

Tipi Design and Math Activity

The objective is to apply math and geometry skills to estimate the size of a Blackfoot Tipi.

Design Challenge: Assume the height (ground to vertex) of a Blackfoot Tipi is about 14 feet tall. How much space on the ground will the Tipi cover and what is the minimum length of the poles. How many buffalo hides are needed to make one Tipi cover? Assume one buffalo hide is approximately 5ft by 5ft.

Resources: Consider the key parts of the Tipi and how they form geometric shapes. Define mathematical relationships for each shape and apply mathematical formulas to design the Tipi and solve for unknown values such as length, dimensions, and area.

Table 1: Tipi Shapes

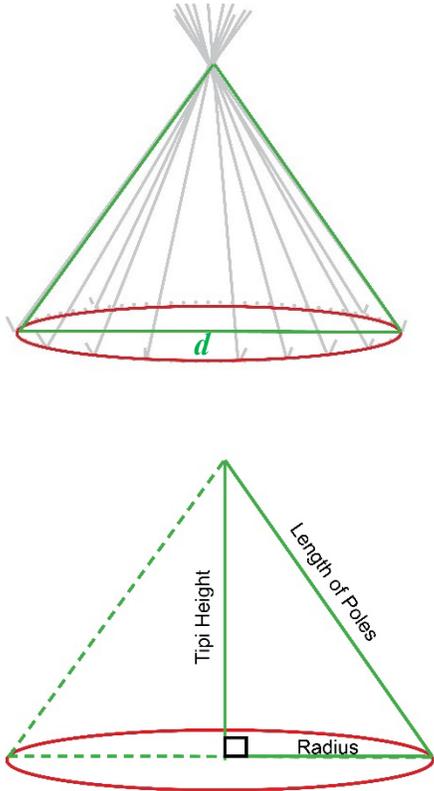
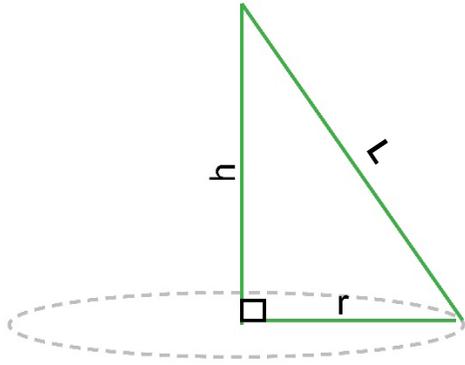
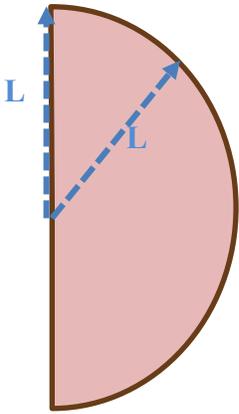
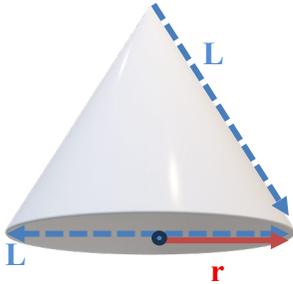
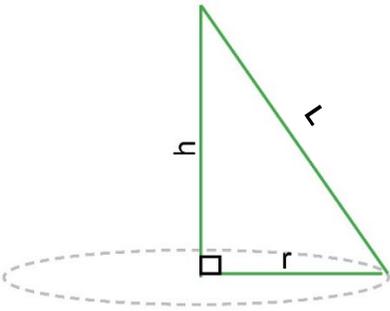
Tipi Shapes	Mathematical relationships: Circle and Triangle	Mathematical Relationships: Right Angle Triangle
		
<p>Area of a circle: $area = \pi \cdot r^2$</p>	<p>Tipi circle: Tipi diameter, $d = 2 \cdot r$ Tipi radius (r)</p>	<p>Right angle triangle: $a^2 + b^2 = c^2$ $r^2 + h^2 = L^2$</p>

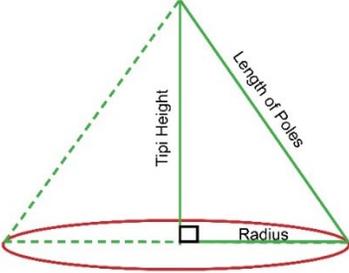
Table 2: Tipi Cover Shapes

Tipi Cover Shapes	Mathematical Relationship: Half-circle	Mathematical Relationship: Cone
		
