NOVATEUR PUBLICATIONS
JournalNX- A Multidisciplinary Peer Reviewed Journal
ISSN No: 2581 - 4230
VOLUME 8, ISSUE 10, Oct. -2022

FEATURES OF TEACHING TRIGONOMETRY IN SPECIALIZED SCHOOLS

Ermatov Sherzodbek Latibjonovich
Base Doctoral Student of Andijan State University
E-mail: u_xonqulov@mail.ru, Telehpone: +998-90-255-95-82

ANNOTATION

This article covers some problems in teaching trigonometry for specialized schools and methodological recommendations for their solution. Ensuring the quality and efficiency of teaching trigonometry is in many ways directly related to memorization and repetition of mathematical concepts. The article developed two methods for memorizing the trigonometry values of the angle and effective proposals for memorizing the trigonometric formula and systematic repetition of educational materials.

Keywords: specialized schools, mnemonic memorization, trigonometric formulas, repetition and memorization techniques, learning in interconnection.

INTRODUCTION

Specialized schools are designed to teach various academic disciplines in depth, providing an opportunity to provide education taking into account the needs of students intellectual development[4]. One of the most important sections of mathematics in particular is the improvement of teaching by deepening trigonometry, the practical application of the principle of exhibitionism, the presentation of educational content using drawing and image models, the systematization of memorization and repetition of mathematical concepts is one of the urgent methodological problems. Trigonometry is closely related to many mathematical sciences as an integral node of algebra and geometry with its practical significance[1]. It is known that before 1970, trigonometry occupied a place in school mathematics education as a separate educational science, while at the same time it is studied in the structure of algebra, geometry. The realization of students talent, the search for solutions to educational methodological problems, especially in the case of in-depth mathematics education, in particular, the improvement of the methodological capabilities of teaching trigonometry, the design of educational content by means of drawing and graphic illustrations, and the teaching of students to solve practical and practical issues are studied as an urgent problem[2].

Material and Methods. Obid Karimi on ways to enrich the scientific and methodological foundations of teaching trigonometry, to solve existing problems in new concepts and conditions, V.N.Timerbaeva, S.R.Murodova, G.M.Loganina, O.X. Khonkulov, A.N.Marasov, Sh.A.Bakmaeva, J.V.Stickle and others carried out scientific research. Despite the fact that significant experiments on teaching trigonometry have been accumulated, trigonometric concepts remain as sections of mathematics, which are most difficult to master by students. This situation is explained by many factors[3]. From the experiments it was found that as the reason for the difficult assimilation of trigonometry by students, we can say the following:

first, since a large volume of formulas is studied in the trigonometry course, problems with memorizing them arise. In particular, memorization of formulas is carried out by students in full, problematic situations, intellectual distress are observed due to the lack of systematic implementation. Trigonometry requires systematic teaching, learning, ignorance of a single topic or formula leads to the inability to connect further topics in students, and such a situation leads to a decrease in motivation to not understand the topic, to gain knowledge;

secondly, trigonometry is associated with the need to organize the regular reproduction of educational material on the basis of consistency and continuity in the learning process and develop a logical-structural model that provides for its educational methodological aspects, content, form, method and Means. It is difficult to carry out this process through the materials allocated for "repetition of topics studied in previous classes" and "repetitions at the end of chapters" presented in textbooks of limited volume and content. For systematic repetition, it is necessary to formulate educational material, draw up theoretical tests aimed at repetition, identify the most effective methods and forms of organizing students ' activities in the classroom and extracurricular activities, introduce a system of repeated assignments into the structure of the educational process, as well as the content of educational materials.

