

Utah's Largest Math Event 2008-2009
Wonderland Map
3rd/4th Grade

Standard II: Students will use number patterns, symbols, operations, and properties of addition and multiplication to represent and describe simple number relationships.

3rd Objective 2: Recognize, represent, and simplify simple number relationships using symbols, operations, and properties.

4th Objective 2: Uses algebraic expressions, symbols, and properties of the operations to represent, simplify, and solve mathematical equations and inequalities.

Intended Learning Outcomes:

1. Develop a positive learning attitude toward mathematics.
2. Become effective problem solvers by selecting appropriate methods, employing a variety of strategies, and exploring alternative approaches to solve problems.
3. Reason logically, using inductive and deductive strategies and justify conclusions.
4. Communicate mathematical ideas and arguments coherently to peers, teachers, and others using the precise language and notation of mathematics.
5. Connect mathematical ideas within mathematics to other disciplines and to everyday experiences.
6. Represent mathematical ideas in a variety of ways.

Background Information

Learning with understanding is essential to mathematical literacy. Mathematical literacy is having procedural and computational skills as well as conceptual understanding. Mathematical proficiency has five interwoven and interdependent strands: understanding, computing, applying, reasoning, and engaging (National Research Council 2002). This activity is intended to promote mathematical literacy and proficiency within your students.

Materials

Copies of "Wonderland Map #1" for each pair of students
Copies of "Wonderland Map #2" for each student
Cubes or other manipulatives

Invitation to Learn

'Cheshire Puss,' she began, rather timidly, as she did not at all know whether it would like the name: however, it only grinned a little wider. 'Come, it's pleased so far,' thought Alice, and she went on. 'Would you tell me, please, which way I ought to go from here?'

'That depends a good deal on where you want to get to,' said the Cat.

'I don't much care where—' said Alice.

'Then it doesn't matter which way you go,' said the Cat.

'—so long as I get somewhere,' Alice added as an explanation.

'Oh, you're sure to do that,' said the Cat, 'if you only walk long enough.'

Alice felt that this could not be denied, so she tried another question. 'What sort of people live about here?'

'In that direction,' the Cat said, waving its right paw round, 'lives a Hatter: and in that direction,' waving the other paw, 'lives a March Hare. Visit either you like: they're both mad.'

'But I don't want to go among mad people,' Alice remarked.

'Oh, you can't help that,' said the Cat: 'we're all mad here. I'm mad. You're mad.'

‘How do you know I’m mad?’ said Alice.

‘You must be,’ said the Cat, ‘or you wouldn’t have come here.’ (*Alice’s Adventures in Wonderland* Chapter 6, Lewis Carroll)

Alice needs help figuring out the map so she can decide where to go next. When she arrived in Wonderland she noticed there were bridges that connected the different areas. On the map, it lists the number of houses from the two areas the bridge connects. It also indicates the total number of houses on all the sections. Your job is to figure out how many houses go in each section.

Instructional Procedures

Activity 1

Illustrate the situation on the board or make a transparency of “Wonderland Map”, and guide the students reasoning about the situation by asking the following questions:

- If 15 houses are supposed to be on Mad Hatter Village and Queen’s Courtyard all together, what are some combinations that might work? (e.g. 5 on Mad Hatter Village and 10 on Queens’ Courtyard)
- Now, on Mad Hatter Village and Main Square there need to be 12 houses all together. How many houses need to go on Main Square? (e.g. 7)
- OK, let’s list all the houses: 5 houses on Mad Hatter Village, 10 houses on Queen’s courtyard, and 2 houses on Main Square. Does that work?
- Demonstrate reasoning on the board while verbalizing it:
Mad Hatter Village + Queen’s Courtyard + 15 \Rightarrow 5 + 10 = 15
Queen’s Courtyard + Main Square = 12 \Rightarrow 10 + 2 = 12
Mad Hatter Village + Main Square = 17 \Rightarrow 5 + 2 \neq 17

Oops! It doesn’t check. Also, 5 houses (Mad Hatter Village) + 10 houses (Queen’s Courtyard) + 2 houses (Main Square) \neq 22, the total number of houses required for the three sections. We need to try another set of values.

Distribute copies of “Wonderland Map #1” as well as the manipulatives. Give the students time to work on the task in pairs. Make sure the students keep a record of their tentative solutions to avoid repeating equations that do not work. The use of manipulatives should facilitate the trial-and-error method.