	<p>Half circle dimensions: Cover radius (R) Tipi cover radius is the same as the Tipi circle diameter, $L = d$.</p>	<p>Tipi Cover forms the shape of a cone. Surface area of a cone: $S.A. = \pi \cdot L \cdot r$</p>

Pole minimum length requirements:

	<p>What information is given:</p> <p>What information is unknown:</p> <p>What formula will help solve for unknown values:</p>
<p>Solution:</p>	

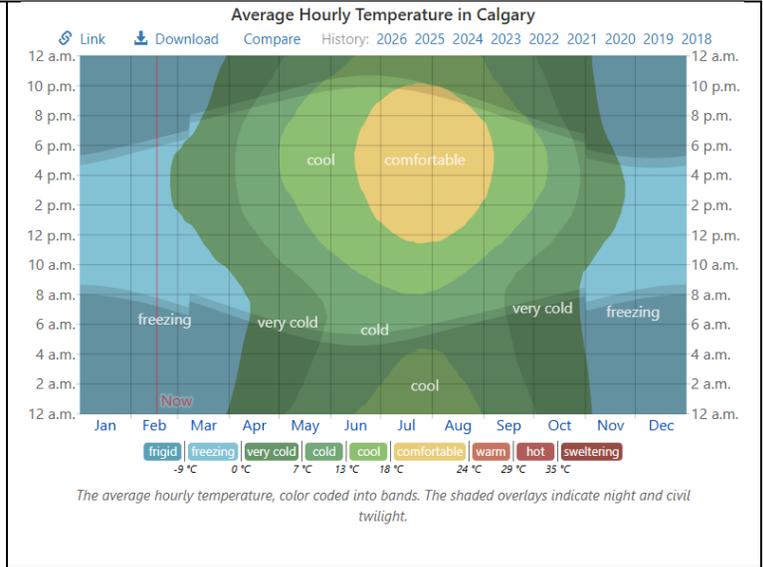
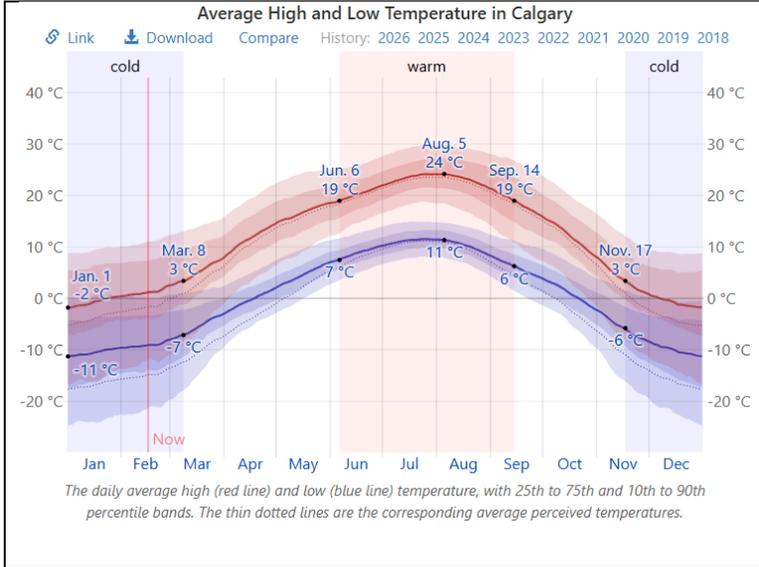
Tipi ground space requirements:

	<p>What information is known:</p> <p>What information is unknown:</p> <p>What formula(s) will help solve for unknown values:</p>
<p>Solution:</p>	

Number of buffalo hides per Tipi cover:

  <p>Buffalo hide image reference: https://www.penn.museum/sites/journal/1365/</p>	<p>What information is known:</p> <p>What information is unknown:</p> <p>What formula(s) will help solve for unknown values:</p>
<p>Solution:</p>	

