

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
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Practical training in information technologies in professional activities

*(for master's students in the field
of knowledge 01
Education/Pedagogy)*

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Introduction

Recently, people have been thinking more and more about how their lives are changing in the 21st century with new technologies. The latest technological advances have affected many areas of human activity and changed the way we communicate, collaborate and learn. The changes that permeate everyone's lives cannot fail to affect the sphere of education, how we teach and learn. Education must respond to changes in society, take into account global development trends, and therefore change in terms of content, forms and methods of teaching.

The study of the course "Information Technology in Professional Activity" is designed to make a significant contribution to the formation and development of general and professional competencies of students, as general values based on knowledge, experience, and abilities. The knowledge, skills, and abilities acquired at the educational institution are undoubtedly important, but in modern society, the general and subject-specific competencies of students are of particular importance, as they make it possible to determine the readiness of students for professional activity, further education and personal development, self-realisation and active participation in public life in the conditions of the modern information society. The process of forming and developing key and subject-specific competencies requires a skilful combination of different technologies, methods and techniques, as well as the pedagogically sound and appropriate use of information and communication technologies. The use of electronic learning tools, the Internet and web-based cloud services are important means of solving the above-described problem.

The integration of e-learning into the traditional learning process changes the learning environment and makes education more accessible. Learning can be supported by various electronic multimedia teaching aids. Teachers have powerful electronic tools for presenting educational material and can select many online resources that students can use to study the material independently and explore topics related to the lesson.

Modern information and communication technologies give students access to a variety of digital resources and sources of information, increase the effectiveness of independent work, and provide entirely new opportunities for creativity and the development of professional skills.

The aim of this workshop is to develop master's students' information and communication skills in the field of education and science, to improve their abilities and skills in working with applied software and the Internet, which are necessary for supporting learning in a subject area, searching, processing, analysing, presenting and storing the results of educational and research activities, and the practical implementation of modern concepts in the field of education.

This workshop offers tasks that will help students master new educational tools and integrate them into the educational environment of the educational institution, apply and develop new approaches to solving research and/or innovative problems in the field of education and pedagogy.

Practical work No. 1

Topic: **Cloud-based technologies in education**

Objective: to examine the concept of cloud technologies and their potential use in creating educational electronic resources and collaborative work; to learn how to use Google presentations for collaborative work and create educational mind maps using online services.

1.1. Using cloud services to create educational electronic resources and collaborate

Cloud technologies are a paradigm that involves remote data processing and storage. It is based on the concept of a **cloud** – a server or network of servers where data and programmes are stored and accessed via the Internet. Cloud technologies are based on the concept of Web 2.0, which provides users with the ability to independently create and edit content. One of the first and most successful Web 2.0 projects is Wikipedia, created in 2001, where any user can add and edit articles. At the same time, all content created and uploaded by users is stored not on the user's computers, but on the developer's server.

The introduction of cloud technologies in education is characterised by the following features [1]:

1. Content creation by the user themselves – teacher, pupil, student.
2. Storage of user-created materials on a remote server, making them constantly available for viewing and editing on the Internet.
3. Differentiation of access rights: the content owner can specify who has the right to view and modify the materials they have created or uploaded.

Cloud technologies in education are extremely popular, and the number of their users is growing rapidly. In 2008, Google offered educators a free package of cloud services called Google Apps for Education (now G Suite for Education). At that time, about 80,000 teachers and students in the United States signed up for it. Today, G Suite for Education has more than 70 million users worldwide. Such rapid growth demonstrates the relevance and popularity of cloud technologies, their demand and usefulness.

The leaders in providing cloud services for education are Google and Microsoft, which offer educational institutions packages of cloud services such as Google Workspace for Education (G Suite for Education) and Microsoft Office 365.

Cloud services are tools for performing specific educational tasks. They should be treated as teaching tools. There is no point in trying to use all the variety of available services to perform similar tasks; it is much more effective to choose one that is the most convenient and reliable and to master its capabilities as fully as possible.

