MATHEMATICS - LESSON PLAN

Age:	7th grade – 8th grade (14 – 15 years old)
Subject:	United in Biodiversity – WILDLIFE TRAFFICKING
Lesson n°:	**1 & 2**
Topic:	"Let them live" – analysis of the scale of the wildlife trade problem and its impact on biodiversity based on statistical data.
Lesson topic and general objectives:	The aim of the lesson is to introduce students to the problem of wildlife trafficking based on the analysis of available statistical data related to these issues. Students will understand how statistical data contributes to investigating, analysing, and forecasting the scale of a problem and taking countermeasures.
Learning objectives	**Objectives** *You will learn to:* - Read, interpret, and analyse statistical data related to wildlife trafficking. - Perform calculations such as percentages, comparisons, and basic graphing - Develop critical thinking and advocacy skills by linking data to conservation efforts - Use ICT tools like Excel/Google Sheets to create and interpret data visualizations *You will expand your scientific knowledge in other fields, such as biology, geography, ICT:* - You will learn what wildlife trading is all about - You will learn about several species threatened with extinction due to illegal wildlife trafficking - You will understand why wildlife trade is dangerous to the environment - You will learn about the effects of illegal wildlife trafficking - You will compare the ways in which international organisations can curb illicit trade - You will realise your personal responsibility in this procedure - You will learn to use ICT tools for presentations *You will also improve your skills:* - Communication - Organisational - Critical thinking

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	Creativity in solving problems Conscious participation in the protection of the natural environment

Materials	• Desktop or laptop • Access to the INTERNET • Smartphones or tablets with INTERNET access • Worksheets for groups with prepared texts and tasks to perform • Calculators or smartphones with calculator • Applications and computer programs
Structure and activities	**Lesson 1 - practical (45 minutes):** 1. A short conversation with students about the issue of wildlife trade - do students know what this phenomenon is and what its effects are? Ask questions like "What do you know about wildlife trafficking? Why is it a problem?" (5 minutes) 2. The teacher gives the topic and objectives of the lesson, informs the students that the topic will be discussed during 2 lessons, the first one is of a practical nature and the second summarises the students' work (2 minutes) 3. The teacher divides the students into groups (the teacher makes sure that each group includes students with different levels of knowledge and skills and that each group chooses a leader who will be able to watch over the students' work in the group) and asks the students to take a designated place to work in the classroom (3 minutes). 4. The teacher distributes to the groups prepared materials on selected endangered species and tasks to be performed on this data – asks them to read their content (10 minutes) 5. Students working in groups perform tasks, develop answers in the form of a presentation, which they will present during the summary lesson – (20 minutes). 6. Short summary of the lesson (5 minutes) **Example tasks for groups** Group I – Indian elephant **The Indian elephant** is in danger of extinction due to poaching and habitat loss. According to information sources, the number of Indian elephants in

1980 was about 50,000 individuals. Over the past 120 years, the number of Indian elephants has decreased by at least half. Today it is about 40 thousand individuals. The territory in which these animals currently live covers only 15% of the areas originally occupied by them. In India, where the largest number of Indian elephants live, the population of this species has decreased significantly over the last 10 years. The main threats to the Indian elephant are habitat loss and fragmentation, conflicts with humans, poaching and disease.

Here is the information for tasks 1 - 5

The Indian elephant population in India in 2010 was 27,312 individuals, and in 2020, it was 26,390 individuals. In 2020, poachers killed 0.255% of India's Indian elephant population to get their tusks, each weighing an average of 5 kg. For a kilogram of ivory, you have to pay about 4 thousand zlotys.

Tasks to perform:

Calculate:

1. Calculate percentage decrease in population between 2010 and 2020. Round the result to 1.
2. How much more was the Indian elephant population in India in 2010 than in 2020? Round the result to 1.
3. How many Indian elephants were killed by poachers in 2020 in India? Round the result to 1.
4. How many kilograms of ivory did poachers in India get in 2020?
5. How much gold did poachers make from selling ivory in 2020 in India (remember that the elephant has two tusks)?
6. Create a bar graph in Excel/Google Sheets showing population trends over decades (1980, 2010, 2020).