When students have completed the activity, pull them back together for a whole group discussion. Ask the following questions:

- What were some combinations you used? (Record these on the board.)
- What were some methods you used for solving the problem?
- What is a method for finding the number of houses without having to use the trial-and-error approach?
- Do you see a pattern for finding the number of houses on each section? What is it?

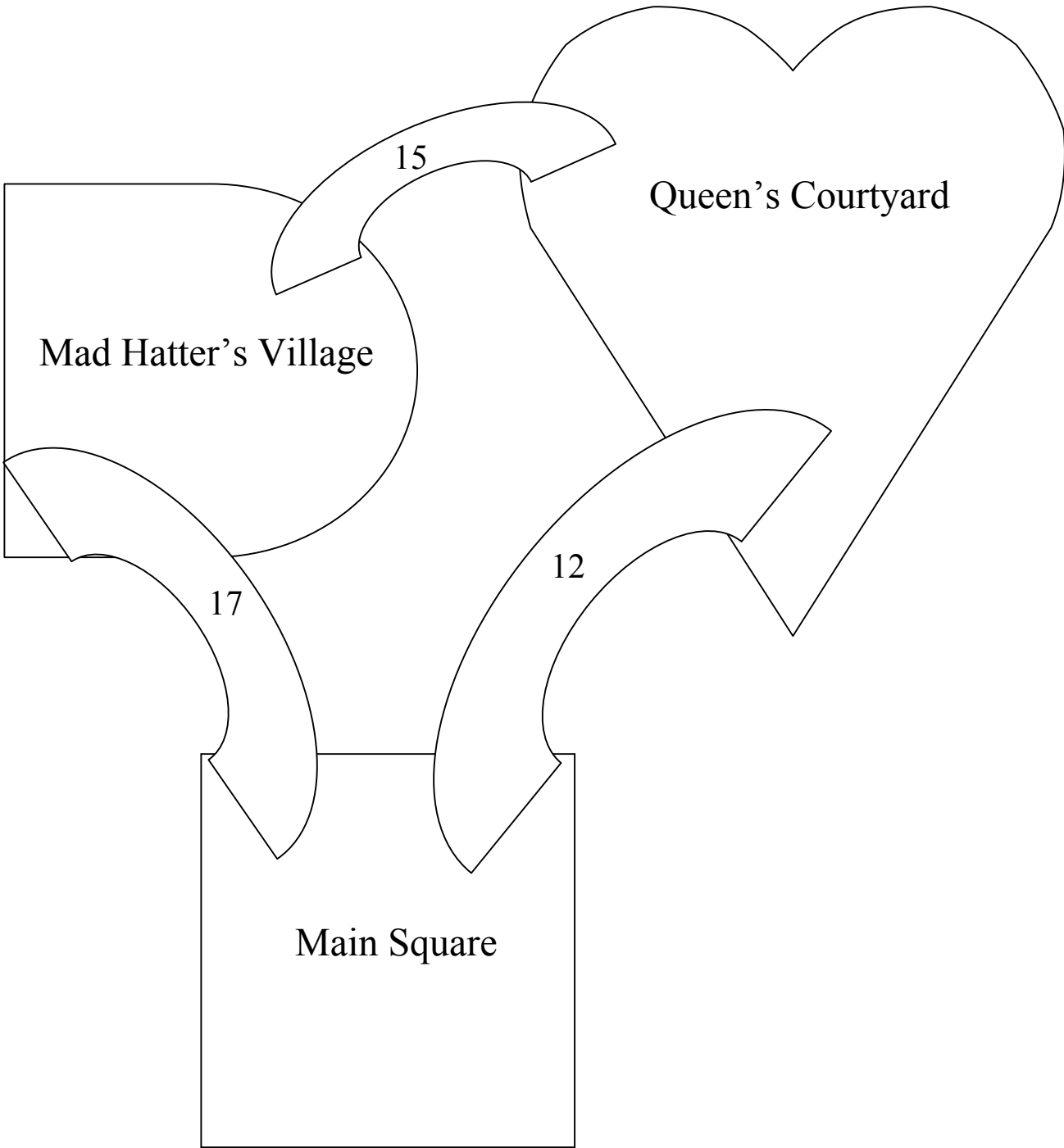
Activity 2 (Qualifying Problem for ULME)

Distribute the copies of “Wonderland Map #2” as well as the manipulatives. Give the students time to work on the task individually.

