



YUKON

GRADE 7

CROSS-CURRICULAR UNIT

# SEASONAL CIRCLES

Math | Physical and Health Education | English Language Arts | Science



**CREATED BY**

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**COVER PHOTO**

Government of Yukon



# CIRCLES

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## PART 1: INTRODUCTION

### RATIONALE

My personal mission, vision and goals for students in this project is to have students discover the different aspects of circles, their identity, and the culture of First Nations in the Yukon. Throughout the project, students will gain an understanding of math concepts in a creative way which will allow them to learn at a level that is differentiated for each student.

### ESSENTIAL QUESTION

To what extent does the perspective of time and seasons affect what you do in the environment?

### CORE COMPETENCIES

This learning activity applies many facets of each of the core competencies. We have chosen to highlight several facets of the three core competencies in our assessment plan, but you may choose other facets depending on your students' needs.

#### Communication

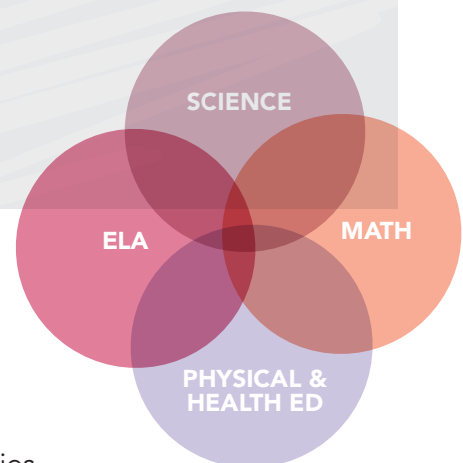
- Journal entries and written description of project
- Connect and engage with others to share and develop ideas
- Acquire, interpret, and present information

#### Creative Thinking

- Developing ideas and using creativity
- Novelty and value (innovation)
- Generating ideas
- Critical thinking: Develop and design

#### Positive Personal & Cultural Identity

- Personal values and choices



### LEARNING GOALS

These learning goals are a combination of Big Ideas, Curricular Competencies, and Content, and Core Competencies. You may choose to use these goals for assessment.

# CURRICULAR CONNECTIONS

Learning in content areas such as Art, ADST and Social Studies can also be addressed in this unit.

MATH	PHYSICAL & HEALTH ED
<p><b>Big Idea</b></p> <ul style="list-style-type: none"> <li>• The constant ratio between the circumference and diameter of circles can be used to describe, measure, and compare spatial relationships.</li> </ul> <p><b>Curricular Competencies</b></p> <ul style="list-style-type: none"> <li>• Use reasoning and logic to explore, analyze, and apply mathematical ideas</li> <li>• Explain and justify mathematical ideas and decisions</li> <li>• Visualize to explore mathematical concepts</li> <li>• Incorporate Yukon First Nations ways of knowing and doing</li> </ul> <p><b>Content</b></p> <ul style="list-style-type: none"> <li>• Circumference and area of circles</li> <li>• Operations with decimals: addition, multiplication, division, subtraction and order of operations</li> <li>• Ratios</li> <li>• Multiplication and division facts</li> </ul>	<p><b>Big Idea</b></p> <ul style="list-style-type: none"> <li>• Daily participation in different types of physical activity influences our physical literacy and personal health and fitness goals.</li> </ul> <p><b>Curricular Competencies</b></p> <ul style="list-style-type: none"> <li>• Describe how students' participation in physical activities at school, at home, and in the community can influence their health and fitness</li> <li>• Identify factors that influence healthy choices and explain their potential health effects</li> </ul> <p><b>Content</b></p> <ul style="list-style-type: none"> <li>• Effects of different types of physical activity on the body</li> <li>• Factors that influence personal choices</li> </ul>
ENGLISH LANGUAGE ARTS	SCIENCE
<p><b>Big Idea</b></p> <ul style="list-style-type: none"> <li>• Exploring and sharing multiple perspectives, extends out thinking.</li> </ul> <p><b>Curricular Competencies</b></p> <ul style="list-style-type: none"> <li>• Synthesize ideas from a variety of sources to build understanding</li> <li>• Recognize and identify the role of personal, social, and cultural contexts, values and perspectives in texts</li> <li>• Recognize and appreciate the role of story, narrative, and oral tradition in expressing Yukon First Nations ways of knowing and doing</li> <li>• Recognize the validity of First Nations oral tradition for a range of purposes</li> </ul> <p><b>Content</b></p> <ul style="list-style-type: none"> <li>• Oral language strategies</li> <li>• Metacognitive strategies</li> <li>• Conventions</li> </ul>	<p><b>Big Idea</b></p> <ul style="list-style-type: none"> <li>• Earth and its climate have changed over geological time.</li> </ul> <p><b>Curricular Competencies</b></p> <ul style="list-style-type: none"> <li>• Make observations aimed at identifying their own questions about the natural world</li> <li>• Apply Yukon First Nations ways of knowing and doing and local knowledge as sources of information</li> <li>• Construct and use a range of methods to represent patterns or relationships</li> <li>• See patterns and connections in data from their own investigations and secondary sources</li> </ul> <p><b>Content</b></p> <ul style="list-style-type: none"> <li>• First Nations knowledge of changes in biodiversity over time</li> <li>• Evidence of climate change over geological time and the recent impact of humans</li> </ul>

## PART 2: LEARNING ACTIVITIES

### ACTIVITY 1

#### SETTING THE STAGE

- Introduce the First Nations Circle Calendar (p.31-32 of book "Land of My Ancestors" Plants as food and medicine, available through Resource Services). This will allow students to see what a finished product can look like.
- Inquiry: Ask students to observe the image and to describe what they notice.
- Tell students that when the project is complete, it will be posted in the hallway for their parents and other students to see, enjoy and learn from.



