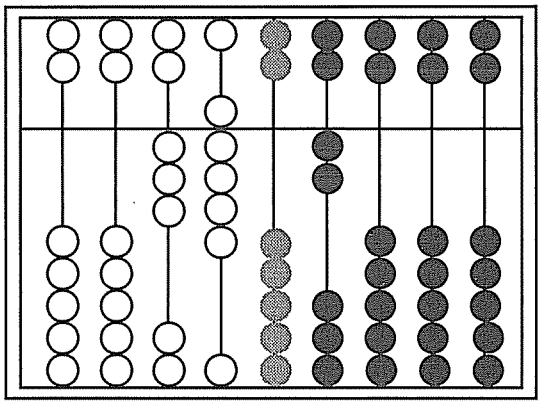
# Abacus

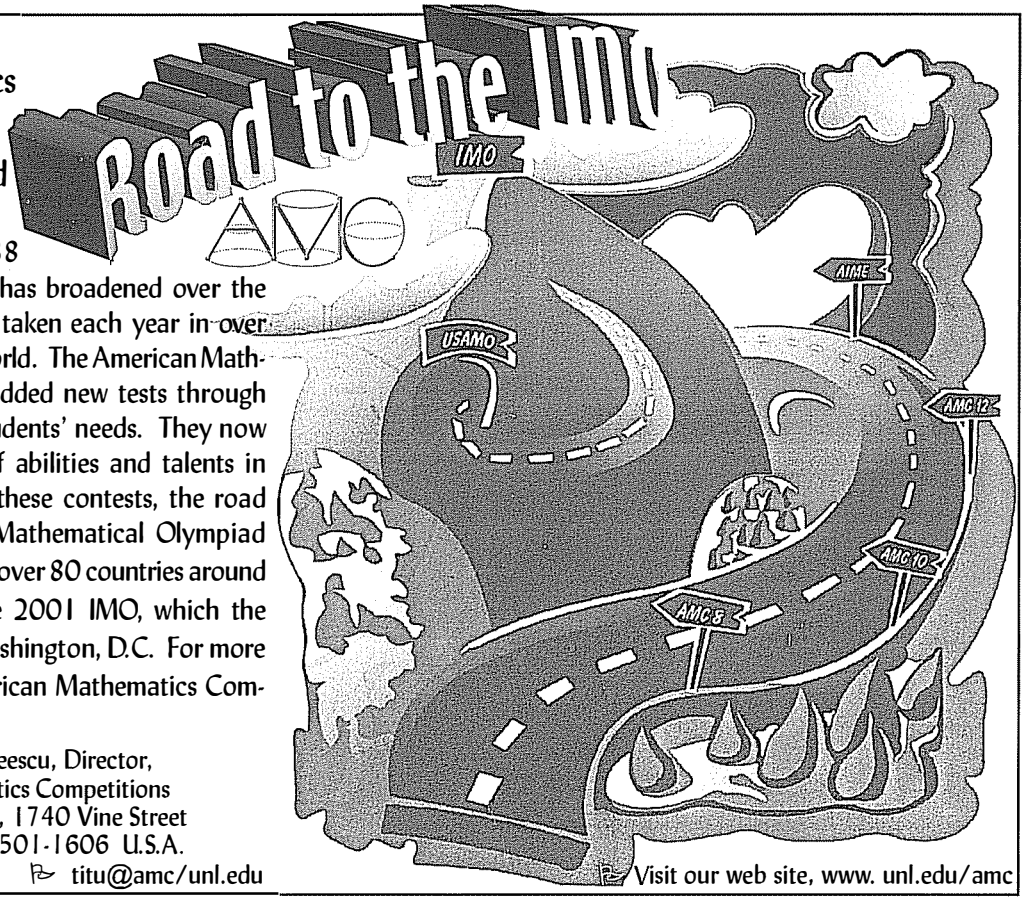
Volume 39 2000



ONTARIO ASSOCIATION OF MATHEMATICS EDUCATORS

**Volume 39 Number 1**
**September 2000**
**A Publication of the OAME/AOEM**
Edited by Frances Schatz

For over 50 years the American Mathematics Competitions have sharpened and opened students' minds. The path that began in 1950 with 238 schools in New York State has broadened over the years to include 5 contests taken each year in over 8,200 schools around the world. The American Mathematics Competitions has added new tests through the years, to better serve students' needs. They now challenge the wide range of abilities and talents in our young people. From these contests, the road leads to the International Mathematical Olympiad (IMO). In July, students from over 80 countries around the world will travel to the 2001 IMO, which the United States will host in Washington, D.C. For more information about the American Mathematics Competitions contact:




Prof. Titu Andreescu, Director,
American Mathematics Competitions
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Visit our web site, www. unl.edu/amc

# ▲ From the Editor's Desk

*Geometry Through the House*, by **Laurie Moher** and the JK-5 Committee, links to the June 2000, *Gazette* article, "Encouraging Mathematics Communication in Children". It is an explanation of the activities described in the journal entry samples cited in the article. This unit incorporates a number of mathematical strands. Sufficient time must be given for the students to internalize the language and concepts in this unit.

