## Specialty Cakes

Summary
Students use geometric shapes to construct cakes and then use costs of the pieces to find the cost of the various cakes.

Group Size
Pairs
Materials

- Utah Bakery Cakes
- Specialty Cake Template
- Bargain Cake Template Overhead pattern blocks
Pattern blocks manipulatives Blank transparencies Markers
- Cook-A-Doodle Doo!


## Additional Resources

Books
Cook-A-Doodle Doo!, by Susan Crummel; ISBN 0152056580
Great Cake Bake, by Helen Ketteman; ISBN 0802789501

## Background for Teachers

On day one of this activity students will construct a large triangle cake using various geometric shapes. They will find both the fractional value of each piece as well as the total cost of the cake. The students will construct a large equilateral triangle. An equilateral triangle is a triangle where the angles are the same and the sides are the same length. This equilateral triangle will be made up of 2 of each of the following pattern block shapes: trapezoid ( 4 sided object with 1 pair of parallel lines, regular hexagon ( 6 sided object), parallelogram ( 2 pairs of parallel lines) and 3 small equilateral triangle (all sides are the same size). Each different shape is associated with a different type of cake. Each cake has a different value. Equilateral Triangle is chocolate mint and has a value of $\$ .50$. Trapezoid is a strawberry cake and has a value of $\$ 1.00$. Parallelograms are blueberry flavored and have a value of $\$ .75$. Hexagon is a lemon cake and has the value of $\$ 1.75$. During the first day of the activity the students will build their cake based on specific instructions. On the second day the students will build the most economical cake.
Students then use cost associated with the pieces to find the cost of their Specialty Cake and their Bargain Cake. Students will also make the fractional connection of each of the pieces and find that the basic unit of the fraction is the small equilateral triangle. Based on breaking the large triangle into equal parts of the equilateral triangle, each small equilateral triangle will represent $1 / 25$ of the whole. Students will have an opportunity to find that each of the shapes used can be made up of the smallest unit (equilateral triangle). The students will discover that it is less expensive to use the biggest pieces possible on the second day.

## Intended Learning Outcomes

2. Become effective problem solvers by selecting appropriate methods, employing a variety of strategies, and exploring alternative approaches to solve problems.
3. Communicate mathematical ideas and arguments coherently to peers teachers, and others using
the precise language and notation of mathematics.
Instructional Procedures

## Invitation to Learn

Invite your students to think of a time when they saw or had a very fancy cake. What do they remember about the cake? Tell the students that they are going to be working for a fancy cake bakery called Utah Bakery Cakes. They will be designing their own specialty cakes. Ask the students to discuss with their table the types of things that they would like to see on their cakes. If time allows ask them to sketch some of their ideas. You could share the book Cook-A-Doodle Doo! by Susan Crummel to help build background information.
Instructional Procedures
Day 1:

1. Divide the students into partners, and then hand out the pattern blocks and Utah Bakery Cakes, and Specialty Cake Template (one per student).
2. Ask the students to make a pile of the 4 different shapes: equilateral triangle, parallelogram, trapezoid, and hexagon. Once they have pulled out the correct shapes, ask the students to construct the specialty cake.
3. Read or have the students read over the Utah Bakery Cakes to find the information about their cakes. They are only completing \#1 on this paper.
4. Remind them that the specialty cake is made up of at least 2 of each of the different shapes or at least 2 of each of the different kind of cakes.
5. Have students begin to construct their specialty cake. As the students are working on their cake wander around to hear what struggles and what celebrations the students are having.
6. As the students complete their specialty cake on their Specialty Cake Template have them trace each of the geometric pieces in their large triangle.
7. As you are monitoring the students' progress, invite the students to find the shape that fits in all of the other pieces. The common piece is the tool to find the fractional value of each piece.
8. Students now find the fractional part of the different types of cakes. Now invite the students to write a paragraph (on the bottom of Specialty Cake Template) outlining how they came to their conclusion, what was difficult about the activity and what was easy. What patterns did they see with the different geometric parts? Also, ask them to include any mathematical connections they might have to this activity.
9. As the partners both complete their own writing on the Specialty Cake Template give each group one transparency and an overhead marker to recreate their own "specialty cake" to share with the class.
10. For those students who quickly finish, ask them to find the cost of the cake. If time allows provide them with another Specialty Cake Template to see if it is possible that their specialty cake looks different. (Average value of gourmet cake is $\$ 8.50$ )
11. Once all the students have constructed their specialty cakes and are ready to share, ask each group to come up and share how they figured out their cake, and what patterns they noticed. 12. When all the groups have shared, ask the students to draw connections between the positioning of the pattern blocks, what was similar between most solutions, and what differences they noticed between the solutions. Invite them to share something they noticed with the geometric parts or fractions they noticed.
12. For those students who were asked to find the cost of the specialty cake, have them share the cost of the specialty cake.
13. Gather the Specialty Cake Template and Utah Bakery Cakes from the students, which can be used as an assessment on their mathematical thinking as well as an insight to the struggles of the students.

