Didactic scenario: How to apply math into real world

Diana Rafa-mathematics teacher

Date: 4-th of March 2021 in online Erasmus workshop;
School grade: VII- grade
School subject: mathematics, geometry;
Lesson title: Calculating area surfaces on practical situations;
Lesson type: knowledge consolidation;

Lesson objectives:

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

-apply formula for calculating area surfaces of geometric shapes studied into seven grade math curriculum;

-recognize school content into practical situation;

-making economic estimation related to costs involved to cover calculated surfaces;

Specific competences from seven grade school curriculum

1.4. Identifying particular quadrilaterals in geometric configuration: recognizing quadrilaterals in the surrounding environment;

2.4. Describing quadrilaterals using definitions and particularities in geometric configurations;

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.

Didactic means:

- Seven grade math textbook;
- lesson presentation;
- Lesson working-sheet on Jam board
- Ruler, compass, flipchart paper, excel sheet,

Didactic methods:

- Conversation;
- Problematization;
- solving exercises;
- Interactive methods (working on groups)

Bibliography:

Chicu.I, Mareș. S.,Ceucă R. – Manual pentru clasa a VII-a, Editura Intuitext, 2019
Cap 6, pag 108-132

Teacher: Diana Rafa
"Avram Iancu" Secondary School, Dej, Cluj county, Romania

Lesson moments:

1. **Organizational moment**

Teacher's activity:
-teacher invites students to an online workshop on math, explaining how the lesson will be organized;
-the teacher provides separate links for group meetings (our available Google account does not allows breakout rooms);
-teacher invites students to connect on lesson Jam board;
Student's activity:
-students are connecting to the lesson on Google/meet platform, they are opening the chat channel for links towards separate group meetings;
-students are connecting to lesson Jam-board;

2. **Catching student's attention**

Teacher's activity:
-teacher present some pictures with spring landscapes and flowers and explain landscaping plans with flowers on selected surfaces;
-teacher asks students what geometric shapes they identify;
Student's activity:
-students watch the images and landscaping plans;
-students identify geometric shapes studied into seven grade curriculum;

3. **Previous knowledge actualization:**

Teacher's activity:
-teacher refresh contents from previous lessons on the quadrilaterals: the square, the rectangle, the trapezoid, the parallelogram,
-teacher asks students what formula should be applied to calculate the area surface of the quadrilaterals mentioned;
-teacher asks students how to calculate a circle's surface;
-teacher asks students to make a frontal calculus on area surface and the economic costs to cover that surface with flowers;
Student activity:
-students answer to teacher's questions related to quadrilaterals' particularities;
-students give frontal answers related on calculating geometric shapes surface;
- students answer to the frontal calculation task;

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 invites a student from every group to explain their result and he verify numbers' accuracy

Student activity:
- Students adapt the model explained on the frontal exercise to their group task;
-students select a representative that will explain their proposal and they compare their result with the results of other groups;
-students search for the formula implemented into lesson presentation;

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: **Lesson working sheet**

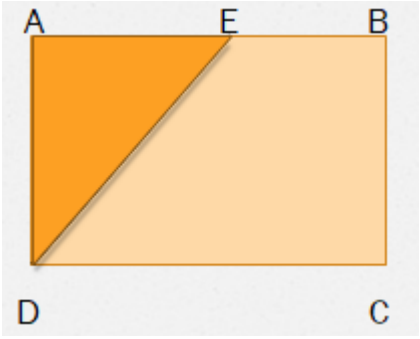
1. Landscaping a garden, we need to use tulips of 3 colors. The garden shape is an rectangle with the lenght of 20 m and the width of 16 m. Inside the garden we will plant diferent color tulips under the shape of: a circle with the radius of 5 m, and a isosceles right triangle with the leg of 6 m. The geometric shapes can be arranged as you want.

a. Please indicate the position ef each geometric shape using relations as: distances, paralel sides etc.

b. Calculate how many tulips on anny diferent colors are needed for landscaping if on a square metter we can plant 10 tulips.

