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LOGIC

**Training manual for test
and examination preparation**

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PREFACE

In terms of transformation of Ukrainian society along the way of European integration, the issue of increasing the level of self-awareness of Ukrainian nation arises, on which the quality of democratic changes and the rule-of-law state building depends. The main factor in such a process is a human mind, the tool of which is logic. The level of civilization depends directly on the level of intellectual culture of the society. Rationality also determines the quality of legal reality, which is formed, developed and protected by educated lawyers. That is why, within the reform of higher legal education logic proves its traditional value of the instrument of intellectual activity of lawyer.

The purpose of the logic course is to teach the basics of logical analysis through acquisition of knowledge about the forms of thought and laws of correct thinking.

The exam preparation guide on logic is based on the programme of general educational course “Logic” for higher education establishments, which is obligatory for future lawyers to study. This guide is intended for students’ preparation for the exam on logic.

Structurally the guide is divided into two sections – theoretical and practical. The theoretical section is structured according to the order of questions for the exam and answers to them. Each question is provided with particular theoretical material and sufficient examples for explanation. The practical section contains the tests, doing which the reader can check his/her knowledge of logic independently, and, thus, prepare for the practical questions on logical analysis. Each test task suggests four possible answers, among them only one is correct.

The team of authors believes the guide will be helpful in learning logical theory and getting skills of logical analysis while preparing for the exam on the discipline “Logic”.

I. THEORETICAL QUESTIONS AND ANSWERS FOR EXAM

===== 1. Subject of logic as a science

The concept «*logic*» comes from Greek word *logos*, which means a thought, word, statement, reasoning, law.

The concept «*logic*» is used for describing:

1) the patterns of the objective world (logic of nature, logic of historical process, etc.);

2) the natural intellectual abilities in everyday thinking (natural logic);

3) the cultural professional thinking;

4) the science which researches human thinking, etc.

The subject of the science of logic is forms of thought with the right thinking and laws on which thoughts in search of truth are formed.

The correct thinking is performed according to logical norms (rules and laws). The principles of correct thinking are: *certainty*, *consistency* and *provability (argumentation)*. Certainty is achieved through the provision of statements to be unambiguous. Consistency becomes possible with the absence of contradictions. Provability means presentation of grounds (arguments) for the main subject of proof.

Incorrect thinking doesn't comply with the logical norms and produces alogisms – logical wrongs.

Basic forms of thought are *concepts*, *statements* and *deductions*.

Basic laws of traditional logic are *the law of identity*, *law of non-contradiction*, *law of the excluded third* and *law of sufficient reason*.

Each thought has a form and content.

The form of thought (logical form) is a way of organization of the content parts of the subject of thought, which corresponds to the subject of reality. The form of thought is invariant, and content is variable.

The truth of the form and content of thought means that a form should be correct (constructed according to the rules), and content should be adequate (appropriate to reality). The thought will be wrong if it has incorrect logical form or inadequate content, or both of them.

Ontological truth means that the object exists in reality.

Epistemological truth means that the subject of thought in content is adequately relevant to the existing object.

Logical truth means that the form of thought is correct.

===== 2. The concept of thinking. Abstract and concrete thinking, their general characteristics

The object of logic as a science is a thought and human thinking.

Thinking from a logical point of view is a process of thought formation and establishing relations between thoughts, that creates certain intellectual structures and is evaluated according to the rules of truth.

Thinking can be: theoretical and practical, figurative and verbal, concrete and abstract, ordinary thinking and scientific thinking.

Legal branch of social activity demands development of different forms of lawyers' thinking. First of all, in legal and legislative activity there is a need for abstract and scientific verbal thinking. In law enforcement activity concrete and figurative thinking matter. A human has one intellect, that is why these forms are indirectly interrelated in the practice of thinking: abstract thinking gains knowledge on the grounds of concrete experience, and knowledge obtained from abstract thinking is used in concrete thinking.

Abstract thinking (from Latin *abstraction* – separate, distract) is a process of creation of generalized objects with distraction from insignificant characteristics and objective form. It is used for theoretical thinking.

Abstract thinking features are: *generalization, indirectness and inseparable copula with language.*

Generalization is an ability of abstract thinking to characterize objects in the aggregate of their essential features. Indirectness fixes relative independence of knowledge from object. Inseparable copula with language means that abstract thinking is not a figurative but verbal one.

Concrete thinking is a process of concept formation in relation to individual objects by essential characteristics and establishing relations among these concepts. It is used for practical thinking. Professional thinking and ordinary thinking should be distinguished. A change of

situational copulas has spontaneous uncontrolled influence on concrete ordinary thinking, whereas professional concrete thinking avoids such influence or takes it into account.