## ACTIVITY 2

### LESSONS ON CIRCLES

- Lesson from the teacher on circumference, radius, diameter and area in Interactive Notebook

Circles

Learning goal: To understand the relationship between the radius and the diameter of a circle.

What I learned  
 $r = 50\%$  of or  $.5d$   
 $D = d \div 2$  or  $R \frac{d}{2}$

$r = 5$   
 $D = 10$

Diameter: the longest line segment in any circle.

$d = 16\text{cm}$   
 $R = 8\text{cm}$

★ the diameter passes through the center of a circle.

Radius: the distance from the center of a circle to the edge of a circle.

★ Any point on a circle is the same distance from the center of a circle.

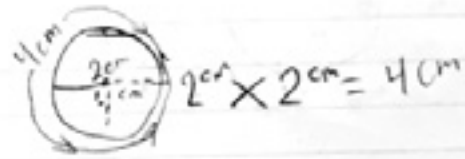
Teacher's lesson

33

# Circles

Learning goal: understanding the relationship between the radius and the diameter of a circle

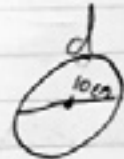
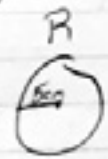
What I know



## Proof

R = Radius  
D = diameter

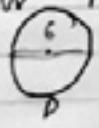
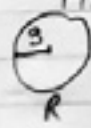
I started with 1 the doubled it = 2



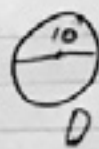
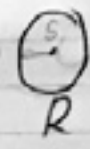
R is always half the D.

## Reflection

How Much is the total of all these added up

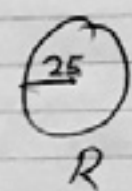
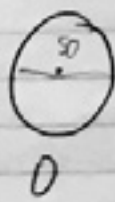


✓



Total: 99 😊

⑤



Student's work



## Circumference

Learning Goal: to understand the relationship between circumference and diameter of a circle

Circumference: the distance around a circle.

Circumference divided by the diameter is approximately  $\frac{C}{d} \approx 3$

The ratio for any circle is  $\frac{C}{d} = \pi$



the circle to keep the cows in.

Greek Letter

$\pi$  is pi. It is a decimal that never repeats & never terminates

$\pi$  is an irrational number.

The formula for circumference can be written 2 different ways.

$C = d\pi$  } When we are using  $\pi$ ,

$C = 2r\pi$  } we are going to use 3.14 always.

The answer will always be approximate

The radius of a tonie is 2cm what is the circumference of the tonie?

$r = 2\text{cm}$  or  $d = 4\text{cm}$

$C = 2r\pi$       3.14

$\pi = 3.14$

$C = 2(2)\pi$        $\times 4$

$C = 12.56\text{cm}$

$C = 4\pi$

$\frac{12.56\text{cm}}$

the circumference of the tonie is 12.56 cm

Teacher's lesson

11-3-14

Circumference  
 Learning Goal to understand the connection between circumference, diameter & radius of a circle

What I know I know what a diameter & radius is

What I learned I learned how to figure out the circumference of a circle

Proof:

$\pi = 3.14$	$r = 4$ or $d = 8$	$r = 9\text{cm}$	$\pi = 3.14$	$r = 3$
$C = 4(2)\pi$	$C = 25.12$	$d = 9(2)$	$C = 66.52\text{cm}$	$C = 37.68$
$C = 8\pi$	$C = 25.12$	$d = 18\text{cm}$	$C = 18\pi$	
$C = \pi d$	$d = 3\text{cm}$	$d = 12$		
$C = 3.14 \cdot 8\text{cm}$	$3.14$	$r = \frac{12}{2}$	$3.14$	
	$= \frac{25.12}{8}$	$r = 6$	$\frac{12}{2}$	
$C = 9.42\text{cm}$	$9.42\text{cm}$	$C = 12\pi$	$6.28$	
I did math		$\pi = 3.14$	$37.68$	

Reflection:

I followed the example on the right hand side and did 4 formulas

Circumference:  
 the enclosing boundary of curved geometric figure, or a circle.

(Synonyms)  
 Human words: perimeter, border, boundary, edge, rim.

La relation avec  $\pi$

The circumference of a circle relates to one of the most important mathematical constants in all of mathematics. The mathematical constant  $\pi$  is found everywhere in mathematics, engineering & science

