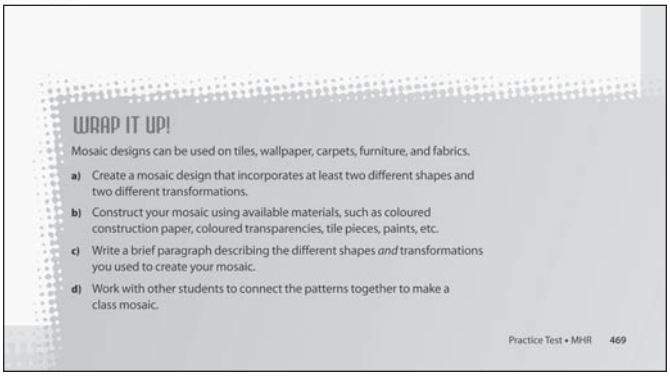
Wrap It Up!



WRAP IT UP!

Mosaic designs can be used on tiles, wallpaper, carpets, furniture, and fabrics.

a) Create a mosaic design that incorporates at least two different shapes and two different transformations.

b) Construct your mosaic using available materials, such as coloured construction paper, coloured transparencies, tile pieces, paints, etc.

c) Write a brief paragraph describing the different shapes *and* transformations you used to create your mosaic.

d) Work with other students to connect the patterns together to make a class mosaic.

Practice Test • MHR 469

***MathLinks 8*, page 469**

Suggested Timing
80–100 minutes

Materials
- construction paper
- coloured transparencies
- tile pieces
- paint
- scissors
- glue
- ruler

Blackline Masters
Master 1 Project Rubric
BLM 12–1 Chapter 12 Math Link Introduction
BLM 12–8 Section 12.1 Math Link
BLM 12–12 Section 12.2 Math Link
BLM 12–15 Section 12.3 Math Link
BLM 12–17 Section 12.4 Math Link
BLM 12–19 Chapter 12 Wrap It Up!

Specific Outcomes
SS6 Demonstrate an understanding of tessellation by:
- explaining the properties of shapes that make tessellating possible
- creating tessellations
- identifying tessellations in the environment.

Planning Notes

Throughout the Math Links in this chapter, students have been practising the skills needed to create a mosaic design that is composed of different shapes and transformations. Discuss the Wrap It Up! problem requirements and clarify the assessment criteria. Encourage students to be creative but realistic in their designs. Ensure the designs are not too complex or intricate. You may wish to provide students with additional examples of tiling patterns and mosaic designs.

WWW Web Link

To see examples of mosaics, go to www.mathlinks8.ca and follow the links.

Assessment	Supporting Learning
Assessment *of* Learning	
Wrap It Up! This chapter problem wrap-up gives students an opportunity to apply their knowledge of Escher-style tessellations. It is important for students to demonstrate understanding of which types of shapes that can be used to tile the plane and how different transformations are used to make tessellations. **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this Wrap It Up! Page 629 in this TR provides notes on how to use this rubric for the Wrap It Up!	• You may wish to have students review the work they have completed in the Math Links in sections 12.1, 12.2, 12.3, and 12.4 before they begin. • If students have not completed the Math Links, you may wish to provide them with **BLM 12–1 Math Link Introduction**, **BLM 12–8 Section 12.1 Math Link**, **BLM 12–12 Section 12.2 Math Link**, **BLM 12–15 Section 12.3 Math Link**, and **BLM 12–17 Section 12.4 Math Link**. • You may wish to have students use **BLM 12–19 Chapter 12 Wrap It Up!**, which provides scaffolding for the chapter problem wrap-up.

The chart below shows the **Master 1 Project Rubric** for tasks such as the Wrap It Up! and provides notes that specify how to identify the level of specific answers for the project.

