

Geometry in Engineering with STACK automatic



assessment

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Introduction

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The screenshot shows the STACK online course interface. At the top, there's a header with the course title and a list of tasks. Below that, there's a grid of assessment tests, each with a title, a description, and a status. The tests are organized into groups, and some are highlighted with red boxes. The interface is clean and user-friendly, with a clear navigation menu on the left.

THEORETICAL MATERIALS

Interactive learning material created in the form of H5P presentations: 6-12 slides with images, video, text and interactive self-assessment questions (questions with one or more answers, open-ended questions). A task with an open question is considered completed if the correct answer is recorded in the form provided for by the instructions for completing the task.

VIDEO

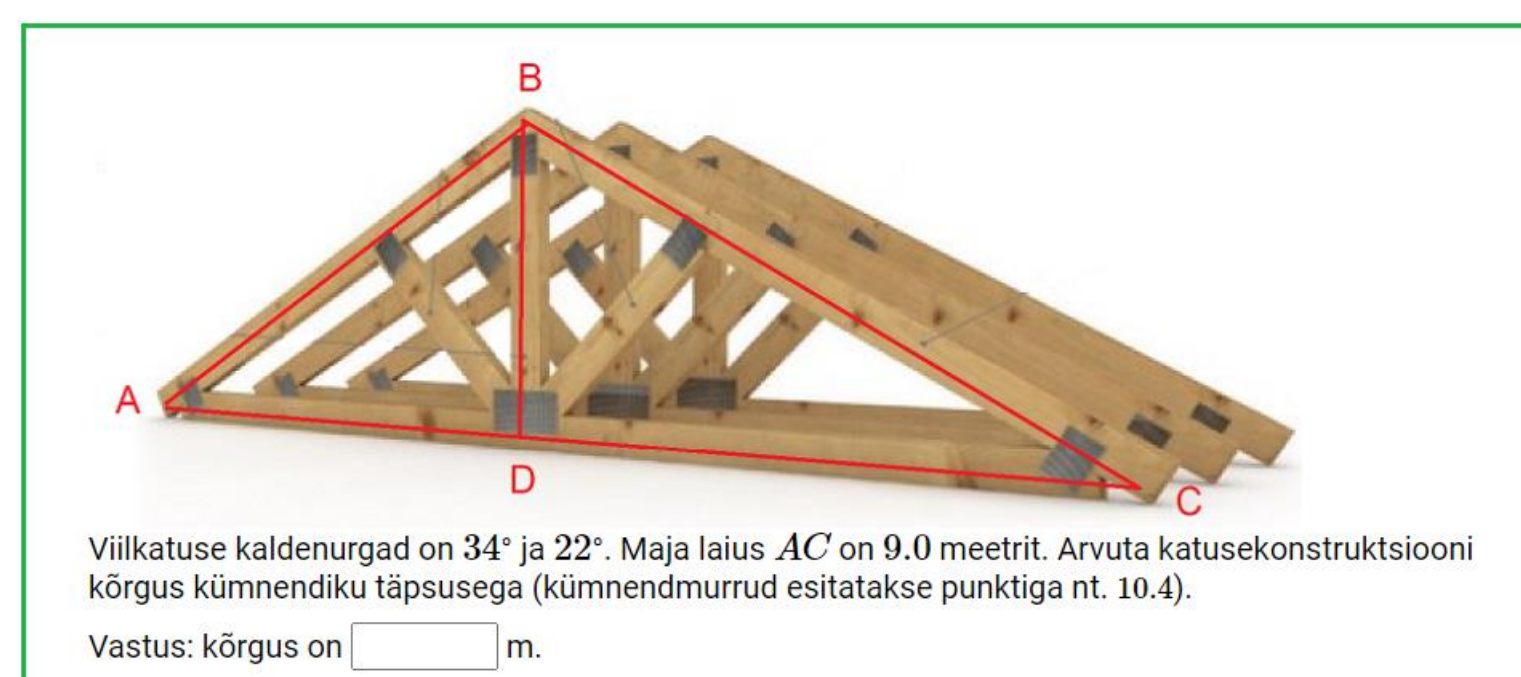
The instructional videos are a set of 3-7 video clips for each H5P presentation. They do not repeat the content of the theoretical lesson; problem situations associated with the activities of enterprises are considered here. Incorporating such real-life examples and problems into the course provides an opportunity to engage students and show them first-hand how the knowledge gained can be applied outside of the learning environment. The duration of all instructional videos is 3-6 minutes.

TESTS

Self-tests: each test consists of 8-12 questions, depending on the topic. These self-tests are optional. They are diagnostic and educational. The number of attempts for self-tests is not limited. The time for passing the self-test is also unlimited, which allows students with different levels of mastering new material to pass the test at an individual pace. For all the developed questions, in addition to the correct answer, a step-by-step solution is offered.

