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IN TEACHING ENGINEERING GRAPHICS APPLY THE "CASE STUDY" METHOD

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Abstract. This scientific article is dedicated to stating what a teacher should do in cases where certain test sheets compiled for the Engineering Graphics subject contain assignments that do not meet validity requirements.
Keywords. Engineering, graphics, validity, keys, research, model, geometric body.

МУҲАНДИСЛИК ГРАФИКАСИ ФАНИНИ ЎҚИТИШДА “CASE-STUDY” УСЛУБИНИ ҚЎЛЛАШ

Аннотация. Ушбу илмий мақола муҳандислик графикаси фани бўйича тузилган айрим назорат топшириғи варақларида валидлик талабига жавоб бермайдиган топшириқлар учраб қолган ҳолларда ўқитувчининг нималар қи-лишлиги ҳақида ёритилган. Жумладан ижодий топшириқларни бажаришда “CASE-STUDY” услубини қўлланиши келтирилган.
Таянч сўзлар. Муҳандислик, графика, валидлик, кейс, тадқиқот, модел, геометрик жисм, проекция.

В ПРЕПОДАВАНИИ ИНЖЕНЕРНОЙ ГРАФИКИ ПРИМЕНИТЬ МЕТОД "CASE STUDY"

Аннотация. Эта научная статья посвящена утверждению того, что должен делать преподаватель в случаях, когда в определенных листах контрольных заданий, составленных по дисциплине инженерная графика, встречаются задания, которые не соответствуют требованиям валидности.
Ключевые слова. Инженерия, графика, валидность, ключи, исследование, модель, геометрическое тело.

In pedagogical technologies, validity is the ability of assignments or questions related to engineering graphics to correspond as closely as possible to the material studied during the semester. Validity, translated from English or French, means validity, legality, validity. In science, validity refers to the degree to which the research results correspond to the research objectives.

In some cases, in the discipline "Engineering Graphics," problems are encountered that are not given special attention to the knowledge and skills that will be used when solving them on the sheets of final control tasks, neither in lectures, nor in practical and independent study sessions. This situation is a clear example of violation of the validity requirement when compiling final control tasks. Worst of all, it's unlikely that a student with such a problem will receive a positive grade on the final exam.
This scientific article is about what teachers should do when they encounter tasks that don't meet validity requirements in some final control task sheets prepared for engineering graphics.
First of all, let's pay attention to what the issues being discussed are.

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Problem. An unfinished (incomplete) isometric technical drawing of a wooden model is given. Identify the missing lines in this figure and complete it (Figure 1 shows 3 problems with such a condition).

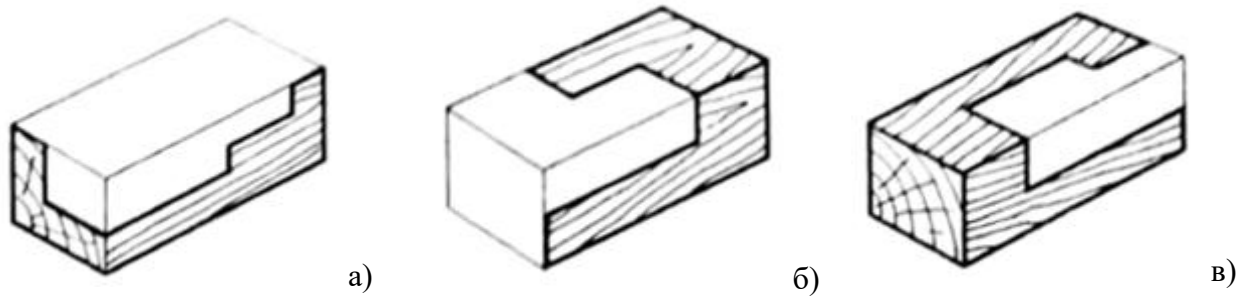


Figure 1.