For example, there are many similar services for creating test tasks, a large number of cloud storage services, and a wide variety of website builders, but there are very few truly high-quality universal resources, and it is worth starting with them.

Knowing how to use one service makes it much easier to learn others.

1.2. Creating mind maps using online services

Mind maps are a technique for visualising thoughts. Mind maps are often referred to as intelligence maps, knowledge maps, etc. The theory of mind maps emerged in the early 1970s thanks to the renowned English psychologist Tony Buzan. Mind maps have a wide range of applications: generating new ideas, preparing for decision-making, planning, etc.

Mind maps are a way of recording and presenting information that is an alternative to continuous text, lists and diagrams. The main difference between mind maps and other visualisation methods is that they activate memory. Lists, continuous text, trees, and diagrams are monotonous. Mind maps, on the other hand, use all possible means to stimulate perception through diversity: different line thicknesses and colours, carefully selected keywords that are personally meaningful to you, and the use of images and symbols. The mind mapping technique helps not only to structure and organise information, but also to better perceive, understand, create associations and remember it.

How to draw a mind map? General instructions.

1. In the centre of the sheet, write the main topic of the map in one or two words. Place it in a closed contour.
2. Draw branches from the central theme and place keywords related to it on them.
3. Continue expanding the map by adding branches with keywords to the branches you have already drawn until the topic is exhausted.

Rules for working with mind maps

The technique seems intuitive, but the following rules help to significantly increase its effectiveness:

- Write one word on each branch. This approach saves a lot of time and space and makes the map easier to read. It may seem unusual at first, and you may worry that you will run out of words. In fact, you will not forget if you choose the most characteristic, vivid, memorable, and "catchy" words as keywords.
- Write keywords as clearly as possible and place them directly on the lines that reflect their relationship.
- use different colours for the main branches so that they do not blend together visually;
- vary the size of the letters in the inscriptions and the thickness of the branches depending on their distance from the main theme;
- Arrange the branches evenly – do not leave empty spaces and do not place the branches too close together.
- Use drawings and symbols (at least for the central theme).

When to use mind maps?

1. **In self-study.** Learning any material can go faster if you record the main ideas in the form of a mind map. Even if you are just reading a book, make a mind map and you will see how convenient it is to comprehend what you have read (not to mention that this map will come in handy if you want to quickly refresh your memory of the book's content later).

2. **To generate ideas (brainstorming).** Write the task in the centre and place ideas or associations on the branches, followed by further associations, constantly asking yourself how this can solve your task.

3. **To understand a new field.** There are situations when you feel that a topic is difficult to understand. Write it in the middle and place everything related to this topic on the branches. When the map becomes large and chaotic, redraw it using a few main branches as structural ones.

4. **To present a large amount of information in a compact form.** This can be done for greater clarity, for example during a presentation, or for yourself, so that you don't forget something important during your speech.

Mind maps are not only a means of visualising our thinking, but also a way of diagnosing it. The very form of the map, how it looks visually, says a lot about your attitude to the topic, how well you understand its aspects (represented by individual branches), and how you perceive this information.

To summarise the above recommendations and rules, they are based on several principles:

- a mind map should activate perception and memory;
- The desire for greater clarity and ease of reading the map provides greater clarity in the presentation of material and awareness in thinking.
- analysing a map that has already been drawn gives you clues as to how your thinking on the topic is structured.

A knowledge map helps to implement one of the principles of pedagogy – the principle of clarity. Mind maps are useful when studying a subject at the following stages of a lesson [2]:

- learning new material – when using a mind map, complex concepts can be explained and presented in a systematic way, which helps the teacher convey to students a clear, generalised understanding of the material being studied;
- reinforcing material – the use of mind maps helps to reinforce the formation of new concepts, phenomena and events by visualising key concepts and generalising their interrelationships;
- Revision of the topic – mental maps can be used to identify material that has not been mastered by students.