## Overall Expectations

*(reprinted with permission from the Ontario Curriculum, Grades 1-8 Mathematics 1987)*

### GRADE 2

***Geometry and Spatial Sense***

- investigate the attributes of 3-D figures and 2-D shapes using concrete materials and drawings
- understand key concepts in transformational geometry using concrete materials and drawings
- use language effectively to describe geometric concepts, reasoning, and investigations

***Patterning and Algebra***

- identify, extend, and create number, geometric, and measurement patterns, and patterns in their environment
- explore patterns and pattern rules
- identify relationships between and among patterns

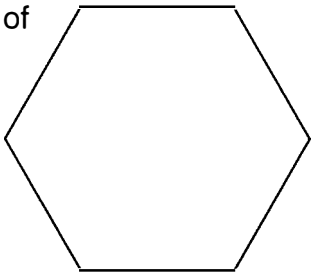
### GRADE 3

***(all of the above Grade 2 Expectations plus)***

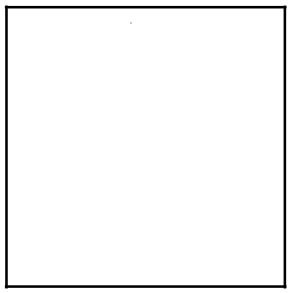
- explore transformations of geometric figures
- recognize that patterning results from repetition
- identify, extend, and create linear and non-linear geometric patterns, number and measurement patterns, and patterns in their environment.

***Mathematics Language***

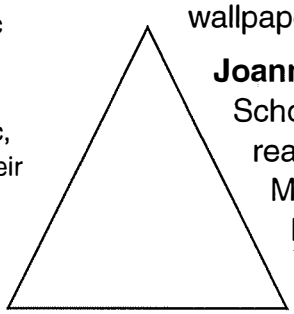
- 3-D (three dimensions)
- 2-D (two dimensions)
- Hexagon
- Square



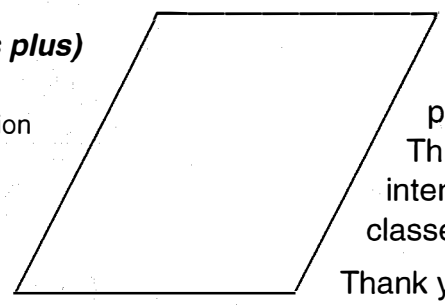
- Turn, rotate
- Symmetry-line, rotational
- 2x2 quilt
- Triangle
- Slide
- Pattern
- Repeat
- Core unit
- Rhombus
- Parallelogram
- Flip
- Design
- Motion



The students should be informed that at the end of the investigation journals, they will be using shapes cut from wrapping paper or wallpaper to create a core unit and a quilt.



**Joanne Harris**, Centennial Middle School, Georgetown, provides *Abacus* readers with a very interesting Data Management and Probability Performance activity. During the past year, Joanne had her class studying Ontario Hockey League (OHL) statistics. In the December *Abacus*, you will see some results produced by her students. This activity will be most interesting to grade six -eight classes.



Thank you Laurie, OAME JK-5 committee, and Joanne for providing hands-on mathematics for our elementary teachers and their students.

Frances Schatz

# ▲ Geometry Through the House

*By Laurie Moher and the JK-5 Committee*

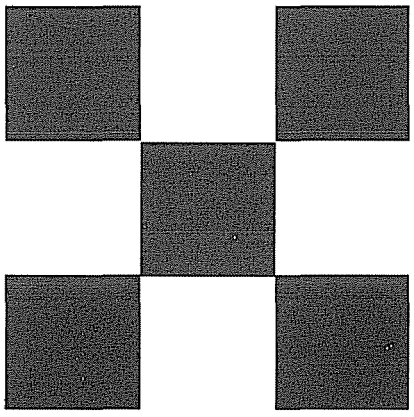
## Teacher Notes

### Journal 1 Investigation

Read Selina and the *Bear Paw Quilt* by Barbara Smucker with the students. When you have finished reading the book, go over the illustrations again and have the students look for the two-dimensional shapes that were used to create each quilt. Other children's books, craft books or craft magazines could be substituted for this story. Select a page in the book where a pattern has been repeated several times. Ask the students if they notice any patterns. Have them describe in their own words what they see. Record their observations on a chart for later reference. Each student can then write a journal note.