Score/Level	Holistic Descriptor	Specific Question Notes
5 **(Standard of Excellence)**	❑ Applies/develops **thorough** strategies and mathematical processes making **significant** comparisons/connections that demonstrate a **comprehensive** understanding of how to develop a complete solution ❑ Procedures are **efficient and effective** and may contain a **minor mathematical error** that does not affect understanding ❑ Uses **significant** mathematical language to explain their understanding and provides **in-depth** support for their conclusion	• provides a complete and correct response
4 **(Above Acceptable)**	❑ Applies/develops **thorough** strategies and mathematical processes for making **reasonable** comparisons/connections that demonstrate a **clear** understanding ❑ Procedures are **reasonable** and may contain a **minor mathematical error** that may hinder the understanding in one part of a complete solution ❑ Uses **appropriate** mathematical language to explain their understanding and provides **clear** support for their conclusion	• provides a complete response to part a), and provides weak communication or justification for part c) *or* • provides a complete response to part a), but neither the shapes nor the transformations are addressed in part c)
3 **(Meets Acceptable)**	❑ Applies/develops **relevant** strategies and mathematical processes making **some** comparisons/connections that demonstrate a **basic** understanding ❑ Procedures are **basic** and may contain a **major error or omission** ❑ Uses **common** language to explain their understanding and provides **minimal** support for their conclusion	• provides a complete response to part a), and a basic response to part c) *or* • provides a partial response to all parts of the question, focusing on one shape or one design only *or* • provides designs but no justification or descriptions
2 **(Below Acceptable)**	❑ Applies/develops **some relevant** mathematical processes making **minimal** comparisons/connections that lead to a **partial solution** ❑ Procedures are **basic** and may contain **several major mathematical errors** ❑ Communication is **weak**	• completes part a) with only one shape and transformation *or* • completes part c) with minimal description
1 **(Beginning)**	❑ Applies/develops an **initial start** that may be **partially correct** or could have led to a correct solution ❑ Communication is **weak or absent**	• makes an initial start to part a) *or* • attempts to describe only one shape or transformation

Math Games

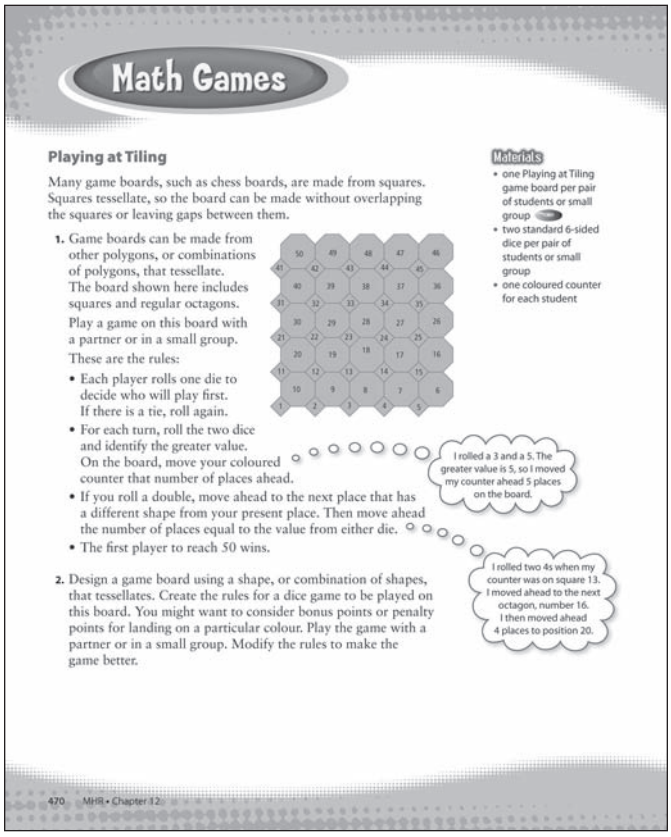
***MathLinks 8*, page 470**

Suggested Timing
40–50 minutes

Materials
- two 6-sided dice per pair of students or small group
- one coloured counter per student
- ruler

Blackline Masters
BLM 12–20 Playing at Tiling Game Board #1
BLM 12–21 Playing at Tiling Game Board #2
BLM 12–22 Playing at Tiling Game Board #3

Specific Outcomes
SS6 Demonstrate an understanding of tessellation by:
- explaining the properties of shapes that make tessellating possible
- creating tessellations
- identifying tessellations in the environment.


Math Games

Playing at Tiling

Many game boards, such as chess boards, are made from squares. Squares tessellate, so the board can be made without overlapping the squares or leaving gaps between them.

1. Game boards can be made from other polygons, or combinations of polygons, that tessellate. The board shown here includes squares and regular octagons. Play a game on this board with a partner or in a small group. These are the rules:
   - Each player rolls one die to decide who will play first. If there is a tie, roll again.
   - For each turn, roll the two dice and identify the greater value. On the board, move your coloured counter that number of places ahead.
   - If you roll a double, move ahead to the next place that has a different shape from your present place. Then move ahead the number of places equal to the value from either die.
   - The first player to reach 50 wins.

Materials
- one Playing at Tiling game board per pair of students or small group
- two standard 6-sided dice per pair of students or small group
- one coloured counter for each student

I rolled a 3 and a 5. The greater value is 5, so I moved my counter ahead 5 places on the board.

I rolled two 4s when my counter was on square 13. I moved ahead to the next octagon, number 16. I then moved ahead 4 places to position 20.

2. Design a game board using a shape, or combination of shapes, that tessellates. Create the rules for a dice game to be played on this board. You might want to consider bonus points or penalty points for landing on a particular colour. Play the game with a partner or in a small group. Modify the rules to make the game better.

