



## Didactic scenario: The length of the circle

Diana Rafa-mathematics teacher

**Date:** 5-th of February 2020 in Erasmus workshop;

**School grade:** VII- grade

**School subject:** mathematics, geometry;

**Lesson title:** The length of the circle – a challenge and an inspiration resource;

**Lesson type:** knowledge consolidation;

### Lesson objectives:

**At the end of the lesson the student will be able to:**

- recognize a circle's elements in practice configurations (the center, the radius, the diameter, the circumference/ the length);
- to apply circle's theorems related to the circumference (using circle's length formula to determine traveled distance of wheels);
- to calculate distances between celestial objects using circle's length formula.

### Specific competences from seven grade school curriculum

1.6. Recognizing circle's elements on a geometric configuration, identifying theorems related to the diameter perpendicular to a chord.

3.5. Applying theorems about the circle on problems solving related to circle's arches, chords and diameter perpendicular to a chord. Problems solving related to the determination of circumference and of distances using circle's radius.

6.5. Modeling practical situations with regular polygons or circles. Practical situations related to circle's theorems and regular polygons analyze. Solving methods optimization related to circle's theorems.

### Didactic means:

- Seven grade math textbook;
- lesson brochure;
- the movie about our Solar System from the following link:  
<https://youtu.be/libKVRa01L8>.  
Title: Solar System 101 | National Geographic  
The content between 4 and 5 minute.
- Lesson working-sheet
- Ruler, compass, flipchart paper, excel sheet,

### Didactic methods:

- Conversation;
- Problematization;
- solving exercises;
- Interactive methods (working on groups with the help of a puzzle)

### Bibliography:



Chicu.I, Mareş. S., Ceucă R. – Manual pentru clasa a VII-a, Editura Intuitext, 2019  
Cap 7, pag 126-132  
<https://ro.wikipedia.org/wiki/Uranus>

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### Lesson moments:

#### 1. Organizational moment

**Teacher's activity:**

-teacher asks students to sit down random on the already prepared tables;

**Student's activity:**

-students are sitting down according to their preferences, not observing the piece of paper glued on chairs' backrest;

#### 2. Catching student's attention

**Teacher's activity:**

-teacher proposes a small game to form study groups according to the color of the small paper situated on every chair's backrest:

**Student's activity:**

-students are rearranged according to the color of the small paper glued on their chairs, now the groups are mixed and heterogeneous;

#### 3. Previous knowledge actualization:

**Teacher's activity:**

-teacher refresh contents from previous lessons on the circle, related to radius, chord, diameter and the formula to calculate the circumference and circle's surface;

-teacher remind students what distance covers a wheel that spins once on a surface;

-he also asks students what distance can be covered if the wheel spins 10 times;

**Student activity:**

-students answer to teacher's questions;

-students give frontal answers and calculate with the help of the teacher what distance will be cover if the wheel spins 10 times;

#### 4. Conducting the lesson

**Teacher's activity:**

-teacher present lesson title and lesson objectives;

-teacher explains lesson's tasks and helps every group understanding their exercise and adapting theoretical content to the practical issue from the exercise;



- teacher invite a student from every group to explain their result and he verify numbers' accuracy with the help of a special created Excel sheet containing formulas for circumference;
- teacher asks students to find a general rule between the circumference and the numbers from every exercise;

#### **Student activity:**

- students adapt the model explained on the brochure to their group task;
- students select a representative that will explain their proposal and they compare their result with the one from the excel sheet;
- students search for the formula implemented into the excel working-sheet;

### **5. Knowledge consolidation**

#### **Teacher's activity:**

- teacher distributes working-sheets with more similar tasks;
- he indicates working tasks on interactive methods;
- he guides every group's task and gives help if it is needed;
- he comment on students' proposals, appreciating different methods from the one in the brochure;
- he asks students to observe links between exercise values and results;

#### **Students' activity:**

- they cooperate, searching into printed material, drawing, calculating;
  - they chose a representative to expose their solution;
  - they observe other teams' judgments;
- They formulate hypothesis and verify them with the excel file.

### **6. Making knowledge transfer**

#### **Teacher's activity:**

- teacher explains homework

#### **Students' activity:**

- they write their homework in their notebooks;
- they identify homework exercises method related to lesson content.

### **Annex 1: The circle- lesson brochure**

**Theme:** practical application on the geometric shape of circle;

**Key words:** the circle, the radius, the diameter, the circumference .

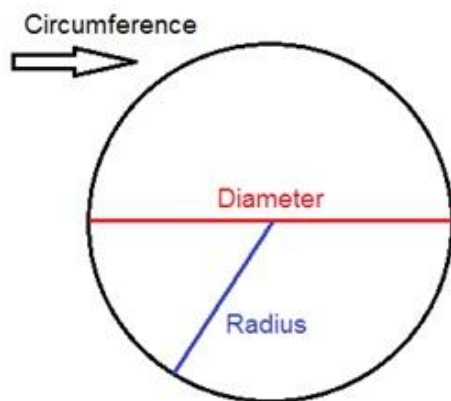
**Content:** form 7 grade core curriculum in Romania.