Examples of online services for creating mind maps

	Mindomo www.mindomo.com
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Features:

- Authorisation is performed using an email address.
- for better compatibility with the available functions in your account, you need to select the purpose for which you will use the mind map: for teaching others (teacher), for your own learning (student), for work or for your own purposes (personal and work);
- 17 interface languages are available;
- When using the service for free, you can create up to three mind maps, generate links for publication on other electronic resources, and create maps collaboratively with others.

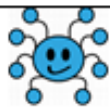


Mindmeister

<https://www.mindmeister.com/>

Features:

- authorisation is performed using an email address;
- 12 interface languages available;
- the free version allows you to create three mind maps;
- link copying and map access rights settings;
- the ability to collaborate on a mind map in real time;
- saving as an image or .pdf document is only available in the paid version.



MindMup

<https://www.mindmup.com>

Features:

- no registration required to create a mind map;
- Unlimited number of maps;
- the map data size must not exceed 100 KB;
- created maps will be freely accessible to other users in the service gallery after the publication service has been performed;
- the map is stored for 6 months without the possibility of deletion;
- the ability to publish maps on other resources.

coggle

Coggle

<https://coggle.it/>

Features

- authorisation is performed using a Google account;
- The free version allows you to create three personal mind maps and an unlimited number of open diagrams.
- the ability to download in PDF or image format;
- Full history of changes.

1.3. Instruction card for creating a mind map in the Coggle service

1. Open the Coggle service page at <https://coggle.it/> and read the information about the service on the main page.

2. Click **Sign Up Now** or **Log in** (see Fig. 1) and register using your Google account, for example (see Fig. 2). Read about the available pricing plans and their terms and conditions.



Figure 1 – Registering with Coggle

3. After selecting a pricing plan, your personal service page will open (see Fig. 3). On the left side of the window, there are three main directories that store: 1) mind maps created by you; 2) mind maps that other users have given you access to; 3) a public gallery of mind maps created by other users of the service. Check out the examples of mind maps in the gallery.

