FRACTIONS AND TEACHING METHODOLOGY IN PRIMARY CLASSES

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Abstract. *The practical importance of studying fractions, introducing shares and fractions, comparing fractions and teaching the methodology of performing operations on fractions in grades III and IV based on the school program.*

Keywords: *curriculum, proportion, fractions, elementary education, doing and solving examples.*

Introduction

According to the school program, preparatory work for learning fractions in grades III and IV should be carried out in primary grades. This means that it is necessary to create clear ideas about fractions and fractions in the elementary grades. For this purpose, it is planned to introduce children to shares and their writing, to teach them to compare shares, to solve problems related to finding shares of a number and a number by its share. All the mentioned issues will be disclosed in an indicative manner.

Research materials and methodology. ***Introduce the concept of fractional number and use it teaching methodology.***

Introduction to shares. Introducing students to proportions means creating clear ideas about proportions in them, that is, teaching children to create proportions in a practical way. For example, in order to make a quarter of a circle, it is necessary to divide the circle into 4 equal parts and take one of these parts; to make one-fifth of a section, it is necessary to divide it into five equal parts, and take one of these parts.

***Introduction to fractions*.** The formation of fractions is treated in the same way as the formation of fractions using instruction manuals.

Divide the circle into 4 equal parts. What can each of these pieces be called? Write. Show three-fourths. You have made a fraction - three quarters. Who can write this fraction? What does the number 4 represent? (How many equal parts the circle is divided into.) What does the number 3 represent? (How many such fractions are taken.) Similarly, students form and write other fractions, explaining what each number represents.

Adding, subtracting, and multiplying a set of whole numbers is always appropriate, but division is not always possible. Because dividing one whole number by another whole number does not always result in a whole number. For example, 7:2 = 3.5, 9:4 = $2\frac{1}{4}$, ... Here is the partition created $3,5;\ 2\frac{1}{4}, \dots$ numbers do not exist in the set of integers. In general $m \cdot x = n,\ m \neq 0$ the solution of an equation of the form does not always exist in the set of integers, this equation is always $x = \frac{n}{m}$ by expanding the set of integers by introducing the concept of fractions to have a solution of the form, add all negative and positive fractions to it. This is the word $\left\{-\frac{p}{q}, 0, \frac{p}{q}\right\}$ means that it is necessary to form a set of rational numbers of the form. Only then $mx=n$ equations of the form always have a solution. Here r and q are natural numbers. According to the above considerations, a rational number can be defined as follows: $\frac{p}{q}$ An irreducible fraction of the form is called a rational number. Now let's look at some examples to introduce the concept of fractions. If a one-meter-long piece of wood is cut into two equal parts, then the length of each piece is half the length of the piece of wood and him $\frac{1}{2}$ is written as. If this one meter long piece of wood is divided into three equal pieces, then the length of each of the pieces will be equal to one third of the length of the piece of wood and him $\frac{1}{3}$ is written as. As well as $\frac{1}{4}, \frac{1}{5}, \frac{1}{6}$ ... If we cut a one-meter-long piece of wood into three equal parts and take two parts from it, the resulting length $\frac{2}{3}$ is written as. If we divide this wood into four parts and take three parts from it, the length $\frac{3}{4}$ of the obtained part is expressed as. Based on the above considerations, the definition of the concept of a fraction can be given as follows.

Description. A certain fraction of a whole number that is equal to each other is called a fraction of that number. Above $\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{3}{4}$ we made fractions. A number that shows how many equal parts a given thing or a whole number is divided into is called the denominator of a fraction, and a number that shows how many of such parts are taken is called the image of a fraction. The denominator is written below the decimal line, and the numerator is written above the decimal line. A fraction in general $\frac{p}{q}$ is expressed in the form. In this r - a picture of a fraction, q - is called the denominator of the fraction. $\frac{p}{q}$ fractions opposite to fractions in form $-\frac{p}{q}$ is expressed in the form. In the coordinate axis $-\frac{p}{q}$ decimals in the form are to the left of zero. By expanding the set of integers $-\frac{p}{q}$ and $\frac{p}{q}$ we have formed fractions of the form. The result is on the coordinate axis $\{-\frac{p}{q}, 0, \frac{p}{q}\}$ generated a set of numbers in the form. Such a set is called a set of rational numbers. If in the set of rational numbers $-\frac{p}{q}$ and $\frac{p}{q}$ denominators of fractions $q = 1$ say, the set of integers known to us is formed.