Day 2 :
15. Review the previous day's activities by reading a couple of paragraphs written by the students the previous day, talking about their experience with the specialty cakes.
16. Have the students get with their partner from the day before and hand out the pattern blocks, return their Utah Bakery Cakes, and hand out the Bargain Cake Template.
17. Students are to complete the 2nd task of creating the bargain cake.
18. Monitor and observe as the students are constructing their cakes. Have them follow the same routine as day one. Once their triangle is constructed, ask them to find the value of the bargain cake. (Note: if the value is not $\$ 8.00$ they need to try again).
19. While the students are working in small groups, look for groups that realize that all of the pieces can be made using the small equilateral triangle. The trapezoid is made up of 3 small equilateral triangles. The parallelogram is made up of two of the small equilateral triangles and the hexagon is made up of 6 of the small triangles. This will be the springboard for the conversation at the end of the lesson. If the students are struggling, ask them how they could make the shape of a lemon cake without using the hexagon. (You can repeat this process with the different pieces).
20. Once they have their bargain cake completed ask them to trace the geometric shapes on their Bargain Cake Template. They will then trace their solution on a transparency.
21. Have the students find the fractional parts of the cake.
22. Once all or the majority of the class has completed the second cake ask for the teams to share.
23. Invite the students to look for similarities and differences in how students figured out the economical cake.
24. Invite the students to write a paragraph(on the bottom of Bargain Cake Template) outlining how they came to their conclusion, what was difficult about the activity and what was easy. What patterns did they see with the geometric parts? Also ask them to include any mathematical connections thy might have to this activity.
25. Lead a discussion about equivalent shapes and how the students determined whether it was better to use the smaller shapes or the larger shapes.

## Extensions

Curriculum Extensions/Adaptations/ Integration
Ask your fast finishers to find the decimal part of each of the shapes, the fractional part, and the percentage of each different shape.
For your learners with special needs, partner them with a competent students that can help them construct their triangle. Provide a template with some of the pieces already in place. Have them tell you what they did so solve the problem and then either write it down for them, or accept their explanation for their assessment.
Social Studies and George Washington 40 egg cake.
Science with physical and chemical change.
Family Connections
As a homework assignment or extra credit Have the students and parents cook or bake something that requires using fractions.
Have the parents and students come up with 10 different ways they use fractions in their house.

## Assessment Plan

Anecdotal Notes / Observation: Using a clipboard and sticky notes document your students' mathematical thinking. Use a checkmark plus, checkmark, or a checkmark minus to show whether students are reaching the benchmark,
Review student's paragraphs on Specialty Cake Template, and Bargain Cake Template. Informal Observation/ Interviews: Prepare questions to find out their mathematical thinking

## Bibliography

Research Basis
Simon, M.A., Tzur, R. (2004). Explicating the role of mathematical task in conceptual learning: An elaboration of the hypothetical learning trajectory. Mathematical Thinking and Learning 6,(2),91-104.
This article focuses on the need of worthwhile tasks and the value that comes in mathematical understanding when they students are given appropriate opportunities to develop their mathematical understanding. Simon went on to say:
This emphasis is based on the idea that if students are challenged at an appropriate level with nonroutine tasks, they develop their cognitive abilities and engage in rich mathematical conversations. Indeed if more time were spent in classrooms with students engaged in working on cognitively demanding non-routine tasks, as opposed to exercises in which a known procedure is practiced, students' opportunities for thinking and learning would likely be enhanced (p.92).
Charles, K., Nason, R., \& Cooper, T. (1999). Mathematical analogs and the teaching of fractions. ERIC \# ED469872. Retrieved December 31, 2007 from eric.ed.gov.
In this study, 3rd grade students were given 30 facilitated activities where they focused on three factors: ecological validity for the children, abstraction ability encompassing the quality and the quantity of interrelated tasks and the quality of portioning strategies and finally the ease of partitioning. Results suggested that for the activities used in this study to be educationally effective in teaching partitive quotient fractions, teachers need to address all 3 factors.

## Authors

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