Results. It is advisable for the teacher to use methodological approaches aimed at the development of their logical thinking, taking into account the individual capabilities of students. We believe that in this regard, it is useful for every teacher to pay attention to the following aspects in the conduct of his professional pedagogical activity:

the formation of the ability of students to memorize is a key factor in the development of thinking. The process of developing the logical memory of students is considered as the formation of methods for organizing educational activities on the basis of memorization and, through this, the establishment of semantic connections, relationships in the educational material. The memorization process itself is characterized by the functions of storing and strengthening educational material in memory, as well as the functions of its development. Trigonometry is known to be central to the scale of the content and relevance of educational material in the school mathematics course. One of the problems faced by students in the early stages of the study of trigonometry is the need to memorize the values of trigonometric functions for Angular values (0º, 30º, 45º, 60º, 90º). Through the technique of mnemonic memorization (mnemonic action-methods that increase the productivity of memory and process memorized material), the properties of the memorized material should lie on the basis of a mathematical model built through its system of mnemonic actions. As the stages of mnemonic behavior in the development of logical memory by researchers, the following are recommended: the organization, comparison, classification, systematization of educational activities that lead to the division of educational material into semantic groups and frequent repetition, The Binding of memorized information to some objects on the basis of analogy and semantic connections, etc. Based on mnemonic memorization, we will cite methods that make it easier for students to memorize the "table" values of trigonometric functions.

Method 1. In this case, the memorization of the angular values of sine, cosine, tangent and cotangent is carried out using the mnemonic rule "trigonometry in the palm of your hand". Through this rule, it is much easier to memorize the values of sine, cosine, tangent and cotangent at 0º, 30º, 45º, 60º, 90º degrees. The rule is the following: starting from the little fingers of our left hand, we name the thumb from 0 to 4. Let the little finger-0º, The Nameless finger-30º, the middle finger-45º, the pointing finger-60º and the thumb-90º. This simple $\sin/\cos=\frac{\sqrt{n}}{2}$ (here $n=0,1,2,3,4$) we use the formula. To calculate the values of the sine in degrees 0º, 30º, 45º, 60º, 90º, in terms of the naming of the fingers upwards, starting from a small commute $\sin x=\frac{\sqrt{n}}{2}$ we find using the formula. To calculate the values of the cosine in degrees 0º, 30º, 45º, 60º, 90º, the naming of the fingers is done in the opposite way, that is, from the thumbs to the little finger, from 0 to 4 is denoted. By finger naming $\cos x=\frac{\sqrt{n}}{2}$ using the formula, the values of the cosine in degrees 0º, 30º, 45º, 60º, 90º are found (See

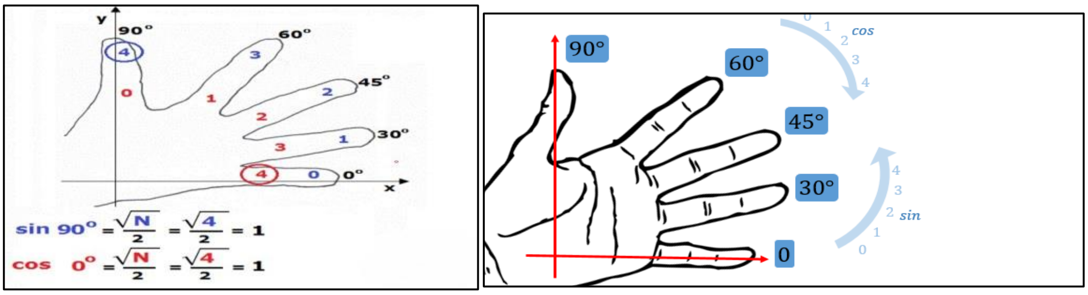


Figure 1). 1-image.

The degree of tangent and cotangent in the calculation of values $tgx=\frac{\sin x}{\cos x}$ and $ctgx=\frac{\cos x}{\sin x}$ formulas are used. Now, in particular, focused on the implementation of mnemonic actions in the development of logical memory, we will cite one more method that will make it easier for students to memorize the "table" values of trigonometric functions.

