Teaching Mathematics in a First Peoples Context

Grades 8 and 9

A PUBLICATION OF

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The *Mathematics 8 and 9 (2008)* curriculum document is available online at www.bced.gov.bc.ca/irp/welcome.php

Unit 7: Button Blankets

Context

The button blanket is post-European contact regalia and is worn for ceremonies, such as feasts, naming ceremonies, memorials, totem pole raisings, weddings, and given as gifts within the Haida, Tsimshian, Tlingit, Nuxalk, Kwakuitl, and Nisga'a nations. A widely used term for the blankets is "Feast Wear."

Dancing in the firelight, the blanket wearer will come alive portraying a particular figure or event. Although the red, black and white colors have spiritual meanings, the button blanket was really designed for temporal reasons rather than spiritual — in other words, they represent family crests, proclaim rank, and the social status of the wearer. That status was and is reinforced by the robe's acclamation of cosmic support — power — the history of which has been validated properly and perpetuated through time."

Prescribed Learning Outcomes

This unit can be used to help students achieve the following Prescribed Learning Outcomes for Mathematics 9:

C3 demonstrate an understanding of similarity of polygons
C4 draw and interpret scale diagrams of 2-D shapes
C5 demonstrate and understanding of line and rotation symmetry

Suggested Resources

The following resources are not required but are useful for enriching this unit:

- *Learning by Designing: Pacific Northwest Coast Native Indian Art,* by Jim Gilbert and Karin Clark (see the Resources section at the end of this document for more information) — an excellent teacher resource for First Peoples design projects
- any text illustrating examples of First People button blankets and other textiles (consult with your school visual arts department)

Unit Introduction

Tell the students what the upcoming lessons will be about and the final project involved. Explain how similar polygons are also represented in First Peoples art. Show students an example of an Aboriginal blanket (e.g., Button, Star, Chikat), either by inviting someone who possesses one to bring it to the class and discuss it or by finding some examples online. Let the students know that after all of the lessons have been done, they will be using this knowledge to design and make their own Aboriginal-style blanket. There will be a couple of smaller student projects prior to the quilt making: logo design, print making activity, and mini blanket. Have examples of each project so the students know what the lessons will be leading to.

After all the lessons have been taught and the students have a grasp on the required outcomes, they will be able to design their own personal button blanket. The lesson can be extended to have the students produce a "full-size, wall quilt." This would be a good opportunity to invite Elders/community members, who have knowledge in quilt making, into the classroom to help with the designing and making of the final project.

Lesson: Similarity

The study of similarity will eventually lead to students designing a personal logo. Show a variety of logo and crest examples, such as

- FNESC: www.fnesc.ca/assets/home_logo.gif
- Four Host First Nations: www.fourhostfirstnations.com/
- local First Nations band associations
- local municipality and school

Point out logos that demonstrate similar polygons. There are many logos that use a letter to represent the company. The logo, later on, can be shrunk and used with the print-making activity.

The study of similarity should include looking at similar figures, corresponding sides, and scale factors. Also look at angles in similar triangles that are congruent. Students should learn how to measure and calculate the scale factors of similar triangles and use this information to find the measurements of missing sides in a figure. Students will also have the opportunity to practice measuring angles with a protractor and measuring lengths with a ruler. Use your preferred Grade 9 text to provide students with extra practice working on similar polygons, corresponding sides, and scale factor.

Introduce similar polygons: (Def: *Similar polygons* = 2 or more polygons that are identical or where each polygon looks like an enlargement or reduction of the other.)

Look at similar polygons, enlarging and reducing, and scale.

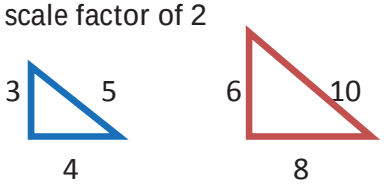
Distribute the Similar Polygons worksheet provided as a handout at the end of this unit, and help students as they work through the questions in pairs or small groups.

As an extension, students can create their own logos. Distribute the Personal Logo worksheet to assist in this project.

Lesson: Scale

Definition of ***Scale Factor***: the factor one dimension of a polygon is multiplied by to calculate the corresponding dimension of a similar polygon.
Scale factor can be shown as a percent, a ratio, or as a whole number, decimal, or fraction.
If the scale factor is **less than 1** (ex: .25, .5) the shape is being **reduced.**
If the scale factor is **larger than 1** (ex: 2, 5, etc.) the shape is being **enlarged**.

Example: scale factor of 2



Distribute the Scale worksheet provided as a handout at the end of this unit, and help students as they work through the questions in pairs or small groups.