It can be seen that the integers are a special case of the set of rational numbers. It is natural to ask whether it is possible to establish a one-value correspondence between the set of rational numbers and the points of the coordinate straight line. We can answer this question as follows, on the contrary, it is not possible to assign a single rational number to each point.

There are three types of fractions:

1. Correct fractions. 2. Improper fractions. 3. Decimals.

1. If the numerator of a fraction is smaller than its denominator, such fractions are called proper fractions.

For example: $\frac{1}{2}, \frac{3}{4}, \frac{1}{6}$ ... .

2. If the numerator of a fraction is greater than its denominator, such fractions are called improper fractions.

For example: $\frac{5}{2}, \frac{7}{4}, \frac{17}{5}$ ... .

3. If the denominator of a fraction consists of one and zero, such fractions are called decimal fractions.

For example: $\frac{1}{10}$=0,1; $\frac{1}{100}$=0,01; ... .

After introducing the concept of fractions, the concept of equality of fractions is introduced. This concept can be explained to students as follows.

Suppose we are given a cross-section one meter long. If we divide this cross-section into two equal parts, the length of each cross-section $\frac{1}{2}$ is represented by a fraction. Now if we divide the divided pill into two parts again, the length of each part $\frac{1}{4}$ expressed as a fraction. This is the length of two of the sections divided into four equal parts $\frac{2}{4}$ expressed as a fraction. And this is when the length of the entire section is divided by two $\frac{1}{2}$ is equal to the value expressed as a fraction. That is why $\frac{1}{2}=\frac{2}{4}=\frac{4}{8}=\ldots$. It appears that, $\frac{1}{2}$ and $\frac{2}{4}$ fractions have equal values, but their expression is different. After explaining the concept of equality of fractions to students, the following properties of fractions can be expressed.

1 - property. If the numerator and denominator of a fraction are multiplied by the same number, the value of the fraction does not change.

$$\frac{p}{q}=\frac{p}{q}\cdot\frac{n}{n}.$$

Examples:

1) $\frac{2}{5}=\frac{2}{5}\cdot\frac{2}{2}=\frac{4}{10}$;

2) $\frac{3}{7}=\frac{3}{7}\cdot\frac{4}{4}=\frac{12}{28}$;

3) $1=\frac{1}{1}=\frac{1}{1}\cdot\frac{4}{4}=\frac{4}{4}=\frac{4\cdot 25}{4\cdot 25}=\frac{100}{100}$.

II - property. If the numerator and denominator of a fraction are divided by the same number, the value of the fraction does not change.

$\frac{p:n}{q:n}=\frac{p}{q}$. Here $n>1$ should be. Examples: 1) $\frac{4}{8}=\frac{4}{4\cdot 2}=\frac{1}{2}$; 2) $\frac{15}{3}=\frac{3\cdot 5}{3}=\frac{5}{1}=5$

III - property. If the numbers in the numerator and denominator of a fraction do not have common divisors, then such a fraction is an irreducible fraction. For example, $\frac{5}{7},\frac{4}{5},\frac{17}{19},....$ are irreducible fractions because 5 and 7, 4 and 5, 17 and 19 numbers have no common divisors.

Search results. Methodology for comparing fractions and performing operations on fractions

I. Exercises on comparing fractions and problems on finding a fraction of a number will help you understand the exact meaning of a fraction.

1. To compare fractions, it is necessary to convert the given fractions into fractions with the same denominator, and then whichever of them has a larger image, the value of that fraction will be larger.