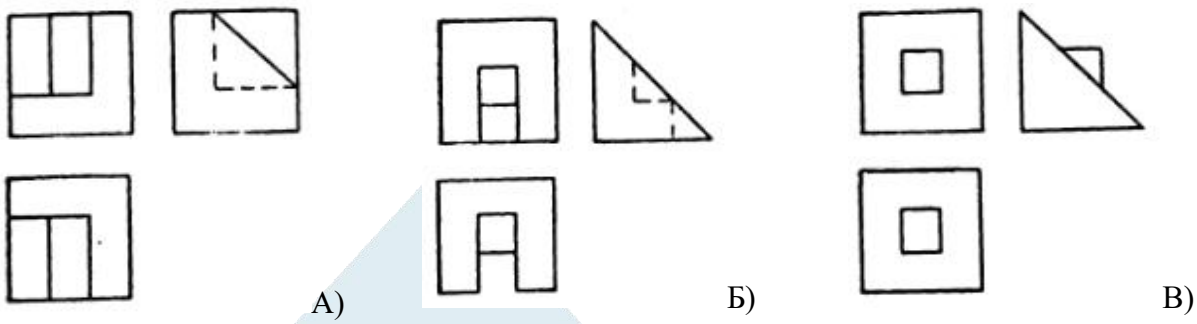
A student may try a little to solve a problem with such a condition, but they cannot solve it completely. Because he hadn't solved similar problems during his semester.

Problems with the condition of completing an unfinished (incomplete) drawing or sketch are very common in engineering graphics. Indeed, almost all problems related to engineering graphics can be considered as incomplete (incomplete) problems. For example: Given the main projection of the model, construct and add its third projection or dimetry based on them.

Another feature of this category of tasks is that they can have several solutions. Let's look at some examples.

Task. Based on the given horizontal and frontal projections, the profile projection of the model is constructed (Fig. 2, A). But it's not the only solution. Profile projection can have other shapes. Identify those shapes.

Solution. In Fig. 2, a, three types of solutions satisfying the problem conditions are presented. In Figures a, b, c, and d, which make up group A of Figure 3, these solutions are presented in the form of dimetric technical drawings. In the diagrams of Figure 2, marked with the letters B and C, the previously considered process is considered on the example of 2 more models with a different appearance. In drawings a, b, c, and d, which make up group B and C of Figure 3, these solutions are presented in the form of dimetric technical drawings.



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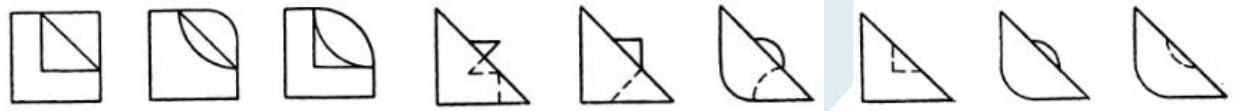
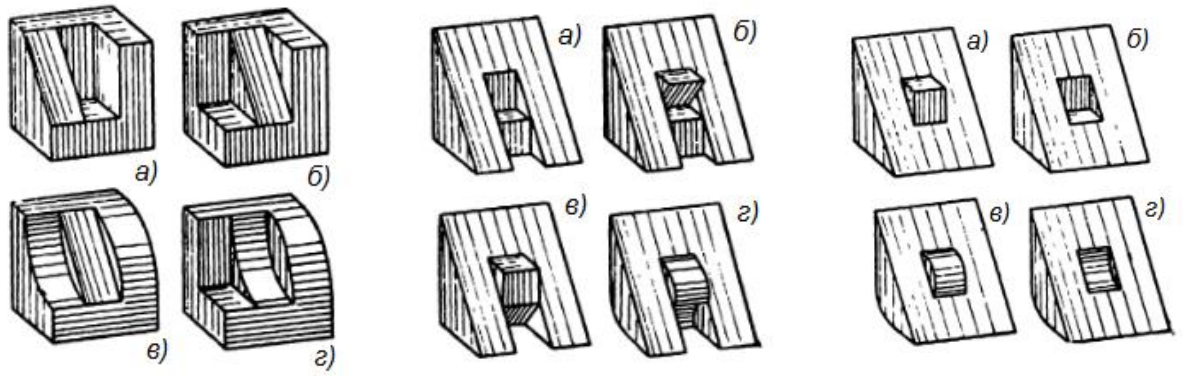


а) б) в)

Figure 2.



А) Б) В)

Figure 3.

Task. Based on the given horizontal and frontal projections, the profile projection of the model is found (Fig. 4, a). But it's not the only solution. Profile projection can have other shapes. Identify those shapes.

