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| Lesson | Operations with positive and negative numbers (lesson №108) |
| Topic | Final review |
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| Translator | Katya Kozhukhova |
| Date | 5.12.2013 |
| Lesson type | Reviewing previously learned material |
| Prerequisites | What the student should know:  - rules for adding two negative numbers and numbers with opposite signs,  - rules for subtracting,  - rules for multiplying numbers with opposite signs and negative numbers,  - rules for dividing numbers with opposite signs and negative numbers.  What the student should be able to do:  - perform operations with rational numbers.  What the student could have forgotten:  - applying the properties of addition and multiplication for rational calculation. |
| Objectives | Educational: 1. Reinforce and systematize material on the topic “Operations with positive and negative numbers” while:  1) Doing assignments on adding and subtracting, multiplying and dividing positive and negative numbers.  2) Applying the commutative and associative properties of the operations of addition and multiplication when doing the assignment: calculate, selecting a convenient order of operations.  3) Evaluating expressions with variables for given values of the variables.  2. Review solving word problems with the arithmetical method. Developmental  1. Develop students’ reasoning, ability to analyze and generalize. 2. Develop an interest for the subject.  Personality development: Inculcate attentiveness when doing assignments. |
| Lesson plan | 1. Mental math (6 min) 2. Knowledge actualization (4 min) 3. Solving problems (24 min) 4. Lesson recap (2 min) 5. Assigning homework |

## Progress of the class

### Stage 1: Mental math

| Blackboard | Teacher | Student | Notebook |
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|  | All of the numbers we know are called rational numbers. Today, we will continue to work with rational numbers. We must review the rules of operations on them, and use the properties of the operations when calculating.  $OS |  |  |
| Operations with positive numbers | Write down the lesson topic: “Operations with positive numbers”. |  | Operations with positive numbers |
|  | Let’s begin the lesson with some mental math. |  |  |
| [1]  1. Find the number opposite to the sum:  а) 0.7+63  b) 12+4.8  c) 6.59+3  d) 0.21+0.32  $new()  $OS | To find the number opposite to the sum, what do we have to do?  [Students answer from their seats. The teacher writes on the board.] | First, we have to calculate the sum, and then we find the number opposite to the number we got. |  |
| а) 0.7+63=63.7 | What is the sum of the numbers 0.7 and 63 equal to? | 63.7 |  |
| а) 0.7+63=63.7 63.7 and -63.7 are opposite numbers. | Name the number opposite to the number 63.7. | -63.7 |  |
| b) 12+4.8=16.8 | What is the sum of 12 and 4.8 equal to? | 16.8 |  |
| b) 12+4.8=16.8 16.8 and -16.8 are opposite numbers. | Name the number opposite to the number 16.8. | -16,8 |  |
| c) 6.59+3=9.59 | What is the sum of the numbers 6.59 and 3 equal to? | 9.59 |  |
| c) 6.59+3=9.59 9.59 and -9.59 are opposite numbers. | Name the number opposite to the number 9.59. | -9.59 |  |
| d) 0.21+0.32=0.53 | What is the sum of the numbers 0.21 and 0.32 equal to? | 0.53 |  |
| d) 0.21+0.32=0.53 0.53 and -0.53 are opposite numbers. | Name the number opposite to the number 0.53. | -0.53 |  |
| 0.53 +(-0.53)=0 | What is the sum of the numbers 0.53 and -0.53 equal to? | 0 |  |
|  | Why?  *[if the student did not answer the question]* Please answer this question. | The sum of opposite numbers is equal to 0. |  |
| [1]  2. Multiply:  а) -0.1\*(-10)  b)  c)  $new()  $OS | Let’s multiply the numbers.  [Students answer from their seats.]  Raise your hand! |  |  |
| а) -0.1\*(-10)=1 | Name the result. | 1 |  |
|  | [In the case of an incorrect answer, the teacher asks the student to explain the solution.]  Why? | We are multiplying -0.1 and -10, two negative numbers. We multiply their absolute values: 0.1 \*10=1. |  |
| b) | Name the result. | 1 |  |
| c) | Name the result. | 1 |  |
|  | The product of the numbers  -0.1 and 10, ,  are equal to 1.  What do we call these numbers?  *[if the student did not answer the question]* Please answer this question. | These are opposite numbers. |  |
| 3. There were some solutions to equations written on the board, but part of the writing got erased.  What was written on the right side of the equation?  а) 0.9х=… b) х÷(-3)=… c) -2.3х=…  х= -0.3 х=0.36 х= -0.2  $new()  $OS | Read the assignment. |  |  |
|  | What do we have to do? | We have to write the number on the right side of the equation. |  |
|  | What is still written on the board? | The board has the left side of the equation and the value of x. |  |
|  | The value of the variable *x* means that the root of the equation has been found. |  |  |
|  | What do we call the root of the equation?  *[if the student did not answer the question]*  It’s very important that you try to answer. | The root of an equation is what we call the value of a variable for which the equation becomes a correct equality. |  |
|  | [If students have difficulty answering, the teacher gives the answer herself.]  Remember that the root of an equation is what we call the value of a variable for which the equation becomes a correct equality. |  |  |
|  | If we replace *x* in the equation with the root of the equation, will we get a correct equality? | Yes. |  |
|  | So we can substitute the root of the equation for x in the original equation and do the calculations, and we’ll find the value of the number on the right side. |  |  |
|  | Let’s restore what was written in equation a).  What do we do? | Multiply 0.9 by -0.3. |  |
| а) 0.9х= -0.27 b) х÷(-3)=… c) -2.3х=…  х= -0.3 х=0.36 х= -0.2 | What did we get? | -0.27 |  |
|  | Let’s restore what was written in equation b).  What do we do? | Divide 0.36 by -3. |  |
| а) 0.9х= -0.27 b) х÷(-3)= -0.12 c) -2.3х=…  х= -0.3 х=0.36 х= -0.2 | What did we get? | -0,12 |  |
|  | Let’s restore what was written in equation c).  What do we do? | Multiply -2.3 by -0.2. |  |
| а) 0.9х= -0.27 b) х÷(-3)= -0.12 c) -2.3х=0.46  х= -0.3 х=0.36 х= -0.2 | What did we get? | 0.46 |  |
| [2]  4.   |  |  | | --- | --- | | -44\*2  16\*3  -11\*(-7)  68÷(-2)  -39÷13  48÷1  -88÷(-11) | 100 |   $new()  $OS | You have cards on your desks.  Do the calculations.  In the circles, write in the letters that correspond to the answer you got. | [Students fill in the blanks on the card.] |  |
| -44\*2= -88  16\*3=48  -11\*(-7)=77  68÷(-2)= -34  -39÷13= -3  48÷1=48  -88÷(-11)=8 | [After 1 min, show the solved problems on the board.]  Check whether you did the calculations correctly.  Correct any mistakes you find.  *[to the student who did the assignment with a mistake]* You were probably hurrying. It’s good that you checked the solution and corrected your mistake. Pay close attention to the signs of the numbers!  $OS |  |  |
| -44\*2= -88 K  16\*3=48 I  -11\*(-7)=77 G  68÷(-2)= -34 E  -39÷13= -3 L  48÷1=48 I  -88÷(-11)=8 A | What word did you get? | Kigelia. |  |
|  | The resulting word, *kigelia*, is the name for a tree that grows in Africa and is called a “sausage tree”. Its fruit look like boiled sausages up to 60 cm in length. Animals consume these sausages eagerly, but to a human, they’re not edible. They are used to manufacture certain medicines and paints. |  |  |

