

My Teacher's Record-Breaking Cup

Partial Quotients Division Method

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Grade Level	5th Grade	**Time Frame**	1-2 class period(s)
Subject	Mathematics	**Duration**	120 minutes
Course	Elementary Mathematics		

Essential Question

How can a large number be divided?

Summary

Students will use a fun problem to discover and practice the partial quotients process for multiple-digit division.

Snapshot

Engage

Students engage in a division problem dealing with their teacher's favorite cup.

Explore

Students use manipulatives to construct different ways to divide a multi-digit number.

Explain

Students first explain how and why they divided the multi-digit number, and then the teacher formalizes new knowledge by connecting to the method of partial quotients for division.

Extend

Students use the Commit and Toss strategy to practice writing and solving division problems using the partial quotients method.

Evaluate

Students individually solve another division problem using the partial quotient method.

Standards

Oklahoma Academic Standards for Mathematics (Grade 5)

5.N.1.1: Estimate solutions to division problems in order to assess the reasonableness of results.
5.N.1.2: Divide multi-digit numbers, by one- and two-digit divisors, using efficient and generalizable procedures, based on knowledge of place value, including standard algorithms.

Attachments

- Exit Ticket.docx
- Exit Ticket.pdf
- Partial Quotients Teacher Slides.pptx
- Strategy Harvest Note Sheet.docx
- Strategy Harvest Note Sheet.pdf

Materials

- The teacher's favorite water bottle, coffee cup, or other beverage container
- 1000, 100, 10, and 1 blocks
- Paper/pencils
- Whiteboard/markers for practice

Engage

Go to slide 3. Display a reusable cup or mug and share your LOVE for your favorite beverage (coffee, water, soda, etc). Explain that you refill this cup five (5) times a every day.

Go to slide 4. Students will use a Think, Pair, Share activity and collaborate to find the solutions for each of the following questions:

- How many refills would I have in one school week (Monday through Friday only)?
- How many refills would I have in one month?
- About how many refills would I have in a year?

Explore

Go to slide 5. Explain to students that you have tracked the number of times you have refilled your cup, but not the number of days. Tell them, "I have refilled my cup 5,235 times, and I refill it 5 times each day."

Go to slide 6. Pass out copies of the Strategy Harvest handout from the attachments. Ask students to use the Strategy Harvest strategy and figure out how many days the cup has been used.

Allow students to think about how to represent the number 5,235 and also attempt to solve the problem. Tell them that it might be helpful to think about how we represent large numbers first. Students might first rewrite the number using expanded notation (5000+200+30+5) or base 10 blocks or rewrite it into friendly numbers like 5000+200+35.

Go to slide 7. As students begin to finish the problem, instruct them to find others who are done and compare notes about what strategies each used to solve the problem. Students should record details about others' strategies on their Strategy Harvest handout.

Strategy Harvest Overview

Students work independently to complete the task. They then work with a partner to compare and share strategies, taking notes, offering feedback, and asking questions about the strategy. They can repeat this process with different partners. Then, the students can share strategies with the whole class that they think would be helpful for them in the future.

Possible Resources

Students might use resources such as base ten blocks, multiplication chart, digit cards from an interactive notebook, vocabulary walls, student-created tables or charts. Or, they might come up with their own ideas for resources.

Management Tip

This process might take a while. Don't rush it. As students begin to display their work, walk around and quietly ask questions about their strategies and reasoning. "How did you decide to divide this number?" "Did you try any strategies that did not work, and what did you do to fix it?" Encourage student groups that are not finished to continue working and consider the strategies they are using.

Explain

Go to slide 8. As a class, have students share strategies that they have used to solve the problem. Build upon student responses and be ready to connect their strategies to the partial quotients strategy.

Go to slide 9. Walk through the partial quotients method by talking about how students divided the quotient to start. You can point out how different groups approached the problems for examples.

Teacher Review: Partial Quotients Method Video

This video is not intended for students, but you can review it yourself to review the partial quotients method.

- When you divide the quotient, do you start with the smallest pieces or the biggest pieces first? The thousands or the ones?
- Model how to “show the work.”

Go to slide 10. Work through this problem as a class:

759 ? 3

Go to slide 11. Have students work in pairs to solve the problems below. After each problem, have the students pair up with another pair and review the other pair's strategies and answers.

1,926 ? 6

3,380 ? 4

Hints For Students:

1) Write multiples of the divisor using factors 1-9 on the side of your page. 2) Think in terms of base tens and place value. 3) Find or use friendly numbers within the dividend.

Extend

Go to slide 12. Follow the prompts on slides 12-17 to engage in a version of the Commit and Toss strategy that will help students practice estimating and evaluating their work.

Teacher's Note

In this activity students will need to be able to read each other's writing. Have students use markers or pens so that the writing is dark enough on the crumpled paper, and encourage students' best handwriting.

1. (Slide 12) Write a division problem on the paper. Toss and pick up a new paper.
2. (Slide 13) Use estimation to find a reasonable answer for the written problem. Discuss, toss, and pick up a new paper.
3. (Slide 14) Solve the division problem on the paper. Discuss, toss, and pick up a new paper.
4. (Slide 15) Evaluate/provide feedback for the solution.
5. (Slide 16) Write a “real-world” situation to match the problem. Remember that key words such as “per,” “each,” and “evenly between” often cue us that a problem is a division problem.
6. (Slide 17) Share problems with the class as time permits.

Discussion Notes

Discussion after step 2: Why would we want to find a reasonable answer? In what situations might that be needed?Discussion after step 3: What happens if it doesn’t go in evenly? Discussion after step 4: If needed, remind students how to use multiplication to check division. (This is a good time to use and review vocabulary such as quotient, divisor, dividend, etc.) What mistakes did you see? Do we have some common mistakes as a class? What do we need to remember?

Teacher's Note

If students have not practiced providing and accepting feedback, you might want to help them understand the importance of incorrect answers and how they help us learn. Check out this video about one teacher’s approach to incorrect answers.

Evaluate

Go to slide 18. Pass out copies of the Exit Ticket handout and have students answer the questions below.

Mrs. Kennedy is preparing a STEM activity where students will build a bridge out of plastic drinking straws. She has 642 straws that need to be shared between the 6 groups of students. Estimate how many straws each group gets.

Next, calculate the exact number of straws each group gets. Remember to show your work.

Why is your estimate higher or lower than your calculated value?

Resources

- Dunn, B. (2011, Nov. 12). Partial quotients division method with whole numbers [Video file]. Retrieved from https://www.youtube.com/watch?v=4NtxVF5bfqs
- K20 Center. (n.d.). Bell ringers and exit tickets. Strategies. Retrieved from https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505d6f2
- K20 Center. (n.d.). Commit and toss. Strategies. Retrieved from https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f505b3d0
- K20 Center. (n.d.). Strategy harvest. Strategies. Retrieved from https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5062662
- K20 Center. (n.d.). Think-pair-share. Strategies. Retrieved from https://learn.k20center.ou.edu/strategy/d9908066f654727934df7bf4f5064b49
- TeachingChannel. (2019). My favorite no: Learning from mistakes [Video file]. Retrieved from https://www.teachingchannel.org/video/class-warm-up-routine