

Integration of Mathematics into Alberta's Homesteading History

Unit: Early Settlement of Alberta, Grade 4

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Rational

As we explore Alberta's history during early settlement, students role play the work done by homesteaders. First the students find their land and roll a die to find out what is on the land, based on fractions. Then the work that the students do through the progression of numerous activities earns them agricultural units (AU) for the final auction. The results of the auction determine what fraction of the homesteaders survived. This is not a lesson but a unit.

Assessment

Mathematics

- Demonstrate an understanding of addition of numbers up to 10,000 and related subtraction of numbers.
- Demonstrate an understanding of multiplication (2- or 3-digit by 1-digit) to solve problems.

- Demonstrate an understanding of fractions less than or equal to one.
- Represent and describe decimals (tenths and hundredths).
- Relate decimals to fractions and fractions to decimals.
- Demonstrate an understanding of regular and irregular 2-D shapes by recognizing that area is measured in square units (square metre).
- Visualization—Visual reasoning is an important component of number, spatial and measurement sense.
- Spatial sense—Spatial sense enables students to communicate about shapes and objects and to create their own representations.

Social Studies

- Recognize how the diversity of immigrants from Europe and other continents has enriched Alberta's rural and urban communities.

- What movement or migration within Canada contributed to the populating of Alberta?
- How did European immigration contribute to the establishment of communities in Alberta in the late 19th and early 20th centuries?
- How did the arrival of diverse groups of people determine the establishment and continued growth of rural and urban communities?
- How are agriculture and the establishment of communities interconnected?
- What led to Alberta joining Confederation?

Science

- Wheels and Levers
- Building Devices and Vehicles that Move

Fine Arts

- Sketching of homesteader artifacts

Language Arts

- Reading comprehension (poetry, journal entries, letters, picture books) and writing to express ideas (poetry, letters and journal entries).

Essential Question

- Why did some homesteaders survive while others failed?

Introduction/Hook

The students are going to be homesteaders. As such, they will each receive a square piece of land that is divided into tenths. The students will roll a die to determine what tenth of their land will be water, grassland, forest or rock. We will explore how rural land addresses work so that the students can find their address in our community. All of the quarter sections (square pieces of paper) will be hung in the hall to record the growth of our rural community.

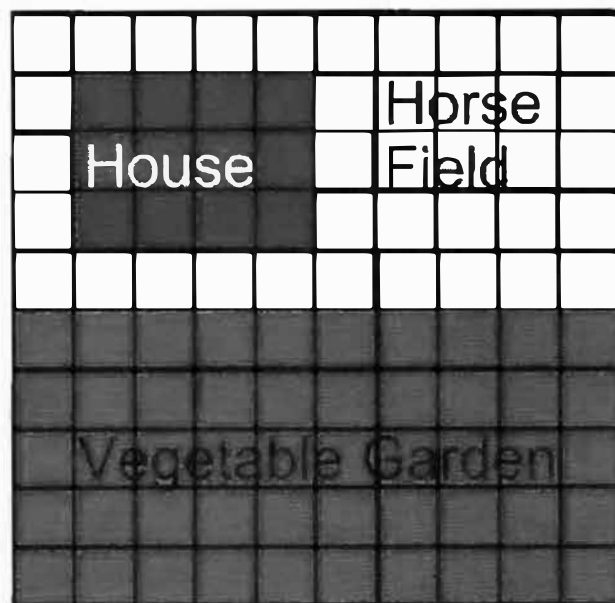
Body

1. The students will earn agricultural units (AU) based on their work in this unit. AUs are recorded as pieces of yellow paper on their quarter section. AUs may be earned as one-quarter, one-half, three-quarters or one full AU, depending on how closely the work approaches the goal. One-tenth of land can hold five AUs and only grassland can support agricultural units. If a student runs out of grassland, then they can pay one AU to clear forest or rock to make more grassland.

2. The main source of agricultural units (AU) is from progressing through numerous activities in the unit. They consist of 20 activities that students complete individually. These 20 activities include mathematics, reading comprehension, writing, homesteader artifacts and 10 science experiments (from our unit on simple machines). Performance on the individual activities results in AUs for the land. The mathematical activities build on spatial awareness, fractions and decimals. Three such activities follow.

Activity 4—Your Yard

You are a homesteader with a yard measuring 10 metres by 10 metres. Your yard has a house, vegetable garden and horse field. Here is a map of your yard:



Complete the following chart:

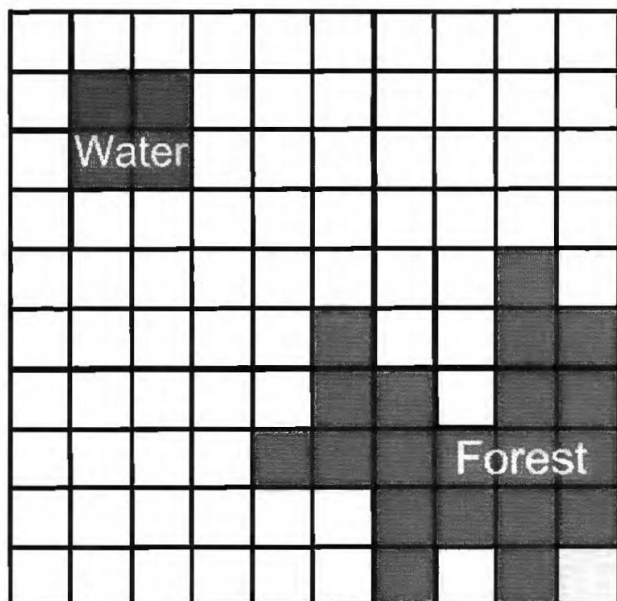
	Area (m ²)	Fraction of Yard	Decimal
House			
Vegetable Garden			
Horse Field			

Activity 8—Two Brothers

Two brothers, Brother Abe and Brother Bob, are dividing a piece of land in half.