### Stage 2: Knowledge actualization

| Blackboard | Teacher | Student | Notebook |
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| 1.  -10 and 5  $new(wa) | [Students take turns answering from their seats.]  On the board, we have the whole numbers -10 and 5. |  |  |
|  | Name the absolute values of these numbers.  Whoever wants to answer - raise your hand!  $OS | The absolute value of the number -10 is equal to 10, and the absolute value of the number 5 is equal to 5. |  |
| 5> -10  $OS | Which number is greater? | 5 is greater than the number -10. |  |
|  | Why?  *[if the student did not answer the question]*  Please answer this question. | Any positive number is greater than any negative number. |  |
|  | Name some whole number that is greater than both numbers. | [A possible answer from the student]  100  $weak |  |
|  | Write the sum of the numbers -10 and 5, and evaluate it. |  | -10+5= -5 |
| -10+5= -5  $OS | What is the sum of the numbers -10 and 5 equal to? | -5  [The student writes the expression and its value on the board.] |  |
|  | [In the case of an incorrect answer, the teacher asks the student to explain the solution.]  Name the summands.  $insa | -10 and 5 |  |
|  | Explain how we add. | We are adding numbers with opposite signs, the sign of the negative number is greater, so we get a negative number. We subtract the smaller absolute value, 5, from the greater one, 10, and get 5.  So the sum is equal to  -5. |  |
|  | Write the difference of these numbers, and evaluate the expression you got. |  | -10-5 |
|  | $end |  | -10-5= -15 |
| -10-5= -15  $OS | What is the difference equal to? | -15  [The student writes the expression and its value on the board.] |  |
|  | [In the case of an incorrect answer, the teacher asks the student to explain the solution.]  Let’s replace the subtraction with addition.  Name the numbers we’re adding.  $insa | -10 and -5 |  |
|  | Explain how we add.  $end | We are adding two negative numbers, -10 and -5, and get a negative number.  Then, we add the absolute values of these numbers:  10+5=15.  So the difference is equal to -15. |  |
|  | Write the product of the numbers -10 and 5, and evaluate it. |  | -10\*5= -50 |
| -10\*5= -50  $new(wa)  $OS | What is the product equal to? | -50  [The student writes the expression and its value on the board.] |  |
|  | [In the case of an incorrect answer, the teacher asks the student to explain the solution.]  What operation should we have performed?  $insa | Multiplication. |  |
|  | What kind of numbers are we multiplying? | We are multiplying the numbers -10 and 5: these are numbers with opposite signs. |  |
|  | What kind of number do we get?  $end | We get a negative number, so we put a minus sign. Then, we multiply the absolute values of these numbers:  10\*5=50. |  |
|  | What is the product equal to?  You’ve just done everything right!  $OS | The product is equal to  -50. |  |
|  | Write the quotient of the numbers -10 and 5, and evaluate it. |  | -10÷5= -2 |
| -10÷5= -2  $OS | What is the quotient equal to? | -10:5= -2  [The student writes the expression and its value on the board.] |  |
|  | [In the case of an incorrect answer, the teacher asks the student to explain the solution.]  What operation should we have performed?  $insa | Division. |  |
|  | What kind of numbers are we dividing? | We’re dividing -10 by 5: these are numbers with opposite signs. |  |
|  | What kind of numbers do we get? | We get a negative number, so we put a minus sign. Then, we divide the absolute value of the dividend, 10, by the absolute value of the divisor, 5, getting 2. |  |
|  | What is the quotient equal to?  $end | The quotient is equal to  -2. |  |
| 2. Compare the sums  а) 6+7 and 7+6  b) -4+9 and 9+(-4)  c) +(-1) and -1+()  $new()  $OS |  | [Students answer from their seats.] |  |
|  | Compare the sums. What can you say about them? | They’re equal. |  |
| а) 6+7 = 7+6  b) -4+9 = 9+(-4)  c) +(-1) = -1+() | [The teacher replaces “and” with “=”.] |  |  |
|  | Why?  *[if the student did not answer the question]* Please answer this question. | Changing the order of the summands does not change the sum. |  |
|  | Correct, these sums are equal based on the commutative property of addition. |  |  |
|  | What is the sum of 6 and 7 equal to? | 13  $weak |  |
|  | What is the sum of -4 and 9 equal to? | 5  $weak |  |
|  | What is the sum of  and -1 equal to? |  |  |
| 3. Replace the squares with numbers that will make the equalities correct.  а) + 811 = 811  b) 726 + = 0  c) + 543 + = 543  $new()  $OS |  |  |  |
| 0  а) + 811 = 811 | What number do we write? | 0 |  |
|  | Why?  *[if the student did not answer the question]* Please answer this question. | Если к числу прибавить ноль, то число не изменится. |  |
| b) 726 + = 0  - 726 | What number do we write? | -726 |  |
|  | Why? | The sum of opposite numbers is equal to 0. |  |
| c) + 543 + = 543 | We added the number 543 to the sum of two numbers, and got the same number, 543. |  |  |
|  | What do you think: what is the sum of the numbers in the square equal to? | 0. |  |
|  | The sum of what numbers is equal to 0? | Opposite numbers.  $tutor |  |
|  | So what kind of numbers are written in the squares? | Opposite numbers.  $tutor |  |
| c) + 543 + = 543  (-2)  2 | What kind of numbers can we write? | [A possible answer from the student]  2 and -2. |  |

