

LESSON PLAN

Subject: Mathematics

Topic: Operations with sets and real numbers

Age of students: 16

Language level: B1, B2

Time: 45 min

Content aims:

After completing the lesson, the student will be able to:
Revise classification of real numbers.
Explain operations with real numbers.
Use operations with sets and real numbers.
List subsets of different sets.

Language aims:

After completing the lesson, the student will be able to:
Use new vocabulary within the topic.
Develop ability to interpret and communicate mathematics.
Describe in words different sets.

Pre-requisites:

- Operations with real numbers, their classification;
- Operations with sets.

Key words: set, union, intersection, difference of sets.

Materials: Worksheet “Operations with sets and real numbers”.

Procedure steps:

1. Students do the exercise 1 in pairs.
2. Students read, listen and compare.
3. Students do the exercise 2 individually.
4. Students read, listen, compare and discuss their point of view.
5. Students do the exercise 3 in pairs.
6. Students read, listen, compare and discuss their point of view.
7. Students do the exercises 4 and 5 in pairs.
8. Students read, listen and compare the results.
9. Students do the exercise 6 in pairs.
10. Students read, listen, compare and discuss their point of view.
11. Students do the exercise 7 in pairs.
12. Students read, listen and compare the results.

Attachment:

Operations with sets and real numbers

1. Match and translate:

| Terms in English | Terms in native language | Simbols |
|---------------------------------|--------------------------|----------------------------------|
| 1. Union of sets A and B | | <i>I</i> $A \subset B$ |
| 2. Intersection of sets A and B | | <i>II</i> $A \cap B = \emptyset$ |
| 3. Subtraction of sets A and B | | <i>III</i> $A \cap B$ |
| 4. Empty set | | <i>IV</i> $A \setminus B$ |
| 5. Disjoint sets A and B | | <i>V</i> $A \cup B$ |
| 6. Set A is a subset of B | | <i>VI</i> \emptyset |

2. Define sets R, S, T as follows:

$R = \{x \mid x \text{ lives in the hostel of Daugavpils State Gymnasia}\}$

$S = \{x \mid x \text{ is a student in Daugavpils State Gymnasia}\}$

$T = \{x \mid x \text{ is an employee of Daugavpils State Gymnasia}\}$

Describe in words each of the following sets:

a) $S \cap R$; b) $S \cup T$; c) $(S \cup T) \cap R$; d) $T \setminus R$.

3. List all subsets of the following sets: a) $\{x\}$; b) $\{a;b\}$; c) $\{1;2;3\}$.

How many of them can you find in each case?

4. Let $A = (-5; 7)$, $B = [2; 9)$. Find $A \cup B$, $A \cap B$, $A \setminus B$.

5. Let $A = (-\infty; -3)$, $B = \{-4;-3;5\}$. Find $A \cup B$, $A \cap B$, $B \setminus A$.



6. Fifty people are interviewed about their food preferences. Twenty of them like Greek food, 32 like Italian food and 12 like neither Greek nor Italian food. How many of them like Greek but not Italian food?

7. Determine to which sets of numbers the results of the following expressions belong:

a) $\sqrt{(7-\sqrt{3})^2} - \sqrt{(1-\sqrt{3})^2}$;

b) $0,5 + \sqrt{10-4\sqrt{6}} - \frac{(2\sqrt{3} + \sqrt{2})^2}{4}$.

Hometask: Define any three sets M, L, P. Find $M \cup L$, $L \cap P$, $M \setminus P$, $(L \cap P) \cup M$.

Operations with sets and real numbers (answers)

1. Match and translate:

| Terms in English | Terms in native language | Simbols |
|---------------------------------|-------------------------------|---------------------------|
| 1. Union of sets A and B | Kopu apvienojums V | I $A \subset B$ |
| 2. Intersection of sets A and B | Kopu šķēlums III | II $A \cap B = \emptyset$ |
| 3. Subtraction of sets A and B | Kopu starpība IV | III $A \cap B$ |
| 4. Empty set | Tukša kopa VI | IV $A \setminus B$ |
| 5. Disjoint sets A and B | Nesavienojamas kopas II | V $A \cup B$ |
| 6. Set A is a subset of B | Kopa A ir kopas B apakškopa I | VI \emptyset |

2. Define sets R, S, T as follows:

R = {x | x lives in the hostel of Daugavpils State Gymnasia}

S = {x | x is a student in Daugavpils State Gymnasia}



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$T = \{x \mid x \text{ is an employee of Daugavpils State Gymnasia}\}$

Describe in words each of the following sets:

- a) $S \cap R$ - students in Daugavpils State Gymnasia who live in the hostel of that school.
- b) $S \cup T$ - students and employees of Daugavpils State Gymnasia.
- c) $(S \cup T) \cap R$ - students and employees of Daugavpils State Gymnasia who live in the hostel of that school.
- d) $T \setminus R$ - employees of Daugavpils State Gymnasia who don't live in the hostel of that school.

3. List all subsets of the following sets:

- a) $\{x\}$ - $\emptyset; \{x\}$ - $2 = 2^1$
- b) $\{a; b\}$ - $\emptyset; \{a\}; \{b\}; \{a, b\}$ - $4 = 2^2$
- c) $\{1; 2; 3\}$ - $\emptyset; \{1\}; \{2\}; \{3\}; \{1; 2\}; \{1; 3\}; \{2; 3\}; \{1; 2; 3\}$ - $8 = 2^3$

How many of them can you find in each case?

4. Let $A = (-5; 7)$, $B = [2; 9)$. Find

$$A \cup B = (-5; 9)$$

$$A \cap B = [2; 7)$$

$$A \setminus B = (-5; 2)$$

5. Let $A = (-\infty; -3)$, $B = \{-4; -3; 5\}$. Find

$$A \cup B = (-\infty; -3] \cup \{5\}$$

$$A \cap B = \{-4\}$$

$$B \setminus A = \{-3; 5\}$$



6. Fifty people are interviewed about their food preferences. Twenty of them like Greek food, 32 like Italian food and 12 like neither Greek nor Italian food. How many of them like Greek but not Italian food?

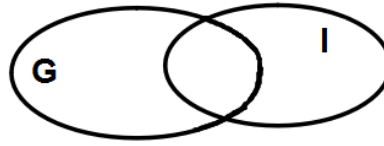
$$n(G) = 20$$

$$n(I) = 32$$

$$n(G \cup I) = 50 - 12 = 38$$

$$n(G \setminus I) \text{ - ?}$$

$$n(G \setminus I) = 38 - 32 = 6$$



7. Determine to which sets of numbers the results of the following expressions belong:

$$\text{a) } \sqrt{(7-\sqrt{3})^2} - \sqrt{(1-\sqrt{3})^2} = |7-\sqrt{3}| - |1-\sqrt{3}| = 7-\sqrt{3} - (1-\sqrt{3}) = 7-\sqrt{3} - 1 + \sqrt{3} = 6$$

$$6 \in \mathbb{N}$$

$$\text{b) } 0,5 + \sqrt{10 - 4\sqrt{6}} - \frac{(2\sqrt{3} + \sqrt{2})^2}{4} = 0,5 + \sqrt{(2-\sqrt{6})^2} - \frac{12 + 4\sqrt{6} + 2}{4}$$

$$= 0,5 + |2-\sqrt{6}| - 3,5 - \sqrt{6} = -3 + 2 - \sqrt{6} - \sqrt{6} = -1 - 2\sqrt{6} \in I$$