

**Whole numbers**

School grade: K7

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For practical reasons (measuring temperature, making maps of both mountainous regions and the bottom of the oceans, showing remarkable historical moments) people have added to the set of natural numbers N= {0, 1, 2, 3, ... , n, . ..} the set of negative integers Z-={...,-n ...,-3,-2,-1}, obtaining:

#### The set of integers

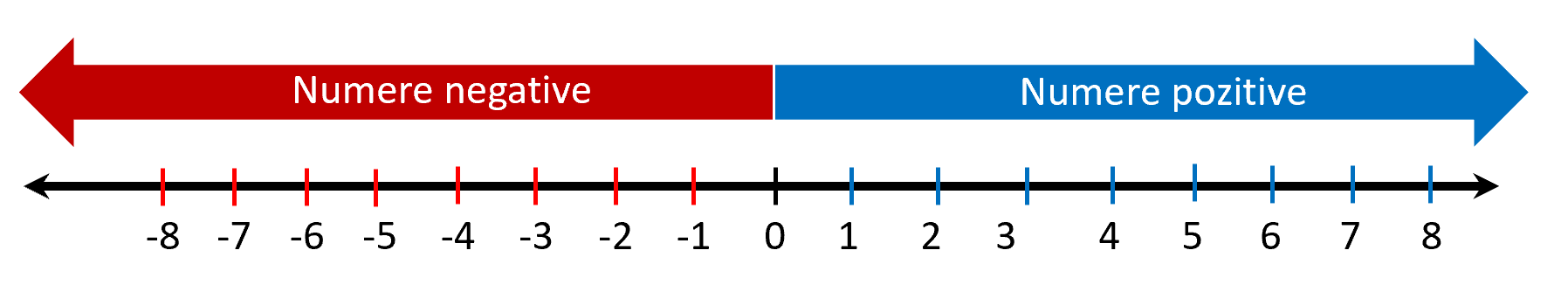
***Z****=*{...,-n ...,-3,-2,-1, 0, 1, 2, 3, ... , n, ...}.

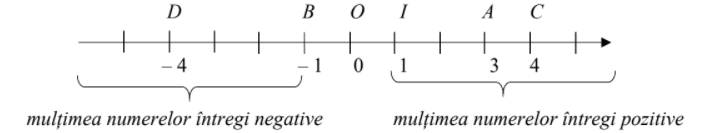
The set of nonzero integers is denoted by ***Z\*=Z-{0}***

We denote by **Z** – the set of negative integers ***Z -***={ x ϵ Z | x<0}

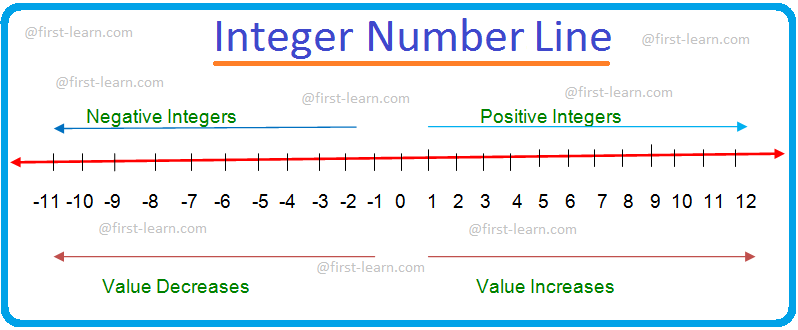
We denote by **Z +** the set of positive integers ***Z +***={ x ϵ Z | x>0}

Positive integers correspond to natural numbers and writing the "+" sign in front of them is optional.

Entering integers was required to be able to perform the subtraction operation. In the lower grades, in natural numbers, you learned that we cannot subtract 3-10. But in the set of integers, any subtraction operation results.



The set of negative integers The set of positive integers



#### Each whole number corresponds to a point on the number line. The number associated with the point is its abscissa (coordinate).

On the number axis in the drawing above, the points O (origin), I, A, B, C and D have abscissas 0, +1, +3, –1, +4, –4, respectively, and we write O(0), I (+1), A(+3), B(–1), C(+4), D(–4).

#### Two integers that differ only in their sign are called opposites. On the number axis, they are represented by two symmetrical points with respect to the origin O.

Example: +4 and –4 are opposite integers and the points C and D, respectively, through which they are represented on the axis are symmetric about the origin O (or O is the midpoint of the segment CD).

Note: The opposite of 0 is 0.