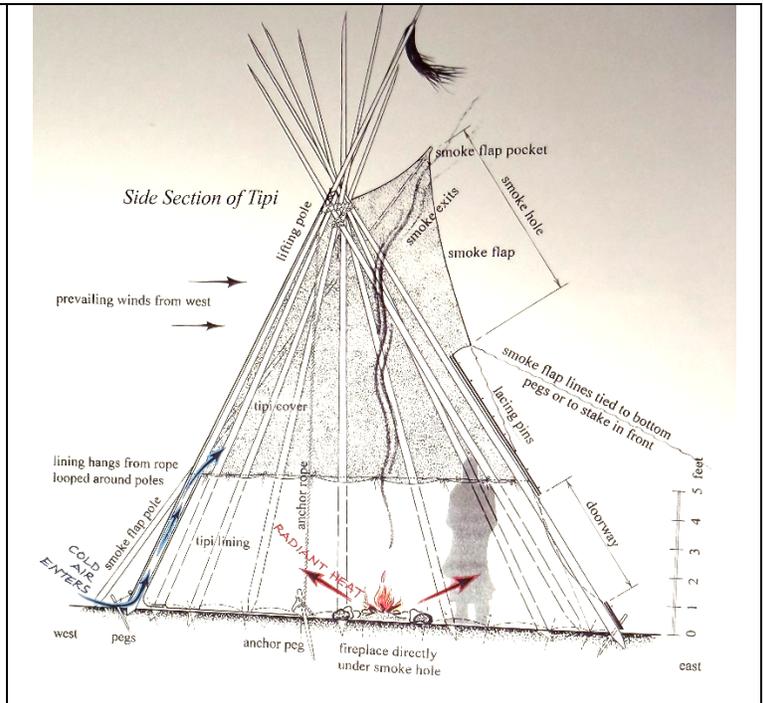
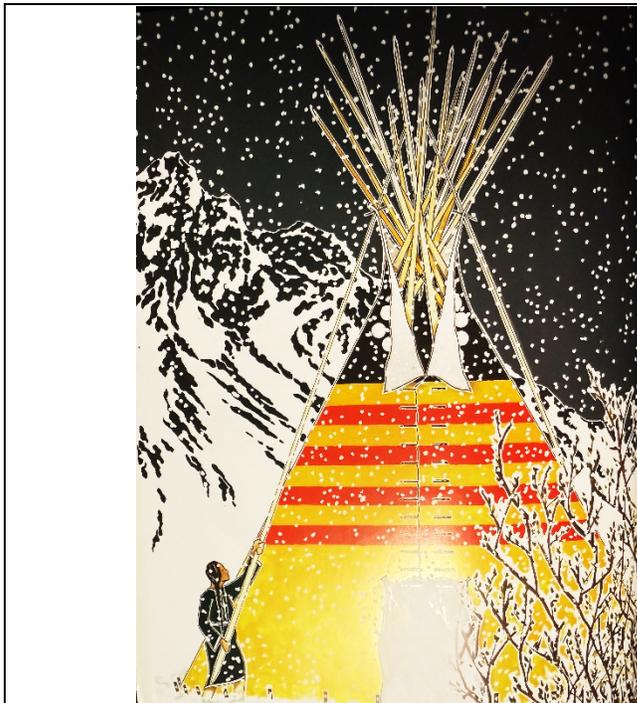
Climate of the Prairies (Calgary)



The prairie climate can be cold for over 6 months of the year with ranges of daily temperatures dipping down to freezing, very cold and cold for all months of the year. Can a Tipi regulate temperature inside of the Tipi?

Weather data reference: <https://weatherspark.com/y/2349/Average-Weather-in-Calgary-Alberta-Canada-Year-Round>

Tipi Design: Tipi liner and smoke flaps



Often a fire is made inside the Tipi to generate heat. Fuel may consist of buffalo chips or wood. The Tipi liner contains the radiant heat shown in the image, while the smoky air can ventilate out near the top controlled by the smoke flaps. Cold air and fresh oxygen can enter at the bottom of the Tipi in between the liner and the cover. The gap between the liner and the cover insulates the radiant heat from cold temperatures outside of the Tipi.

Images reference: Paul Goble, "TIPI: Home of the Nomadic Buffalo Hunters", World Wisdom, 2007.