Method 2. unit circle is drawn, the center of which is in the system of right-angled couordanas. $O(0;0)$ the beam passing through the point is a unit circle $A(x;y)$ cut at the point he with the positive direction of the abscissa axis α arrange the corner. OAB from the Triangle $\sin\alpha=y$, $\cos\alpha=x$. "Table" the values are found only in the first quarter, using the periodicity of trigonometric functions to the found values πn ($n=0,\pm1,\pm2,\ldots$) the remaining values can be found by adding the number. This method is based on the definition of sine, cosine, tangent and cotangent. For example, $\sin 0^0=0$ ra ва $\cos 0^0=1$ equal because n nur OX overlap with the axis falls. If n нур OX with Axis 30^0 if the angle is formed, OAB from the Triangle 30^0 using a cathet lying opposite an angle equal to half the hypotenuse $\sin 30^0=AB=\frac{1}{2}$ келиб чиқади (OAB triangle OX it is based on a regular triangle formed from a symmetric displacement relative to the axis of). $\cos 30^0=OB$ and the value is found using the Pythagorean theorem:

$\cos 30^0 = OB = \sqrt{OA^2 - AB^2} = \sqrt{1 - \frac{1}{4}} = \frac{\sqrt{3}}{2}$.

If n nur OX with Axis 45^0 if the angle is formed, OAB the triangle becomes an equilateral right-angled triangle: $\sin 45^0 = \cos 45^0 = OB = AB$. According to Pythagorean theorem $OB = AB = \sqrt{\frac{1}{2}} = \frac{\sqrt{2}}{2}$. If n nur OX with Axis 60^0 if the angle is formed, without it OAB from the Triangle $\angle OAB = 30^0$ is, and the cathet opposite it is half the size of the hypetenuse: $OB = \frac{1}{2} = \cos 60^0$. According to Pythagorean theorem $AB = \sqrt{OA^2 - OB^2} = \sqrt{1 - \frac{1}{4}} = \frac{\sqrt{3}}{2} = \sin 60^0$ comes from. Агар n нур OX with Axis 90^0 if the angle is formed, $AB = 1 = \sin 90^0$ and $OB = 0 = \cos 90^0$. So it turns out that the values of the sine and cosine are in the reverse order. To make it easier for students to memorize the values of trigonometric functions, it gives a good result to present them in the form of a table and describe the values in it diagonally (Table 1).

Such a table will speed up the search for the required values, since no other values are presented in this table.

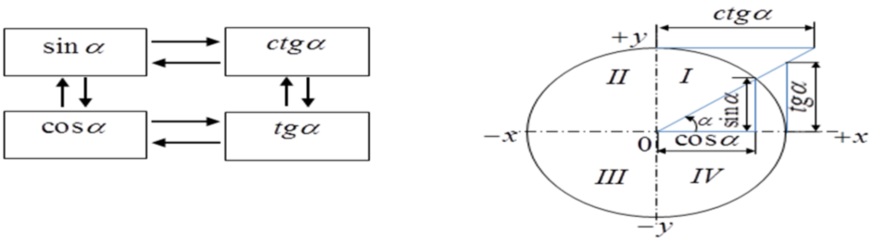
$\cos\alpha$ / $\sin\alpha$	0^0 $(0\ rad)$	30^0 $(\frac{\pi}{6}\ rad)$	45^0 $(\frac{\pi}{4}\ rad)$	60^0 $(\frac{\pi}{3}\ rad)$	90^0 $(\frac{\pi}{2}\ rad)$
0^0 $(0\ rad)$					0
30^0 $(\frac{\pi}{6}\ rad)$				$\frac{1}{2}$	
45^0 $(\frac{\pi}{4}\ rad)$			$\frac{\sqrt{2}}{2}$		
60^0 $(\frac{\pi}{3}\ rad)$		$\frac{\sqrt{3}}{2}$			
90^0 $(\frac{\pi}{2}\ rad)$	1				

In order not to confuse where to write the sine and cosine in this table 1, they must be written in a situation where their axis is located, that is, the sine is placed in a vertical column, and the cosine in a horizontal column.