#### The distance from the origin to the point through which an integer a is represented, on the number line, is called the modulus of the number a and is denoted |a|.

Example: In the above figure the module of the number +4 is equal to the distance from O to A and we write |+4| = 4, and the modulus of its opposite, – 4, is equal to the distance from O to B and |–4| = 4.

Likewise we get |0| = 0, |–1| = |+1|, |+3| = 3.

Note: The modules of two opposite numbers are equal because the points representing them on the number line are equidistant from the origin.

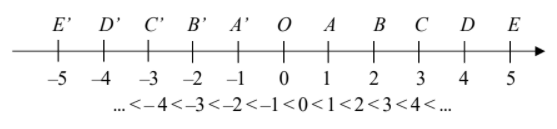
#### Of two different integers, the larger one is the one on the axis represented on the right. Of two positive (negative) integers, the one with the larger (smaller) modulus is greater. Any positive number is greater than any negative number..

**Examples:**

1) ***Comparisons***

a) –3 > –5 because |–3| = 3 < 5 = |–5|.

b) –5 < +3 because point C is to the right of point E' on the axis or because -5 is negative and +5 is positive.

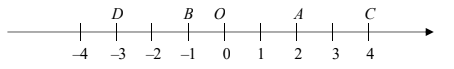


**2) Everyday problems.**

**a)** Of two citizens who have debts to the bank, one 1000 and the other 2000 banking units, which one should be calmer? Let's model the information in the language of integers.

b) Two citizens have, one a deposit of 1000 in the bank, and the other a credit of 1000. Which should be quieter? Let's model the information in the language of integers.

**3) Copy and represent on the axis the points A', B', C', D', whose abscissas are, respectively, the opposites of the abscissas of points A, B, C, D in the given drawing.**



***Solving:***



The abscissa of point A is 2 and the opposite of 2 is - 2, so we will represent point A' of abscissa - 2. Analogously, point B has abscissa - 1, and the opposite of - 1 is 1 and we will represent point B' of abscissa 1; point C has abscissa 4 and its opposite is - 4 and we will represent point C' of abscissa - 4; point D has abscissa – 3 and its opposite is 3 and we will represent point D' of abscissa 3. Thus, we obtain points A'(–2), B'(1), C'(–4) and D'(3).

**4) Determine the sets:**

****

***Solving*:**

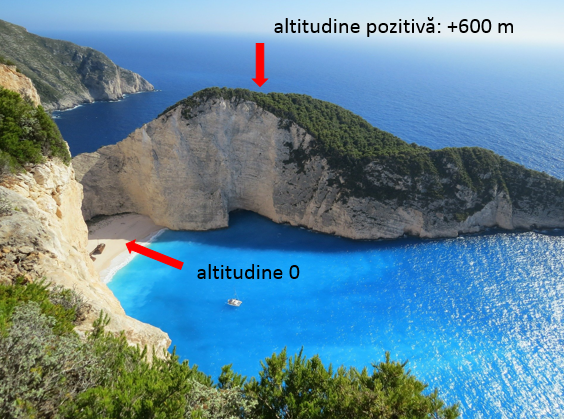
The integers x whose distance on the axis is less than or equal to 2 are the positive ones 1 and 2, but also the negative ones –2 and –1, as well as the integer 0. We deduce that A = {–2, –1, 0, 1, 2}. If |y| < 4, then the positive integers y are 1, 2 and 3, the negative ones – 1, – 2 and – 3, but also 0. We get B = {–3, –2, –1, 0, 1, 2, 3}. How |z| > 0, for any non-zero integer, we deduce that C=Z\*.

**5) The table below shows the temperatures at 8 o'clock at a weather station on each weekday in February.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Day | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
| Temperature (℃) | -1 | -8 | -10 | -3 | 1 | 3 | 5 |

**According to the table, the arithmetic mean of positive temperatures is equal to ...℃**

**6) You must have seen in winter, in the weather forecast, that some temperatures have a minus sign. These temperatures are below zero degrees and for this reason we will call them negative temperatures (ex: -7℃). Instead, in summer we will have positive temperatures, because in summer the temperature is higher than 0 degrees (ex: 25℃).**



Positive altitude: +600 m Negative altitude: -60 m

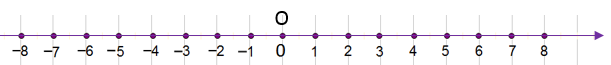
The deepest point on the surface of the earth is the Mariana Trench, in the Pacific Ocean, having a depth/altitude of approximately -11000 meters. The highest place is Mount Everest, in the Himalayas, with +8848 m.