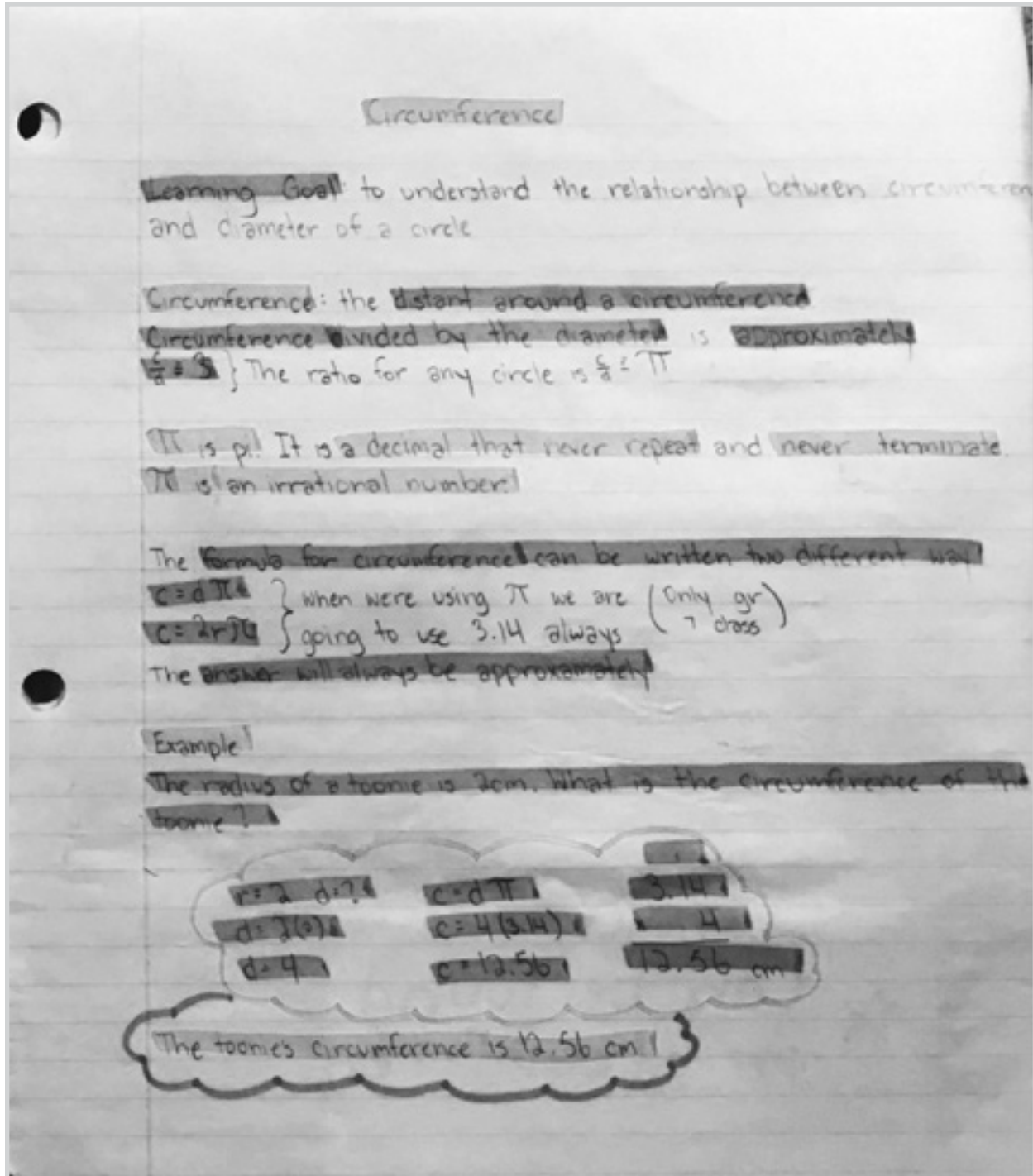
$\pi = \frac{C}{d}$

Student's work

# ACTIVITY 3

## INQUIRY QUESTION

- How can you figure out where the centre of the page is to start your calendar?