### Journal 2 Investigation

Work with pattern blocks and/or tangrams. Have the students make patterns with the shapes and compare the shapes according to how many sides and vertices they have. Activity books such as *Pattern Animals* are useful for this investigation because the books provide puzzles in the shapes of animals that the students fill with pattern blocks.



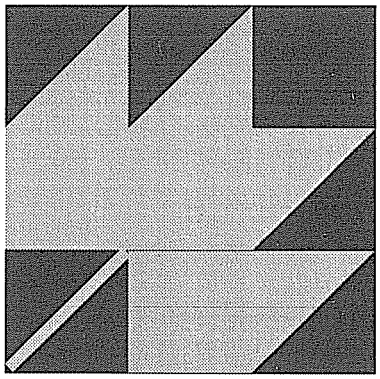
### Journal 3 Investigation

Have students work with a partner. Use books or magazines that have floor tiles or quilts to observe. Describe the quilt or floor tile patterns according to the following prompts:

- What shapes have been used in the quilts (or floors)?
- How have the shapes been used to make patterns?
- How has colour been used to make patterns?

Put a picture on the journal page and complete the chart.

### Journal 4 Investigation

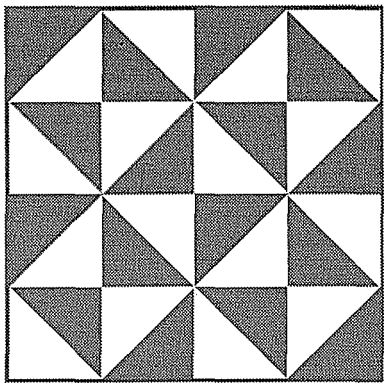


Students work with four triangles and find all the different shapes that can be made using the four triangles. The triangles must touch on one side, they cannot be joined at the vertices.

At the end of the investigation time, call the group together and have them talk about their discoveries. The teacher and some students will be able to lead the class to see that some of the shapes are the same; they have just been rotated.

Create a class chart of the different shapes that can be made with four triangles. Reinforce the language "flipped, turned, or rotated".

For the journal, have the students repeat this activity on their own using five triangles. Have the students record their discoveries in the journal. How do you know you have found all the shapes that can be made with five triangles?



## Journal 5 Investigation

This investigation assumes some prior experience with symmetry. Provide a background paper that is 8 cm x 8 cm. Have students create several 4 cm x 4 cm squares using two different colours of paper. Pose the questions.

How many different core units can be made using two colours?

Which of the core units are symmetrical?

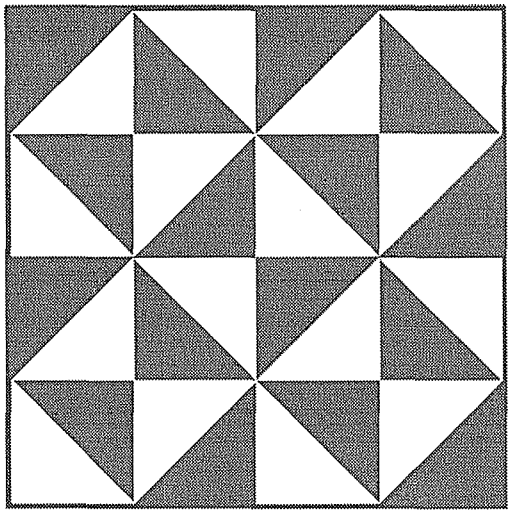
How do you know they are symmetrical?

Cut the squares into triangles. After the students have had sufficient time to investigate the various arrangements of the triangles, have them create their favourite design, draw it on their journal page, and name their design. Share the designs with others in the class, explaining what shapes they have used, where they have used flips, slides or turns, and where there is symmetry. The students will notice that some people have the same core unit but the final design looks different. Discuss why this happens, reinforcing the language of transformational geometry.

## Investigation 6 - Assessment Activity

Return to the book used in Investigation 1. Students will be able to look at the quilts in the book with the knowledge they have gained throughout the unit. Add this new information to the chart made at the beginning.

Ask the students to create a core unit and a quilt using construction paper, wrapping paper, or wallpaper. The students will still need their 8 cm x 8 cm background papers, 4 cm x 4 cm squares, and 4 cm x 4 cm squares cut into quarters to create smaller triangles to use.