Positive integers correspond to natural numbers and writing the "+" sign in front of them is optional.

Entering integers was required to be able to perform the subtraction operation. In the lower grades, in natural numbers, you learned that we cannot subtract 3-10. But in the set of integers, any subtraction operation results.

#### Comparing and ordering integers

On a straight line we fix a point O called the origin, a unit of measure and a positive direction indicated by the arrow. Point O corresponds to the number zero. We thus obtain an axis of numbers, on which we will represent some integers. We cannot represent them all, because the set of integers is infinite.



**The set of integers** is the union of the set of positive natural numbers, their opposites (negative numbers), and the number 0.

straight integer numbers equals open curly brackets... comma space minus n comma space... comma space minus 3 comma space minus 2 comma space minus 1 comma space 0 comma space 1 comma space 2 comma space 3 comma space... comma space n comma space... close curly brackets
straight integer numbers to the power of asterisk times equals straight integer numbers backslash open curly brackets 0 close curly brackets

The inclusion relationship takes place:

straight natural numbers subset of straight integer numbers.

If a number is preceded by a '+' sign, then the number is positive. Positive numbers are located on the axis to the right of the number 0.

If a number is preceded by a '-' sign, then the number is negative. Negative numbers are located on the axis to the left of the number 0.

*Note*: we agree that the '+' sign in front of positive integers should no longer be written*.*

*Example:* +9 = 9; +37 = 37.

#### The absolute value of an integer

**The absolute value** or **modulus** of an integer is the distance from the origin to its position on the number line.

*Examples:*

open vertical bar negative 2 close vertical bar equals 2
open vertical bar plus 4 close vertical bar equals 4
open vertical bar negative 15 close vertical bar equals 15
open vertical bar 0 close vertical bar equals 0

**The opposite of an integer** x is the number -x, so that*x+ (-x) = (-x)+x = 0.*

*Examples:*

the opposite of the number 3 is the number -3

the opposite of the number -5 is the number 5

the opposite of the number 0 is 0

Two integers are opposite if they have opposite signs and the same absolute value.

The absolute value of a positive integer is that number.

Absolute value of a negative integer is its opposite.

Therefore, for any integer a, it occurs:

open vertical bar a close vertical bar equals space left enclose negative a comma space d a c ă space a less than 0
space space 0 comma space d a c ă space a equals 0
space space a comma space d a c ă space a greater than 0. end enclose





#### Ordering integers

Two integers a and b are in the relation a < b if, representing them on the axis, b is located to the right of a.

To compare two integers, we will take into account the following aspects:

the number 0 is less than any positive integer; *ex: 0 < +5*

between two positive integers, the one with the higher modulus is greater; *ex: 32 >10*

the number 0 is greater than any negative integer; *ex: 0 > -6*

between two negative integers, the one with the smaller modulus is larger; *ex: -8 > -12*

any positive integer is greater than any negative integer; ex: 7 > -14.

#### Operations with integers

#### Addition and subtraction

*1. Addition of integers with the same sign*

To add two integers with the same sign, add their modules and the result will have the common sign..

*Examples:*

left parenthesis plus 2 right parenthesis plus left parenthesis plus 8 right parenthesis equals plus 10
left parenthesis negative 3 right parenthesis plus left parenthesis negative 5 right parenthesis equals negative 8

*2. Addition of integers with different signs*

To add two integers with different signs, subtract their moduli, and the result will have the sign of the number with the larger modulo.

*Examples:*

5 plus left parenthesis negative 3 right parenthesis equals 2
minus 9 plus 3 equals negative 6

*Observation:* the sum of two opposite integers is equal to 0.

left parenthesis negative 11 right parenthesis plus 11 equals 0

*Properties of addition of integers*

associativity: *a+(b+c) = (a+b)+c,* whatever the integers are *a, b, c*

commutativity: *a+b = b+a*, whatever the integers are *a* și *b*

number 0 is neutral element: *a+0 = 0+a =a*, whatever the whole number is *a.*

*3. Subtraction of integers*

Subtracting an integer is equivalent to adding the opposite of that number.

*Examples:*

left parenthesis negative 8 right parenthesis minus left parenthesis plus 3 right parenthesis equals left parenthesis negative 8 right parenthesis plus left parenthesis negative 3 right parenthesis equals negative 11
9 minus left parenthesis negative 5 right parenthesis equals 9 plus left parenthesis plus 5 right parenthesis equals 14

(we added to the decrement the opposite of the decrement).