### Stage 3: Solving problems

| Blackboard | Teacher | Student | Notebook |
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|  | We’ll do the next assignment in writing. |  |  |
| 1. Evaluate the expression    $new(ws)  $OS | *[with a strong student, you can work differently]*  How do we begin the solution? | [One student works at the board, while the rest work in their notebooks.]  Determine the order of operations. |  |
|  |  | First, we do the operation in parentheses: the first is division, the second is addition, and we divide the result by -0.01 in the third operation. The fourth operation is multiplication. |  |
| 1) 4.32÷(-1.8)= | Let’s perform the first operation. | We divide 4.32 by -1.8. |  |
| 1) 4.32÷(-1.8)= - | Explain how we divide. | We’re dividing numbers with opposite signs. We get a negative number, so we put a minus sign. | 1) 4.32÷ (-1.8)= - |
| 1) 4.32÷(-1.8)= -4.32÷1.8=  43.2÷18=2.4 |  | Then, we divide the absolute value of the dividend, 4.32, by the absolute value of the divisor, 1.8. In the divisor and dividend, we move the decimal point one digit to the right, and divide 43.2 by 18.  $strong |  |
| 1) 4.32÷(-1.8)= -4.32÷1.8= -2.4  43.2÷18=2.4 (written calculation) | Name the result of the first operation. | -2.4 | 1) 4.32÷(-1.8)= -4.32÷1.8= -2.4  43.2÷18=2.4 (written calculation) |
| 2) -1.2+(-2.4)= -3.6 | Let’s do the second operation. | We add -2.4 to the number -1.2. We got -3.6 | 2) -1.2+(-2.4)= -3.6 |
| 3) -3.6÷(-0.01)=  $new(ws) | What do we do after that? | We divide the resulting number by -0.01. |  |
| 3) -3.6÷(-0.01)=3.6÷0.01= | Explain how we divide. | To divide a negative number by a negative number, divide the absolute value of the dividend, 3.6, by the absolute value of the divisor, 0.01:  $tutor | 3) -3.6÷(-0.01)=3.6÷0.01= |
| 3) -3.6÷(-0.01)=3.6÷0.01=360÷1=360 |  | In the dividend and divisor, we move the decimal point two places to the right, and divide 360 by 1.  We get 360. | 3) -3.6÷(-0.01)=3.6÷0.01=360÷1=360 |
| 4) 360\*(-0.3)= -108  х360  0.3  108.0 | Let’s do the fourth operation. | We multiply the resulting number by -0.3.  We get -108. | 4) 360\*(-0.3)= -108  х360  0.3  108.0 |
|  | Look at how many operations there were, and we’ve done them all!  $OS | There were four operations, and I did them all.  $weak |  |
| [Final appearance of the board.]  1) 4.32÷(-1.8)= -4.32÷1.8= -2.4  43.2÷18=2.4 (written calculation)  2) -1.2+(-2.4)= -3.6  3) -3.6÷(-0.01)=3.6÷0.01=360÷1=360  4) 360\*(-0.3)= -108  х360  0.3  108.0 | Have we evaluated the expression?  *[end of the assignment]* | Yes, -108. | [Final appearance of the notebook.]  1) 4.32÷(-1.8)= -4.32÷1.8= -2.4  43.2÷18=2.4 (written calculation)  2) -1.2+(-2.4)= -3.6  3) -3.6÷(-0.01)=3.6÷0.01=360÷1=360  4) 360\*(-0.3)= -108  х360  0.3  108.0 |
|  | *[to a student who did the assignment with no mistakes:]*  Your careful work has made me very happy!  *[to the student who made a mistake:]* This assignment turned out to be difficult for you. You will have to pay closer attention when you work with numbers that have opposite signs (with negative numbers)!  $OS |  |  |
| 2. Find the number opposite to the value of the expression    $new(ws)  $OS | Read the assignment. | [One student works at the board, while the rest work in their notebooks.] |  |
|  | What do we have to do? | We have to find the number opposite to the value of the expression. |  |
|  | To find this number, what do we need to know? | We have to know what the value of the expression is equal to.  $tutor |  |
|  | Let’s evaluate the expression.  How do we begin the solution? | We determine the order of operations:  First is the operation in parentheses, subtraction, the second is division, the third operation is subtracting -1 from the result of the second operation.  $strong |  |
| 1) | Let’s do the first operation. | We subtract  from . | 1) |
|  | Let’s replace the subtraction with addition. Name the summands. | and - |  |
| 1)  - | How do we add? | and - are negative numbers, so the sum we get will be a negative number. We put a minus sign. | 1)  - |
| 1)  - |  | Now we add the absolute value of these numbers: we add the number  to .  We got . | 1)  - |
| 1)  - | Name the result of the first operation. | - | 1)  - |
| 2) | Let’s do the second operation. | We divide the resulting number -by.  We’re dividing numbers with opposite signs – we get a negative number, so we put a minus sign.  $weak | 2) |
| 2) |  | Then, we divide the absolute value of the dividend, , by the absolute value of the divisor, .  We got . | 2) |
| 2) | Name the result of the second operation. |  | 2) |
|  | Let’s do the third operation. | We subtract  from the number -1. |  |
| 3)  $new(ws) | When we write, let’s put the number we subtract in parentheses. |  | 3) |
| 3) | What do we do? | We add -1 to a number to the subtrahend, that is, the number. | 3) |