Group II – Northern White Rhinoceros

The northern white rhinoceros is the most endangered mammal in the world. The last male of this subspecies died in 2018, and only two females remained in the world. And although it is not possible to save the rhinoceros using the natural method, thanks to science, it will probably be possible to reproduce the animals again, using the in vitro method. In 2020, scientists took eggs from the last two females and combined them with frozen sperm from deceased males. In this way, they obtained 5 viable embryos.

The main cause of extinction of northern white rhinos was poaching, which is the illegal hunting of these animals for their horns. Rhino horns were a highly coveted commodity in illegal Asian markets, as some people believed that they had medicinal, magical, or aphrodisiac properties. However, scientific research does not confirm these beliefs. Poachers killed rhinos without mercy, often leaving them alive after cutting off their horns. Thus, the population of the northern white rhinoceros fell from about 2000 individuals in 1960 to only 2 in 2018.

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Here is the information about tasks 1 - 5

Let's assume that in 1960 the population of the northern white rhinoceros was about 2000 individuals, in 1970 about 1000, in 1980 about 500, in 1990 about 50 individuals, in 2000 30, in 2010 15, and in 2018 it decreased to 2 individuals that turned out to be females. In 2000, poachers killed about 66% of the population of northern white rhinos to get their horns, each of which weighed an average of 3 kg. For a kilogram of rhinoceros horn you have to pay about 80 thousand zlotys.

Tasks to perform:

Calculate:

1. Calculate percentage decrease in population between 1960 and 1990. Round the result to 1.
2. How much more was the population of the northern white rhino in 1990 than in 2010? Round the result to 1.
3. How many northern white rhinos were killed by poachers in 2000? Round the result to 1.
4. How many kilograms of rhino horn did poachers get in 2000?
5. How much money did poachers make from selling rhino horn in 2000?
6. Create a bar graph in Excel/Google Sheets showing the drastic population decline (1960, 1970, 1980, 1990, 2000, 2018).

Group III – Snow Leopard

The snow leopard is a species that is threatened with extinction, as it has to deal with many threats, mainly from humans. Some of these risks include:

1. Poaching - the snow leopard has beautiful fur and other body parts that are highly valued on the black market. Some people hunt leopards for their skins, bones, claws, and teeth, which are used in traditional medicine or as ornaments.
2. Habitat loss - the snow leopard lives in harsh conditions, in the high and rocky mountains of Asia. However, its habitats are being destroyed by infrastructure development, the exploitation of natural resources, climate change, and armed conflicts.
3. Conflicts with humans - The snow leopard is a predator that hunts wild animals such as ibex, argali or deer. However, when these prey become scarce or difficult to obtain, the leopard can attack domestic or farm animals such as sheep, goats or yaks. This leads to conflicts with local farmers and shepherds who kill leopards in retaliation or pre-emptively.

Here is the information about tasks 1 - 5

In 1960, there were about 10,000 leopards in the world, and in 2020 their population was estimated at about 4,000 individuals. If appropriate conservation measures are not taken, their population may fall by 30% in the next 50 years. Therefore, the snow leopard is considered an endangered species by the International Union for Conservation of Nature (IUCN).

Illegal trade in snow leopards is a very lucrative crime. According to the WWF, the fur of one leopard can be sold on the black market for $10,000. Other parts of the body, such as bones, claws, or teeth, are also highly valued by some cultures, who believe that they have healing or magical properties and can be sold for $5,000 per kilogram. The average weight of a leopard is about 40 kg, but it can vary depending on the sex, age and health of the animal. Males are usually larger and heavier than females, and their weight can reach up to 75 kg. About 10% of the body weight of the leopard is bones, claws and teeth. It is estimated that about 200 leopards die annually due to poaching.