#### Multiplication and division

*The product of two integers with the same sign is a positive integer whose modulus is obtained by multiplying the modulus of the two numbers.*

*Examples:*

left parenthesis plus 3 right parenthesis times left parenthesis plus 7 right parenthesis equals plus 21
left parenthesis negative 5 right parenthesis times left parenthesis negative 6 right parenthesis equals plus 30

*The product of two integers with different signs is a negative integer whose modulus is obtained by multiplying the modulus of the two numbers.*

*Examples*:

left parenthesis negative 2 right parenthesis times left parenthesis plus 9 right parenthesis equals negative 18
3 times left parenthesis negative 5 right parenthesis equals negative 15

*Properties of multiplication of whole numbers*

*Let a, b, c be integers. The following properties occur:*

commutativity: *a·b = b·a*

associativity: *(a·b)·c = a·(b·c)*

number 1 is neutral element: *a·1 = 1·a = a*

distributiveness of multiplication over addition and subtraction: *a·(b+c)=a·b+a·c* and *a·(b-c)=a·b-a·c*

*Division of whole numbers*

*The sum of two integers with the same sign is a positive integer whose modulus is obtained by dividing the modulus of the two numbers.*

*Examples:*

left parenthesis plus 35 right parenthesis colon left parenthesis plus 7 right parenthesis equals plus 5
left parenthesis negative 63 right parenthesis colon left parenthesis negative 9 right parenthesis equals plus 7

*The sum of two integers with different signs is a negative integer whose modulus is obtained by dividing the modulus of the two numbers.*

*Examples:*

left parenthesis plus 72 right parenthesis colon left parenthesis negative 9 right parenthesis equals negative 8
left parenthesis negative 32 right parenthesis colon 8 equals negative 4![plus times plus equals plus
minus times negative equals plus
plus times negative equals negative
minus times plus equals negative
](data:image/png;base64,iVBORw0KGgoAAAANSUhEUgAAAE4AAABiCAYAAAD+xOVQAAABOUlEQVR4Xu3ZQW7EIAwF0Nz/Ij1mq0rtxjJJcAhJJu9JfzMDGMwuLEvbd/zhBDNq7DF0H0MXa5hRY4+h+xi6WEOlxu+crfSqzGnqWezrL716apzp0D7irWVp2fr/X1wvywyxZpayQ5N3qtSIB8zSqzKnaehiDTNq7DF0H0MXa5hRY4+h+xi6WMOMGnvcZR8AAAAAPJrPTEWvaFx8b8jSqzJniOpz4V2UGhdvK8uW3nFrmSHWzPJx4gGz9KrMYdG4Mo0r0jgAAACAw3xiKdK4ors3Lr4vZLlEpfDTnwdL4m1l2dI7bi0zxJpZupUmTRQPmOUSlxV+Oo0r0jgAAAAAbs4nrCKNK6o0Lr4vZHmM6vPgow4ZxdvKsqV33FpmiDWz3Fplg/GAWT7eKw55Bo0r0jgAAAAAAOBVfgAYSfBNAmcV9gAAAABJRU5ErkJggg==)

**Conclusion:** the rule of signs is valid for both multiplication and division of whole numbers and it is as follows:

*c) Raising whole numbers to powers* a to the power of n equals stack a times a times a times... times a with underbrace below
space space space space space space space space space space space space space space space space space space n space o r i

Let a be an integer, and n be a natural number zero.

*a*- it is called a base

*n*- is called an exponent

*Examples:*

left parenthesis plus 2 right parenthesis to the power of 5 equals 2 to the power of 5 equals 2 times 2 times 2 times 2 times 2 equals 32

*Remarks:*

1. When we raise a positive number to a power, the result will always be a positive number.

2. When we raise a negative number to a power, we have two possible situations:

if the exponent is an even number, the result is positive

if the exponent is an odd number, the result is negative

left parenthesis negative a right parenthesis to the power of n equals open curly brackets table attributes columnalign left end attributes row cell space space space a to the power of n comma space n minus p a r end cell row cell negative a to the power of n comma space n minus i m p a r end cell end table close a element of straight integer numbers to the power of asterisk times comma space n element of straight natural numbers

*Examples:*

*left parenthesis negative 2 right parenthesis to the power of 5 equals negative 32
left parenthesis negative 2 right parenthesis to the power of 6 equals 64
left parenthesis negative 1 right parenthesis to the power of 2015 equals negative 1
left parenthesis negative 1 right parenthesis to the power of 2016 equals 1*