|  |  | We are adding numbers with opposite signs, the absolute value of the positive number is greater, so we’ll get a positive number. |  |
| 3) |  | Then, we subtract the smaller absolute value, 1, from the greater one,  getting . | 3) |
| [Final appearance of the board.]    1)  -    2)    3) | Have we evaluated the expression? | Yes, . | [Final appearance of the notebook.]    1)  -    2)    3) |
|  | Have we finished this assignment? | No. We have to find the number opposite to . |  |
| Answer:  is the opposite number. | Find the number opposite to the number . |  | Answer:  is the opposite number. |
|  | You’ve shown that you know the rules for operations with positive and negative numbers, and can apply them.  $OS |  |  |
|  | To evaluate this expression, we had to perform various operations: addition, subtraction, multiplication and division, using a specific order of operations.  But if an expression only contains addition (or only multiplication) of several numbers, we can add (or multiply) these numbers in any order. |  |  |
| 3. Calculate, using the most convenient method:  а)  b)  $new()  $OS | Let’s evaluate the expression, applying the commutative and associative properties. |  |  |
| а) | [One student works at the board, while the rest work in their notebooks.] |  | а) |
|  | Name the summands. | , -38.57; 0.7 and 38.57 |  |
| а) | Among these numbers, are there any opposite numbers? | Yes, -38.57 and 38.57. |  |
|  | What is their sum equal to? | 0 |  |
|  | Does 0 influence the value of the entire sum? | No. |  |
| а) | So we can cross out the opposite numbers. |  | а) |
| а) = | Write the sum of the remaining numbers. | $tutor | а) = |
| а) =  = | What do we have to do to add the fraction to the decimal? | [A possible answer from the student.]  We have to write 0.7 as the fraction , and add the fractions. | а) =  = |
| а) =  = | How do we add? | We bring the fractions to the least common denominator 10: we multiply the fraction  by the complementary factor 2, and leave the fraction  unchanged. |  |
| а) =  = |  | We add , and get . | а) =  = |
| а) =  = | What do we have to do to add the fraction to the decimal? | [Another possible answer from the student.]  We should write  as a decimal and add the decimals. | а) =  = |
|  | What do we have to do to convert a fraction to a decimal? | We have to divide the numerator by the denominator. |  |
| а) =  =  1÷5=0.2 (written calculation) | Divide.  What did we get? | 1÷5=0.2 | а) =  =  1÷5=0.2 (written calculation) |
| а) =  =0.2+0.7=  1÷5=0.2 (written calculation) | In the expression, let’s replace  with the decimal 0.2.  What do we do после этого? | Find the sum of 0.2 and 0.7. | а) =  =0,2+0,7=  1÷5=0.2 (written calculation) |
| а) =  =0.2+0.7=0.9  1÷5=0.2 (written calculation) | Name the value of this expression. | 0.9 | а) =  =0.2+0.7=0.9  1÷5=0.2 (written calculation) |
|  | If we are finding the sum of several numbers, first we should check if there are any opposite numbers: after all, their sum is equal to zero, and zero does not influence the value of the sum. |  |  |
| b)  $new()  $OS | [One student works at the board, while the rest work in their notebooks.] |  | b) |
|  | Name the summands. | $weak |  |
|  | Among these numbers, are there any opposite numbers? | No. |  |
|  | We can add the numbers in any order. Which numbers is it most convenient to add first? |  |  |
| b) | Why? | These are numbers with the same denominator. | b) |
|  | Indeed, they have the same denominators, and also, both of these numbers are positive, and it’s easier to add numbers with the same sign than it is to add numbers with opposite signs. |  |  |
| b) | Add the numbers .  What number do we write after the equality sign instead of their sum? |  | b) |
|  | We still have to find the sum of what numbers? (What numbers have not been crossed out?)  Don’t forget to name the number together with the sign written in front of this number. |  |  |
|  | Explain how we add. | We are adding two negative numbers, so we will get a negative number - we put down a minus sign. Then, we add the absolute values of these numbers:  we add  to .  $tutor |  |
| b) | Write the sum of the absolute values below, and evaluate it. | We get , or 5. | b) |
| b) | What number do we add to ? | -5 | b) |
| b) | Name the result. |  | b) |
|  | To make the calculations easier when we do this assignment, first we’ll find the sum of the numbers with the same signs: positive and negative numbers separately, and then we’ll add the results we got.  If we are finding the sum of fractions, we also pay attention to the denominators: if there are fractions with the same denominator, it’s convenient to work with them, that is, to add them. |  |  |
| 4. Calculate, using a more rational method:  а)  b) -4\*(-1.3)\*(-5)\*(-2)  $new()  $OS |  |  |  |