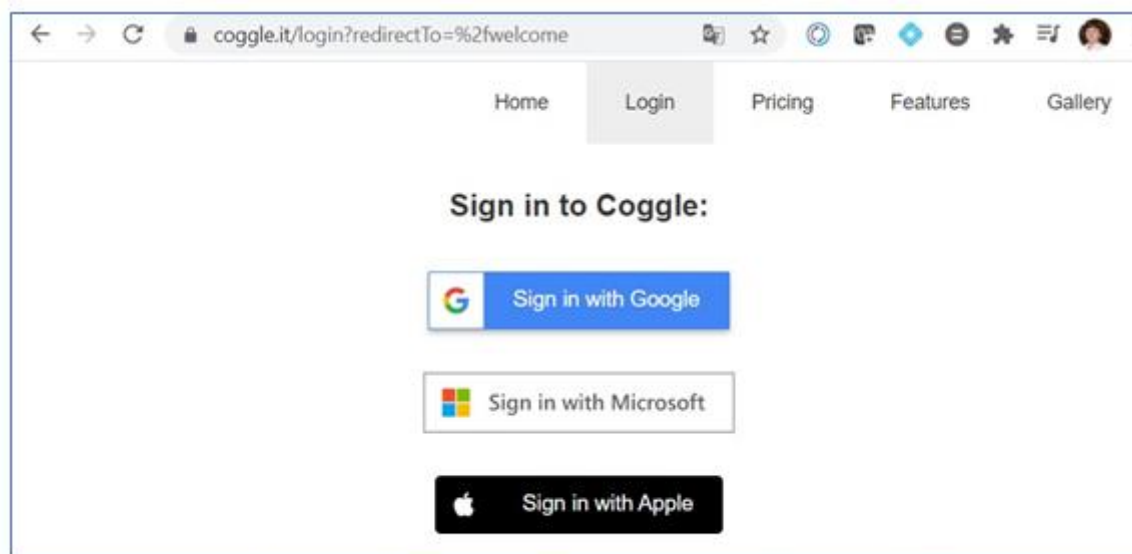


Figure 2 – Registration using a Google account

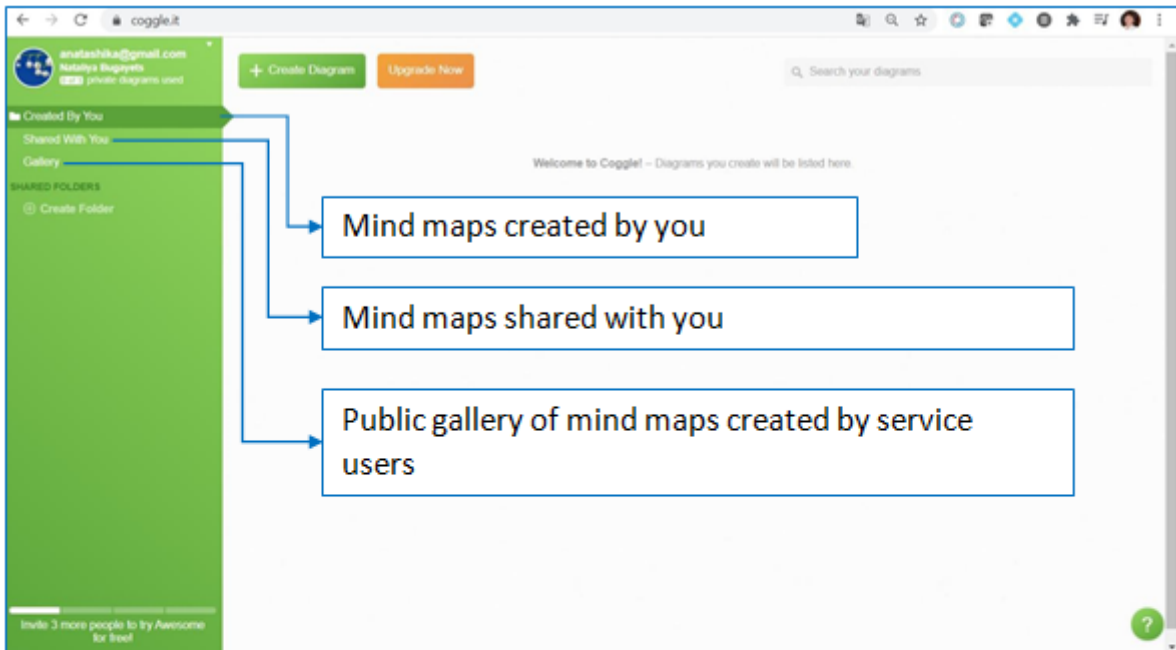


Figure 3 – Personal page of the Coggle service

4. To create your own mind map in the Created By You directory, click the **Create Diagram** button (see Figure 3). A workspace with the central element of the mind map will appear. For example, let's create a knowledge map about various cloud services used by teachers. Enter the central element – "Cloud Services" (see Fig. 4).