Concrete thinking features are: direct copula with practice; operation with single objects that have an imaginary figurative form; detailing; relative dependence on time and contexts.

===== 3. Historical stages of Logic development

The history of science of logic is connected with a public practice of discussion. The stages of development of logic as a science are as follows:

I stage – traditional logic (from the IV century b. c. to the middle of the XIX century);

II stage – modern logic (from the middle of the XIX century to nowadays).

In turn, modern logic is divided into classical (mathematical, symbolic) and non-classical (modal, fuzzy etc.).

The appearance of logic as an independent science is connected with the name of Aristotle. Aristotle is an ancestor of traditional logic. Basic logical theories are the theory of syllogisms (deduction) and theory of proof. The principal complex of works on logic called the «Organon» includes «Categories», «The first and second analytics», «Topic», «About interpretation», «About sophistic refutations» and «Rhetoric». Aristotle didn't use the concept of «logic», he used the term «analytics».

For the first time the word «logic» started to be used by Stoics (Zeno, Diodorus, Eubulid, Philo and others). The development of the theory of expression and studying the problems of modal logic are attributed to them.

The logic of Aristotle and Stoics found its continuation in scholastic logic of the Medieval period. The representatives of this period are: John Roscelin, Pierre Abelard, Peter of Spain, Raymond Lully, Duns Scott, William Ockham and others. In this period logic acquired the status of a university discipline, the first textbooks on logic appeared in Medieval Europe (Peter Spanish).

In the XVII century scholastic logic was strongly criticized. F. Bacon developed «the logic of discovery» and in the work «New Organon» he introduced a new method of induction.

Modern logic stage began with the appearance of mathematical logic. Mathematical logic represents a classical paradigm in logic history. It uses the method of formalization with involvement of special language of logic which is an analogy with the mathematics' language. It is connected with the name of G. Leibniz, as well as T. Hobbes and R. Descartes. The period of algebra of logic started with the publication of J. Bull work «Mathematical analysis of logic». The method of logical calculations with the use of algebraic symbolism appeared, the deduction process was treated as solving logical equations. Logic became a theory of substantiation of mathematics. German logician Gottlob Frege developed axiomatic constructions of computational expression, quantification theory, basic principles of logical semantics.

Non-classical period of modern logic includes the period from the beginning of the XX century until nowadays. Non-classical logic appeared as a set of different formal systems, in which the apparatus of traditional and formal logic varies, which allows to obtain different models of logical conclusions and logical truth. Among the types of non-classical logic are: fuzzy logic, intuitionistic calculus of statements, linear logic, modal logic, paracontradictory logic, relevant logic and others.

===== 4. The importance of logic for jurisprudence and legal practice

There can be distinguished theoretical and practical importance of logic.

General theoretical significance of logic is in its methodological function. Logic contains laws and rules of design of scientific subjects, logical criteria of truth, which became a formal basis of criteria of scientific truth. It means that despite content difference sciences follow the same rules of formation of scientific objects, laws, they have the same truth criteria. Wrong thinking is also a subject to criticism in any science according to logical criteria of truth.

Creation of the theory of artificial intelligence is evidence of general theoretical significance. The language of logic appeared as a basic symbolic apparatus for programming languages.

Logical knowledge has its methodological significance for jurisprudence science. Law appears in it as a certain logical system. General legal concepts are formed according to the logical criteria. Basic evaluation concepts of law are explored by deontological logic (the logic of norms). Logical methods are used both while creating legal acts, and while interpreting texts of laws. Methods of traditional and modern logic are used in scientific legal researches. Thanks to their use theoretical modelling in jurisprudence theory becomes possible. Traditional and modern logic methods are part of jurisprudence methodology.

General cultural practical significance of logic is in the formation of thinking culture by mastering and applying logical laws and rules of strict thinking. Logical culture is a condition of raising the level of rationality, which is a basis for the growth of the level of civilization and formation of «smart nation».

Logic forms the lawyers' intellectual culture. Knowledge of logical theory of definition is necessary, in particular, for correct legal qualification of offences, interrogative logic is necessary for interrogation, induction and analogy methods are used while constructing investigative versions, deductive method has a great significance both in investigative practice and in court decisions, theory of proof is used at various stages of proceedings, and so on.

5. Thinking and language. Semiotics

Thinking expresses itself in an oral or written language forms.

Language is a system of signs with a relation determined by the rules of formation and transformation. That is, language is a system of signs with a given interpretation which is used for communication and cognition.

Languages are divided into natural, artificial, hybrid.

Natural languages appear spontaneously in practical activity. They are used as an effective means of communication. All national languages are natural (Ukrainian, English, French, etc.).

Artificial languages are created by humans for fixation, saving and processing of results and means of cognition (ciphers, language of mathematics, logic, programming language and so on). Artificial languages are used for technical communication according to the set rules.