For example: $\frac{3}{4}$ and $\frac{2}{5}$; $\frac{3\cdot 5}{4\cdot 5}=\frac{15}{20}$ and $\frac{2\cdot 4}{5\cdot 4}=\frac{8}{20},\frac{15}{20}>\frac{8}{20}$, that is why

$\frac{3}{4}>\frac{2}{5}$. Here we used the property that if the numerator and denominator of a fraction are multiplied by the same number, the value of the fraction does not change.

2. Of the fractions with the same sides and different denominators, if the denominator is larger, the fraction will be smaller. If the denominator is smaller, the fraction will be larger.

For example: $\frac{4}{15}$ and $\frac{4}{21}$ for s $\frac{4}{15}>\frac{4}{21}$.

Add fractions. To add fractions with the same denominator, it is enough to add their pictures and write one of the denominators.

$\frac{p}{q}+\frac{r}{q}=\frac{p+r}{q}$; For example, $\frac{3}{5}+\frac{1}{5}=\frac{3+1}{5}=\frac{4}{5}$.

Discussions. II. To add fractions with different denominators, it is enough to add them by bringing them to the lowest common denominator and using the rule for adding fractions with the same denominator:

For example, $\frac{2}{5}+\frac{3}{7}=\frac{2\cdot 7}{5\cdot 7}+\frac{3\cdot 5}{7\cdot 5}=\frac{14}{35}+\frac{15}{35}=\frac{14+15}{35}=\frac{29}{35}$;

In the general case $\frac{p}{q}+\frac{r}{s}=\frac{p\cdot s}{q\cdot s}+\frac{r\cdot q}{s\cdot q}=\frac{ps+rq}{sq}$.

III. Adding fractions that add up to a whole number is done as follows:

1) $\frac{2}{4}+\frac{1}{2}=\frac{2}{4}+\frac{2\cdot 1}{2\cdot 2}=\frac{2+2}{4}=\frac{4}{4}=1$;

IV. Add a whole number to a decimal

1) $3+\frac{1}{2}=3\frac{1}{2}$;

2) $3+\frac{1}{2}=\frac{3}{1}+\frac{1}{2}=\frac{3\cdot 2}{1\cdot 2}=\frac{6+1}{2}=\frac{7}{2}=3\frac{1}{2}$;

V. Add a mixed number to a decimal

$$3\frac{3}{4}+\frac{1}{2}=3+\left(\frac{3}{4}+\frac{1}{2}\right)=3+\left(\frac{3}{4}+\frac{1\cdot 2}{2\cdot 2}\right)=3+\left(\frac{3}{4}+\frac{2}{4}\right)=3+\left(\frac{3+2}{4}\right)=3+\frac{5}{4}=4+\frac{1}{4}=4\frac{1}{4}.$$

VI. Adding a mixed number to a mixed number:

$$2\frac{1}{3}+3\frac{1}{2}=(2+3)+\left[\frac{1}{3}+\frac{1}{2}\right]=5+\left[\frac{1\cdot 2}{3\cdot 2}+\frac{1\cdot 3}{2\cdot 3}\right]=5+\frac{2+3}{6}=5+\frac{5}{6}=5\frac{5}{6}.$$

Conclusion

Examples of solving problems.

Laws of Addition.

1. The value of the total fraction does not change when the places of the addends of the fraction are changed:

$$\frac{a}{q}+\frac{b}{q}=\frac{a+b}{q}=\frac{b+a}{q}=\frac{b}{q}+\frac{a}{q}.$$

Example:

$$\frac{3}{5}+\frac{1}{5}=\frac{3+1}{5}=\frac{1+3}{5}=\frac{1}{5}+\frac{3}{5}.$$

2. The grouping law applies to the addition of fractions:

$$\left(\frac{a}{q}+\frac{b}{q}\right)+\frac{c}{q}=\frac{a}{q}+\left(\frac{b}{q}+\frac{c}{q}\right).$$