Assessment tests: each consisting of 7-8 questions, focused on the practical application of knowledge. Each question is framed as a separate test. There are two attempts to pass the grading tests, each attempt is open for 24 hours. The best result of two attempts is taken into account, and the test is considered passed if at least 50% of the maximum is obtained. There are no detailed reviews of the assessment test. The student receives only information about whether the answer was correct and the correct answer.

Problems and methodology



Viilkatuse kaldenurgad on 34° ja 22° . Maja laius AC on 9.0 meetrit. Arvuta katusekonstruktsiooni kõrgus kümnendliku täpsusega (kümnendmurdude esitatakse punktiga nt. 10.4).
Vastus: kõrgus on m.

PROBLEM 1

Viilkatuse kaldenurgad on 34° ja 22° . Maja laius AC on 9.0 meetrit. Arvuta katusekonstruktsiooni kõrgus kümnendliku täpsusega (kümnendmurdude esitatakse punktiga nt. 10.4).
Vastus: kõrgus on m.

Vastus on vale.
Lahendus:
Kolmnurgast $\triangle ABC$ saab leida sarkikate pikkused (nt. AB).
Kaldenurgad on $\angle A = 34^\circ$ ja $\angle C = 22^\circ$, siis maja lausele vastav nurk $\angle B$ on $180^\circ - 34^\circ - 22^\circ = 124^\circ$.
Leiame AB pikkus sinusiteoreemist:
 $\frac{AB}{\sin 34^\circ} = \frac{9.0}{\sin 124^\circ}$ | $\sin 34^\circ$
 $AB = \frac{9.0 \cdot \sin 34^\circ}{\sin 124^\circ}$
 $AB = 6.07057665118$
Täpsuskõrgus kolmnurgast $\triangle ABD$ leiame kõrgus:
 $BD = AB \cdot \sin 22^\circ = 2.3$ (m)

The difference between Sins and Tans is 0.1

PROBLEM 2

Viilkatuse kaldenurgad on 34° ja 22° . Maja laius AC on 9.0 meetrit. Arvuta katusekonstruktsiooni kõrgus kümnendliku täpsusega (kümnendmurdude esitatakse punktiga nt. 10.4).
Vastus: kõrgus on m.

Vastus on vale.
Lahendus:
Kolmnurgast $\triangle ABC$ saab leida sarkikate pikkused (nt. AB).
Kaldenurgad on $\angle A = 34^\circ$ ja $\angle C = 22^\circ$, siis maja lausele vastav nurk $\angle B$ on $180^\circ - 34^\circ - 22^\circ = 124^\circ$.
Leiame AB pikkus sinusiteoreemist:
 $\frac{AB}{\sin 34^\circ} = \frac{9.0}{\sin 124^\circ}$ | $\sin 34^\circ$
 $AB = \frac{9.0 \cdot \sin 34^\circ}{\sin 124^\circ}$
 $AB = 6.07057665118$
Täpsuskõrgus kolmnurgast $\triangle ABD$ leiame kõrgus:
 $BD = AB \cdot \sin 22^\circ = 2.3$ (m)

The answer is asked to the nearest tenth

PROBLEM 3

Viilkatuse kaldenurgad on 34° ja 22° . Maja laius AC on 9.0 meetrit. Arvuta katusekonstruktsiooni kõrgus kümnendliku täpsusega (kümnendmurdude esitatakse punktiga nt. 10.4).
Vastus: kõrgus on m.

Sisu viimast vastust tõlgendati järgnevalt: „,“
Selle vastuse on vigane. Sisu vastuseis sisaldas koma arvuasumatus kohas. Koma tuleb kasutada elementide eraldamiseks järjestis, hulgas jne. Kümnendmurdudes tuleb kasutada punkti, mitte koma.

This answer is incorrect. Your answer contains a comma in a strange place. A comma must be used to separate elements in a sequence, among, etc. A dot must be used in decimals, not a comma.

2021/2022

Problem 1: variability of solution methods

Problem 2: inattentiveness of learners

Problem 3: dot vs comma

2022/2023

To solve **problems 1 and 2**, the *NumAbsolute* answer test is allowed in STACK questions for processing floating point responses, with a tolerance calculated for each question separately.

Finding tolerance:

students' previous answers/analyzing possible solutions

Eliminating misunderstandings:

in the feedback of the question, there is a note to the learners about the reason for answer variability.

Results

Approximately 170 questions in the course require rounding in answer, with roughly half of them involving decimal fractions.

The analysis of the educational process in 2022/2023 has shown that there is currently a manual modification of answers related only to Problem 3.

Conclusions

- 1) The use of additional settings in STACK questions when processing floating point answers (in TTK case it is absolute error with tolerance) reduces the teacher's workload.
- 2) Reduces the student's misunderstanding due to the difference between their answer and the one provided in the test.
- 3) Suggest to STACK developers to expand the *Extra Options* settings to allow for changing the decimal point to a comma.