Lesson 3: Line and Rotational Symmetry

Bring a variety of examples that show symmetry: First Peoples designs, objects from nature that display symmetry (flowers, etc.), Escher designs, etc. Ask students if they see the symmetry. Explain symmetry and reflections:

- **Symmetry** is when one shape becomes exactly like another if you flip, slide or turn it.
- The **Line of Symmetry** is the line that divides a 2-D shape in half.
- **Rotational Symmetry** is when a rotating shape, when turned less that 360 degrees, fits exactly over its original position.
- **Reflection** results from the flip of an object.
- A **translation** is a slide along a straight line: left or right, up or down.
- **Transformations** include translations, reflections and rotations.

Using a flat mirror, demonstrate a reflection and the symmetry of an object. Students can draw a variety of shapes (on graph paper) and then draw the reflection using a flat mirror. The flat mirror can also be used on the Cartesian plane to demonstrate reflections and what the reflected coordinates are.

Distribute the Symmetry worksheet provided as a handout at the end of this unit, and help students as they work through the questions in pairs or small groups.

Final Project: Button Blanket

Introduce the button blanket by showing examples (collected from the community, or illustrated in books or online). The following site includes a series of video clip depicting the making of a button blanket:
www.lttacollection.ca/content/lesson-plan.asp?SessionId=747741&ItemId=379&ProvinceId=5

Distribute the Button Blanket handout provided at the end of this unit, and assist students as they create their blankets.

As a time-saving alternative, students can create their “blankets” using art paper.

Extension: School Quilt

Have students work as a group to combine their individual button blanket patches into a quilt. Many quilt patterns are available online (for example, www.quilterscache.com/QuiltBlocksGalore.html), or consult with your school home economics department for assistance.

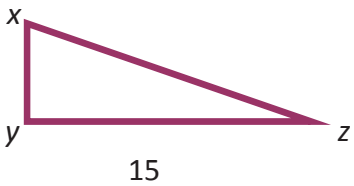
Similar Polygons

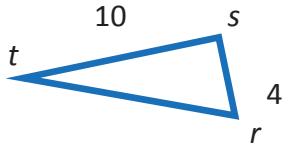
1. 3 rectangles measure 5 cm x 3 cm, 10 cm x 6 cm, and 15 cm x 9 cm. Are they similar? Explain.

2. 

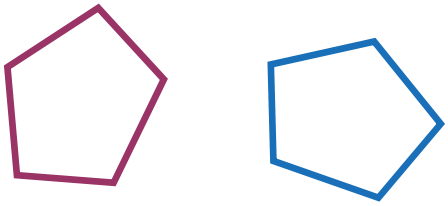
Which shapes are similar?

3. These triangles are similar. What is the length of side xy?



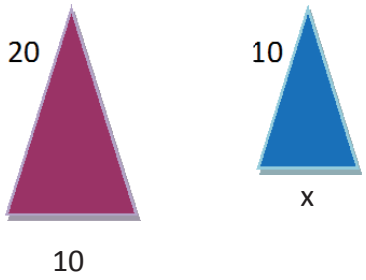


4. Measure the sides of the polygons. Are they similar? Explain.



Scale

1. Jim is designing a pattern to paint on his paddle. This is one of the shapes he will be using. Jim needs to reduce the pattern t fit on the handle. How long does the bottom of the triangle need to be?



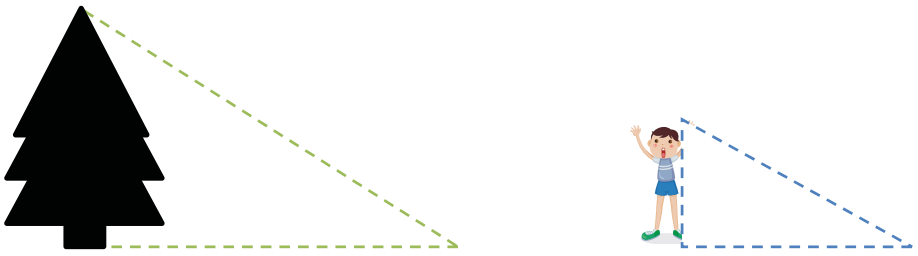
2. Measure the rectangle. Draw similar rectangles for each scale factor.
   Reduce by a scale factor of 40%.
   Enlarge by a scale factor of 1.5.
   Reduce by a scale factor of 1/3.

3. Draw a polygon, on graph paper, which you would use for a border around the bottom of a quilt. Draw to 2 polygons that are similar – one enlargement and one reduction.

4. On graph paper draw your initial in block letters. Now reduce it by 50% and then enlarge it 2.5 times.

5. You and your family are heading to a feast 75 km away. On the map you are following, 1 cm equals 10 km. How long is the line on your map between home and the feast?