Tasks to perform:

Calculate:

1. Calculate percentage decrease in population between 1960 and 2020.
2. How much more than the snow leopard population was in 1960 than it was in 2020? Round the result to 1.
3. How many animals will decrease by 2070 and how large will the snow leopard population be then, if the predictions of world organizations come true? Round the result to 1.
4. Calculate how much zlotys an illegal trafficker can earn by selling one male snow leopard weighing 75 kg. For calculations, assume the conversion rate of PLN 4.04 per USD 1.
5. Assuming that 30% of the current snow leopard population may become extinct in the next 50 years, and assuming that 80% of this would become extinct as a result of illegal trade, and that the average weight of a leopard is 40 kg, calculate how much zlotys in total can illegal traffickers earn from the snow leopard trade by 2070? For calculations, assume the conversion rate of PLN 4.04 per USD 1.
6. Create a bar graph in Excel/Google Sheets showing the drastic population decline (1960, 1970, 1980, 1990, 2000, 2018).

Group IV – Asian Tiger

The Asian tiger is in danger of extinction for a number of reasons, such as:

1. Poaching and illegal trade in tiger body parts that are used in traditional medicine or as trophies.
2. Loss and fragmentation of natural habitats caused by agricultural development, urbanisation, road and dam construction12.
3. Conflict with humans that arises from competition for resources, attacks on pets or humans, and a lack of awareness and acceptance of tiger conservation.
4. Climate change, which affects the availability of water, food and shelter for the tiger.

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	Here is information about tasks 1 – 5 According to various sources, the population of the Asian tiger varied as follows: 1920 – about 100,000 individuals, 1970 – about 40,000 individuals, 1990 – about 4,000 individuals, 2010 – about 3,200 individuals. Currently, according to the World Wide Fund for Nature (WWF), the population of the Asian tiger is about 3900 individuals in the wild. The illegal trade in Asian tiger body parts is one of the main threats to this endangered species. Tiger fur – considered a valuable hunting trophy – is used to decorate clothing, and bones, vibrissae and other body parts are used in Chinese folk medicine and as aphrodisiacs, which are in increasing demand as wealth increases in some Asian countries. Small tigers are especially eagerly killed by poachers, because of the high price obtained on the black market. According to some sources, the price of Asian tiger body parts can reach up to several hundred thousand zlotys on the black market. However, there is no exact data on how much illegal traffickers earn from this practice, as it is difficult to determine and monitor. However, it can be assumed that it is a very profitable business, since they risk their lives and freedoms to acquire and sell tiger body parts. Let's assume that illegal traders sell the following body parts of an Asian tiger at the following prices: skin - 100,000 PLN per piece, bones - 50,000 PLN per kg, tusks - 10,000 PLN for 1 piece, claws - 5,000 PLN for 1 piece. Also, suppose the average body weight of an Asian tiger is 200 kg and the bone mass is 15% of the body weight. The table collects some data on wild cats. Tasks to perform: Calculate: 1. Calculate percentage decrease in population between 1920 and 2020. Round the result to 1. 2. How much percent larger was the population of the Asian tiger in 1970 than in 2020? Round the result to 1. 3. Calculate by what percentage the population of the Asian tiger increased compared to 2010. Round the result to 1. 4. Calculate how much money an illegal trader can earn by selling only Asian tiger bones with the maximum possible weight. 5. Calculate how much money illegal traders can earn by selling the body of one average Asian tiger (an Asian tiger has 18 claws on its front and hind legs). 6. Create a bar graph in Excel/Google Sheets showing population trends (1920, 1970, 1990, 2010, 2020). The teacher constantly monitors the students' work, supports, advises, checks methodological and accounting correctness, and discusses the results with them. The teacher pays attention to what units and symbols are used in calculations, how to round numbers, how to read the text with

