edugraal

TOPIC: FIRST-DEGREE EQUATIONS WITH ONE VARIABLE

SUBJECT: MATHEMATICS

LEVEL/AGE: MIDDLE SCHOOL - 14-15 YEARS OLD

FOREKNOWLEDGE: Operations with real numbers, operations with fractions

LENGTH: 5 PAGES (DURATION: 50 MINUTES)

LEARNING OUTCOMES

At the end of the lesson, the students should be able to:

- Solve a first-degree equation with one variable,
- Calculate the unknown side of a right triangle using the Pythagorean Theorem,
- Recognise the Pythagorean triples.

RESOURCES

Workbook
Collection of formula
Revision worksheet
Practice worksheet

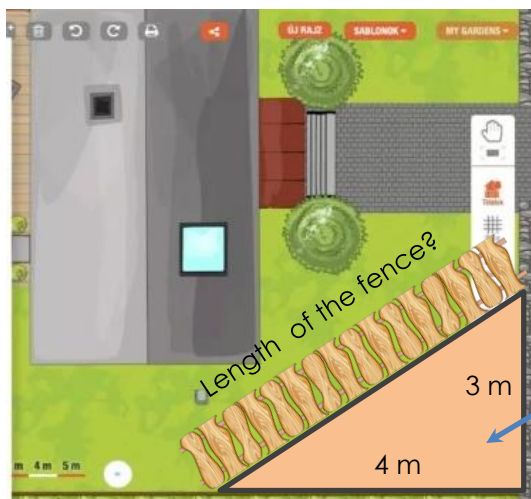## TEACHING METHODS

Revision
Presentation
Exploratory worksheet
Projected worksheet

ACTIVITIES

INTRODUCTION (5 minutes)

Imagine that you can build your own tree house in the corner of your garden. Your parents ask you to calculate the length of the separation fence, if you can take possession of 3 metres to the right of the house and 4 metres behind the house.

You have learned how to solve equations with real numbers, and in geometry, you have learned how to calculate the length of one side of a right triangle, knowing the size of the other two sides. These are exactly the skills you need.

THEORY PART (10 minutes)

First, revise the concept and solving method of the first-degree equation with one variable.

Remember!

If an equation contains a variable, it is called a univariate explicit statement.

The set from which the variable can take its value is called the interpretation set.

Solving the equation means finding the values of x in the interpretation set for which the equality is true.

The set of these values is the solution set.

> Pythagorean theorem: the sum of the squares on the sides of a right triangle is equal to the square on the hypotenuse (the side opposite the right angle).
>
> Pythagoras' theorem is used to calculate the unknown side of a right triangle when the dimensions of the other two are known.

Another interesting correlation:

A triplet of natural numbers (x,y,z) is called a Pythagorean triplet if **$x^2+y^2=z^2$**.

HANDS-ON PART (25 minutes)

1. Solve the following equation using the set of real numbers:

$$\frac{x+3}{x-1} = -\frac{2}{3}$$

Solution: It is important to specify that the denominator of the fraction cannot be zero, i.e. $x-1 \neq 0$, so the solution can be any real number except 1 : $x \in \mathbb{R} \setminus \{1\}$

Cross-replicate: $3 \cdot (x+3) = -2 \cdot (x-1)$, so $3x + 9 = -2x+2$, where $3x+2=2-9$,

meaning $5x=-7$, as a conclusion $x = -\frac{5}{2}$.

The solution set is $M = \left\{-\frac{5}{2}\right\}$

2. Solve the following equation using the set of real numbers:

$$\frac{x+2}{x-5} = \frac{7}{x-5}$$

Solution: It is also important to specify that the denominator of the fraction cannot be zero: $x - 5 \neq 0$, so the solution can be any real number except 5: $x \in \mathbb{R} \setminus \{5\}$

Since the denominators of the two fractions are equal, the numerators are equal, too. So add the parts $x+2=7$, namely $x = -5$, but this was excluded at the beginning, so the equation has no solution.
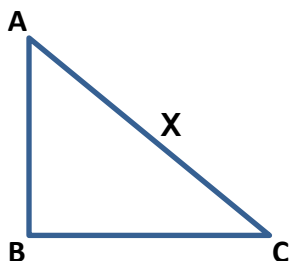
Solution: $\mathbf{M = \Phi}$

3. Now you should solve the following equation using a set of real numbers:

$$\frac{1}{5} \cdot \left[\frac{1}{2} \cdot \left(\frac{1}{5}x + 1 \right) + 1 \right] = 1$$

To calculate the length of the fence of your little cottage, it is necessary to revise the pythagorean theorem for right triangles.

EXERCISE PART (5 minutes)

1. If one leg of a right triangle is 6 cm and the other leg is 8 cm, then how much is the hypotenuse of the triangle?

Solution: Mark with x the length of side AC
Based on the theorem $AC^2=AB^2+BC^2$, replace:
$x^2=6^2+8^2$, namely $x^2=36+64$, namely $x^2=100$,
where $x=10$, so the length of the hypotenuse is $AC=10$.
You can notice that the numbers 6, 8 and 10 form a Pythagorean triplet.

2. The two bases of a rectangular trapeze are 12 cm and 7 cm, and the length of one diagonal is 13 cm; calculate the length of the non-parallel sides.

CONCLUSION (3 minutes)

The teacher assesses the work of the students.

Evaluation of the students' work, distribution of rewards and red bullets.

SYNTHESIS/SUMMARY (2 minutes)

I invite you on to an adventure! **"Searching for the Corvina"**

By doing your homework, you will be part of an adventure! The knowledge you have gained and revised during this class will be helpful while going through the homework adventure. You will be able to solve equations with one variable, calculate the unknown side of a right triangle using the Pythagorean Theorem and recognise the Pythagorean triples.

Good luck!

BIBLIOGRAPHY

Simon József – Mathematics grade VI. – Theory and exercises - Alutus Publishing House 2018, Miercurea Ciuc