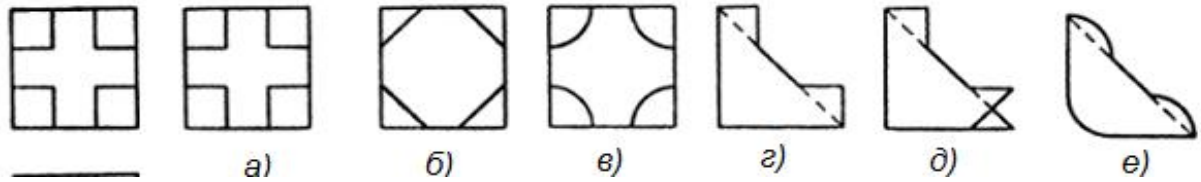


Figure 4.

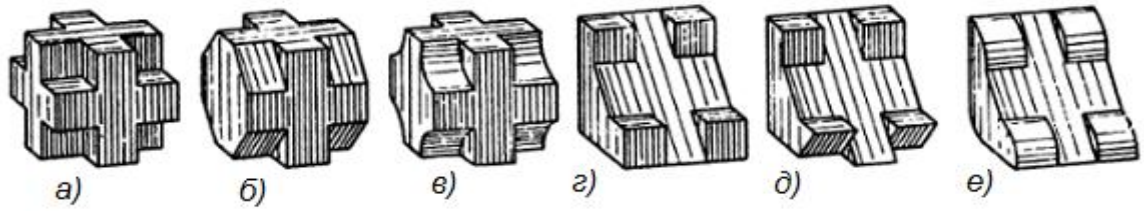


Figure 5.

Solution. In Figure 4, the desired projections are presented in the drawings marked with the letters b, c, d, e. Fig. 5 shows dimetric technical drawings of solutions satisfying the problem conditions.
Task. Based on the given single frontal projection (Fig. 5, a), construct an isometric technical drawing of the model. Assume that the length of the model (the distance measured by the "y" axis) is equal to its height (the distance measured by the "z" axis) and that the model has a plane of symmetry parallel to the frontal projection plane.

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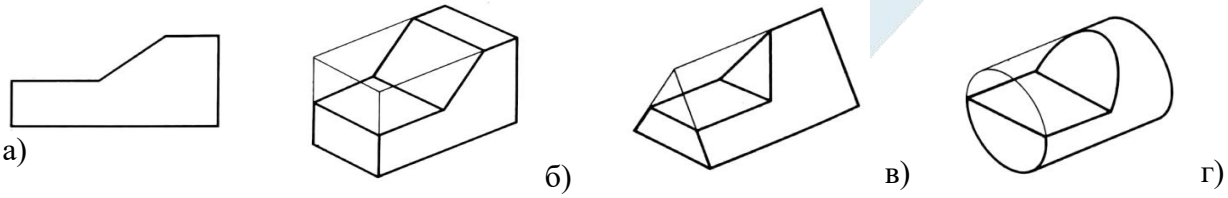


Figure 6.

Solution. Figures b, c, and d of Figure 6 show some of the dozens of solutions that satisfy the problem conditions in the assignment.

In one study on engineering graphics, it was stated that 35 different technical drawings can be constructed based on the three main projections of a single geometric body (octahedron).

Now, returning to the problem presented above, in Figure 1, it becomes clear why the student is not ready to solve it. After all, during the training sessions during the semester, students were not given theoretical guidance on solving similar problems, examples were not shown.

In general, adhering to the methods and techniques recommended by pedagogical technologies yields good results in identifying and addressing shortcomings in pedagogical processes, systems, and situations. In particular, the analysis of the pedagogical situation we are currently studying, the identification of factors that were not taken into account on the eve of its establishment as shortcomings, is reminiscent of the method called "Case study" in pedagogical technologies.

Assigns tasks to groups so that students have a general understanding of the task.

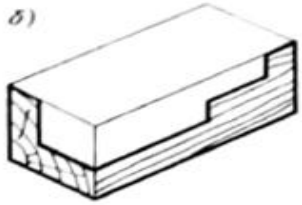
Case Study Task. What type of orthogonal frontal projection of parts can the images given in this example serve as? Finish the technical drawing of the part and present the answer in a clear image.