| а) | Let’s evaluate the first expression. | [One student works at the board, while the rest work in their notebooks.] | а) |
|  | First, let’s determine the sign of the product – it depends on the number of negative factors.  How many negative factors are there in the product? | 3 |  |
|  | Is this number even or odd? | Odd. |  |
|  | If there is an odd number of negative factors, what will the product be: positive or negative?  *[if the student did not answer the question]* Please answer this question. | If the number of negative factors is odd, the product is a negative numbers. |  |
| а) | Let’s put a minus sign. |  | а) |
| а) | We’ve determined the sign of the product.What do we do after that? | We multiply the absolute values of these numbers: | а) |
|  | Take a look at the numbers written in this product. Among these numbers, are there any whose product we can calculate mentally? | Yes, these are the numbers  and 2. |  |
| а) | Let’s underline these numbers. |  | а) |
|  | What is the product of these numbers equal to? | 1 |  |
|  | Why? | These are reciprocal numbers: their product is equal to 1. |  |
| а) = | Let’s replace the product of the underlined numbers with 1.  Then what will the expression look like? (Don’t forget about the sign?) | -1 times  and times 77.  $tutor | а) = |
| а) = | Explain how we multiply. | When we multiply a number by 1, we get the same number, so we multiply  by 77. | а) = |
| а) =  -33 | Name the value of the expression. | -33 | а) =  -33 |
|  | Very good! You did everything right.  $OS |  |  |
|  | If there are several negative factors in a product, first we determine the sign of the entire product. |  |  |
|  | If there’s an odd number of negative factors, what will the product be, positive or negative? | Negative. |  |
|  | If there is an even number of negative factors, what will the product be, negative or positive?  *[if the student did not answer the question]* Please answer this question. | Positive. |  |
|  | If there are reciprocal numbers among the factors, we find their product (it’s equal to 1), and then multiply the remaining numbers. |  |  |
| b) -4\*(-1.3)\*(-5)\*(-2)  $new(wa)  $OS | How do we begin solving? | [One student works at the board, while the rest work in their notebooks.]  We determine the sign of the product. | b) -4\*(-1,3)\*(-5)\*(-2) |
|  | What do we do? | Count the negative summands.  $strong |  |
|  |  | There are 4 negative factors.  $strong |  |
|  | Is this number odd or even? | Even. |  |
|  | If there is an even number of negative factors, what will the product be: positive or negative? | If the number of negative factors is even, then the product is a positive number. |  |
| b) -4\*(-1.3)\*(-5)\*(-2)=4\*1.3\*5\*2= | What do we do after that? | Multiply the absolute value of these numbers:  4\*1.3\*5\*2 | b) -4\*(-1.3)\*(-5)\*(-2)=4\*1.3\*5\*2= |
|  | Because we can multiply the numbers in any order, what numbers will we multiply first? | Multiply 5 by 2, getting 10. |  |
|  | What other numbers do we have to multiply? | 4 times 1.3 is 5.2. |  |
| b) -4\*(-1.3)\*(-5)\*(-2)=4\*1.3\*5\*2=  =5.2\*10= | What will we write after the equal sign? | 5.2 times 10. | b) -4\*(-1.3)\*(-5)\*(-2)=4\*1.3\*5\*2=  =5.2\*10= |
| b) -4\*(-1.3)\*(-5)\*(-2)=4\*1.3\*5\*2=  =5.2\*10=52 | Name the value of the product. | 52 | b) -4\*(-1.3)\*(-5)\*(-2)=4\*1.3\*5\*2=  =5.2\*10=52 |
| 5. Fill in the table:   |  |  |  |  | | --- | --- | --- | --- | | *х* | 3 | -6 | 0 | |  |  |  |  |   $new(ws)  $OS | You can see a table, which has the values of the variable *x* written in its top line.  In the second line, we have to write the corresponding values of the fractional expression which has the number -6 written in its numerator, and *x* in its denominator. |  |  |
|  | Tell me, what operation can replace the fraction bar? | Division. |  |
|  | What expression do we get for х= 3? | -6 divided by 3 |  |
| |  |  |  |  | | --- | --- | --- | --- | | *х* | 3 | -6 | 0 | |  | -2 |  |  | | What is its value equal to? | -2  [The student writes the number in the table.] |  |
|  | What expression do we get for х= -6? | -6 divided by -6  $weak |  |
| |  |  |  |  | | --- | --- | --- | --- | | *х* | 3 | -6 | 0 | |  | -2 | 1 |  | | What is its value equal to? | 1  [The student writes the number in the table.] |  |
|  | What expression do we get х=0? | -6 divided by 0 |  |
|  | Can a number be divided 0?  *[if the student did not answer the question]* Please answer this question. | We cannot divide by zero. |  |
| |  |  |  |  | | --- | --- | --- | --- | | *х* | 3 | -6 | 0 | |  | -2 | 1 | \_\_ | | Can we evaluate the expression for x=0? | No. |  |
|  | The expression does not have a value for x=0. |  |  |