## RESOURCES


Birmingham, Duncan. *'M' is for Mirror*, Tarquin Publications, 1988. ISBN 0-906212-66-9

Burns, Marilyn. *The Greedy Triangle*, Scholastic, Inc., 1994. ISBN 0-590-48992-5

Cobb, Mary. *The Quilt-Block History of Pioneer Days,* The Millbrook Press, 1995. ISBN 1-56294-692-7

Friedman, Aileen. *A Cloak for the Dreamer,* Scholastic Inc., 1994. ISBN 0-590-99698-3

Mogensen, Sandra. *Pattern Animals, Puzzles for Pattern Blocks.* Cuisenaire, 1986. ISBN 0-914040-46-4

Paul, Ann Whitford. *Eight Hands Round,* Harper-Collins Publishers, 1991. ISBN 0-06-024704-5

Sharman, Lydia. *The Amazing Book of Shapes,* Scholastic, 1994, ISBN 0-590-24306-3

Smucker, Barbara. *Selina and the Bear Paw Quilt,* Stoddart Publishing, 1995. ISBN N-0-7737-5837-2

Walter, Marion. *The Mirror Puzzle Book,* Tarquin Publications, 1985. ISBN 0-906212-39-1

Yenawine, Philip. *Shapes,* The Museum of Modern Art, New York/Delacorte Press, 1991. ISBN 0-385-30255-X

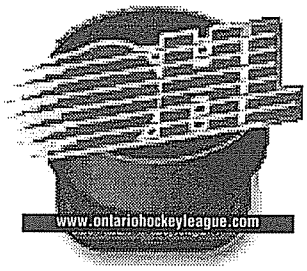
Web Site:
http:www.nmt.edu/~breynold/quiltfiction_kids.html

# ▲ Data Management and Probability Performance Task

*by Joanne Harris*

## Teacher Notes

This task, given to my students as a performance task after they had completed the unit on probability, could be used with a variety of sports. As a major fan of the *Ontario Hockey League* I selected their play-offs to use for this project. Hockey is a sport that most of my students know; however, many of the students were unfamiliar with the players and the team stats. The Ontario Hockey League has a web site **http://www.ontariohockeyleague.com/** that can be used to access a wide variety of statistics ranging from individual records to team vs team match ups during the regular season, to winning streaks etc. I also had recent issues of *The Hockey News*, a newspaper/magazine that is devoted to hockey information, in the classroom. Depending on your location, the daily newspaper would also be useful. Some of the assumptions include that students understand the game and what constitutes a winning team, that students understand how the play-offs are structured and that students have access to the statistical data they can use to make a prediction.




The specific expectation is to apply a knowledge of probability in sports by systematically collecting, organizing and analysing primary data, then interpret displays of data and present the information using mathematical language.

The students work in teams to make their predictions. Encourage the students to think carefully about the make-up of their team. What frequently happens is an academically sound pair of students teams up with a less academically sound but more sports knowledgable pair.

The awarding of prizes as well as grades seemed to be in keeping with the task and is a popular addition to the task. All the predictions were sealed in an envelope and we kept a large wall chart in the classroom, to track the progress of the play-offs.

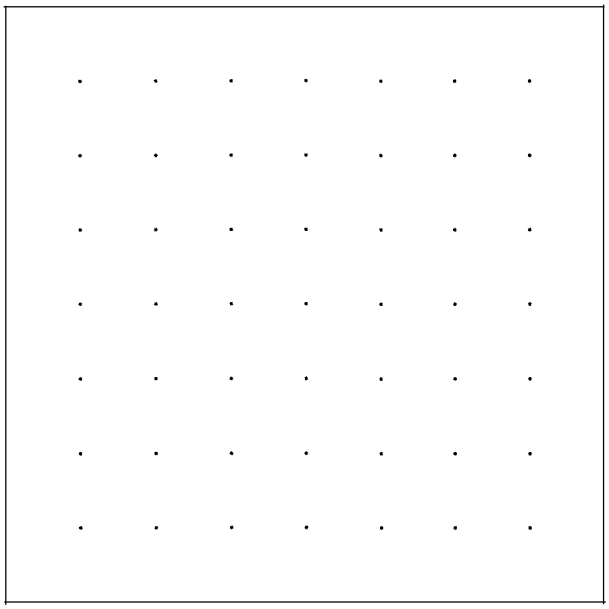
It should be noted that timing is critical for working on this project and handing it in. The teams involved in the play-offs and their first round match ups must be known but the games shouldn't have started before the due date. Our due date was six days after the play-offs began and most teams had played a maximum of two out of a possible seven game schedule. Everyone won something and the students who demonstrated an understanding of probability were rewarded with a high performance rating.

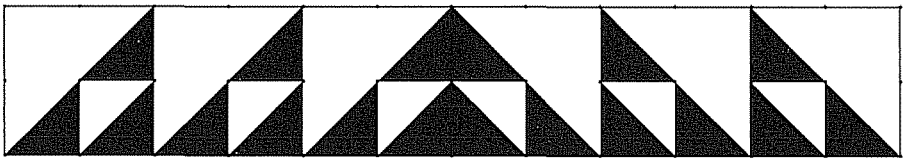



The marking scheme on page 11 is the one I used for this assignment.