- They each need half of the water.
- They each need half of the forested area.
- They each need half of the grassland (white).
- They want to build only one straight fence.
- Below is the map of the land of the two brothers.

How can they divide the land into two equal pieces? Draw the line.



Complete the chart. One square = 1 unit.

	Area of Water	Area of Forest	Area of Grass
Brother Abe			
Brother Bob			
Total Land			

How do you know the brothers each have half?

Activity 16—Garden Plan

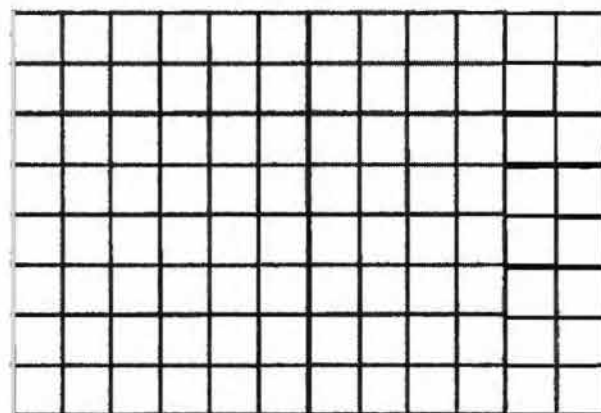
As a homesteader, you have a garden that is 12 metres by 8 metres. You want to plant potatoes, carrots, turnips, corn and peas.

You want to plant

- potatoes in a rectangle with an area of 24 m^2 , so the potato hills are easier to maintain;
- corn in a rectangle with an area of 24 m^2 , so the wind has a greater chance of pollinating all of the corn flowers;
- peas in the longest row possible, so you only have to run one length of mesh for the vines to grow up; and
- carrots and turnips in an equal area.

Below is a map of your garden plan.

Use coloured pencil crayons and a legend to show your plan.



- As part of our science unit on wheels, levers and devices that move, students will plan, construct and test a catapult and a vehicle that rolls down a ramp. The students will each be given a credit at the general store of \$50 or one-half AU. As they need to purchase materials for their constructions, they will do the subtraction from the money they have available. If they run out of money at the general store, they will need to sell the store one-half AU for an additional \$50.
- As homesteaders, students will need to build a house. Prior to building the house, students will explore the concept of the metre square. We will explore the actual size of a homesteader house. Students will calculate how much space is required to build a house for a single person, consisting of a bed, stove, table, chest and pantry. Often, this comes out to approximately 12 to 18 meters square. Students experiment with fractions of a square metre (such as one-half or one-quarter of a square metre). Students will then draw a map of their homestead house, using criteria for the house size

and furniture inside the house. A thumbnail sketch of their house will take up one-tenth of their land, so it must be built of either sod, logs or stone.

Conclusion and Final Project

In addition to the culminating projects for language arts and social studies, the culminating project for mathematics takes the form of an auction. First, students explore the concept of an auction through video clips and a picture book. Then students take the number of remaining agricultural units to sell at the auction. Students can choose what fraction of their AU is wheat or cattle. There are two different auctions, so students can decide what fraction of their cattle and wheat are sold at the first or the second auction. The price for one AU of wheat and one AU of cattle is determined by rolling a die. The students then calculate how much money they made by multiplying and adding. (Based on probability of the prices on the die, approximately half of the students should survive as a homesteader, which reflects what happened in Alberta historically.)

Teams, Individual and Class

As a team, students took their square metre on a hunt through the school for 2-D shapes that are less than, equal to or greater than the referent. Many of the cooperative learning strategies listed below used a partner. The students conducted their science experiments and math activities individually. Full-class discussions included picture books, the vote on confederation and explorations of life as a homesteader.

Differentiated Instruction and Cooperative Learning

PWIM (picture word induction model), line up (with fractions and decimals), Quiz-Quiz-Trade (naming decimals), Think-Pair-Share, Round Robin, Rally Coach, Placemat (What do you know about $\frac{1}{2}$?), the Frayer Model, Graffiti Board, Math Court (pros and cons of various strategies).

Learning Styles/Multiple Intelligences

Visual (picture books, graphs, PWIMs, posters, videos, sketching artifacts), auditory (picture books read aloud, class discussions, videos), kinesthetic/physical (line up, hands-on science experiments), linguistic (poetry and journal entries), logical/mathematic (math activities), interpersonal (class discussions, Round Robin, Think-Pair-Share, picture books), intrapersonal (individual responses, story writing), existential (concepts of survival and diversity).

Number of articles Dalyce Harrison has submitted to delta-K = 1

Number of years Dalyce Harrison has been teaching Grade 4 in Medicine Hat = 10

Number of years Dalyce Harrison's family has been ranching in southern Alberta = 100

Number of times Dalyce Harrison tries exploring math in a new way with students = ∞