*Power calculation rules*

a to the power of m times a to the power of n equals a to the power of m plus n end exponent space left parenthesis a element of straight integer numbers to the power of asterisk times comma space m comma space n element of straight natural numbers right parenthesis

a to the power of m colon a to the power of n equals a to the power of m minus n end exponent space left parenthesis a element of straight integer numbers to the power of asterisk times comma space m comma space n element of straight natural numbers comma space m greater or equal than n right parenthesis

open parentheses a to the power of m close parentheses to the power of n equals a to the power of m times n end exponent space left parenthesis a element of straight integer numbers to the power of asterisk times comma space m comma space n element of straight natural numbers right parenthesis

a to the power of m times b to the power of m equals left parenthesis a times b right parenthesis to the power of m space left parenthesis a comma b element of straight integer numbers to the power of asterisk times comma space m element of straight natural numbers right parenthesis

a to the power of m colon b to the power of m equals left parenthesis a colon b right parenthesis to the power of m space left parenthesis a comma b element of straight integer numbers to the power of asterisk times comma space m element of straight natural numbers right parenthesis

a to the power of 0 equals 1 space left parenthesis a element of straight integer numbers to the power of asterisk times right parenthesis

a to the power of 1 equals a space left parenthesis a element of straight integer numbers to the power of asterisk times right parenthesis

#### The order of performing integer operations

The order of performing operations on integers is the same as on natural numbers:

first we calculate the exponentiations (3rd order operations)

then we perform the multiplications and divisions (2nd order operations)

at the end we perform additions and subtractions (first-order operations).

If we also have parentheses in an exercise, we first perform the operations in the round brackets, then the operations in the square brackets, then the braces.

***Application***

A shopping center has 8 levels: ground floor, 5 floors, a mezzanine and an underground parking lot. A person on the 4th floor descends 6 levels. What level did it reach?

*Solving:*

We represent the 8 levels on a vertical "axis". A person on the 4th floor going down 6 levels will reach the underground car park.

5

Floor 5

4

Floor 4

3

Floor 3

2

Floor 2

1

Floor 1

0

Ground floor

-1

Semi-basement

-2

Parking

#### Solving problems with equations/inequalities in the context of whole numbers

A1. A sphygmomanometer, together with its battery, costs 155 lei, and the sphygmomanometer is 135 lei more expensive than the battery. Determine the price of the battery and the price of the tensiometer by the following procedures:

Using segment representation, given;

Let the black segment be the price of the tensiometer and the blue segment be the price of the battery.

Either the segment in red, the price of 2, i.e. 155 lei. The green segment represents 135 lei.

Denote by x the price in lei of the battery, express the price of the tensiometer as a function of the price of the battery, form the equation that expresses the problem in mathematical language, solve the equation and formulate the answer. Finally, check the prices obtained.

A2. Three consecutive natural numbers have a sum less than 19. Determine the three numbers by completing the following steps:

a) Denote by x the smallest number and express the next two numbers with its help;

b) Form the inequality that expresses the problem in mathematical language and solve it

inequality;

c) Formulate the answer;

d) Check the results obtained;

e) Determine what other unknown could have been denoted by x and solve the problem in that case;

f) Solve the problem by other studied methods (figurative, experiments, etc.).

*The steps in solving problems using equations (inequalities) are as follows:*

1. Identifying known and unknown data from the problem statement.

2. Establishing the unknown (usually denoted by x) and expressing the other unknowns (if any) using it.

3. Forming the equation / inequality that transcribes the problem in mathematical language.

4. Solving the equation / inequality.

5. Interpreting the solution(s) and formulating the answer to the problem.

6. Checking the solutions obtained in the initial (unprocessed) form of the problem.

***Example:***

I bought candies, wafers and juice from the store and paid a total of 123 lei. The wafers were 9 lei cheaper than twice the amount of candies, and the juice was 6 lei more expensive than the triple amount of candies. How much did each one cost?

|  |  |  |
| --- | --- | --- |
|  |  |  |

Step 1. Identifying known and unknown data from the problem statement.

We know: the total cost and prices of wafers and juice compared to the price of candy.

Step 2. Establishing the unknown (usually denoted by x) and expressing the other unknowns (if any) using it. We denote by x the price of the candies. Then the price of wafers, being 9 less than twice the price of candy, is 2x – 9, and the price of juice, being 6 more than triple the price of candy, is 3x + 6.