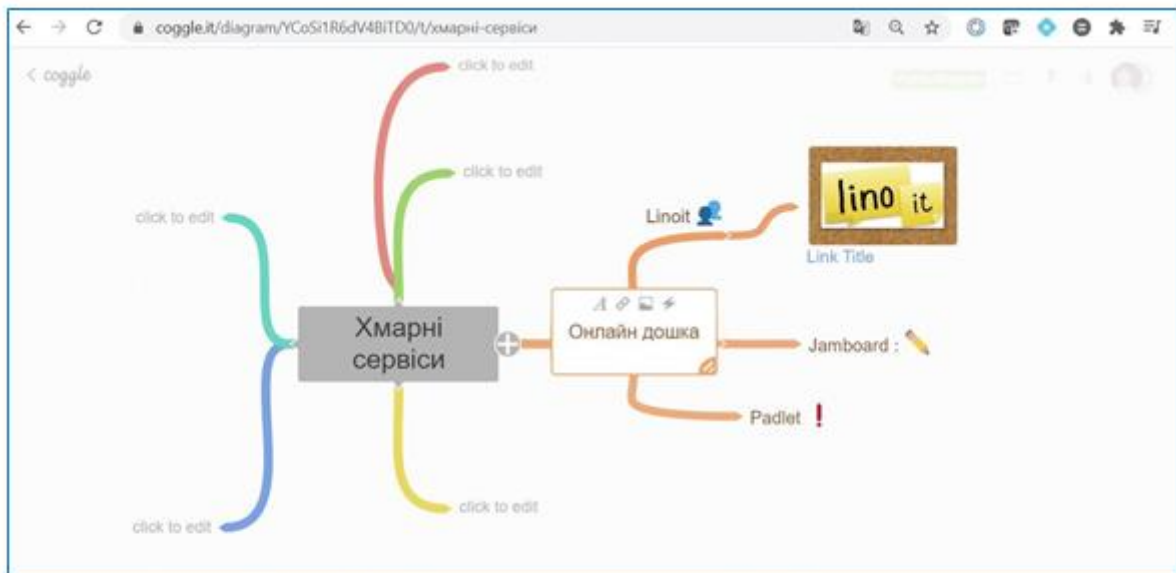


Figure 4 – Creating a mind map "Cloud Services"

5. Press the plus sign to create a branch from the central element. Write the names of the online service categories. An unsuccessful action can be cancelled with the key combination Ctrl+Z.

6. Each key element has a set of services for formatting text, adding links, images and icons (see Fig. 5).

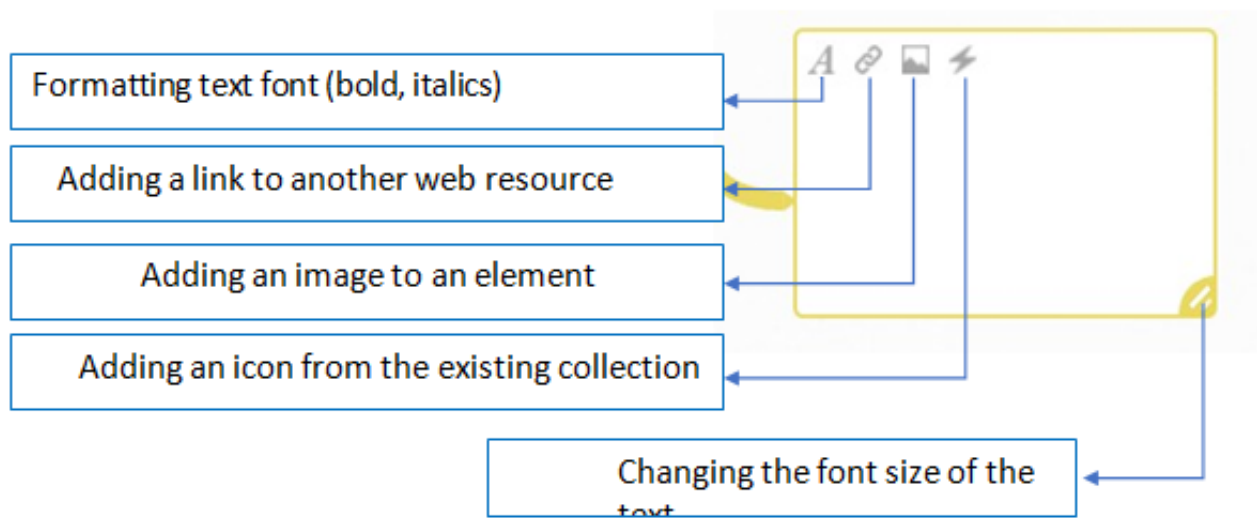


Figure 5 – Options for working with individual elements

7. When adding links or images, special markup text appears, which disappears when you click outside the element (see Figure 6).