When memorizing basic trigonometric formulas, special attention should be paid to those aspects that need to be connected, remembered, to some object or object. For example, we will highlight what readers should pay attention to when memorizing formulas:

-$\sin x$ the ordinate axis (OY), $\cos x$ the abscissa axis (OX) understand that their $tgx=\dfrac{\sin x}{\cos x}$ ва $ctgx=\dfrac{\cos x}{\sin x}$ it is necessary to pay attention to the fact that the function and the gesture of the functions are determined accordingly. OX above the axis OY for which the positive values of are located $\sin x$ positive, and below negative, OY right from the arrow OX for the location of the positive values of the axis $\cos x$ positive, and on the left-negative and their ratio $tgx=\dfrac{\sin x}{\cos x}$ and $ctgx=\dfrac{\cos x}{\sin x}$ it should be remembered that the functions determine the gesture;

-$\sin^2 x+\cos^2 x=1$ understanding the origin of basic trigonometric formulas from the formula, $\sin x$ with $\cos x$ of the tgx with $ctgx$ it is necessary to remember that they are adjacent functions, their values alternate in order, have similar properties. Attention should be paid to the fact that there is a simple way to connect them. The following image will help to understand the essence of the link (See Figure 2).



2-image.

It is recommended to remember the formulas in the following specific consistency according to the link in the image:

		Group I	Group II
1.	Basic formula	$\sin^2 x+\cos^2 x=1$	
2.	$\sin x$ from $\cos x$ transition to and vice versa	$\sin x=\pm\sqrt{1-\cos^2 x}$ $\cos x=\pm\sqrt{1-\sin^2 x}$	
3.	$\sin x$ from $ctgx$ transition to and vice versa	$1+ctg^2x=\dfrac{1}{\sin^2 x}$	$\sin x=\pm\dfrac{1}{\sqrt{1+ctg^2x}}$ $ctgx=\pm\sqrt{\dfrac{1}{\sin^2 x}-1}$
4.	$\cos x$ from tgx transition to and vice versa	$1+tg^2x=\dfrac{1}{\cos^2 x}$	$\cos x=\pm\dfrac{1}{\sqrt{1+tg^2x}}$ $tgx=\pm\sqrt{\dfrac{1}{\cos^2 x}-1}$
5.	tgx from $ctgx$ transition to and vice versa	$tgx\cdot ctgx=1$	$tgx=\dfrac{1}{ctgx}$ $ctgx=\dfrac{1}{tgx}$

Readers will definitely need to memorize Group I formulas, since Group II formulas are formed from Group I formulas, it is also possible not to memorize them. But it is desirable to focus on memorization from the need and ability of some students. $\sin x = \pm\sqrt{1-\cos^2 x}$ ва $\cos x = \pm\sqrt{1-\sin^2 x}$ the inclusion of formulas in Group I is explained by the fact that they can be used a lot and that Group II formulas can be produced in sign accuracy, reflecting the imagination in readers.

- readers should keep in mind that all trigonometric formulas are appropriate for arbitrary arguments belonging to the field of definition of a function, that they are of the same form, are not appropriate for different arguments, that the arguments in the left and right part of the formula can be divided or multiplied by an invariant number. For example, $\sin^2 nx + \cos^2 nx = 1$, $\sin^2 \frac{x}{n} + \cos^2 \frac{x}{n} = 1$, $1 + tg^2 nx = \frac{1}{\cos^2 nx}$ formulas are appropriate. $tgx = \frac{1}{ctgnx}$, $\sin^2 nx + \cos^2 kx = 1$, $\sin^2 \frac{x}{n} + \cos^2 \frac{x}{k} = 1$, $1 + tg^2 nx = \frac{1}{\cos^2 kx}$ formula Larisa is not appropriate.

- it should be remembered that in the formulas of the binary angle and the formulas for lowering the degree, the arguments of the expressions on the left and right sides differ from each other twice. Then, by dividing and multiplying the arguments by an invariant real number, an opportunity arises to apply the above formulas for arbitrary arguments.

For example, $\sin 2x = 2\sin x \cos x$ by dividing the arguments from the formula in two $\sin x = 2\sin\frac{x}{2}\cos\frac{x}{2}$ by multiplying the equality by five $\sin 10x = 2\sin 5x \cos 5x$ and so it will be possible to form equations.