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Planning Notes

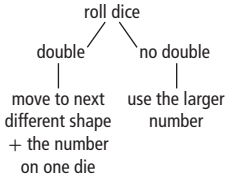
Before having students play the game, you may wish to read the directions with the class and then have a small group of students do a demonstration round to show how to play the game. Provide a copy of each game board to each pair of students or small group using **BLM 12–20 Playing at Tiling Game Board #1**, **BLM 12–21 Playing at Tiling Game Board #2**, and **BLM 12–22 Playing at Tiling Game Board #3**.

Meeting Student Needs

- Partner students with others of similar skill. Pairing students who have similar abilities will make the game more interesting.
- When designing a new game board in #2, students may benefit from discussing the differences between the game boards provided as BLMs and the one they design, and how these differences might affect the rules.

Gifted and Enrichment

- Have students work with a partner or in small groups to make up a set of rules for playing a dice game on **BLM 12–21 Playing at Tiling Game Board #2**. For example, students might consider bonus points or penalty points for landing on a particular colour. After playing the game, have students modify the rules to make the game better.

Assessment	Supporting Learning
Assessment *for* Learning	
Playing at Tiling Have students play the game with a partner or in small groups.	• Review the directions for #1. It may be beneficial for students to develop a decision tree to help them remember how to deal with different rolls.  • Have students work in small groups on #2. Some students may benefit from reviewing the shapes that tessellate.

Challenge in Real Life

***MathLinks 8*, page 471**

Suggested Timing
80–100 minutes

Materials
- construction paper
- scissors
- ruler
- coloured pencils or markers
- glue

Blackline Masters
Master 1 Project Rubric

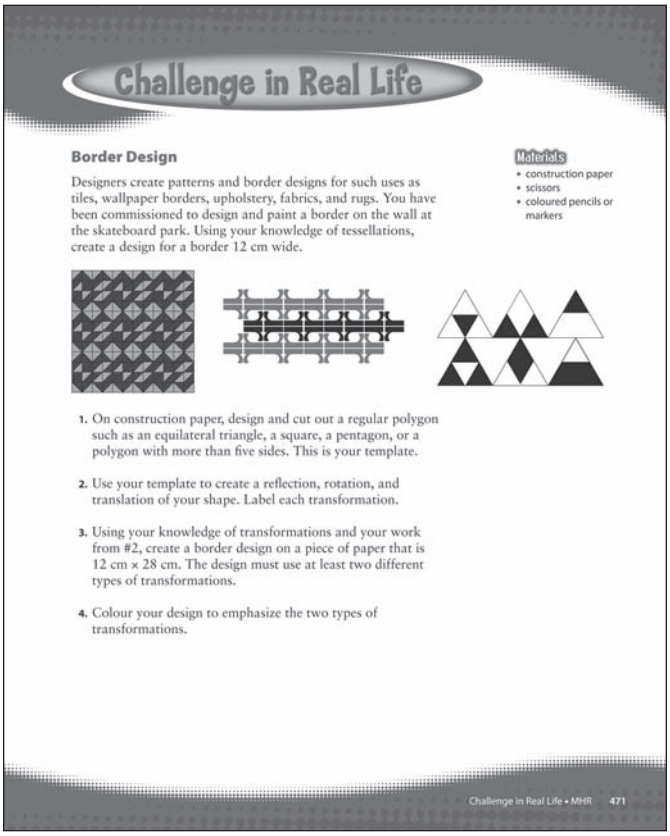
Mathematical Processes
- ☑ Communication (C)
- ☑ Connections (CN)
- ☐ Mental Mathematics and Estimation (ME)
- ☑ Problem Solving (PS)
- ☑ Reasoning (R)
- ☐ Technology (T)
- ☑ Visualization (V)

Specific Outcomes
SS6 Demonstrate an understanding of tessellation by:
- explaining the properties of shapes that make tessellating possible
- creating tessellations
- identifying tessellations in the environment.

Planning Notes

You may wish to use the following steps to introduce and complete this challenge:

1. Start with a discussion of M.C. Escher's tessellations. Show students some examples of these tessellations so they can see the interesting forms tessellations can produce. Escher wrote, "[Mathematicians] have opened the gate leading to an extensive domain, but they have not entered this domain themselves. By their very nature they are more interested in the way in which the gate is opened than in the garden lying behind it." Discuss what students think Escher meant by this quote.


Challenge in Real Life

Border Design

Designers create patterns and border designs for such uses as tiles, wallpaper borders, upholstery, fabrics, and rugs. You have been commissioned to design and paint a border on the wall at the skateboard park. Using your knowledge of tessellations, create a design for a border 12 cm wide.