As you may know a **circle** is a geometric shape formed by the points from a plan, situated to the same distance from a fix point named the centre of the circle.  
Please write the name of four objects that include a surface of a circle and indicate your nickname:

**Geometric elements tied to the circle:**

**The radius(R)** is a line segment between the center of the circle and any point situated on



the circle.

**The diameter(D)** is a line segment with both extremities on the circle, that contains the center of the circle.

**The circumference(L)** or the length of the circle is the length of a string that surrounds completely a circle.

Please write the element of the circle pointed in red in the following pictures and write your nickname:

During practice we observed that the ratio between the circumference and the diameter is the same value. In fact the value is the famous number pi:

$$\pi=L/D=3.141592....$$

According to that observation, the circumference of the circle is

$$L=2 \cdot \pi \cdot R=\pi \cdot D$$

**Lesson's goal:** At the end of the material the reader must be able to answer to the question "How many times a wheel spins?"

**Practical issue:**

So if I have a wheel with an diameter of 1,5 m, how many times will it rolls in my courtyard from the entrance gate to the garage, considering that the distance between the gate and the garage 10 m.

The calculus for the number of rolls:

$$D=1,5 \text{ m}$$



This wheel circumference is  $L = \pi \cdot D = 3,14 \cdot 1,5 = 4,71$  m

The number of spins is a ratio:  $n = \text{distance} / L = 10 / 4,71 = 2,12$

Answer: the wheel will roll completely 2 times.

### Annex 2: Lesson working sheet

1. We have a tire with the radius of 65 cm. Starting from those numbers calculate:
  - a) Tire's diameter in m;
  - b) The tire circumference;
  - c) How many times a tire spins if the car makes 1500 km?
2. Knowing that the planet Uranus has a leaning angle from the vertical direction of  $98^\circ$  and planet's diameter is 52 000 km, calculate:
  - d) Uranus' circumference;
  - b) Considering that one Uranus day is the time necessary for the planet to do a complete spinning around its axis which is the link between the number of rotations and the number of Uranus days necessary to cover the orbit?
  - c) The planet makes 30800 complete rotations around its axis for covering his orbit around the sun. How long is Uranus orbit?
3. A football ball has a diameter of 22 cm.
  - a) Transformate the diameter in m;
  - b) Calculate ball's circumference. What distance the ball will cover on a complete roll?
  - c) If the football field has a length of 100 m how many times, the ball will roll?
4. A locomotive wheel has a 1,8 m diameter.
  - a) Calculate wheel's circumference;
  - b) How many times the wheel will spin to cover a distance of 12 000 km ?
5. A diesel locomotive wheel produced in Romania has the diameter of 80 cm.
  - a) Transformate the diameter in m;
  - b) Calculate the circumference of the wheel;
  - c) How many times the wheel will roll if the train goes for 1000 km?
6. On your desks, there is an circle that simulate a basket ball.
  - a) Use the ruler to measure the diameter;
  - b) Measure the length of the desk that you are staying on;
  - c) Count how many times the circle rolls completely on the desk;
  - d) Verify by calculus if you counted right.



### Annex 3: Excel formulas and tables

#### Values from the excel table and working formula

The diameter (m)	Cricle's circumference L (3,14*D)	The distance (Dist)	Rotations numbers (Dist/L)	Exercise from the working sheet
1,3	4,082	1500000	367466,928	Ex 1
0,22	0,6908	100	144,7596989	Ex 3
1,8	5,652	12000000	2123142,251	Ex 4
0,8	2,512	1000000	398089,172	Ex 5
1,3	4,082	1500000	367466,928	Ex 1

Desk length (cm) L	Ball diameter D	The circumference C (3,14*D)	Rotatio number (L / C )	Ex
40	4	12,56	3,184713376	ex 6
Planet diameter (km) D	The circumference C (=3,14*D)	Rotations number N	Orbit circumference (C *N)	Ex.
52000	163280	30800	5029024000	Ex 2

#### Online resources:

<https://jamboard.google.com/d/1YTYUYJJBx6QJJ9khwsypdFwDw9QyR9EW1ByqmCvT5AY/edit?usp=sharing>

<https://jamboard.google.com/d/1kgVbPb5jpLonsYWxsEYFNzyECOCQLAclQXSWHwOgZEw/edit?usp=sharing>

<http://teaching21.com/wp-content/uploads/2021/11/the-brochure.pdf>

<http://teaching21.com/wp-content/uploads/2021/11/probleme-pentru-atelier.pdf>