

Ministry of Science and Higher Education of the Russian Federation
NATIONAL RESEARCH
TOMSK STATE UNIVERSITY (NR TSU)

Institute of Applied Mathematics and Computer Science


APPROVE:
Director
A. V. Zamyatin

Evaluation materials of the current control and intermediate certification in the discipline

(Evaluation tools by discipline)

Adaptive Math Training

in the major of training

01.04.02 Applied mathematics and informatics

Orientation (profile) of training:

Big Data and Data Science

ET was implemented:

Cand. physics and mathematics, associate professor,
Associate Professor of the Department of Probability Theory
and Mathematical Statistics

D.D. Dummer

Reviewer:

Dr. tech. sciences, professor,
Professor of the Department
of Probability Theory and Mathematical Statistics

A.A. Nazarov

Evaluation tools were approved at a meeting of the educational and methodological commission
of the Institute of Applied Mathematics and Computer Science (EMC IAMCS).

Protocol dated 20.05.2024 № 2

Chairman of the EMC IAMCS,
Dr. tech. Sciences, Professor

S.P. Sushchenko

Evaluation tools (ET) are an element of the system for assessing the formation of competencies among students in general or at a certain stage of its formation.

The ET is developed in accordance with the work program (WP) of the discipline.

1. Competencies and training outcomes, obtained upon the discipline mastery

Competencies	Competence indicator	Code and name of planned training outcomes that characterize the stages of competency formation	Criteria for evaluating training outcomes			
			Excellent	Good	Satisfactory	Unsatisfactory
OPK-1. Able to apply fundamental knowledge obtained in the field of mathematical and (or) natural sciences and use them in professional activities	IOPC-1.1. Demonstrates the skills of working with educational literature on the main natural science and mathematical disciplines. IOPC-1.3. Carries out marketing research of scientific and technical information.	OP1.1.1 Know the apparatus of elementary mathematics OP1.2.1 Be able to apply the methods of elementary mathematics OR 1.3.1 Able to implement scientific and technical information in the field of mathematical disciplines	Formed systematic knowledge	Formed, but containing separate gaps of knowledge	General but not structured knowledge	Lack of knowledge

2. Stages of competency formation and types of evaluation tools

№	Stages of competency formation (discipline sections)	Code and name of training outcomes	Type of evaluation tool (tests, assignments, cases, questions, etc.)
1	Converting Algebraic Expressions	OP1.1.1, OP1.2.1, OP 1.3.1	Test tasks, practical test
2	Rational equations and inequalities	OP1.1.1, OP1.2.1, OP 1.3.1	Test tasks, practical test
3	Irrational equations and inequalities	OP1.1.1, OP1.2.1, OP 1.3.1	Test tasks, practical test
4	Logarithms	OP1.1.1, OP1.2.1, OP 1.3.1	Test tasks, practical test
5	Trigonometry	OP1.1.1, OP1.2.1, OP 1.3.1	Test tasks, practical test
6	Functions	OP1.1.1, OP1.2.1, OP 1.3.1	Test tasks, practical test

3. Typical control tasks or other materials necessary for the assessment of educational training outcomes

3.1. Typical tasks for conducting ongoing monitoring of progress in the discipline:
Examples of test tasks:

$$\frac{\left((2a^2 - c + b)^2 - (2a^2 + c - b)^2\right)^3}{a(ab - ac)^6}$$

1. Simplify:

$$1) \frac{128}{a(b-c)^3} \quad 2) \frac{8}{a^5(b-c)^3} \quad 3) \frac{8}{a^7} \quad 4) \frac{a^4 512}{(b-c)^3} \quad 5) \frac{8}{a^5(b-c)^5} \quad 6) \frac{512}{a(b-c)^3}$$

$$2. \text{ Simplify: } \sqrt[3]{4\sqrt{x^{15}y^3}}$$

$$1) |x| \cdot \sqrt[4]{xy} \quad 2) \sqrt[7]{x^{15}y^3} \quad 3) x \cdot \sqrt[4]{xy} \quad 4) \sqrt[12]{x^{15}y^3} \quad 5) x^{\frac{5}{8}} y^{\frac{1}{8}}$$

$$3. \text{ Simplify and Calculate } \frac{\lg 900 - 2}{2 \lg 0,5 + \lg 12}$$

$$\log_6 3 \quad 2) 2 \quad 3) 2,2 \quad 4) \lg 3 \quad 5) 20/3 \quad 4) \frac{8 + \lg 9}{\lg 3}$$

Examples of tasks in an open form:

- Solve the equation
 $\log_{\sqrt{5}} x = \log_5 (2x^2 - 2)$
- Write down all the angles by which you need to rotate the point to get a point with coordinates $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
- Solve the equation
 $1 + 7 \cos^2 x = 3 \sin 2x$
- Solve inequalities:
 $19x - (3x - 2) \leq 4(5x - 1) - 2,$
 $x^2 - 2|x + 1| < |x + 2|$

3.2. Typical tasks for conducting intermediate certification in the discipline.

Screenshots from the Plario system with tasks

The screenshots show the Plario system interface with the following tasks:

Task 1 (Screenshot 1):

Упростите выражение: $\frac{\sqrt{50} \cos^6 \frac{9\pi}{8} - \sqrt{50} \sin^6 \frac{9\pi}{8}}{\cos^4 \frac{9\pi}{8} + \cos^2 \frac{9\pi}{8} \sin^2 \frac{9\pi}{8} + \sin^4 \frac{9\pi}{8}}$.