Figure 6 – Special markup text

8. By clicking and holding the left mouse button on a free space on the mind map, you can move it.

9. If you hover the mouse pointer over the plus sign, press the left button and drag it without releasing it, the branches will stretch. The white circles on the branches are key nodes, which can be moved to change the shape of the branch.

10. To delete a branch element, hover the mouse pointer over the plus sign and, holding down the Alt key, click on the cross that appears instead of the plus sign. A complete list of possible actions using key combinations can be found on the additional panel that opens after clicking the question mark in the lower right corner of the screen (see Fig. 7).

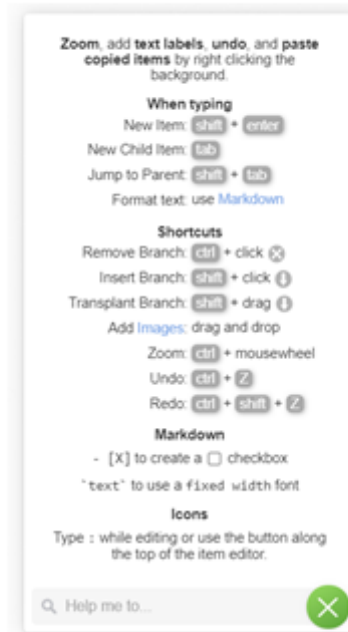


Figure 7 – Complete list of possible actions using key combinations

11. To add a key element of a mind map between two already created elements, move the mouse pointer over the plus sign in front of the element.

and press the Shift key. The plus sign will then change to an arrow, which you can click with the left mouse button to create a new element (see Fig. 8).

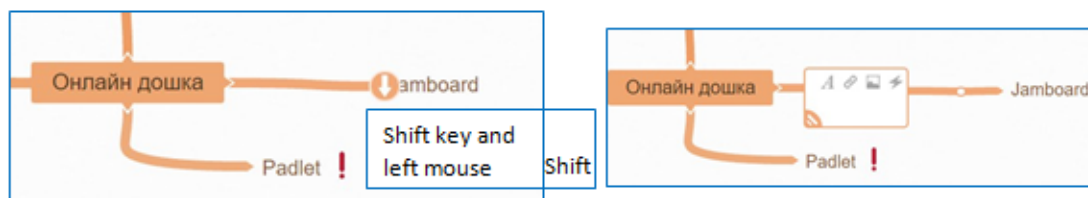


Figure 8 – Adding a key element of a mind map between two already created elements

12. If you right-click on the plus sign, a circular menu appears. Using **choose shape**, you can select the key element in the form of rectangles (see Fig. 9). Some services in this menu are not available in the free version, in particular, branch colour settings.





Figure 9 – Menu for working with mind map elements

13. Take a look at the menu options at the top right of the program window. The first button, shaped like a screen, is for displaying the created map in full screen mode (see Fig. 10).

14. Use this service to publish your work on other resources (see Fig. 10).

15. The service with a downward arrow is designed to download the image of the created mind map in various formats (see Fig. 10).