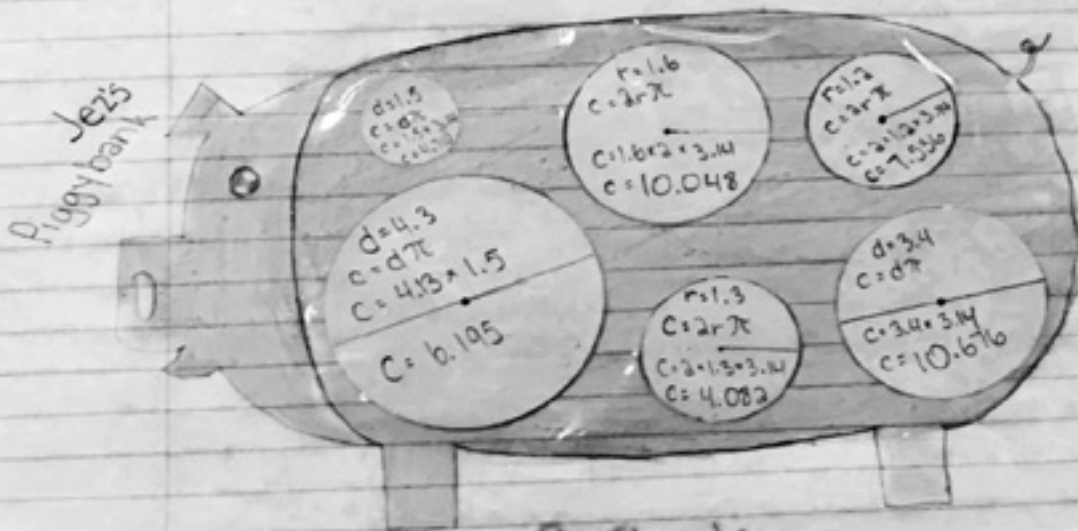
Teacher's lesson

**Learning goal:** To know the formula of circumference and diameter.

**What I know:** I know what circumference is and I know what a diameter is.

**What I learned:** I learned the formula for the circumference.

# Proof



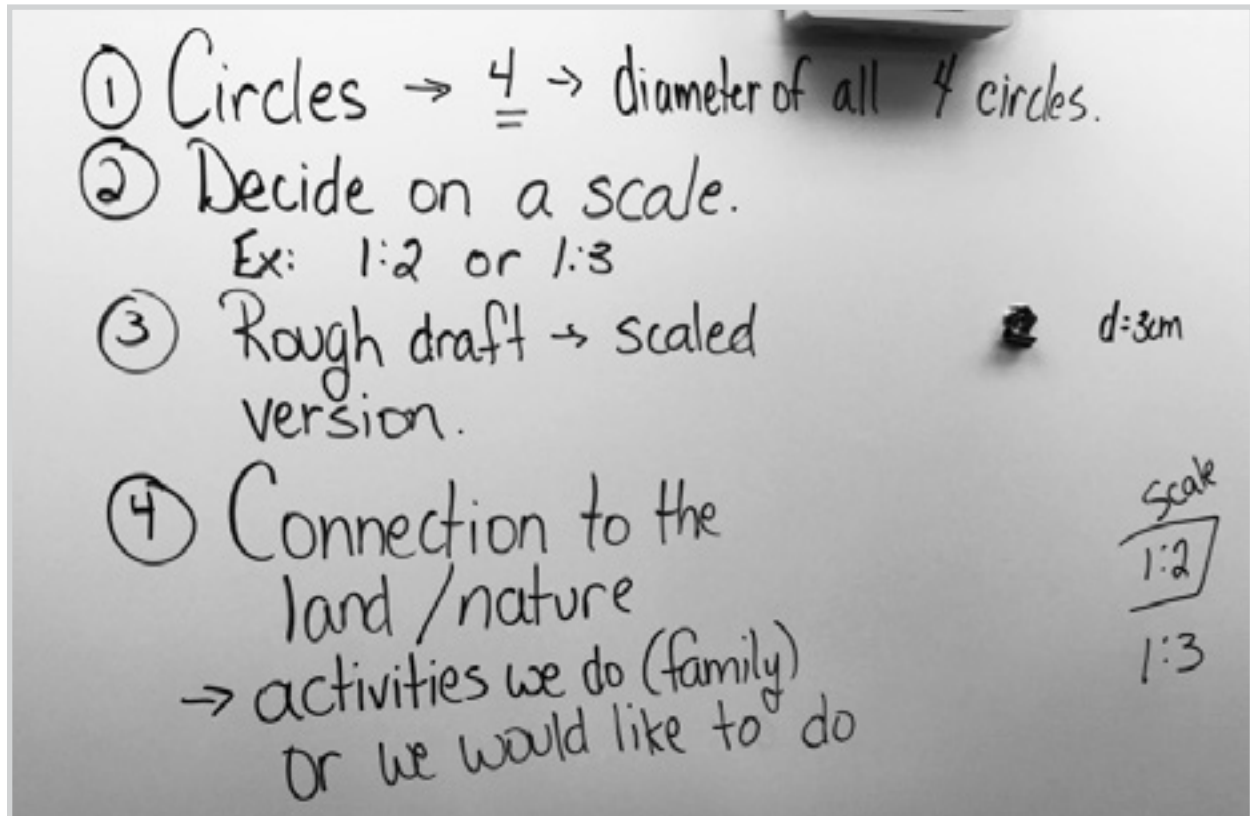
Reflection

Student's work

## ACTIVITY 4

### CO-CONSTRUCTING CRITERIA FOR ROUGH DRAFT

- Brief discussion and outline co-created with students of what to include in the project.
- Co-construct criteria for the rough draft of the calendar

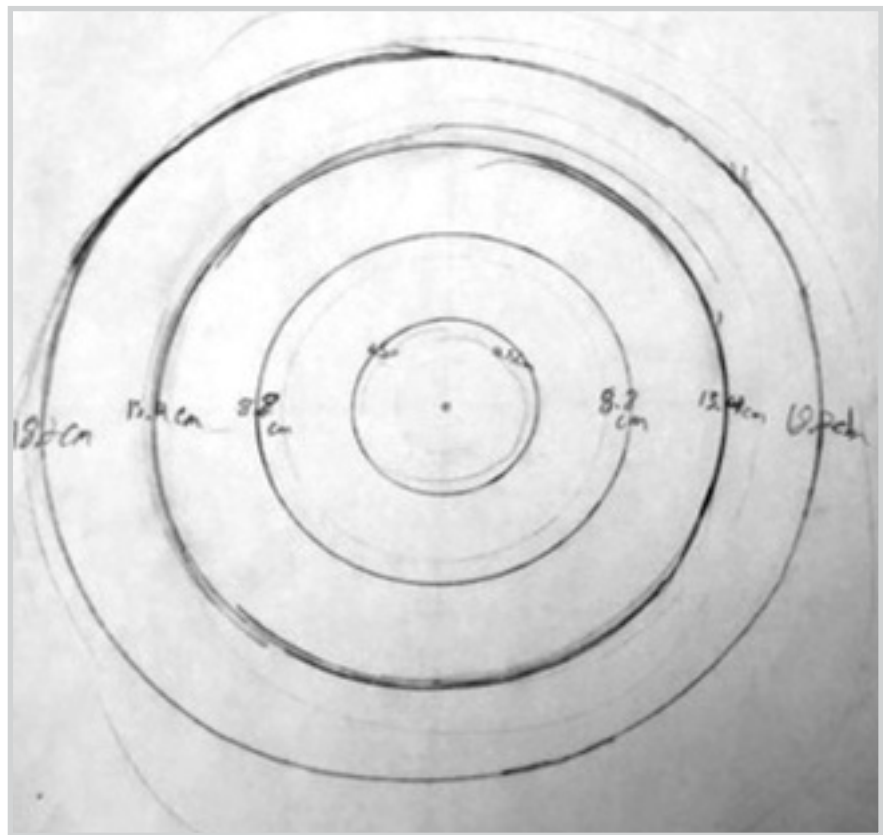
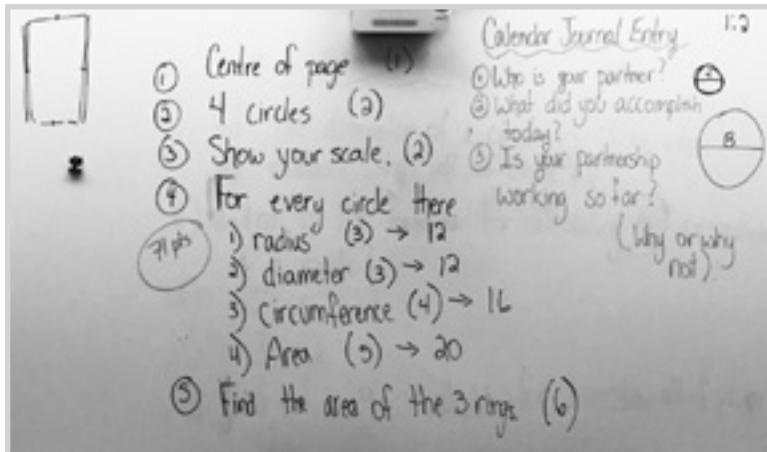


Further discussion about how to find the centre of the page to do the rough draft. Solutions are discussed.