Students must explain their thinking in words and pictures by:

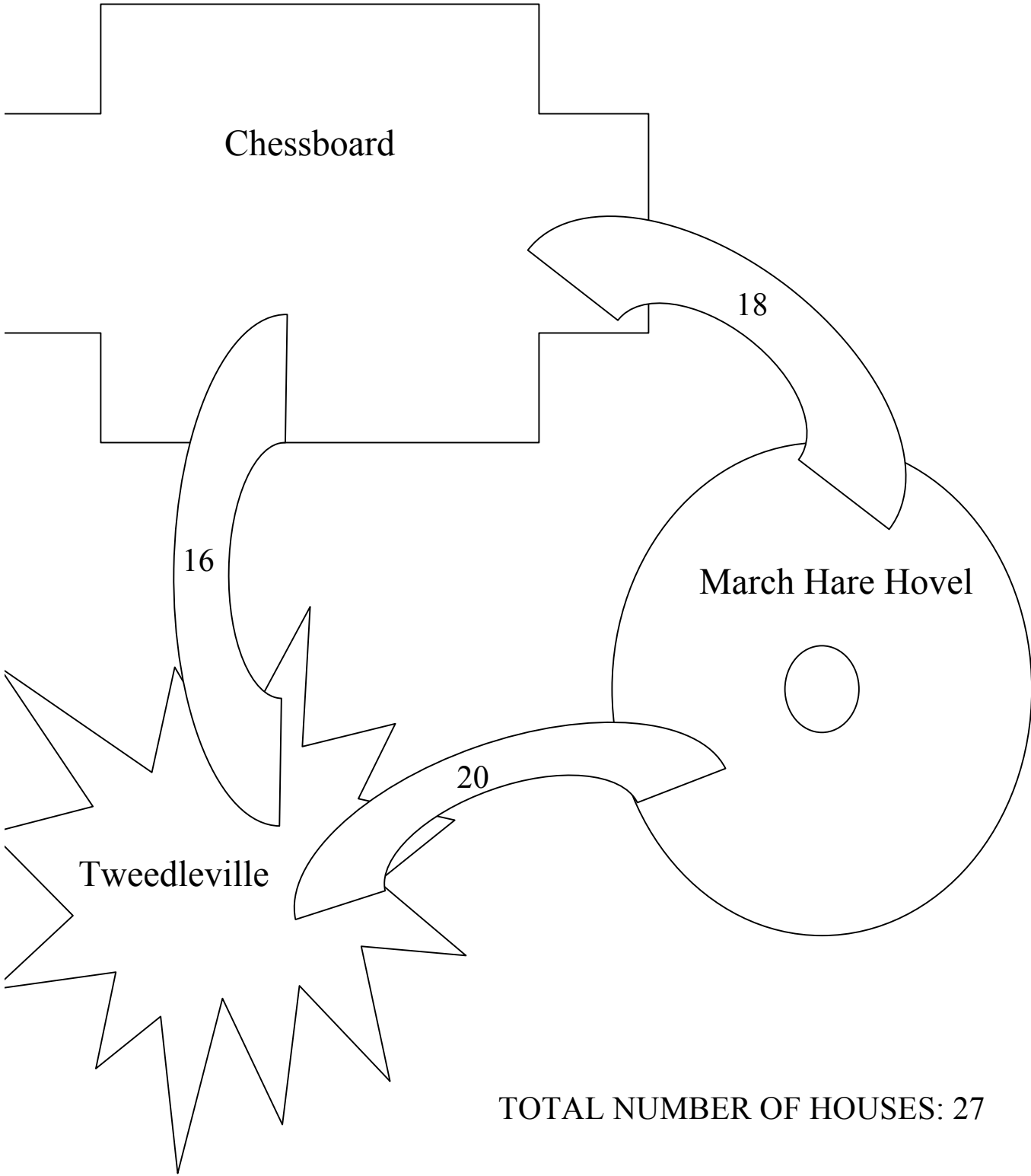
1. Producing a visual representation of possible combinations.
2. Writing a description of the reasoning and justification of the process they used as well as their solution.

Wonderland Map #1
Utah's Largest Math Event (warm-up)



TOTAL NUMBER OF HOUSES: 22

Wonderland Map #2
Utah's Largest Math Event (qualifier)



TOTAL NUMBER OF HOUSES: 27

Show all the combinations you tried.

How did you find the number of houses? Explain your thinking using words and/or pictures.