Step 3. Formation of the equation / inequality that transcribes the problem in mathematical language. The total amount being 123, we deduce that x + (2x – 9) + (3x + 6) = 123.

Step 4. Solving the equation / inequality.

x + 2x – 9 + 3x + 6 = 123 ⇔ 6x – 3 = 123 ⇔ 6x = 126 și x = 21.

Step 5. Interpret the solution(s) and formulate the answer to the problem. The candies cost 21 lei, the wafers 2 21 – 9 = 42 – 9 = 33 lei, and the juice 3 21 + 6 = 63 + 6 = 69 lei.

Step 6. Checking the solutions obtained in the initial (unprocessed) form of the problem. We calculate the total amount: 21 + 33 + 69 = 33 + 90 = 123. So the determined costs are correct.

The theater club charges an entrance fee to the show of €4 per student. The club borrowed €400 from the parents for costumes, gym and supplies. After the show, he returned the loan to his parents and was left with €100. How many spectators were at the show?

Let's establish the known data, the unknown, the unknown which is denoted by x, the equation. We solve the equation and interpret the solution.

Find two integers, knowing that one is triple the other, and their sum is equal to –36.

Solution: If we denote one of the numbers by x, the other is 3x, we get the equation

x + 3 x = – 36. Hence, adding 2 to each term, we have 4 x = – 36. So a number is x

= – 36 : 4 = – 9, and the other is – 9  3 = – 27. Really, – 9 + 3 (– 9) = – 36.

If we subtract 2 from the product of an integer and 3, we get a number between –8 and 7. Find the integers that verify this condition.

Solution: Denoting the unknown integer with x, the condition in the statement is written in the form:

– 8 < 3 x – 2 < 7. From here, we deduce that ‒ 8 + 2 < 3x < 7 + 2 – 6 < 3x < 9 și – 2 < x < 3. So

x poate fi– 1, 0, 1, 2.

#### Worksheet

1. The sum of an integer and 130 is –15. Determines the integer.

2. The difference between 59 and an integer is 19. Determine the integer.

3. The product of an integer and –7 is 56. Determine the integer.

4. The quotient between an integer and 8 is –3. Determines the integer.

5. Find the negative integers that, when added to 3, give at least –1.

6. Find the positive integers from which, if you subtract 5, you get at most 2.

7. If the double of an integer is added to 3, the result is a number between –5 and 5. Find out these numbers.

8. Find the integers whose mode is less than 5 than 13.

9. Find the integers whose mode is – 5 less than –2.

10. Find the integers whose mode is 3 greater than 7.

11. Determine the largest negative integer which, when divided by 5 and by 7, gives a remainder of 1.

12. The arithmetic mean of the numbers 2, x, –6 and 8 is 2. Find the integer x.

13. The arithmetic mean of three whole numbers is 4. Find one of the numbers, knowing that the mean arithmetic of the other two is –2.

14. Find the whole number which, added to the numbers 15, 21 and 18, makes their rithmetic mean is increased by 2.

15. If 2 students sit in each bench of a class, 3 students remain standing, and if3 students are placed in a bench, 4 benches remain free. How many benches and how many students are in the class?

16. A cinema ticket costs 18 lei, and a theater ticket costs 45 lei. Find out how many theater tickets are available buy with the amount paid for 5 cinema tickets.

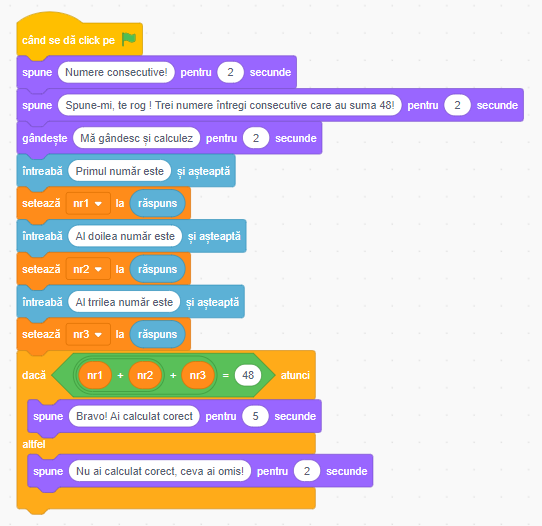
17. The sum of three consecutive odd integers is –33. Find out the three numbers.