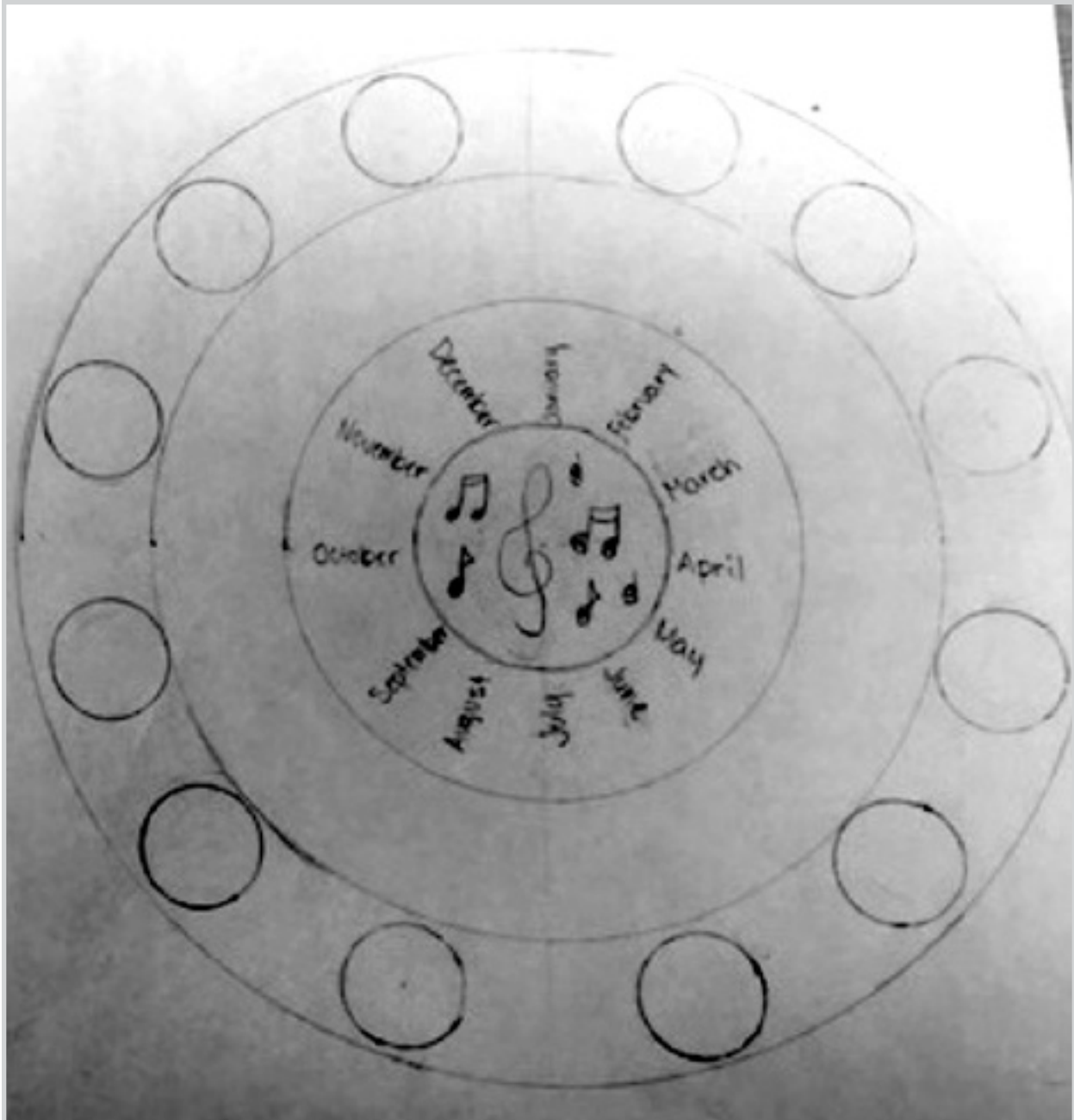
## ACTIVITY 5

### CREATING FOUR CIRCLES (ROUGH DRAFT)

- Students begin planning their rough draft. Students will have to decide what diameter for each of the four circles will allow for them to all fit on the rough draft page, keeping in mind how they might scale it to put it on the larger page later.
- Show students an example of a previous student's rough draft.



Sample of four circles including radius and diameter from the rough draft.



Sample of four circles including the moons, months and visual of identity from the rough draft.

