LESSON SCENARIO 04:
PRIME NUMBERS

Topic: Algebra

Level: Age 14 -18

Foreknowledge: The 4 operations

Correlation: Cryptography

LEARNING OUTCOMES

- Determine the prime numbers up to150

TEACHING METHODS

- Practical work
- Hands-on activity

KEY WORDS

- Prime number
- Multiples
- Divisors

RESOURCES

- Coloured pencils
- Eraser
- Calculator
- Stamp/Ink

INTRODUCTION TO PRIME NUMBERS (15 MIN)

EXERCISE 1:

The teacher can complete this table with the help of the students.

Fill in the table with the criterium for recognizing if a number is a ...:

Multiple of 2:
Multiple of 3:
Multiple of 5:

1. **Multiple of 2: The last digit must be divisible by 2 (even)**
2. **Multiple of 3: Sum the digits, the result must be divisible by 3**
3. **Multiple of 5: The last digit is 0 or 5**

<u>Worksheet for students: The sieve of Eratosthenes</u>

Then the teacher gives instructions on what to do:

Cross out all multiples of 2 in yellow except 2.

Cross out 1

Cross out in yellow all multiples of 2, except 2

Cross out in green all multiples of 3 except 3.

Cross out in purple all multiples of 5 except 5

Cross out in blue, all multiples of 7 except 7

Cross out in red all multiples of 11.

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129
130	131	132	133	134	135	136	137	138	139
140	141	142	143	144	145	146	147	148	149

The teacher supervises the classroom and notices various ideas that students have explored and written down.

After the completion of the task by the students, teacher and students discuss these questions:

Why didn't we ask to cross out all multiples of 4, of 9, … ?

Because all multiples of 4 are multiples of 2 and have already been crossed out. The same goes for all the other even numbers of the table, for multiples of 9, of 25, and so on.

Why did we stop at 11?

Because, the following number would have been 13. All the multiples of 13 minus than 150 have already been crossed out, because $13 * 13 > 15$

More generally, if the table ends at *N*, we can stop the process at the greatest number

a <= $\sqrt{N}$

All the remaining numbers are called prime numbers.

Give the definition of a prime number.

A prime number is an integer greater than or equal to two, which has exactly two divisors: 1 and itself.

THE MAIN PART (25 minutes)

The teacher divides students into groups of 2 and prepares one token per game. Use a stamp. Then he/she gives instructions on what to do:

Leave a trace with the stampon the 'Start' box....

Go on over the maze of numbers - horizontally and vertically only. The object of the game is to arrive to the 'Arrival' box. To do this, you will only have to pass over the boxes with a prime number.

73	17	START 2	130	22	379	127	301	299	1
402	509	126	25	28	4	449	132	310	405
7	89	19	400	63	487	151	353	108	497
533	80	367	9	213	11	80	79	3	55
11	97	229	47	150	383	418	107	18	12
281	481	398	199	445	ARRIVAL 12 589	15	421	500	473
113	42	270	338	33	6	459	389	75	16
139	61	433	251	13	193	317	179	200	327

BONUS:

Using the Python code, the teacher can propose to code this algorithm in order to know if a number is prime or not.

```
def eratosthenes(n):
    all = []
    prime = 1
        print(2)
i = 3
    while (i<= n):
        if  i not in all:
            print(i, ",")
            prime += 1
            j = i
            while (j <= (n / i)):
all.append(i * j)
                j += 1
i += 2
    print("\n")

eratosthenes(150)
```

EVALUATION

FINAL PART (5 minutes)

1. DO I KNOW HOW TO DEFINE A PRIME NUMBER?

2. ARE THESE NUMBERS PRIME ?
367 , 418 , 153 , 107

1. Do I know how to define a prime number?

Write the definition of a prime number.

A prime number is an integer greater than or equal to two, which has exactly two divisors: 1 and itself.

2. Are these numbers prime?

Here are some numbers: 367, 418, 153, 107

Are they all prime numbers? If not, why not?

2 numbers are not prime numbers.

418 is not a prime number because it is a multiple of 2

153 is not a prime number because it is a multiple of 3

107 is not divisible by 2, by 3, by 5, by 7. It is prime number because $11 > \sqrt{107}$.

INCLUSIVENESS GUIDELINES

Every student is different and their needs for the material might vary. Below you will find several tips that could make mathematics lesson more inclusive for students who struggle with learning disorders.

- **When giving assignments to classroom try to break them into small pieces of information. Avoid the double tasks in the instructions. Remember that in case of operations/exercises with multiple steps, it is critical to help learners decompose the steps.**
- **You can use checklists for your students to make sure they have done all the steps**
- **Make sure the font, line spacing, and alignment of your document is accessible for students with learning disorders. It is recommended to use a plain, evenly spaced sans serif font such as Arial and Comic Sans. Others: Verdana, Tahoma, Century Gothic and Trebuchet. Spacing should be 1.5 and try to avoid justification in the text.**
- **At the end of each activity, take some time to ask the students what they have learnt to acknowledge every step in their learning process**
- **Make sure that the material the students manipulate is easy enough to grasp**
- **While using different media (paper, computer and visual aids) choose different background than white which can be too bright for students with learning disorders. The best choice would be cream or soft pastel but try to test different colours to learn more about student's preference.**
- **To stimulate short and long-term memory prepare for all the students in the classroom an outline describing what they are going to learn on this lesson and finish it with a resume of what has been taught. In this way they will strengthen the ability to remember information.**

EXAMPLE:

1. Start every lesson with a short "CHECK-IN"

- **Today, we will study the topic (name of the topic)**
- **I will tell you about: (name 3 keywords connected with the topic)**
- **Then I will present exercises: (name the exercises form the student book)**
- **Then we will do exercises (explain the way student will be working: ex. together with teacher / in pairs /individually)**
- **Once the exercises will be done [To continue]**

2. Then finish lesson with a short "CHECK-OUT"

- **During the lesson we learn about (topic of the lesson)**
- **The most important things were: (name 3 keywords connected with the topic)**
- **We were able to do… (tell about the work student done during the lesson)**
- **We will explore the topic next time when we will learn about (name the following topic)**

It is a small adjustment that will take 5 min from the lesson but can make a great difference in the way that the material will be remembered. Try to create this as a routine habit.