## Quilt Journal 1

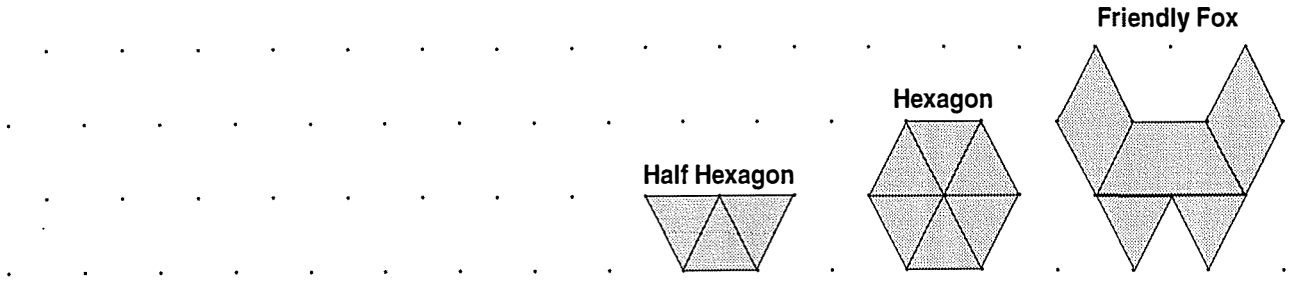
What I know about quilt patterns. Draw and write a story.

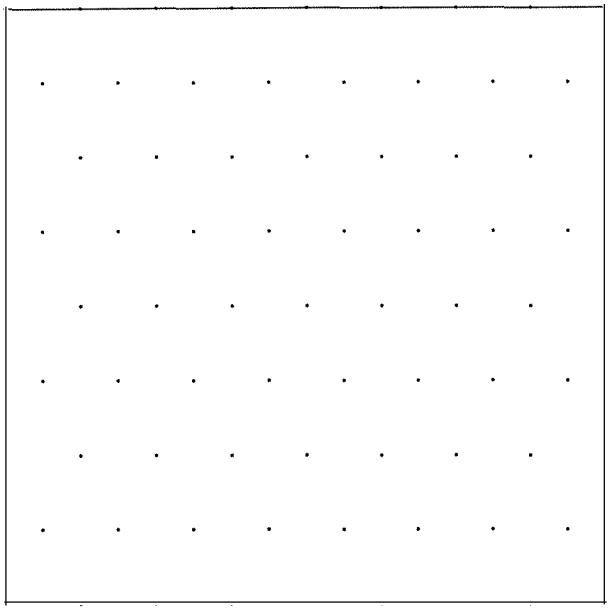


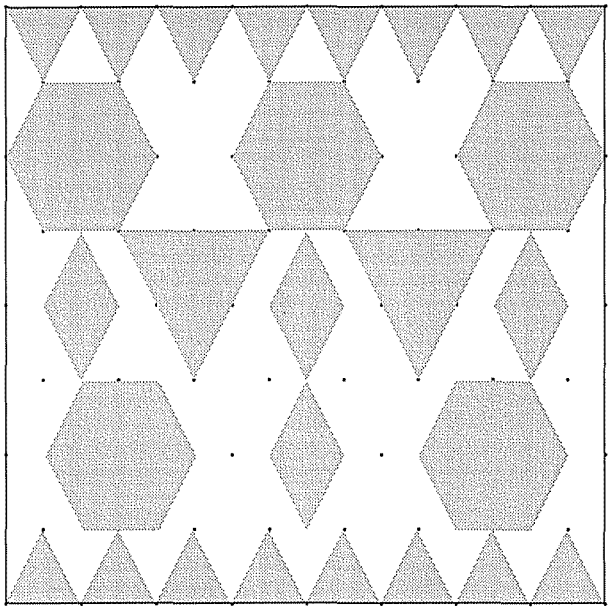


## Quilt Journal 2 - 3

Here are my pattern shapes.

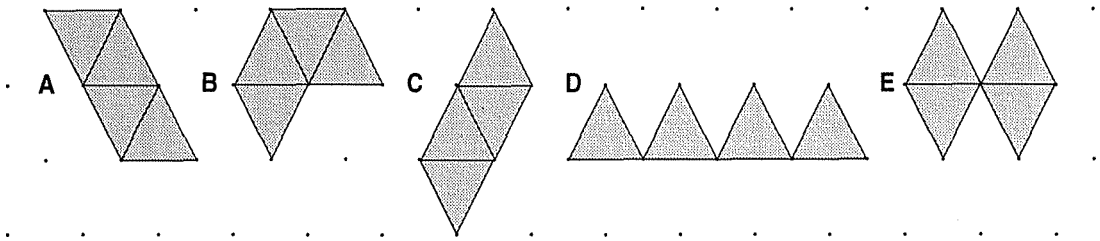




| Name of Shape | Number of Shapes | Number of Sides | Number of Vertices |
|---|---|---|---|
| triangle | 1 | 3 | 3 |
| Half Hexagon | | | |
| Hexagon | | | |
| Friendly Fox | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## Quilt Journal 4




C is a flip, slide, and a turn of A.