16. The service  is designed to invite other users to collaborate on a mind map in real time (see Fig. 10).

17. The service  is used to view the history of actions performed and to cancel them if necessary (see Fig. 10).

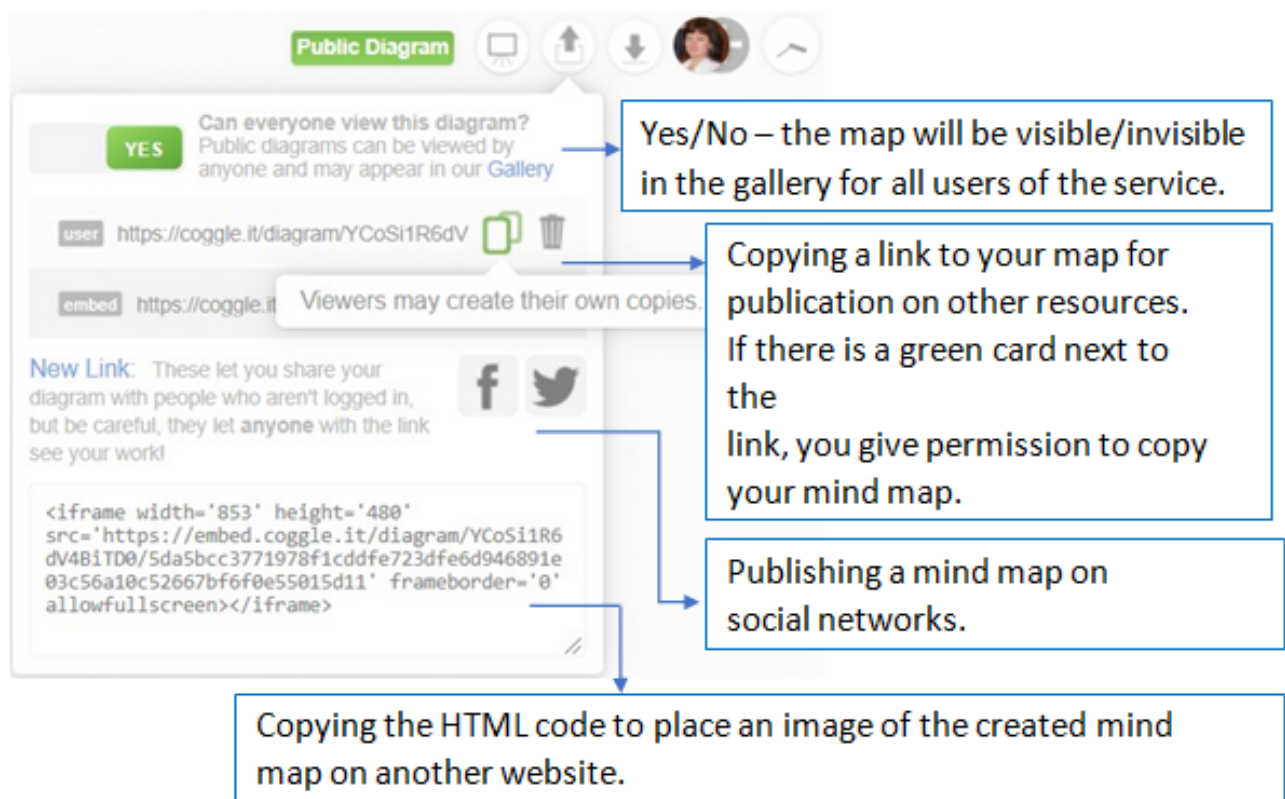


Figure 10 – Menu services for managing the mental map

1.4. Practical work assignment

1. Create a slide business card in a shared Google presentation. The link to the presentation is on the e-course page or ask your teacher. On the slide, write your surname, first name, patronymic, group code, add your photo, and format the slide according to the presentation requirements. Do not change the general presentation settings, including the theme. This slide will be used to publish links (see Fig. 11) to your completed work.

2. Create a mind map (knowledge map) using the Coggle service on any topic related to your speciality. The map should have at least three levels of branches, images, links, and other design elements. Generate a link to this map and publish it on your business card slide of the joint presentation.

3. Familiarise yourself with the mind mapping software described above in the practical work, and compare them with Coggle. Create a mind map together with another student in your group using a different service (e.g. Mindmeister). Post a link to your work on your slide-business card.