#### Scratch project

Model the following scenario: On a green background with the title 'Consecutive Numbers', a character says 'Tell me, please! Three consecutive integers that sum to 48 (where 48 is randomly chosen up to 1000). And waits for the response (comma-separated list), followed by the appropriate comment "Bravo !" or "Whoah! It had to be ..." (followed by the correct value, in our case it would be 15,16,17).

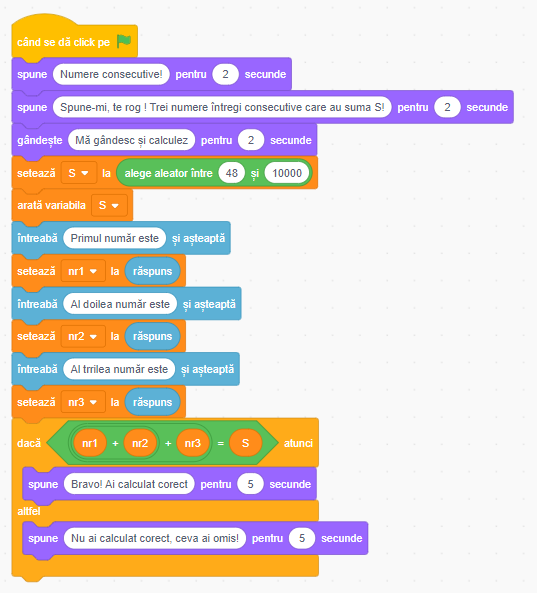
Project implementation:

I know the sum is 48



|  |  |
| --- | --- |
|  |  |

Random calculator selects a number between 48 and 1000



#### Sources

<http://fs.unm.edu/EnciclopediaNumerelor.pdf>

<https://drive.google.com/file/d/1sdynPztLBAxrSM1I7--UhevQkjp7zwpO/view> **- edupedu manual**

<https://www.matera.ro/2019/12/numere-intregi/>

#### Assessment test – model 1

Are the following sentences true or false?

(-19) + (-43) = -56

(-81) : (+27) = -3

(-3)2 2 – (-2)3  = -26 (6p)

The sum of 7 consecutive integers is equal to 0. Circle the correct answer:

the product of the numbers is -3;

the product of the numbers is 0;

the product of the numbers is 3;

the product of the numbers is -1: (6p)

Match the number corresponding to each equation in column A with the letter corresponding to the solution in column **B**:

|  |  |
| --- | --- |
| **A**  4x+3=6x–7  –2 x–8=4x+4  |x|=4  6x–2=4  x:5= -3 | **B**  -2  -15  1  5  -4; +4 (5p) |

a) The integer equal to its opposite is........

b) The sum between an integer and its opposite is..............

c) The product of two integers is 0 if.............. (6p)

Complete the following exercises:

Determine the integer values ​​of x for which . (6p)

To solve the equation . (7p)

Either the crowds: A=

B= {

Calculate AB (14p)

*Working time 50 min.*

*TOTAL 50p.*

**ORRECTION SCALE**

a) false 2p

b) true 2p

c) false 2p

To circle the answer b) 6p

For pairs: 1→d 1p

2→a 1p

3→e 1p

4→c 1p

5→b 1p

a) 0 2p

b) 0 2p

c) if one of the numbers is 0 2p

I. x  D8 2p

x{±1; ±2; ±4; ±8 4p

II. | 10 2p

2(3x+1)=5(x+7)-50 2p

6x+2=5x+35-50 1p

6x-5x=35-50-2 1p

x=-17 1p

III. 2x-5>-15

2x>-10 2p

x>-5 2p

A = {-4; -3; -2; -1; 0;.................. 2p

3x+1≤8

3x≤7 2p

x≤ 2p

B = {....................-4; -3; -2; -1; 0; 1; 2 2p

AB= {-4; -3; -2; -1; 0; 1; 2 2p

***Nomogram of the test with items from the program.***

Total 50p. For grade 5 we set 50% of the total.

Chart, diagram

Description automatically generated with medium confidence So 

The test was given to a total of 24 students.

The grades obtained are according to the score:

Grade 5 \_ \_ \_ \_ \_ - 2 grades

6 \_ \_ \_ \_ \_ - 4 marks

7 \_ \_ \_ \_ \_ - 6 notes

8 \_ \_ \_ \_ \_ - 5 marks

9 \_ \_ \_ \_ \_ - 4 grades

10 \_ \_ \_ \_ \_ - 3 notes

Grade curve:

Chart, engineering drawing, line chart

Description automatically generated with medium confidence

**Analysis of the results of the assessment test administration**

1. Motivation

In the test I carried out, I took into account the contents required in the syllabus for the thesis with a single subject in the mathematics discipline, 7th grade, in the 1st semester.