6. You are standing by a cedar tree and wondering how tall it is. Your shadow is 4.6 m long and you are 1.5 m tall. The shadow cast from the cedar tree is 70 m long. How tall is the tree?



Symmetry

Definitions

- **Symmetry** is when one shape becomes exactly like another if you flip, slide or turn it.
- The **line of symmetry** is the line that divides a 2-D shape in half.
- **Rotational symmetry** is when a rotating shape, when turned less that 360 degrees, fits exactly over its original position.
- **Reflection** results from the flip of an object.
- A **translation** is a slide along a straight line: left or right, up or down.
- **Transformations** include translations, reflections, and rotations.

Questions

1. Look at the block letter initial you drew for the previous lesson. How many lines of symmetry does it have? Share with a partner.

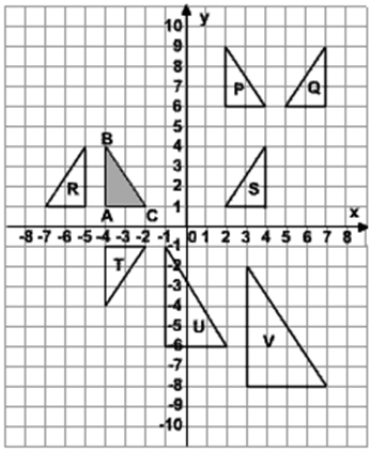
2. Draw and cut out this shape; the internal angle at C is 60 degrees. Rotate the shape (and trace) on the vertex to make a shape with rotational symmetry. What is the order of rotation symmetry?

   C = the centre of rotation

3. Determine the order of rotation symmetry and the angle of rotation for each polygon:

4. Identify the line of symmetry and the order of rotation symmetry:

5. a. Which triangle is a translation of triangle ABC?
   b. Which triangle is the image of triangle ABC after a reflection in the x-axis?
   c. Which triangle is an enlargement of triangle ABC?
   d. What is the scale factor of the enlargement?
   e. Rotate triangle ABC ¼ turn clockwise around the origin. Label the new triangle A'B'C'. What are the co-ordinates for point 'C'?



Personal Logo

The Vancouver 2010 games were held on the shared traditional territories of the Lil'Wat, Musqueam, Squamish, and Tsleil-Waututh First Nations. The Host First Nations wanted the cultures, protocols, and traditions of its peoples represented and respected before, during, and after the Olympics.

The Vancouver 2010 Aboriginal Licensing and Merchandising Program was created as part of the partnership. It was another first in Olympic history. The program showcased excellence in Aboriginal arts, culture, and enterprise. As part of the licensing and merchandising program, a Four Host First Nations logo was developed.

Materials needed: graph paper, pencil, felt pens (pencil crayons).

Using 8 ½ x 11 graph paper design a personal logo. In the centre draw your initial in block letters. Around the outer edge of the paper you are going to make a repeated pattern of at least 3 different polygons. Once you have come up with your personal logo you will enlarge your drawing to fit on poster paper.

Extension

Reduce your personal logo by 50%. Now you can make a "patch" that can be sewn onto your book bag or on your jacket.

Materials needed: logo design, craft felt (plain and self-adhesive type in a variety of colors), scissors (craft knife), small white buttons, embellishments (optional), needle and thread.

Procedure:

1. Transfer design onto self-adhesive felt.
2. Cut out design.
3. Iron cut-out pieces onto plain felt.
4. Place buttons and/or embellishments.
5. Hand or machine sew patch onto bag or jacket.

Final Project: Button Blanket

Your final project will combine what you have learned about scale, similar polygons, and symmetry to make a mini button blanket.

The centre of your blanket will be a First Peoples themed design. Buttons are sewn on wherever you want to accent the blanket. The outer edges of the blanket will consist of polygons that have been reduced, enlarged, and rotated.

Materials needed:
- graph paper
- felt squares (variety of colors)
- iron-on sticky glue
- small white buttons
- craft knives
- wooden dowels — length of finished banner (to make hanger)
- ribbon/cord (to make hanger)

Steps

1. Find or make a design that will fit in the felt square.
2. Iron on the "sticky glue" to the felt square. You can also buy felt squares that are pre-glued.
3. Trace your design onto the felt square.
4. Cut out the design and iron on to another felt square (a different color)
5. Cut out a variety of polygons and shapes that have been rotated, flipped, enlarged, etc.
6. These shapes also receive the iron-on glue.
7. Place the shapes on the outer edge of the quilt.
8. Add buttons where desired.
9. Roll down top edge, with dowel inside, glue closed.
10. Add ribbon or string to act as a hanger.