Proof:

$$\left(\frac{a}{q}+\frac{b}{q}\right)+\frac{c}{q}=\frac{a+b}{q}+\frac{c}{q}=\frac{(a+b)+c}{q}=\frac{c+(b+a)}{q}=\frac{a}{q}+\frac{b+c}{q}=\frac{a}{q}+\left(\frac{b}{q}+\frac{c}{q}\right).$$

Example:

$$\frac{1}{7}+\frac{3}{5}+\frac{2}{7}=\left(\frac{1}{7}+\frac{2}{7}\right)+\frac{3}{5}=\frac{1+2}{7}+\frac{3}{5}=\frac{3}{7}+\frac{3}{5}=\frac{3\cdot 5}{7\cdot 5}+\frac{3\cdot 7}{5\cdot 7}=\frac{15+21}{35}=\frac{36}{35}.$$

Subtract fractions. Suppose we are given a cross-section AB, which is divided into 7 equal parts. Of them $AC=\frac{1}{7}$, $CD=\frac{3}{7}$, $AD=\frac{4}{7}$ be equal to. CD the value of the cross section $CD=AD–AC$ will be, in that case $\frac{4}{7}-\frac{1}{7}=\frac{3}{7}$ equality is appropriate.

2) Karim loaded two cars $\frac{5}{7}$ dropped on the clock. He is the first car load $\frac{3}{7}$ downloaded in 1 hour. How many hours did Karim unload the second car? $\frac{5}{7}-\frac{3}{7}=\frac{2}{7}$. Validation of the found result is done by addition operation: $\frac{2}{7}+\frac{3}{7}=\frac{2+3}{7}=\frac{5}{7}$

Now let's look at the following rules for subtracting fractions:

I. To subtract fractions with the same denominator, it is enough to subtract their images and write one of the denominators as the denominator.

1) $\frac{3}{5}-\frac{1}{5}=\frac{3-1}{5}=\frac{2}{5}$; 2) $\frac{4}{7}-\frac{3}{7}=\frac{4-3}{7}=\frac{1}{7}$;

II. To subtract fractions with different denominators, reduce them to the lowest common denominator and use the rule for subtracting fractions with the same denominator:

$$\frac{3}{4}-\frac{2}{7}=\frac{3\cdot 7}{4\cdot 7}-\frac{2\cdot 4}{7\cdot 4}=\frac{21-8}{28}=\frac{13}{28}.$$

In general:

$$\frac{p}{q}-\frac{r}{s}=\frac{p\cdot s}{q\cdot s}-\frac{r\cdot q}{s\cdot q}=\frac{ps-rq}{sq}.$$

III. Subtracting a fraction from a whole number:

1- method. $4-\frac{2}{3}=\frac{4}{1}-\frac{2}{3}=\frac{4\cdot 3}{1\cdot 3}-\frac{2}{3}=\frac{12}{3}-\frac{2}{3}=\frac{12-2}{3}=\frac{10}{3}.$

2- method. $4-\frac{2}{3}=3+\left(\frac{3}{3}-\frac{2}{3}\right)=3+\left(\frac{3-2}{3}\right)=3+\frac{1}{3}=3\frac{1}{3}.$

IV. Subtracting a whole number from a fraction:

$$\frac{3}{7}-2=-\left(2-\frac{3}{7}\right)=-\left(\frac{2\cdot 7}{1\cdot 7}-\frac{3}{7}\right)=-\left(\frac{14}{7}-\frac{3}{7}\right)=-\frac{14-3}{7}=-\frac{11}{7}=-1\frac{4}{7}.$$

V. Subtracting a mixed number from a whole number:

$$5-2\frac{1}{4}=4\frac{5}{5}-2\frac{1}{4}=(4-2)+\left(\frac{5}{5}-\frac{1}{4}\right)=2+\left(\frac{5\cdot 4}{5\cdot 4}-\frac{1\cdot 5}{4\cdot 5}\right)=$$
$$=2+\frac{20-5}{20}=2+\frac{15}{20}=2+\frac{3}{4}=2\frac{3}{4}.$$