| 6. Evaluate the expression  *3а-15в* for *а*= -7, *в*= -3;  *а*=  and *в*=0.8.  $new()  $OS | Let’s evaluate an expression with variables. |  |  |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=* | [One student works at the board, while the rest work in their notebooks.]  What do we do to evaluate the expression for *а*= -7, *в*= -3? | In the expression *3а-15в*, we replace *a* with the number -7, and  *в* is the number -3. | If *а*= -7, *в*= -3, then *3а-15в=*  *=* |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=* | How will we evaluate the expression we got? | Determine the order of operations: the first is multiplication of 3 by -7, the second is multiplication of 15 by -3, and in the third operation, we subtract the result of the second operation from the first. | If *а*= -7, *в*= -3, then *3а-15в=*  *=* |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=*  - | Do the first operation. | We are multiplying numbers with opposite signs, so we put a minus sign and multiply the absolute values of these numbers. |  |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 | What did we get? | -21 | If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 |
|  | What do we do after that? | Do the second operation: multiply15 by -3.  $tutor |  |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45 | What did we get? | -45 | If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45 |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45  -21-(-45)= | What do we do after that? | We subtract the number we got from the result of the first operation, -21. |  |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45  -21-(-45)= -21+45=  \_45  21  24 | How do we subtract? | Add the minuend, -21, to the number opposite to the subtrahend, that is, 45. | If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45  -21-(-45)= -21+45=  \_45  21  24 |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45  -21-(-45)= -21+45=24  \_45  21  24 | Name the result of the third operation. | 24 | If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45  -21-(-45)= -21+45=24  \_45  21  24 |
| If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45  -21-(-45)= -21+45=24  \_45  21  24 | What is the value of the expression equal to for *а*= -7, *в*= -3? | 24 | If *а*= -7, *в*= -3, then *3а-15в=*  *=*  -21 -45  -21-(-45)= -21+45=24  \_45  21  24 |
| If *а*= , *в*= 0.8, then *3а-15в=*  *=*  $new(ws)  $OS | Let’s evaluate the expression for *а*=  and *в*=0.8.  *[with a strong student, you can work differently]* | In the expression *3а-15в*, we replace *a* with the number, and *в* with the number 0.8. | If *а*= , *в*= 0.8, then *3а-15в=*  *=* |
| If *а*= , *в*= 0.8, then *3а-15в=*  *=* | Comment on the solution. | We determine the order of operations: the first is multiplication of 3 by , the second is multiplication of 15 by 0.8, and the third is subtraction of the results. | If *а*= , *в*= 0.8, then *3а-15в=*  *=* |
| If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1) | Do the first operation. | We’re multiplying 3 by .  These are numbers with opposite signs, so we will get a negative number; we put a negative number. | If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1) |
|  |  | Next, we multiply the absolute values of these numbers and get , which is equal to . |  |
| If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1) | Name the result first operation. | - | If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1) |
| If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1)  2) х15  0.8  12.0  $new(ws) | Do the second operation. | We multiply 15 by 0.8, and get 12.  $weak | If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1)  2) х15  0.8  12.0 |
| If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1)  2) х15  0.8  12.0  3) | What do we do in the third operation? | Subtract the number 12 from -.  We got . | If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1)  2) х15  0.8  12.0  3) |
| If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1)  2) х15  0,8  12,0  3) | What is the value of the expression equal to for *а*=  and *в*=0.8? |  | If *а*= , *в*= 0.8, then *3а-15в=*  *=*  1)  2) х15  0,8  12,0  3) |
| Answer: 24; . | Write down the answer.  *[end of the assignment]* |  | Answer: 24; . |
| 7. Solve the word problem.  A manuscript contains 42 pages.  One typist can type up this manuscript in 2 h, and another one will take 3 times more time.  How many more pages will the first typist type up in 1 h than the second?  $new()  $OS | Let’s solve the problem. |  |  |
|  | Let’s write the problem givens with the help of a table. | [One student works at the board, while the rest work in their notebooks] |  |
| |  |  |  | | --- | --- | --- | | Productivity | Time | Work | |  |  |  | | What quantities is the problem about? | Productivity, time, work. | |  |  |  | | --- | --- | --- | | Productivity | Time | Work | |  |  |  | |