## Quilt Journal 5

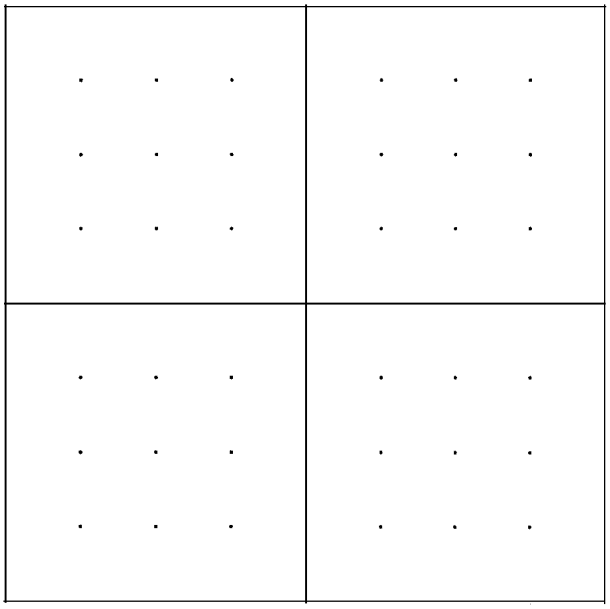
(see sample of core unit)

(provide cutting lines for four squares that are 4 cm x 4 cm in two different colours)

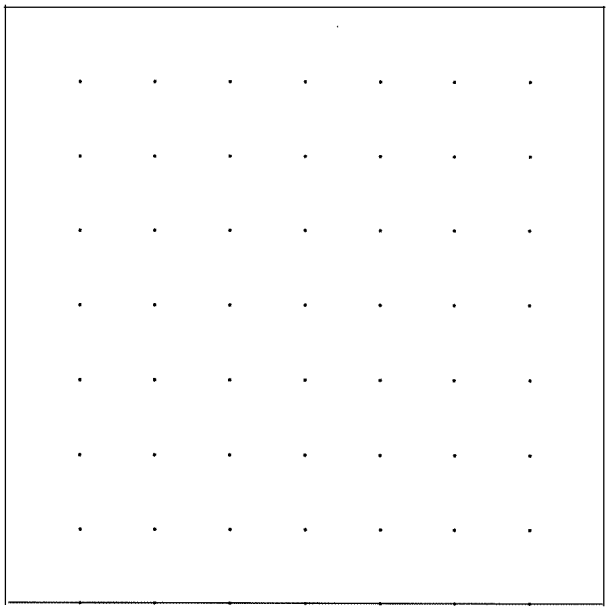
1. Draw all the possible core units.
2. Which of the core units are symmetrical?
3. I know _____ is symmetrical because _____ .

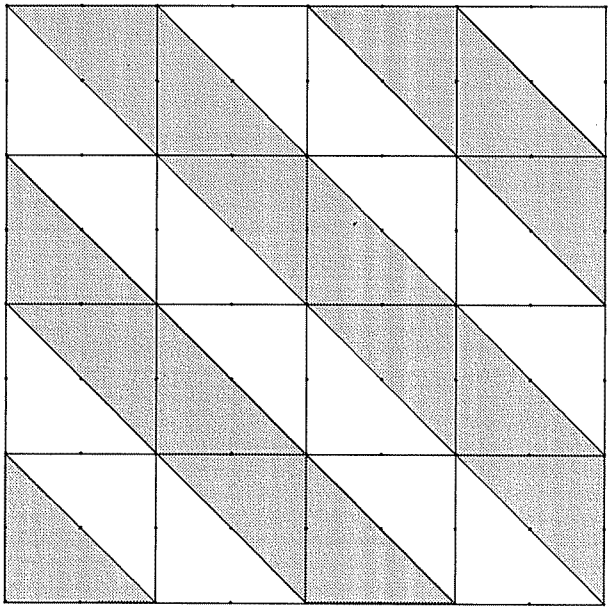
(cut the four squares into triangles)

Draw a core unit that uses some or all of the triangles.

