to find out how many it will take for a meter stack, a kilometer stack, and finally a stack that is 384,400 kilometers tall.

* Answers and/or discussion are included in the lesson.

Teacher Guide

Stack Up Work

Questions 1–3 (TG pp. 1–2)

1. **A.** Predications will vary.

   B.* Answers may very slightly but a reasonable estimate is 34 or 35 pennies. The accuracy of a student's prediction will vary depending on the original predication.

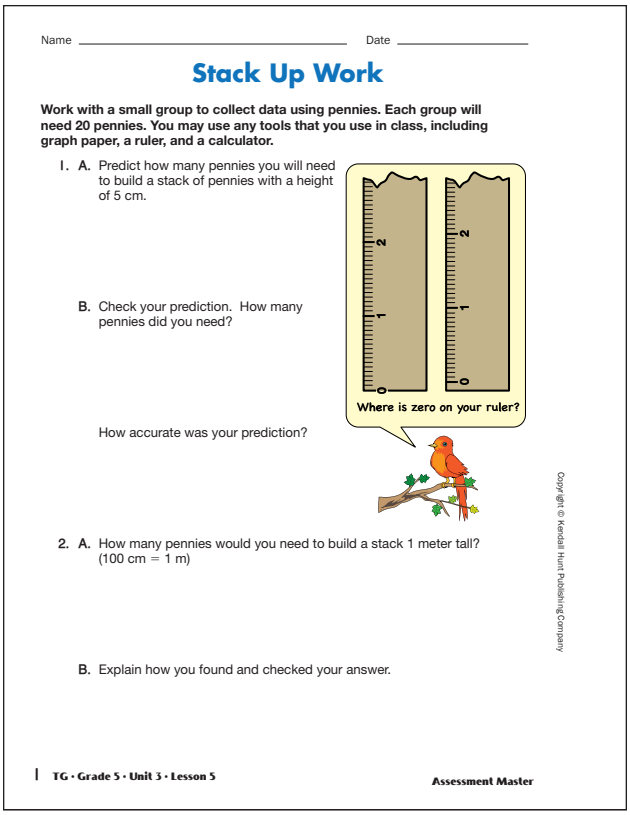
2. **A.*** It will take about 700 pennies to make a stack 1 meter tall.

   B.* Possible response: I measured my pennies and found that I needed 7 pennies to make a stack 1 centimeter tall. That means I will need 7 pennies × 5 centimeters = 35 pennies for a 5 centimeter tall stack. I doubled that and found that I need 70 pennies for a stack 10 centimeters tall. Since there are 100 centimeters in a meter and there are 10 tens in 100, I multiplied 70 pennies × 10 = 700 pennies in a one meter stack.

   I checked my answer using a table to see a pattern. Each time I added 70 pennies to the stack the height of the stack increased by 10 centimeters.

Number of Pennies in Stack	Number of Centimeters Tall
70	10
140	20
210	30
280	40
350	50
420	60
490	70
560	80
630	90
700	100

3.* Answers will vary. See the discussion of two student work samples with sample scored feedback boxes to use as a guide.



Name _____ Date _____

Stack Up Work

Work with a small group to collect data using pennies. Each group will need 20 pennies. You may use any tools that you use in class, including graph paper, a ruler, and a calculator.

1. **A.** Predict how many pennies you will need to build a stack of pennies with a height of 5 cm.

B. Check your prediction. How many pennies did you need?

How accurate was your prediction?

Where is zero on your ruler?

2. **A.** How many pennies would you need to build a stack 1 meter tall? (100 cm = 1 m)

B. Explain how you found and checked your answer.

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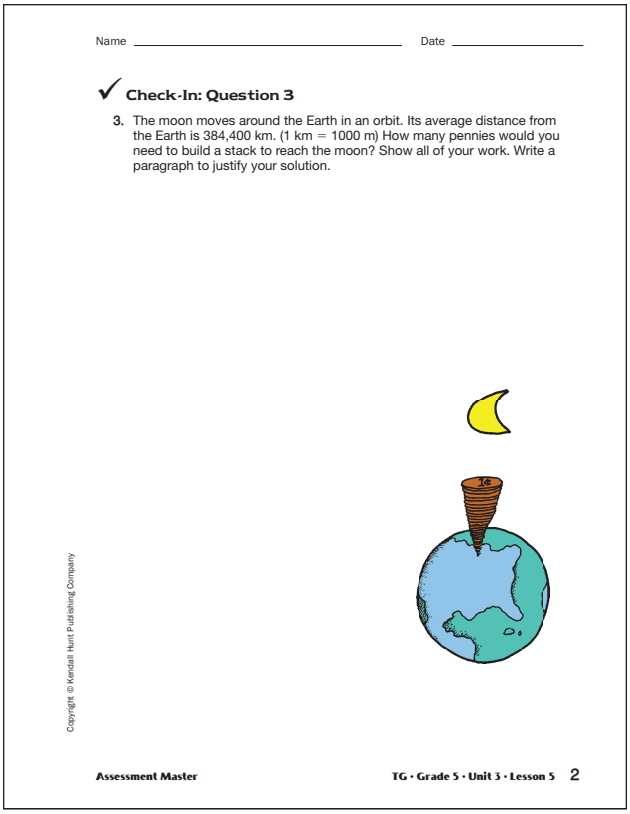

Name _____ Date _____

Check-In: Question 3

3. The moon moves around the Earth in an orbit. Its average distance from the Earth is 384,400 km. (1 km = 1000 m) How many pennies would you need to build a stack to reach the moon? Show all of your work. Write a paragraph to justify your solution.

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* **Answers and/or discussion are included in the lesson.**