| |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  |  |  | | In this problem, what units are productivity, time and work measured in? | Work in pages, time in hours, and productivity in pages per hour. | |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  |  |  | |
|  | Who is the problem about? | About two typists. |  |
| |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  |  |  | |  |  |  | | This problem describes two situations. So we will be filling in two lines. |  | |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  |  |  | |  |  |  | |
|  | What do we know about the first typist? | The first typist can type up the manuscript in 2 h. |  |
| |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  | 2 |  | |  |  |  | | Where will we write that? | 2 h is the time. | |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  | 2 |  | |  |  |  | |
|  | What else do we know about the first typist? | He is typing up a manuscript that contains 42 pages. |  |
|  | A typist types 42 pages: that’s his work. |  |  |
| |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  | 2 | 42 | |  |  |  | | In the “work” column, let’s write 42 pages. |  | |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  | 2 | 42 | |  |  |  | |
|  | What work does the second typist do? | He types up a manuscript which has 42 pages. |  |
| |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  | 2 | 42 | |  |  | 42 | | Where do we write that? | We write it in the “work” column on the second line. | |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  | 2 | 42 | |  |  | 42 | |
| |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  | 2 | 42 | |  | 3 times more than ↑ | 42 | | What else is known about the second typist? | The second typist needs 3 times more time. | |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | |  | 2 | 42 | |  | 3 times more than ↑ | 42 | |
|  | Read the problem’s question. | How many more pages will the first typist type up in 1 h than the second? |  |
| |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Work,  pg | | ? less than↓ | 2 | 42 | |  | 3 times more than ↑ | 42 | | What quantities do we have to compare? | The productivity of the first and second typist. | |  |  |  | | --- | --- | --- | | Productivity,  pg/h | Time,  h | Работа,  pg | | ? less than↓ | 2 | 42 | |  | 3 times more than ↑ | 42 | |
| $new() | Is the productivity of the first typist known? | No. |  |
|  | What do we have to know to find the productivity? | We have to know the time and work. |  |
|  | Do we know the time? | Yes, 2 h |  |
|  | Do we know the work done by the first typist? | Yes, 42 pages. |  |
|  | Can we find the productivity of the first typist? | Yes. |  |
|  | What do we have to do to find the productivity? | To find the productivity, we divide the work by the time. |  |
| 1) 42÷2 | What do we write in the first operation? | 42÷2 |  |
| 1) 42÷2=21 (pg/h) is the productivity of the first typist. | What did we get? | 21 pages per hour is the productivity of the first typist. | 1) 42÷2=21 (pg/h) is the productivity of the first typist. |
|  | Now, let’s find the productivity of the second typist.  What do we have to know for that? | We need to know time and productivity. |  |
|  | Are these quantities known? | The work is known: 42 pages.  It also says that the second typist will need 3 times more time than the first one. |  |
|  | What do we have to do? | Find the time the second typist’s work would take. |  |
| 2) 2\*3 | What do we write in the second operation? | 2\*3 | 2) 2\*3 |
| 2) 2\*3=6 (h) is how long the second typist would take. | What did we get? | 6 hours is how long the second typist would take. | 2) 2\*3=6 (h) is how long the second typist would take. |
|  | Knowing the work and time, what can we find? | Productivity. |  |
|  | What do we do? | Divide the work – 42 pages – by the time: 6 h. |  |
| 3) 42÷6=7 (pg/h) is the productivity of the second typist. | What did we get? | 7 pages per hour is the productivity of the second typist. | 3) 42÷6=7 (pg/h) is the productivity of the second typist. |
|  | Knowing the productivity of the first and second typist, what can we find? | We can find how much more the productivity of the first typist is than the productivity of the second typist. |  |
| 4) 21-7 | What do we do? | Subtract the smaller amount of pages, 7 pages, from the greater one, 21 pages per hour. |  |
| 4) 21-7=14 (pg) more is typed by the first typist in 1 hour than by the second. | What did we get? | 14 pg more is typed by the first typist in 1 hour than by the second. | 4) 21-7=14 (pg) more is typed by the first typist in 1 hour than by the second. |
|  | Have we answered the problem’s question? | Yes. |  |
| Answer: 14 pages more. | Write down the answer. |  | Answer: 14 pages more. |
|  | Excellent! You’ve succeeded at solving this problem!  $OS |  |  |