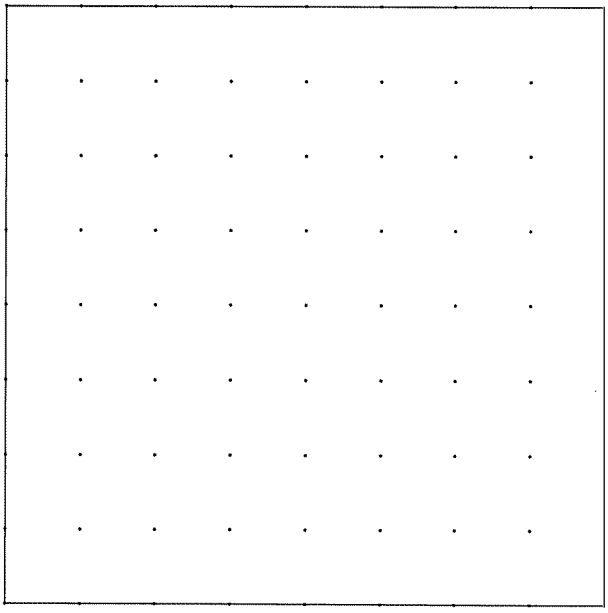


**Core Unit**





**Opposite Stripes**

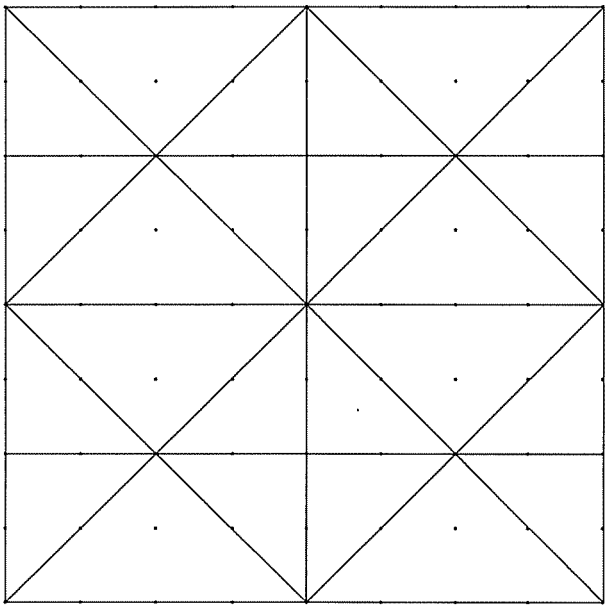


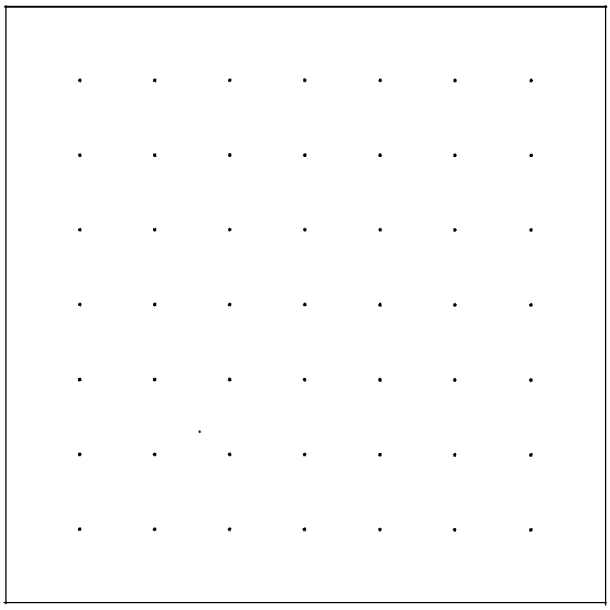
## Quilt Journal 6 - Assessment Activity

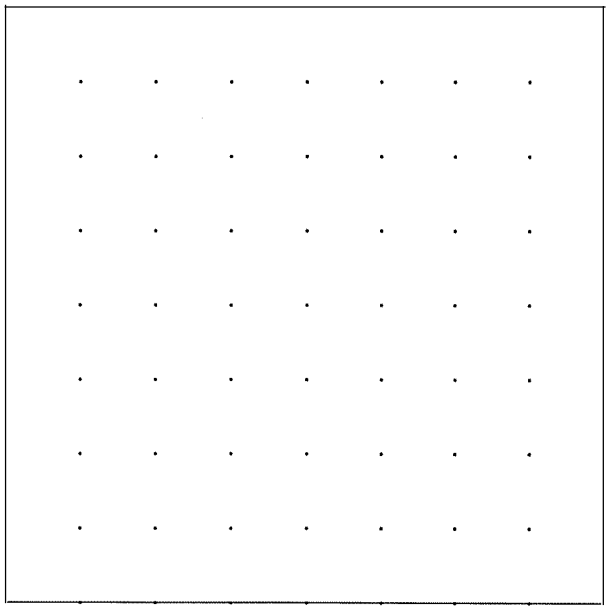
(provide the 8cm by 8 cm background paper, squares and triangles of Journal 5)