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	understanding, how to interpret data, how to choose a model for solving the task. **<u>Lesson 2 - summarizing (45 minutes):</u>** 1. Reminder of the previous lesson – discussion (5 minutes) 2. The teacher gives the topic and objectives of the lesson (3 minutes) 3. Students present the effects of their work in groups from the previous lesson. They present both information on the animal species they dealt with as well as the results of the graphs and calculations they performed (7 minutes for each group - 28 minutes in total) 4. Summary – Creating a cloud of words, associations, ideas, proposals – The teacher asks students to answer questions previously prepared in the "Mentimeter" or "Slido" application (6 minutes): 1) Why do you think wildlife trafficking is so difficult to combat? 2) What actions can you take to raise awareness? 5. Students self-assess and evaluate group work (3 minutes)
Inclusion	**Explanation of the purpose and structure of the lesson:** This lesson is designed to engage students in learning about and understanding the problem of wildlife trafficking. By analysing the available statistical data related to this issue, students will understand how this data contributes to investigating, analysing and forecasting the scale of the problem and taking remedial measures. To ensure full participation in the lesson for all students with different learning styles, the structure of the lesson should be adapted to take into account their needs. **Clear instructions, tailored to the needs of all students:** The teacher gives instructions to students in a clear and tailored way to the needs of all students. He makes sure that everyone understands the instructions. The teaching resources used (videos, photos, other materials) will help students with different learning styles to understand the content. If necessary, he repeats or explains instructions for individualized support. **Creating integration groups:**

	During classes, students work in groups, which will allow for cooperation and mutual learning. By dividing students into groups, the teacher takes care of creating integration groups, consisting of students with different levels of knowledge, skills and backgrounds. The teacher motivates students to act and share their thoughts, appreciating the contribution of each student. **Monitoring engagement and support interventions:** The teacher constantly monitors the students' work, supports and advises, making sure that all students actively participate in the group's work. Responds sensitively to possible cases of exclusion or lack of involvement, undertaking discreet interventions consisting in encouraging participation in the group's work or providing additional explanations or modifying assigned tasks. stresses the importance of using mathematics to analyse data on wildlife trafficking, prevention and environmental protection;

Supporting documentation/resources:

1. **Movies:**

a. **National Geographic Wild:** National Geographic Wild is a place for all animals and animal lovers alike. With this site, you can take a journey through the animal kingdom and discover things you never knew before or rediscover your favourite animals! https://www.youtube.com/@NatGeoWild

b. **National Geographic Kids:** National Geographic Kids produces films about wildlife conservation, including the effects of illegal wildlife trafficking. These videos are designed specifically for younger audiences and provide valuable insights into the issue in a visually appealing format. https://kids.nationalgeographic.com/history/article/endangered-species-act

c. **World Wildlife Fund (WWF):** WWF offers films and documentaries on wildlife conservation and trafficking, featuring interviews with experts and real-life stories that can help students understand the seriousness of the issue and the importance of conservation action. www.worldwildlife.org

Assessments:

#1 Practical exercises using numerical data and the tools offered by mathematics in monitoring the phenomenon of illegal wildlife trafficking

	Initiating	Developing	Excelling
Description of performance	It can read the data of the illegal wildlife	Can read, interpret and analyse data on	He is excellent at reading, interpreting

	trade. Can search for numerical values in the source text. It may have trouble analyzing data more broadly and drawing conclusions.	the changing numbers of selected endangered species. He knows how to compare them, perform calculations for comparison. Can discuss the scale of wildlife trafficking in relation to the figures at its disposal. He formulates conclusions.	and analysing data on population changes in rare and endangered species, and is able to formulate far-reaching conclusions and design informed actions aimed at protecting wildlife. Demonstrates proficiency in the use of mathematics, calculator and ICT tools in researching, analysing and formulating conclusions and proposing solutions for wildlife conservation.
Sample student response	"I can search for numerical data from the source text and materials available on the Internet, I can compare them, but I have trouble analysing the entire data set, I cannot draw conclusions. I can give you examples of the effects of illegal wildlife trafficking".	"I can read, interpret and analyse data. I can compare data from the entire set. I can do the necessary calculations to compare the data. I can tell you about the illegal wildlife trade based on the data I analyse. “	"I can analyse data on illegal wildlife trafficking and I can draw conclusions based on it. I know what I can do myself to protect wildlife. I can plan wider activities to promote wildlife conservation. I can prepare, present and share the collected information with a wider audience.