I built this docimological test aiming to check the students' performances in order to support the thesis with a single subject. We also tracked the measurement of the degree of knowledge of the contents contained in the learning unit: "Integers".

2. Formulation of evaluation objectives.

After completing the learning unit, the student is able to:

To prove that he has mastered the contents of the learning unit;

To notice and justify the connections that can be made between the points in the learning unit;

To make the correspondence between the various points in the learning unit;

To select from a list of formulas those appropriate to the test;

To write a structured essay.

3. Working assumptions

Representative contents regarding solving the problems in the items were selected from the school curriculum. The students' intellectual abilities exceed the average level. All students in the class can get marks higher than 5.

4. Experiencing the test

It was carried out on a sample of 24 students from the 7th grade A from the Elena Cuza National College, sector 6, Bucharest.

**F. Statistical analysis and test improvement**

Number of students tested: 24

Weighted average:

A picture containing text

Description automatically generatedA picture containing text

Description automatically generated=A picture containing text, watch

Description automatically generated==7,58

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Note | 5 | 6 | 7 | 8 | 9 | 10 |
| Nr. of notes | 2 | 4 | 6 | 5 | 4 | 3 |

Results by items:

The test included all categories of items.

***1.***

|  |  |  |  |
| --- | --- | --- | --- |
| Item category | Item type | No. correct solutions | Success rate |
| Objection | With dual choice | 24 | 100% |

The wording of the premise, key and distractors was correct.

Conclusion: because all the students' answers were correct, it is concluded that the chosen items were not in accordance with the predisposition level of the students in the evaluated class.

Recommendations: formulation of items in which to request more complex thinking operations.

***2.***

|  |  |  |  |
| --- | --- | --- | --- |
| Item category | Item type | No. correct solutions | Success rate |
| Objection | Multiple choice | 21 | 87,5% |

The items were formulated correctly.

The premises and the answers were on the same page.

Conclusion: the requested items were at the predisposition level of the students in the evaluated class.

Recommendation: formulating some items to request more complex thinking operations.

***3.***

|  |  |  |  |
| --- | --- | --- | --- |
| Item category | Item type | No. correct solutions | Success rate |
| Objection | of mating | 18 | 75% |

The items were formulated correctly, the proposals in the second column being plausible, anticipating calculation errors that may occur.

The conclusion: the most frequent mistakes occurred when passing terms from one member to another.

Recommendation: several exercises of this type will be carried out in class

***4.***

|  |  |  |  |
| --- | --- | --- | --- |
| Item category | Item type | No. correct solutions | Success rate |
| With open answer | incomplete | 16 | 66,6% |

The items were clearly formulated, also allowing clear answers, without the risk of ambiguity.

Conclusion: the confusions in the answers prove that the assimilation of information is not enough, requiring more attention.

Recommendation: it will be insisted on updating the knowledge related to operations with whole numbers.

***5.***

|  |  |  |  |
| --- | --- | --- | --- |
| Item category | Item type | No. correct solutions | Success rate |
| With open answer | fully developed | 5 | 25% |

This last topic was structured on sub-points. To the first item of the subject, 23 students answered correctly.

For item II, 16 students answered correctly, 5 students were wrong only at the end.

Item III, however, posed more problems to the students.

Recommendations: carrying out in class several exercises of the type of item III and returning to the notions about sets and operations with sets.

#### Assessment test – model 2

**1p** **1**. a) Write the opposite of the number +124

b) Write the modulus of the number | -76 |

**1p** **2**. Write the integers greater than or equal to -3 and less than or equal to 1.

**1p** **3**. Arrange the following integers in ascending order: -2; 0; -7; +4; 12; -11; +7; -8

**2p** **4**. Place one of the signs >, <, =, so that the sentences below are true:

– 5 -4 b) - 1 1 c) 0 -3 d) 1 | -8 |

**2p** **5.** Calculate:

a) (+4) + (-9) = f) ( -40) : ( -10)=

b) (+1) - (-7)= g) (-2)2 =

c) -15-6 = h) 20150 =

d) -9 + │-3│= i) -52 =

e) (- 6) ∙( +7) = j) (-3)37 :(-3)35 =

**3p 6.** Calculate:

a) 

b) 

c) · =

d) 

e) (-2)101:299-10∙{ -3-3∙[(-3)5:34-2]}