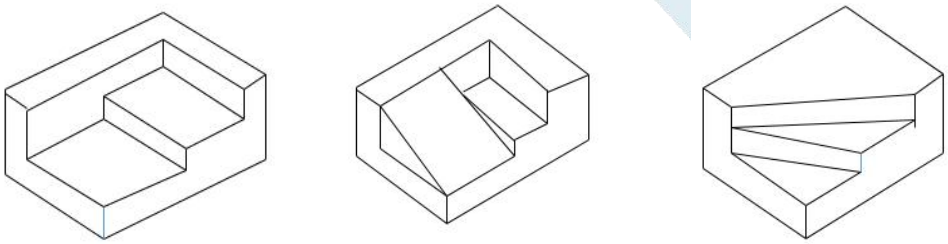
Case resolution process:

1. Students will sufficiently understand the essence of the case study task by familiarizing themselves with it two or three times, discussing it with their partner and groupmates.
2. Students determine the factors that serve to find a solution to the problem by discussing it with their partner and groupmates.
3. Students identify the factor most relevant to the problem among the identified factors.
4. Students present the solution based on the selected factor.
5. The solution is discussed individually, with the participation of small groups.

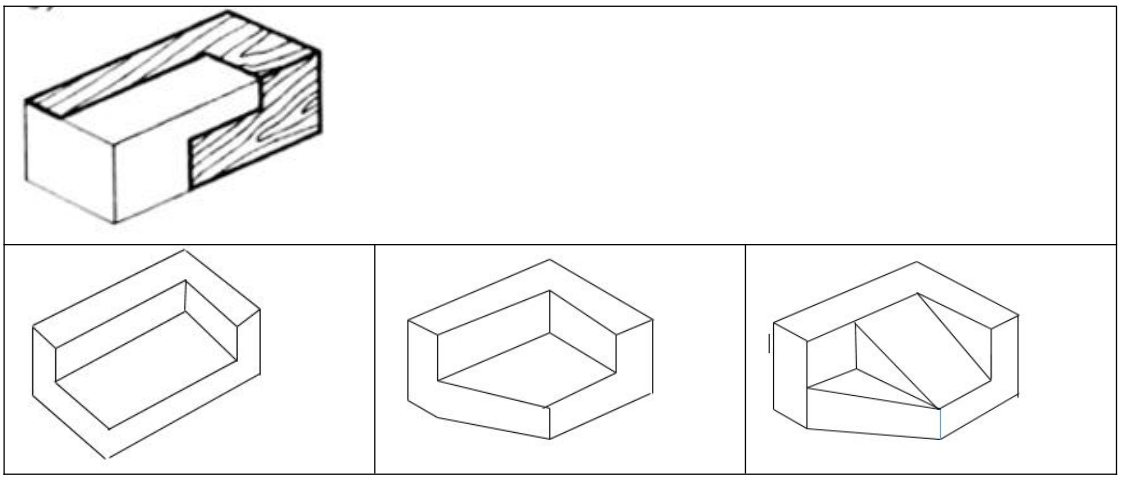
Solving the tasks given to the groups:

Solution of the case for Task 1.





Solution of the case for Task 2.



The teacher summarizes the answers and fills in the gaps.

With the help of the "case study," students will acquire the following skills and abilities:

1. Analytical skills (the ability to distinguish information from data, classify them, distinguish between necessary and unnecessary information, analyze, present; for this, the person must be able to think clearly and logically).
2. Practical skills (the ability to analyze the real situation based on the complexity of the problem, the ability to apply the most important theories, methods, and principles).
3. Creative skills (in this case, it is not important to solve the situation (problem) based on logic, but it is necessary to find several solutions to the problem based on a creative approach and analyze them).
4. Communication skills (according to which the future specialist must master the skills of conducting discussions, defending their point of view, convincing others of their decision, preparing a very brief and reliable report).
5. Social skills (in the process of discussing a decision, future specialists must be able to analyze the behavior of others, listen to others, support the opinions of others in a debate, express an opinion that contradicts the one put forward, and be able to control themselves).
6. Self-analysis (it is important to be able to behave in the process of discussion, to be an example to others).

Every teacher should be able to achieve a thorough justification of the learning tasks based on the case study.

With the help of "case studies," students achieve clear expression of tasks related to the topic, develop students' spatial imagination, organize discussions, and make decisions on the solution of the topic.

In conclusion, it can be said that, as Confucius said, "What I hear, I forget, what I see, I remember, and what I do, I understand," students will have the opportunity to independently analyze through the use of interactive teaching methods, a critical approach to educational and cognitive activity, and to put forward creative ideas on the issue (topic, problem) being studied. As a result, based on

existing theoretical knowledge, skills, and abilities, independent and creative thinking, the creation of new ideas, and the development of spatial imagination are achieved.

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