#2 – Presentation and dissemination

	Initiating	Developing	Excelling
Description of performance	It prepares a presentation illustrating the issues discussed regarding the causes and effects of illegal wildlife	He can use sophisticated numerical data to create an interesting presentation with well-selected	He demonstrates proficiency in the use of mathematics by creating visually attractive presentations that

	trafficking. He may have a problem with choosing the content on the presentation slides so that it is readable for the audience. He makes his presentation available to a small audience - students from the class.	material, which attracts the attention of the recipient. He makes his presentation available to a wider audience - through a virtual school newspaper.	present the discussed issues in a comprehensive, interesting and thought-provoking way. He makes his presentation available to a wide audience - through social networks, e.g. school fb, generating a QR code with access to the presentation.
Sample student response	"Wildlife trafficking is a phenomenon that is on an increasing scale. The presentation slide provides information on the reasons for this phenomenon, i.e. the increasing demand for meat and products from wild animals."	"Man and his desire to have original products or "souvenirs from his travels" drives the mechanism of increasing the number of illegal markets and is associated with increasing poaching. Analysis of numerical data allows us to realise the huge scale of this phenomenon. In my presentation, I present important information on the illegal wildlife trade and proposals to counteract it."	"Illegal wildlife trafficking has serious consequences. Enormous suffering of animals, the risk of spreading dangerous viruses or bacteria. Becoming aware of this network of interconnections is a sufficient argument to convince us to join various actions and programs that increase people's awareness. I am making my presentation available to the entire school community."

Quantitative evaluation heading:

Criteria	Initiating	Developing	Perfect
Performance Description			
Practical exercises using numerical data and the tools offered by mathematics in monitoring the phenomenon of illegal wildlife trafficking			
- Read, interpret and analyse data	1-3 Points	4-6 points	7-10 points

- Formulating conclusions	1-3 Points	4-6 points	7-10 points
Presentation and dissemination			
- In-depth and creative presentation plan	1-3 Points	4-6 points	7-10 points
- Execution and strategy of influencing the recipient	1-3 Points	4-6 points	7-10 points
- Consider the wider impact on the community	1-3 Points	4-6 points	7-10 points

Calculating the total points:

- The total points for each criterion can be calculated by adding up the points awarded in each category.

Rating table: Inclusion and diversity – WILDLIFE TRAFFICKING

Criteria	Check
Information offered in multiple formats	
- Variety of educational materials provided	
- Textual, visual, auditory resources	
Integrative methodologies such as peer-to-peer learning	
- Opportunities for joint activities	
- Group discussions, peer teaching	
Use of ICT tools	
- Integrating technology into educational activities	
- Use of online platforms, interactive tools	
Overall Inclusion and Diversity	
- Integration of different perspectives	
- Opportunities for student engagement	
- Promoting equitable participation	

Explanation of the criteria:

- **Information offered in multiple formats:**
    - Assess whether the lesson plan includes learning materials in different formats such as text, visuals, and listening resources to cater to different learning styles.
- **Integrative methodologies such as peer-to-peer learning:**
    - Assess whether the lesson plan includes inclusive methodologies such as peer-to-peer learning, group discussions, and collaborative activities to encourage student interaction and engagement.
- **Use of ICT tools:**

- Determine whether the timetable uses ICT tools, such as online platforms and interactive resources, to enhance learning experiences and accessibility.

- **Overall Inclusion and Diversity:**

  - Summarise the overall assessment of inclusion and diversity in the lesson plan, considering the integration of different perspectives, opportunities for student engagement, and the promotion of equitable participation.