## ACTIVITY 6

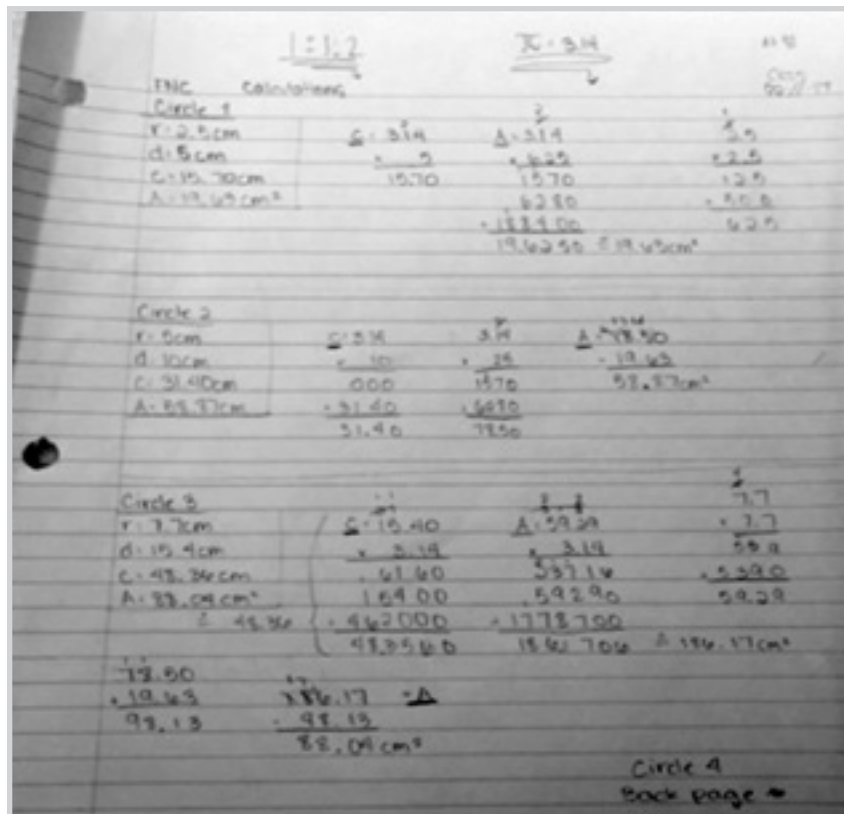
### UNDERSTANDING OF FIRST NATIONS CALENDAR AND PERSONAL IDENTITY

- Explanation of the original First Nations Calendar – The book “*Land of My Ancestors*” Plants as food and medicine has information on the calendar on page 31. A copy of the calendar is on page 32.
- The centre circle of the calendar can be discussed at this time. Students can draw either a symbol or small drawing of what they feel represents themselves or their culture.
- This is a good time to have a First Nations Elder or the First Nations Language Teacher explain the seasons and the importance of the circle.

## ACTIVITY 7

### MATHEMATICAL THINKING

- Students continue to work on their rough draft of their calendar using the co-constructed criteria that was created. By the end of the week they should be finished. All of the math required to finish the criteria should be neatly written out on a separate sheet. See the following examples:



Sample of student's mathematical thinking for the circles on their calendar



manraj (m)

circle 2	$\pi = 3.14$	circle 2	$\pi = 3.14$
d = 3cm	$\times 4$	d = 3cm	$\times 4$
C = 12.56cm		r = 1.5cm	$\times 282.6\text{cm}$
$\frac{1}{2}$	$\times 3.14$	4.5	$\times 3.14$
$\frac{1}{4}$	$\times 4$	24.5	$\times 2025$
$\frac{1}{4}$	$\times 12.56\text{cm}$	225	$\times 1570$
		1800	$\times 6280$
		2025	$\times 00000$
			$+ 628000$
			$A = 635850\text{cm}^2 = 63.59\text{cm}^2$

Circle 3	$\pi = 3.14$	circle 4	$\pi = 3.14$
d = 7cm	$\times 14$	d = 20cm	$\times 20$
r = 3.5cm	$\times 1256$	r = 10cm	$\times 000$
	$+ 3140$		$+ 6280$
	$C = 43.96\text{cm}$		$C = 62.80$
7	$\times 3.14$	10	$\times 3.14$
$\times 7$	$\times 49$	$\times 10$	$\times 100$
49	$\times 2826$	100	$\times 000$
	$+ 12560$		$\times 0000$
	$A = 153.86\text{cm}^2$		$A = 314.00\text{cm}^2$

ring 1	63.59
	- 12.56
ring =	51.03cm <sup>2</sup>
ring 2	153.86
	- 63.59
ring =	90.27
ring 3	314.00
	- 153.86
ring =	241.86

Sample of student's mathematical thinking for the circles on their calendar

## ACTIVITY 8

### HEALTHY ACTIVITIES

- Once students are finished their rough draft, they should write down activities on a separate piece of paper that will go on their final copy. The activities to be included are only those that encourage health and being active. (Activities like reading a book or video games should not be listed). The activities can be done with family, friends, at school or individually. If there are students that are having a difficult time coming up with activities, they can list activities they would like to do or try. This can be a class discussion before students begin making their lists. Students should show their teacher their list before putting it on the calendar to ensure the activities are healthy and active.