Hybrid (specialized) languages connect natural and artificial languages elements (language of logic of Aristotle, scientific terminology).

Each language is a system of signs.

Semiotics is a science about signs and systems of signs. It was created by American philosopher and logician Charles Pierce in the XIX century. C. Pierce identified the subjects of logic and semiotics.

Sign is a material object which is an object substitute in language, sign represents it symbolically. V. Leibniz supposed that signs make logical operations easier. Signs should be short in form and rich in content.

Signs are divided into: indexes, iconic and symbolic signs.

Signs-indexes (pointers) are items which point to other items. Causal relation is established between them.

Signs-indexes are divided into: decent indexes (fingerprints, bullets, bruises) and conventional (conditional) indexes (traffic signs).

Iconic signs (images) are similar to the corresponding objects (map, photo robot, metaphor).

Symbolic signs are not connected with items physically and figuratively. The copula is conditional or spontaneous, it is established in practice (trident in Ukrainian symbols). Words of natural language are fixed in an alphabet as symbolic signs. Symbolic signs have different meanings.

Each sign has its objective meaning and significance.

Objective meaning is an object that corresponds to the sign.

Significance is information about the item, on the basis of which a perfect image of the subject is constructed.

Significance can be: 1) *direct*, that separates the item from others; 2) *indirect* (figurative), that is established on the basis of the similarity of objects and 3) *etymological* (literal), indicating the origin of the word.

Semiotics include three theories that represent levels of semiotic analysis of language: syntax, semantics and pragmatics.

Syntax (from Greek *sintaxis* – addition, construction, order) determines types of signs and relation between signs (sign – sign), develops rules of sign system constructing.

Semantics (from Greek *semanticos* – marked) explores the relation between item and sign system (sign – meaning). Within semantics there is a theory of interpretation (meaning).

Pragmatics (from Greek *pragmaticus* – practical) explores the relation between a subject of cognition and sign system (sign – significance). Significance is an object of imagination (but not directly of observation) which is represented meaningfully. Within pragmatics there appeared a pragmatic theory of interpretation (significance).

The relation between sign, meaning and significance constitutes a semiotic *triangle*. Semantic and pragmatic theories of interpretation are used in legal hermeneutics for interpretation of legal norms and other legal texts.

===== 6. General characteristics of concept as a form of thought. Concept and word

The term «concept» is used: a) for marking a system of knowledge about the items and their relation (in theoretical meaning) and b) for marking an imaginary action (in practical meaning).

Forming a concept means generalizing sensory knowledge by identifying the essential characteristics of the object.

Each concept corresponds to a specific *object of thought*: material thing, phenomenon, ideal objects (abstractions), symbolic signs, creations of human imagination, etc.

Concept is a form of thought which corresponds to the items of reality with a set of their common essential features.

Concepts can be true or false. False concept doesn't correspond to the reality and can contain contradictions. True concept is meaningfully adequate to reality and correct in logical form.

Logical structure of concept contains: content and scope.

Methods of concept formation are comparison, analysis, synthesis, abstraction and generalization.

Comparison is a recognition of similarity or difference of items.

Analysis is a division of concept into constituent parts.

Synthesis is a combination of components of the object.

Abstraction is a distraction from the insignificant features of the object.

Generalization is the formation of sets of objects by one property by its identification.

Language form of concepts are words and phrases. But not every word expresses a concept, but only: noun parts of speech (nouns, adjectives, numerals, pronouns). Particles, exclamations, verbs and adverbs do not define concepts.

Verbal naming of concepts is called a term. Concepts have objective and semantic meaning. Objective meaning is named denotation. *Denotation* is an object which corresponds to the concept and word (phrase). *Semantic meaning (significance)* is meaningful information about the object. Concepts are unambiguous, and words are ambiguous or residual in relation to the conceptual form of thought. Homonyms are the same words which correspond to different concepts, and synonyms are different words which correspond to the same concept.

===== 7. Logical structure of concept. Law of inverse relation between concept content and scope

Concept is a form of thought which corresponds to the objects of reality with a set of their general essential features.

Logical structure of concept contains: content and scope.

Concept content is a quality (intentional) characteristic of concept, which represents a set of essential features of the object of thought.

Content conveys general information concerning the object of cognition (denotation). Concept content is a characteristic of the object of thought. Since concept content consists of a certain amount of essential features that are structured in a certain way, the content of concept cannot be exactly identical to a set of characteristics of the object of reality.

For example, according to the legal definition presented in art. 185 of Criminal Code of Ukraine, the content of concept «theft» contains features of «secret abduction of someone else's property». It is clear that the object of thought is a generalized theft with general features of all