Варианты ответов:

- ☒ 5
- ☐ $\sqrt{50}$
- ☐ $\frac{\sqrt{50}}{2}$
- ☐ $\sqrt{50}(\cos^6 \frac{9\pi}{8} - \sin^6 \frac{9\pi}{8})$

Task 2 (Screenshot 2):

Решите уравнение: $3 + \log_{\sqrt{2}}(x - 7) = \frac{1}{\log_{(2x+1)} 2}$.

Варианты ответов:

- ☐ $x = 7$
- ☐ $x_{1,2} = \frac{1 \pm \sqrt{56}}{2}$
- ☐ Решений нет
- ☐ $x_1 = 8, 5, x_2 = \frac{23}{4}$
- ☒ $x = 8, 5$

Task 3 (Screenshot 3):

Постройте эскиз графика функции: $y = \frac{1}{(x+2)^2} - 1$.

Решите неравенство: $2 \sin(x - \frac{\pi}{6}) + 1 > 0$.

Варианты ответов:

- ☐ $x \in (-\frac{2\pi}{3} + 2\pi n; 2\pi n), n \in \mathbb{Z}$
- ☐ $x > \arcsin(-\frac{1}{2}) + \frac{\pi}{6} + 2\pi n$
- ☐ $x \in (-\frac{5\pi}{6} + 2\pi n; \frac{\pi}{6} + 2\pi n), n \in \mathbb{Z}$
- ☒ $x \in (2\pi n; \frac{4\pi}{3} + 2\pi n), n \in \mathbb{Z}$
- ☐ $x \in (\frac{\pi}{3} + 2\pi n; \pi + 2\pi n), n \in \mathbb{Z}$

4. Methodological materials that determine the procedures for evaluating training outcomes

4.1. Methodological materials for assessing the current control of progress in the discipline.

Current control is carried out by monitoring the individual trajectories of students in the Plario system (Fig. 1)

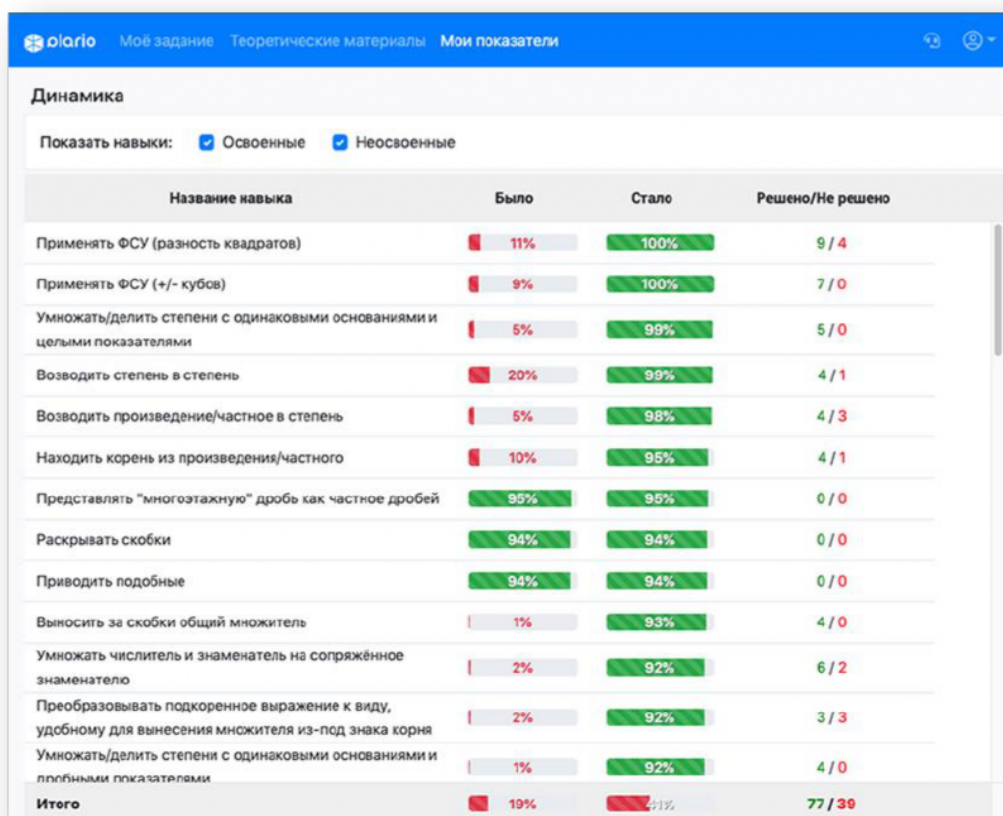


Fig.1 - Screenshot of the progress diary of one student in the section "Transformation of algebraic expressions"

4.2. Methodological materials for conducting intermediate certification in the discipline.

Certification is carried out in the classroom, synchronously, or online with the cameras turned on. No more than 90 minutes are allocated for the examination. During this time, students must solve 15 tasks, including all the skills of basic mathematics, mark the answers in the Plario system, attach the solutions to the course in LMS Moodle and transfer them to the teacher in the classroom.

The student receives a "pass" rating if he has completed at least 5 out of 6 sections in the Plario system, for each section he showed mastery of skills by 75 points (out of 100) or more, scored at least 50 points on the basis of passing the general test (15 tasks) (out of 75). If it is impossible to pass the Metatest (due to technical reasons), the work attached to the LMS Moodle and handed over to the teacher in the classroom is evaluated.