## ACTIVITY 9

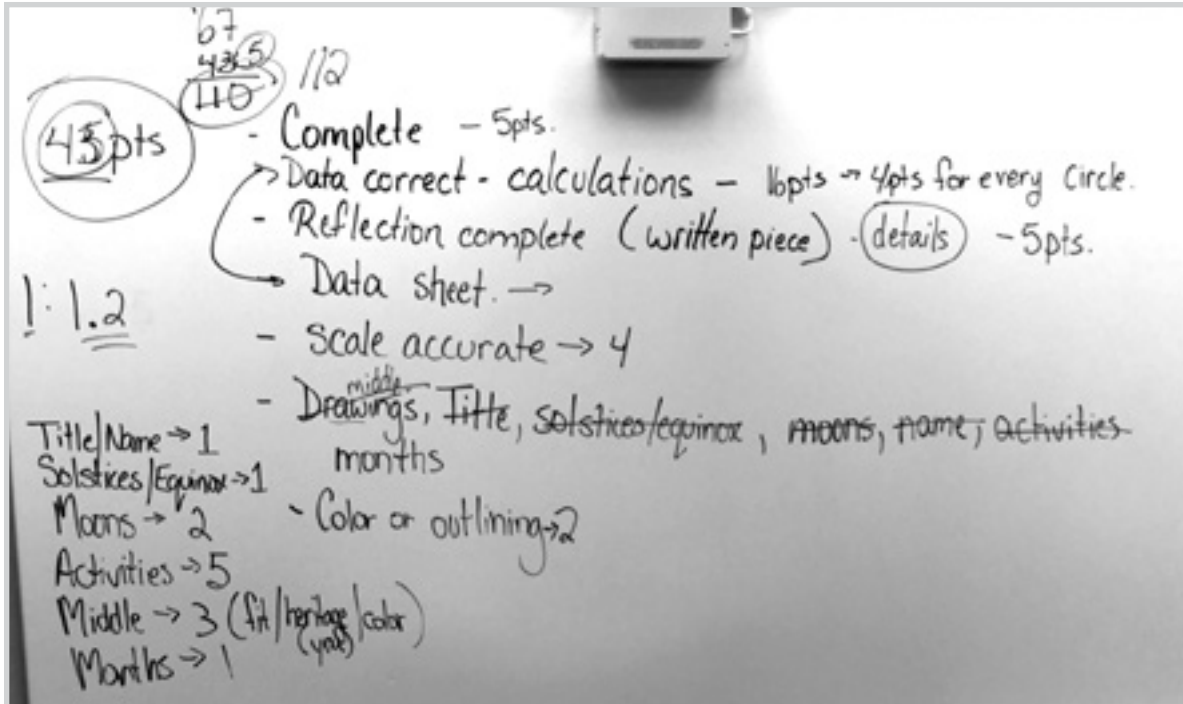
### SCALING THE CALENDAR

- Mini lesson on creating a scale for their draft, so their circles can be put on the larger paper. Many students will come up with a scale from 1.1 to 1.3. A number of students try to use 2.0, but they find that it ends up being too big. It's important for them to make this discovery. This is where discussion about using decimals to find the scale can come in. Many students will be able to discover this on their own.

## ACTIVITY 10

### PULLING IT ALL TOGETHER

- Students will need to discover how to draw the larger circles on their good copy. The compass won't be big enough. They will have to make a tool. The following is a great resource on how to create the tool. <https://www.youtube.com/watch?v=-EWy6PiNXWM>
- Students will begin putting their calendars on the large piece of paper.
- They will have to ensure that they include the moons on their good copy, and the moons should be authentic to the First Nations Calendar. The equinoxes and solstices should remain the same as well.
- Students have the option of putting the months in any language they would like. Some students choose to use their First Nations language, French etc.
- Students should have a title for their project.

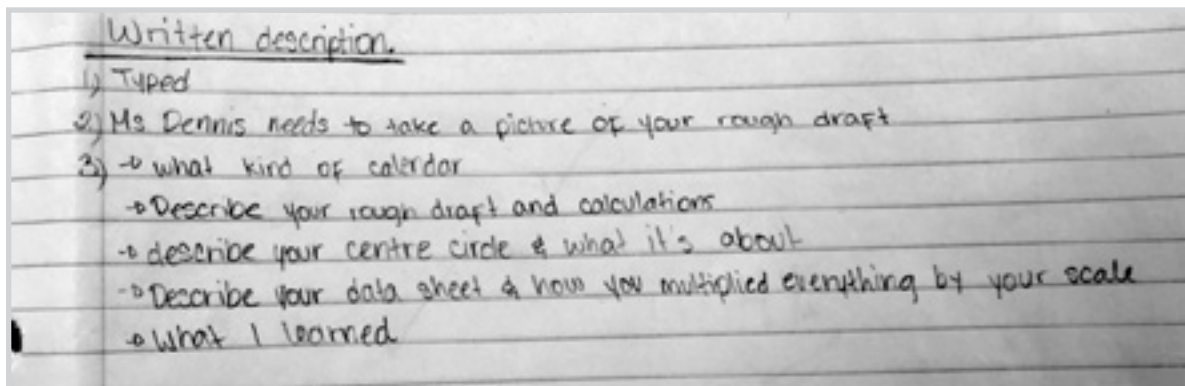


Sample of co-constructed criteria for the final copy

## ACTIVITY 11

### REFLECTION

- Written description or reflection of the project.
- As a class co-construct the criteria for the written description.
- After students are finished and their calendar is on the wall, they will use the marking sheet for the good copy and mark themselves.



## FIRST NATION CALENDAR STUDENT REFLECTION

This project is the most exciting math project of the year! This circle project taught me a lot about circles and that they are really complicated but fun to work with. I am happy that I did my data sheet correct the first time.



Scale 1:1.5

**FIRST NATIONS CALENDAR DATA**

<p>Inner Circle</p> <p>Radius: 3cm</p> <p>Diameter: 7cm</p>	<p>Area: 29cm<sup>2</sup></p> $\frac{36}{2} = 18$ <p>Circumference: 92.9cm</p> $\frac{92.9}{2} = 46.45$
<p>Second Circle</p> <p>Radius: 7cm</p> <p>Diameter: 14cm</p>	<p>Area: 154cm<sup>2</sup></p> $\frac{154}{2} = 77$ <p>Circumference: 91cm</p> $30 \times 1.5 = 45$
<p>Third Circle</p> <p>Radius: 10.5cm</p> <p>Diameter: 21cm</p>	<p>Area: 346.5cm<sup>2</sup></p> $\frac{346.5}{2} = 173.25$ <p>Circumference: 73.5cm</p> $\frac{73.5}{2} = 36.75$
<p>Fourth Circle</p> <p>Radius: 15.5cm</p> <p>Diameter: 31cm</p>	<p>Area: 766.5cm<sup>2</sup></p> $\frac{766.5}{2} = 383.25$ <p>Circumference: 97.9cm</p> $\frac{97.9}{2} = 48.95$

Name: \_\_\_\_\_

*Handwritten notes on the right side of the sheet:*

- Family names into Denman
- calendar/spirit September 21
- Game gets Fat moon
- My 1st year in the school

Sample of finished data sheet that is posted on the wall

This is how I got my data sheet. First I just took my answers like my circumference, area, diameter and radius I multiplied them by my scale which is 1:1. Those were my answers for my good copy.