- $y = \sin x$, $y = \cos x$, $y = tgx$ ва $y = ctgx$ when studying the properties of functions, it is necessary for students to remember the graph of the function. It is natural that when memorizing large-scale properties of a function, students face various problems. In this situation, it is much easier to fully check it by drawing graphs of trigonometric functions, and this is considered an effective method. 2) Repetition, in order to prevent, strengthen the forgetfulness of the studied learning material by students, and as a means of ensuring the internal integration of mathematics, is desirable to be organized at different stages of training[1]. In the analyzes, it is obvious that most researchers recommend organizing repetitions in three stages: at the beginning of the school year, within the framework of the topic or section under study and at the end of the year. We believe that thematic repetitions should also be included among these. A specially selected set of examples and issues, theoretical tests and control questions are used as a means of carrying out thematic repetitions. In thematic repetitions, together with each subject under study, it implies a repetition of the previously studied topics and, through this, the consolidation of the previously studied topics. When carrying out a thematic repetition, it is necessary to focus as much as possible on the solution of the tasks that students face to repeat in the most optimal way[4]. In the process of teaching trigonometry, the effectiveness of the organization of thematic repetitions and the implementation of its functions is recommended, in which, of course, one should not neglect the external environmental factor, in particular, the individual and age characteristics of students, the content of the trigonometry course, the structure and duration of the educational process.

-in the introductory part of the lesson, the teacher will definitely be able to repeat on the topic covered and do it orally or through handouts;

-when choosing educational materials for practical classes, it is advisable for the teacher to divide them into three parts (issues of the reproductive and deductive levels related to the newly studied topic, issues of the level of problematic and creative research, issues of various difficulty levels on all topics covered).

Discussion and Conclusions. When studying trigonometry, the main attention should be paid to memorizing the "table" values of trigonometric functions and basic formulas. It is recommended that the teacher give his students methodological instructions for memorizing trigonometric formulas, launch mnemonic behavior mechanisms in the development of logical memory, and through this form a logical construction of concepts. The use of mnemonic methods in the course of the lesson gives a good result for students. Memorizing the values of trigonometric functions in particular allows students to ensure their high activity in the lesson, interest in the study of trigonometry and mathematics in general, as well as a significant increase in knowledge, skills and abilities. The application of various methods in memorizing the values of trigonometric functions expresses the conformity of the purpose, content, organizational forms, methods and laws of the didactic process.

Acknowledgement. In the current school textbooks, each topic contains issues of the reproductive and deductive level related to the newly studied topic, issues of the level of problematic and creative research. But tasks for repetition on previously studied topics are rare. It is advisable to systematically immerse such assignments in each new topic.

Used Literature

1. Sh.L.Ermatov. Trigonometrik tenglamalar yechimlari to'plamini umumlashtirishning bir usuli. Наманган давлат университети илмий ахборотномаси. -Наманган, 2021. -№ 10. -Б.445-450.
2. Sh. Ermatov. Trigonometrik funksiyalarning qiymatlarini yodlash usullari. ЎзМУ хабарлари. -Тошкент, 2021. -№ 1/5/1. -Б.87-91.
3. У.Х. Хонқулов. Математика ўқув фани амалий машғулотларини такомиллаштиришнинг айрим масалалари.Наманган давлат университети илмий ахборотномаси. - Наманган, 2019. -№ 7. -Б.256-262.
4. Khankulov U.Kh. Description of methodical system of teaching the line of stochastics elements of mathematics by using computer technologies. Eastern European Scientific Journal. № 6. -Dusseldorf, Germany, 2016. -pp. 200-206.
5. Thompson, Kevin. (2007). Students' understanding of trigonometry enhanced through the use of a real world problem: Improving the instructional sequence. (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses Database (AAT 3280913).
6. Van Brummelen, Glen. (2009). The Mathematics of the Heavens and the Earth. Princeton: Princeton University Press.
7. Weber, K. (2005). Students' understanding of trigonometric functions. Mathematics Education Research Journal, 17(3), 91–112. doi:10.1007/BF03217423.
8. Хонкулов У.Х. О статистическом методе в педагогическом эксперименте и современный учебный процесс // Вестник- МГОУ. –Москва, 2011. -№3. Б. 104–111.
9. Хонқулов У.Х. Применение электронные таблицы MS EXCEL в обучении элементов стохастики // Научные перспективы XXI века. Достижения и перспективы нового столетия: Халқаро илмий-амалий анжуман. - Россия: Новосибирск шаҳри, 2014. - Б. 46-48.