### Stage 4: Lesson recap

| Blackboard | Teacher | Student | Notebook |
| --- | --- | --- | --- |
|  | In today’s lesson, we performed operations with positive and negative numbers.  Let’s review the rules we used. | [Frontal work: the teacher asks questions, and students answer from their seats.] |  |
|  | What do we have to do to add two negative numbers? | To add two negative numbers:  add the absolute values of the summands and put a minus sign in front of the result. |  |
|  | What do we have to do to add two numbers with opposite signs? | To add numbers with opposite signs:  subtract the smaller absolute value from the greater one, and put the sign of the summand with the greater absolute value in front of the resulting number. |  |
|  | What sign will the product (or quotient) have if we multiply (divide) two negative numbers? | Plus. |  |
|  | What sign will the product (or quotient) have if we multiply (divide) numbers with opposite signs? | Minus. |  |

### Stage 5: Assigning homework.

| Blackboard | Teacher | Student | Notebook |
| --- | --- | --- | --- |
|  | “Diligence is the key to success in mathematics.” And to receive this “key”, that is, to succeed, you have to work hard at school and at home.  $OS |  |  |
| 1. Evaluate the expression:    $OS |  |  | 1. -294  1) 3.64÷ (-0.4)=-36.4:4=-9.1  36.4÷ 4=9.1 (written calculation)  2) -0.7+(-9.1)=-9.8  3) -9.8÷ (-0.01)=9.8÷0.01=980÷1=980  4) 980\*(-0.3)=-294  х980  0.3  294.0 |
| 2. Calculate, using the most convenient method:  а) 5.37-9.29-5.37  ~~b)~~  b)  ~~c)~~  c)  d)  $OS |  |  | 2. Solution:  а) ~~5.37~~ – 9.29 – ~~5.37~~ = - 9.29  b)      c)      d) |
| 3. Solve the word problem.  A worker manufactured 720 machine parts in 8 h.  To manufacture the same amount of parts, his apprentice needs 4 more h.  How many more machine parts will a worker manufacture in 1 hour than his apprentice?  $OS |  |  | 3.   |  |  |  | | --- | --- | --- | | Productivity,  p./h | Time,  h | Work,  parts | | ? times g. than ↓ | 8 | 720 | |  | 4h l. than↑ | 720 | |
|  |  |  | 1) 720÷8=90 (p./h) is the productivity of the worker.  2) 8+4=12 (h) is how long the apprentice will need.  3) 720÷12=60(p./h) is the productivity of the apprentice.  720÷12=60 (written calculation)  4) 90÷60=1.5 (times) more parts per hour are manufactured by the worker than the apprentice.  9÷6=1.5 (written calculation)  Answer: 1.5 times more. |

Homework evaluation criteria:

«5» - all assignments are done correctly

«4» - the assignments are done, but with 1-2 calculation errors, or the student didn’t apply the properties of operations for rational calculation (evaluated the expression operation by operation).

«3» - two assignments are done correctly (possibly with one calculation error).

Possible errors:

- when evaluating the expression, the student didn’t apply the properties of operations with rational numbers;

- mistake when calculating the absolute value of the result of operations with positive and negative numbers;

- incorrect sign of the result of operations with positive and negative numbers;

- calculation error (operations with decimals)

- when solving the problem, incorrectly set up the expression showing the “…greater than” (“…times greater than”) relationship.