To get my rough draft to my good copy I made a tool out of cardboard. All I had to do is get the radius for my good copy then poke a hole in the cardboard accordingly to the radius. I drew my circles by putting my pencil in the hole. I did that to all four circles. My center circle represents my heritage and my culture.

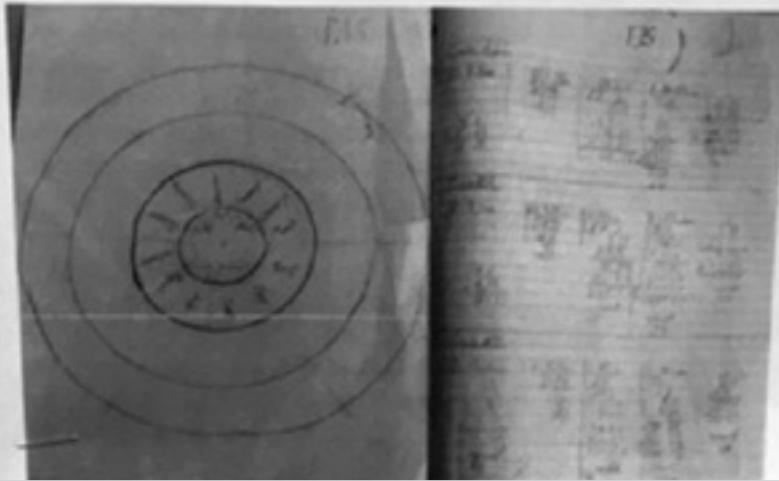


## **First Nations Calendar Reflection**

This poster looking thing to the left is a first nations calendar. My entire grade 7 class made one. I learned more about circles than I ever thought possible. It turns out that circles are not just mundane shapes, but interesting and complicated mathematical equations. For this project we had to calculate the radius, diameter, circumference and area of all four circles. To calculate area I used the radius formula. ( $\pi r^2$ ) I also learned what pi is. I have heard people in high school talk about pi, but I had no idea what they were talking about. But now I know! There is more to circles than I ever thought possible! Thanks for reading, enjoy the circles!

### **Description**

The center circle is where my family is from. Canada, Romania, Poland and Great Britain. The second circle contains the months of the year. The third circle has the healthy activities that I do or want to do, during the year. The outer circle has the first nations months, (moons) all related to the outdoors.



*Sample student reflection and picture including rough draft posted*

## THE GRADE 7 CIRCLE PROJECT

The grade 7 circle project involved creating a First Nations Calendar. Students observed that the authentic calendar had four circles that the information circled around.

Students personalized their own calendars using the centre circle, writing the months in the language of their preference and listing healthy activities that they do or wish to do.

To maintain the First Nations authenticity of the calendars, students were asked to use the same moons, equinoxes and solstices.

Students were required to measure and calculate the radiuses, diameters, circumferences and areas of the circles on their rough draft. In order to make the larger calendar, students had to decide what scale they would use to transfer their original work onto the large paper. It was an interactive way to learn about the different properties of circles.

Ms. Dennis

## PART 3: EVALUATION

### MARKING CRITERIA

#### for Rough Draft

	Possible Points	Actual Points
Completion of project	5	
Data Sheet - Calculations correct - 4 circles x 4 points	16	
Reflection complete	5	
Scale is accurate	4	
Title and Name	1	
Solstices and Equinoxes	1	
Moons	2	
Activities	5	
Middle Circle Complete (does the circle represent the student's interests)	3	
Months	1	
Colour or outlining	2	
<b>Total</b>	<b>45</b>	

#### for Final Copy co-constructed with students

	Possible Points	Actual Points
Find the center of the page	1	
Four circles on the page	2	
Show your scale	2	
For every circle note the radius (2x4)	8	
Diameter for every circle (3x4)	12	
Circumference for every circle(4x4) 16 points	16	
Area for every circle (5x4)	20	
Find the area of the 3 rings (2x3)	6	
<b>Total</b>	<b>67</b>	



## First Nations Calendar Data

<b>Inner Circle</b>	
Radius:	Area:
Diameter:	Circumference:
<b>Second Circle</b>	
Radius:	Area:
Diameter:	Circumference:
<b>Third Circle</b>	
Radius:	Area:
Diameter:	Circumference:
<b>Fourth Circle</b>	
Radius:	Area:
Diameter:	Circumference:

**Materials Needed:** Compass, 8.5 x 11 paper (letter size) for the draft, 14 x 11 paper for the final copy, cardboard to make circle tool, First Nations examples of artwork (if your library has some books), Book - "Land of My Ancestors" Plants as food and medicine available through Resource Services.

**Timeline: 4 – 5 weeks:** This project is based on students having one hour of math per day.

Comments:

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## Assessment for Learning

- Students will be able to show how they know about the lessons in their notebooks by creating and describing their own problems on the left hand side of their notebooks. If students are able to complete the left hand side of their notebook with the required information, they will receive 5 marks out of 5.
- Students will write a “Show What You Know” (small quiz) every second day, to review math concepts. The next day, students will correct their “Show What You Know” before moving onto the daily tasks in math.
- Students will co-create criteria for marking the project.
- Students will self assess their final project using the co-constructed criteria.

### TEACHER NOTES

#### Differentiating Instructions

- For students with processing delays or if the workload was too big, they were only required to do calculations for 2 circles.
- Throughout the project, students did short journal entries to describe their experiences during the project.
- Students did work in partnerships to help each other understand concepts and to encourage each other.
- Mini lessons were done throughout the project to assist students with any difficulties they may have been experiencing with operations and decimals.