Materials
- construction paper
- scissors
- coloured pencils or markers

1. On construction paper, design and cut out a regular polygon such as an equilateral triangle, a square, a pentagon, or a polygon with more than five sides. This is your template.
2. Use your template to create a reflection, rotation, and translation of your shape. Label each transformation.
3. Using your knowledge of transformations and your work from #2, create a border design on a piece of paper that is 12 cm × 28 cm. The design must use at least two different types of transformations.
4. Colour your design to emphasize the two types of transformations.

Challenge in Real Life • MHR 471

2. For #1, help students recall the features of a regular polygon. Ensure students accurately design and cut out a regular polygon to use as a template.
3. You may wish to do #2 together as a model and then have students continue with the rest of the challenge on their own.
4. Clarify that the task is to
   - create a tessellation that fills a piece of construction paper that is 12 cm × 28 cm
   - use at least two different types of transformations to create the tessellation
   - colour the design to emphasize the two transformations
5. Review the **Master 1 Project Rubric** with students so that they will know what is expected.

Meeting Student Needs

- Encourage students to create tessellations that reflect their interests or heritage.

ELL

- Ensure that students understand the meaning of the following terms: *upholstery*, *wallpaper borders*, *skateboard park*, and *template*.

Gifted and Enrichment

- Invite students to create tessellations that have at least two reflections, rotations, and translations.
- Have students choose a regular polygon, cut a piece of the polygon out, and reposition it to create a non-regular polygon to use as their template.

This challenge can be used for either Assessment *for* Learning or Assessment *of* Learning.

Assessment	Supporting Learning
Assessment *for* Learning	
Border Design Discuss the challenge with the class. Encourage students to use manipulatives to model their transformations. Discuss with the group typical ways that designers use designs. Relate these uses to tessellations.	• Coach students to remember how to create reflections, rotations, and translations of shapes. • Remind students that they must use at least two types of transformations for their design. • For a second challenge, complete with teaching notes and student exemplars, go to www.mathlinks8.ca, access the online Teacher Centre, go to Assessment, and then follow the links.
Assessment *of* Learning	
Border Design Introduce the challenge to the class. Have students work on #1 and #2 and share their answers with a partner. Then, have them complete #3 and #4 independently.	• Remind students that they must create a design that uses at least two different transformations. • **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this challenge. Page 633 provides notes on how to use this rubric for the challenge. • To view student exemplars, go to www.mathlinks8.ca, access the online Teacher Centre, go to Assessment, and then follow the links.

The chart below shows the **Master 1 Project Rubric** for tasks such as the Challenge in Real Life and provides notes that specify how to identify the level of specific answers for this project.

Score/Level	Holistic Descriptor	Specific Question Notes
5 (Standard of Excellence)	❑ Applies/develops **thorough** strategies and mathematical processes making **significant** comparisons/connections that demonstrate a **comprehensive** understanding of how to develop a complete solution ❑ Procedures are **efficient and effective** and may contain a **minor mathematical error** that does not affect understanding ❑ Uses **significant** mathematical language to explain their understanding and provides **in-depth** support for their conclusion	• provides a complete and correct solution
4 (Above Acceptable)	❑ Applies/develops **thorough** strategies and mathematical processes for making **reasonable** comparisons/connections that demonstrate a **clear** understanding ❑ Procedures are **reasonable** and may contain a **minor mathematical error** that may hinder the understanding in one part of a complete solution ❑ Uses **appropriate** mathematical language to explain their understanding and provides **clear** support for their conclusion	• provides a complete response with an error or omission in a transformation in #2 *or* • provides a complete response with weak communication (i.e., the transformations are not clearly labelled or identifiable in #2) *or* • provides a complete response based on an incorrect #1 *or* • provides a complete response but multiple colours on the design do not make it clear as to the type of transformation being identified or evident
3 (Meets Acceptable)	❑ Applies/develops **relevant** strategies and mathematical processes making **some** comparisons/connections that demonstrate a **basic** understanding ❑ Procedures are **basic** and may contain a **major error or omission** ❑ Uses **common** language to explain their understanding and provides **minimal** support for their conclusion	• provides a correct and complete #1, #2, and #3 *or* • provides a correct #1, #3, and #4
2 (Below Acceptable)	❑ Applies/develops **some relevant** mathematical processes making **minimal** comparisons/connections that lead to a **partial solution** ❑ Procedures are **basic** and may contain **several major mathematical errors** ❑ Communication is **weak**	• completes #1 and #2 *or* • completes #1 and #3 with no transformations identified.
1 (Beginning)	❑ Applies/develops an **initial start** that may be **partially correct** or could have led to a correct solution ❑ Communication is **weak or absent**	• provides a correct initial start to any part of the design *or* • provides a correct #1

For student exemplars, go to www.mathlinks8.ca and follow the links.