****Exploring Circumference**

**Big Idea:** The constant ratio between the circumference and diameter of circles can be used to describe, measure, and compare spatial relationships.

**Learning Intentions:**

**Curricular Competencies in relation to Content**

* *use reasoning to explore and make connections between the different parts of a circle*
* *estimating reasonably the diameter and circumference of a circle*
* *use tools (e.g., measuring tapes, string, circles, pencils, paper) to explore the relationship between the diameter and the circumference of a circle and test conjectures*
* *model mathematics (e.g., using concrete materials, drawing pictures) in contextualized experiences to explore the relationships between different parts of a circle*
* *develop, demonstrate and apply mathematical understanding of the circumference of a circle through play, inquiry and problem solving.*
* *use mathematical vocabulary connected to circles (e.g., radius, diameter, circumference)*
* *communicate and represent mathematical thinking about circles using concrete materials, oral language, charts and diagrams, and written text.*
* *Connect mathematical concepts (e.g., the circumference of a circle is equal to roughly 3 and a bit of the measure of the diameter of the same circle)*

**Materials Needed**:

* *Sir Cumference and the First Round Table* by Cindy Neuschwander and Wayne Geehan
* Circular lids
* String
* Bubble Solution (Dawn dish detergent and water)
* Tinfoil plates
* Straws
* Adding Tape
* Measuring Tape
* Scissors
* Different sized hoola hoops

**BEFORE (10 – 12 min):**

To activate prior knowledge and introduce new mathematical vocabulary, read aloud *Sir Cumference and the First Round Table*.

Next, at table groups, have students turn and talk with their peers about what they know about circles. Ask for volunteers to share out what they heard. Record what they know. Capture key terms such as radius, diameter, and circumference and represent these with diagrams on the board.

Next ask what they wonder and record these. Hopefully someone will ask a question about Pi – and if they don’t, let the students know that today we are going to spend some time exploring relationships between the different parts of circles.

**DURING (30 – 40 min):**

Students will need to work with a partner. Together they will explore relationships through engaging with materials. At each exploration, students will need approximately 10 minutes. Students can choose where to start and when to move.

**Place materials at different table groups:**

|  |
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| Circular lids, adding tape, and scissors **How many measures of the diameter can you remove from the measure of the circumference?**  |
| Bubble solution, straws, string, tin foil bowls, paper towel, and scissors**How many times does the measure of the diameter go around the circumference?** |
| Hoola hoops, string, scissors, and measuring tapes**Record the measure of the diameter and circumference in centimeters. Using a calculator divide the measure of the circumference by the measure of the diameter. What do you notice? What do you wonder?**  |
| Sir Cumference and the First Round Table book- compasses, pencils, paper, scissors, rulers **How are the radius and diameter of a circle related? Can you create a**  **model to prove your conjecture?**  |

**Guiding questions during exploration time:**

* What’s going on here?
* What are you noticing? What do you think is happening?
* What do you wonder?
* Do you have a plan – where are you planning to start? And go to next?
* You tell me you are noticing… Do you think this will always be true?
* Will that work with all circles?
* What is similar about these two explorations? What is different?
* Before you calculate that, what are you estimating and why?
* Do you think there is a relationship between the diameter and the circumference? Or a relationship between the radius and the diameter?

**AFTER (10 – 15 min):**

**Summarize the learning:**

Gather as a class. Have the student turn and talk with their partner about what relationships they noticed and what they are wondering. Engage in a class discussion.

* What did you notice?
* Where there any relationships between the parts of the circle?
* Did anything surprise you here?
* What are you thinking now?
* Did you end up reexamining anything you’d thought you knew?
* What would help you settle your remaining questions?
* What new questions are you asking now?
* What new understandings did you come to?
* What do you think you’ll remember for next time?

**EXIT SLIP - Formative Assessment (5 minutes):**

How are the diameter and circumference of a circle related?

**Extending our thinking (8 min):**

Let’s enjoy some real Pie!

While eating, we will watch a video that explains the number Pi. <https://www.youtube.com/watch?v=cC0fZ_lkFpQ>

Anyone know why we are exploring Pi today on March 14th?

Can you create a formula to determine the circumference of a circle?

Which will be taller – the height of Mr. Penny or the circumference of his bike wheel? What about Mr. Bourgeious?