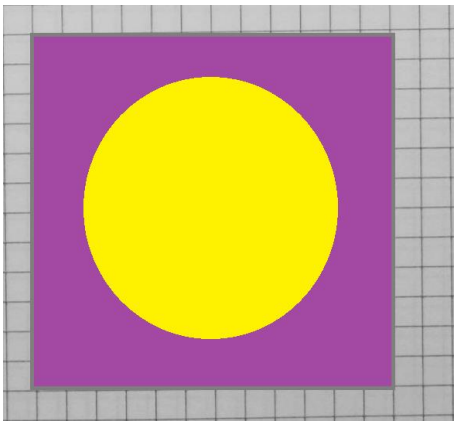
2. Describe concentric 3 circles of tulips on diferent colors. The biggest radius is 10m. Every circle has the radius 2 m smaller than the previous one. On 1 m^2 it s recommended to plant 25 tulips. Estimate $\pi = 3{,}14$. How many tulips should we buy at any different color?

3. A rectangle ABCD has the length of 8 m and the width of 6 m. On the length AB we put a point E, so that the angle ADE has 45°. Calculate how many tulips will fit on the surface of CDEB, if on 1 m^2 it will be planted 30 tulips.



4. A parallelogram has the sides of 20 m and of 16 m. One angle of the parallelogram has 150°. Calculate the area surface of the parallelogram. If the surface is covered by flowers on parallel stripes with the longer side, 4 m wide, in different colors. How many flowers will be necessaries if on 1 m^2 it will be planted 28 flowers on every paralell stipe?

5. In a suqare with sides of 12 m, we will form a model of a circle with the radius of 5 m. The surface of the circle will be covered with yellow tulips and the rest of the square will be covered with purple tulips. On 1 m^2 we will plant 25 tulips. How many yellow and purple tulips do we need? Estimate $\pi = 3{,}14$.



Annex 2: Frontal calculation to explain methods

1. A rectangle has the lenght of 12 m and the width of 8 m. How many tulips we can plant on the surface if it is recommended to plant 8 tulips on a square meter. If a tulip costs 0,2 euro, how much do we have to pay?

$$S = L \cdot w = 12 \cdot 8 = 96\ m^2$$
$$1\ m^2 \dots\dots\dots\dots\dots\dots 8\ tulips$$
$$96\ m^2 \dots\dots\dots\dots\dots\dots x\ tulips$$
$$x = 96 \cdot 8 = 768\ tulips.$$

costs= $0{,}2 \cdot 768 = 153{,}6$ euro.

2. A circle has the diameter of 16 m. Calculate circle's surface. Considering that $3{,}14 < \pi < 3{,}15$, round the surface to a natural value and calculate how many tulips can be planted on the circle's surface if on $1\ m^2$ it is recommended to plant 20 tulips.

$$r = D:2 = 16:2 = 8\ m$$
$$S = \pi \cdot r^2 = \pi \cdot 8^2 = 64\pi\ m^2.$$
$$3{,}14 < \pi < 3{,}15 \mid \cdot 64$$
$$200{,}96 < S < 201{,}6$$
$$S \cong 201\ m^2$$

Tulips= $201 \cdot 20 = 4020$.

Annex 3: Some mathematic methods for several surfaces calculation

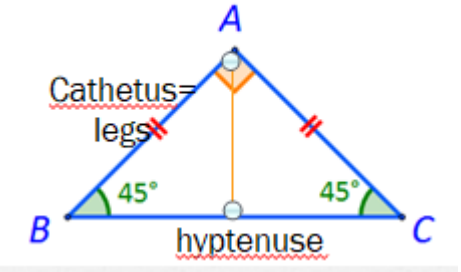
The area surface of an isosceles right triangle

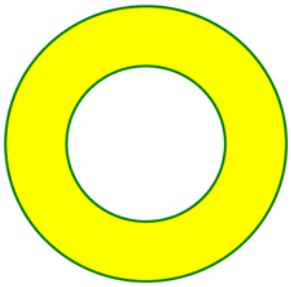
The sides that form the right angle are equal. The height from the right angle is also a median

$$h = \frac{ip}{2}$$

$$S = \frac{b \cdot h}{2} = \frac{BC \cdot \frac{BC}{2}}{2} = \frac{BC^2}{4}$$

Or in other situations: $\boldsymbol{S = \frac{c^2}{2}}$.





The annulus is the surface situated between two concentric circles.

The surface of the annulus is the substraction between the surface of the big circle and the surface of the small circle.

Online resources:

https://jamboard.google.com/d/11kg8w8A9ssdJJBwNFYXdq_yKLuN0-dxa5hHi-8pUS00/viewer
https://jamboard.google.com/d/1ChdMXvsh7brFOp8dJ3w6QXS6gDkjeiWWHBTgVMcOESo/viewer
http://teaching21.com/wp-content/uploads/2021/11/How-to-apply-Maths-in-real-world.pdf
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