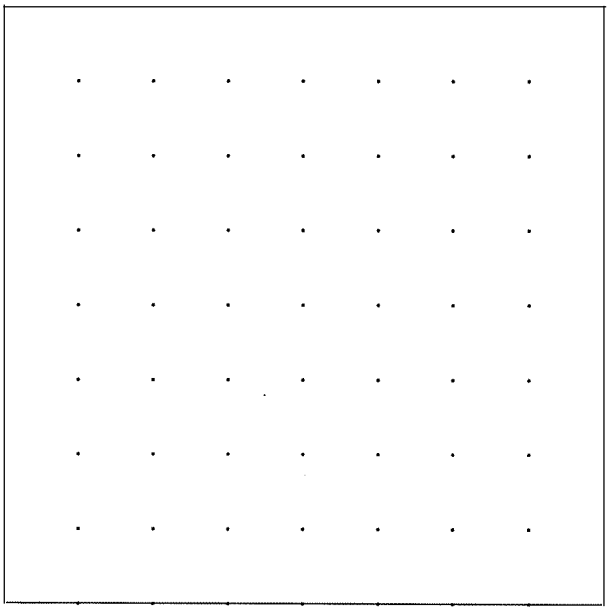
Use the squares, triangles, or small squares and triangles to make a core unit. Make the unit 5 more times. Arrange the core units to make a quilt. Your quilt must have symmetry somewhere in it. On your journal explain what shapes you used in your quilt and how you used flips, slides or turns to make your design.

Give your quilt design a name.









# ▲ Data Management and Probability Assignment

Group Members: _____

Class: _____

Prediction: _____

Second Choice: _____

| | |
|---|---|
| Stated prediction in % | /1 |
| Project handed in on time | /2 |
| Reasons given for choice | /3 |
| Logic clearly explained | /2 |
| Predicted result | /3 |
| Predicted runner-up | /2 |
| Predicted one of the four semi finalists | /1 |
| Assignment was word processed | /2 |
| Graphics or charts were used | /2 |

Comments: _____

_____

_____

_____

Total /15

# ▲ Data Management and Probability Group Assignment

### Overall expectations

- systematically collect, organize and analyse primary data
- interpret displays of data and present the information using mathematical terms

### Specific expectation

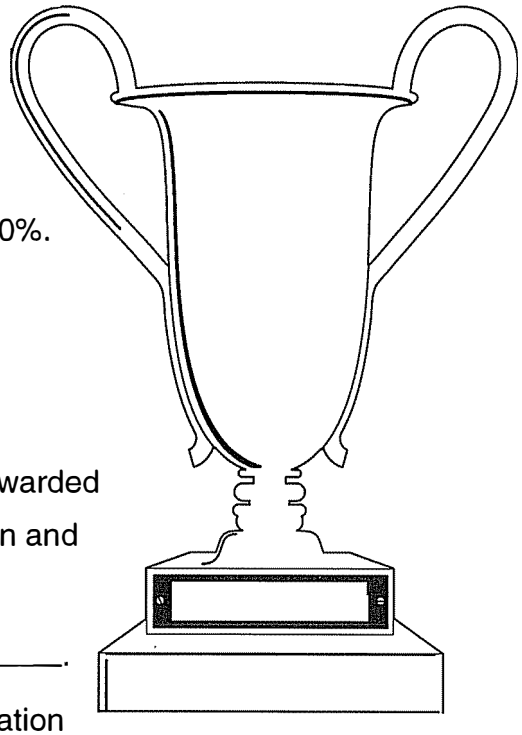
- apply a knowledge of probability in sports

Many popular sports have a regular session followed by a playoff season.

Use your knowledge of probability to predict which team will eventually win the Ontario Championship and represent Ontario in the Memorial Cup Championship.

Work in a team of four to create your prediction. Use your knowledge of the sport, specific knowledge of the playoff schedule, and knowledge of special circumstances (eg. The team's leading scorer out for the first round with a broken finger) to help make your predictions.

Hint: you might want to check the regular season records between specific teams.



State your probability for each team in this year's playoffs to eventually be declared the Ontario League Champion. Remember to state your probability in percent from 0% to 100%.

Identify the factors your group used to make its probability predictions.

Try to keep your team's prediction confidential.

Prizes (Skittles[tm]) and high performance level rating will be awarded to the most accurate prediction, the most thoughtful prediction and the most carefully documented prediction.

Playoffs begin _____.

Your probability predictions with all accompanying documentation is due _____.

Hint: check out this web site for information. **http://www.ontariohockeyleague.com/**