VI. Subtracting a whole number from a mixed number:

1) $3\frac{3}{4}-2=(3-2)+\left(\frac{3}{4}-0\right)=1+\frac{3}{4}=1\frac{3}{4}.$

2) $3\frac{3}{4}-2=\frac{15}{4}-\frac{2}{1}=\frac{15}{4}-\frac{2\cdot 4}{1\cdot 4}=\frac{15-8}{4}=\frac{7}{4}=1\frac{3}{4}.$

VII. Subtract a fraction from 1:

$$1-\frac{3}{4}=\frac{1}{1}-\frac{3}{4}=\frac{1\cdot 4}{1\cdot 4}-\frac{3}{4}=\frac{4-3}{4}=\frac{1}{4}.$$

VIII. Subtracting a mixed number from 1:

1 - method.

$$1-3\frac{1}{2}=-\left(3\frac{1}{2}-1\right)=\left[(3-1)+\left(\frac{1}{2}-0\right)\right]=-\left(2+\frac{1}{2}\right)=-2\frac{1}{2}.$$

2 - method.

$$1-3\frac{1}{2}=\frac{1}{1}-\frac{7}{2}=\frac{1\cdot 2}{1\cdot 2}-\frac{7}{2}=\frac{2-7}{2}=\frac{-5}{2}=-2\frac{1}{2}.$$

Multiplication of fractions. 1. To multiply a fraction by a whole number, it is enough to multiply this whole number by the image of the fraction:

1) $\frac{5}{17}\cdot 3=\frac{5\cdot 3}{17}=\frac{15}{17}$; 2) $\frac{2}{9}\cdot(-4)=\frac{2\cdot(-4)}{9}=-\frac{8}{9}$. According to the multiplication rule, $\frac{5}{17}\cdot 3$, $\frac{2}{9}\cdot(-4)$ expressions can be written as follows:

1) $\frac{5}{17}\cdot 3=\frac{5}{17}+\frac{5}{17}+\frac{5}{17}=\frac{5+5+5}{17}=\frac{15}{17}$;

2) $\frac{2}{9}\cdot(-4)=-\frac{2}{9}\cdot 4=-\frac{2}{9}-\frac{2}{9}-\frac{2}{9}-\frac{2}{9}=-\left(\frac{2}{9}+\frac{2}{9}+\frac{2}{9}+\frac{2}{9}\right)=-\frac{8}{9}.$

2. To multiply a mixed number by a whole number, simply convert the mixed number to an improper fraction and multiply the whole number by its image:

1. $2\frac{1}{2}\cdot 3=\frac{2\cdot 2+1}{2}\cdot 3=\frac{5}{2}\cdot 3=\frac{5\cdot 3}{2}=\frac{15}{2}=7\frac{1}{2}.$

2. *a*) $3\frac{3}{4}(-2)=\frac{3\cdot 4+3}{4}\cdot(-2)=\frac{15}{4}\cdot(-2)=\frac{15\cdot(-2)}{4}=$

$=-\frac{30}{4}=-\frac{15\cdot 2}{2\cdot 2}=-\frac{15}{2}=-7\frac{1}{2}.$

b) $3\frac{3}{4}(-2)=-3\frac{3}{4}\cdot 2=-3\frac{3}{4}+\left(-3\frac{3}{4}\right)=-\left(3\frac{3}{4}+3\frac{3}{4}\right)=$

$=-\left(6+\frac{3+3}{4}\right)=-\left(6+\frac{6}{4}\right)=-7\frac{1}{2}.$

3. To multiply a fraction by a fraction, it is enough to multiply their pictures by their pictures and their denominators by their denominators:

$\frac{p}{q}\cdot\frac{s}{r}=\frac{p\cdot s}{q\cdot r}.$

Example:

1) $\frac{2}{7}\cdot\frac{5}{9}=\frac{2\cdot 5}{7\cdot 9}=\frac{10}{63};$ 2) $\frac{7}{11}\cdot\frac{2}{5}=\frac{7\cdot 2}{11\cdot 5}=\frac{14}{55};$

4. To multiply mixed numbers, it is enough to convert each of them to an improper fraction, and multiply their numbers by their numbers and their denominators by their denominators:

1) $2\frac{1}{3}\cdot 4\frac{2}{5}=\frac{7}{3}\cdot\frac{22}{5}=\frac{7\cdot 22}{3\cdot 5}=\frac{154}{15}=10\frac{4}{15}.$

Multiplication of fractions obeys the laws of substitution, grouping, and division.

1. When multiplying fractions, the value of the product does not change when the multipliers are changed:

1) $\frac{2}{3}\cdot\frac{4}{7}=\frac{2\cdot 4}{3\cdot 7}=\frac{8}{21};$

2. When multiplying fractions by grouping them, the value of the product does not change:

1) $\left(\frac{2}{3}\cdot\frac{4}{5}\right)\cdot\frac{3}{7}=\left(\frac{2\cdot 4}{3\cdot 5}\right)\cdot\frac{3}{7}=\frac{8}{15}\cdot\frac{3}{7}=\frac{24}{105}.$

3. When multiplying fractions, if the distributive law is applied to them, the value of the product does not change:

$\left(\frac{a+b}{c}\right)\cdot\frac{p}{q}=\frac{(a+b)p}{cd}==\frac{ap+bp}{cd}.$

An example. 1) $\left(\frac{4+3}{9}\right)\cdot\frac{4}{5}=\frac{(4+3)\cdot 4}{9\cdot 5}=\frac{4\cdot 4+3\cdot 4}{9\cdot 5}=\frac{16+12}{45}=\frac{28}{45}.$

Dividing fractions. The topic of dividing fractions is covered in the mathematics course. As we know from the topic of integers, to divide two integers, we need to multiply the first by the inverse of the second.

Similarly, to divide two decimal numbers, multiply the first fraction by the inverse of the second fraction, that is: $\frac{15}{27}:\frac{2}{3}=\frac{15}{27}\cdot\frac{3}{2}=\frac{45}{54}$. It is appropriate to explain this rule to students through the following problem. Matter. $\frac{6}{7}$ piece find the number that is equal to 30. Solving. If we denote the unknown number by x, then the condition of the problem can be written as follows: $\frac{6}{7}\cdot x=30$, because the quotient of a number is found by multiplication. This equation is solved like this:

$\frac{1}{7}x=30:6=5$. From this $x = 5\cdot 7 = 35$ will be. So, the desired number is 35.

When finding the number itself according to the value of the given fraction, it is appropriate to consider different cases, like finding the fraction of the number. The definition of dividing a number by fractions is the same as the definition of dividing whole numbers. It is appropriate to explain this rule to the students. After that, it is useful to consider the following cases of dividing fractions.

1. To divide a fraction into a whole number, it is enough to write the fraction as it is, and the whole number in reverse, and multiply them:

$$\frac{5}{7}:4=\frac{5}{7}\cdot\frac{1}{4}=\frac{5\cdot 1}{7\cdot 4}=\frac{5}{28}.$$

2. To divide a mixed number by a whole number, convert the mixed number to an improper fraction and then divide as if dividing the fraction by the whole number:

$$2\frac{5}{7}:4=\frac{19}{7}:4=\frac{19}{7}\cdot\frac{1}{4}=\frac{19}{28}.$$

3. To divide a whole number into a mixed number, it is necessary to write the whole number as it is, convert the mixed number to an improper fraction, and multiply them.

$$4:1\frac{3}{5}=4:\frac{8}{5}=4\cdot\frac{5}{8}=\frac{20}{8}=2\frac{4}{8}=2\frac{1}{2}\ .$$

4. To divide a mixed number into a mixed number, convert one of them to improper fractions, and then divide according to the rule of dividing two fractions by each other:

$$2\frac{3}{5}:3\frac{2}{7}=\frac{13}{5}:\frac{23}{7}=\frac{13}{5}\cdot\frac{7}{23}=\frac{13\cdot 7}{5\cdot 23}=\frac{91}{115}\quad .$$

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