Figure 11 – Adding a link in a shared Google presentation

Examples of mind maps

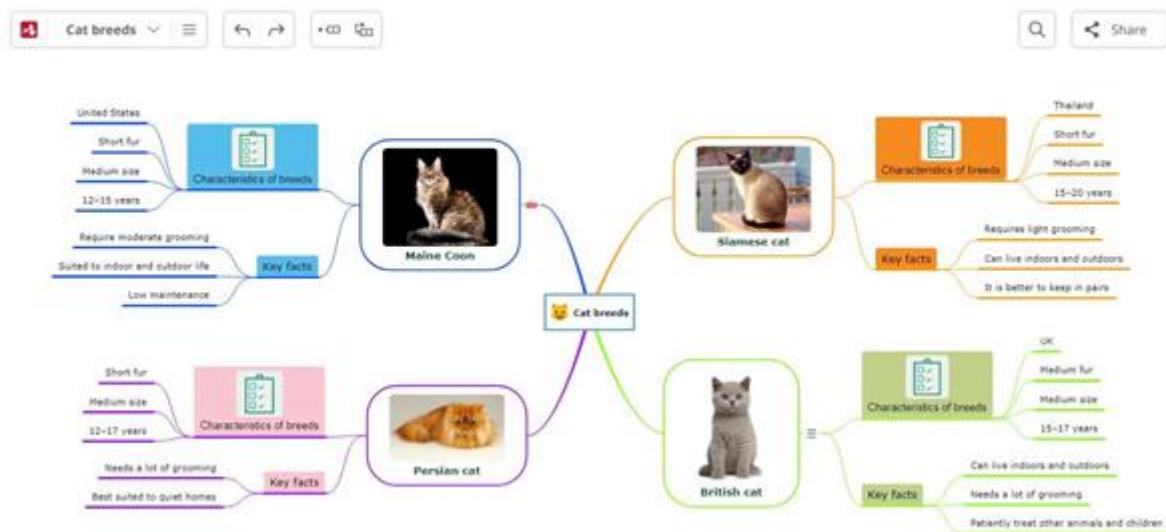


Figure 12 – Mind map created in mindomo.com (<https://cutt.ly/TLCsuuB>)



Figure 13 – Mind map created using the service <https://www.mindmeister.com> (<https://cutt.ly/GLCs2Op>)

Practical work No. 2–3

Topic: Development of informational and demonstration materials

Objective: to review online services for creating infographics and interactive drawings, to learn how to create educational infographics and interactive drawings using the Thinglink online service

2.1. Infographics. Online services for creating infographics

In today's fast-paced world, infographics (see Fig. 15) are becoming increasingly relevant. Graphical presentation of information

– A good way to focus the reader's attention on the main point, especially since 80% of the information we receive comes through visual communication with our surroundings.



Figure 15 – Example of infographics

Infographics are used in a wide variety of fields, including science and education. With the help of infographics, you can not only structure large amounts of data, but also show the relationship between objects and facts in time and space in a clear and easy-to-understand form, as well as demonstrate trends. Infographics are an effective way to combine text, images,

design elements to demonstrate complex data in a sequential story format is infographics.

Infographics (information graphics) is the visualisation of data or ideas with the aim of conveying complex information to an audience in a quick and understandable way [3].

Infographics is a branch of communication design based on the graphic representation of information, connections, numerical data and knowledge (V. Laptev). In addition to illustrations and images, infographics can consist of graphs, diagrams, flowcharts, tables, maps, lists, etc.

There are three types of infographics:

- static – an image or slide without dynamic elements;
- interactive – contains elements with animation, the user can interact with dynamic data;
- Video infographics – a short video clip combining visual images of data, illustrations and dynamic content.

Principles of infographic creation: relevance of the topic, conciseness and simplicity, creativity, imagery, accuracy and structure of data; aesthetic appeal.

There are two approaches to creating (designing) infographics, which differ in terms of the importance of aesthetics and decoration for infographics.

The exploratory approach is based on age-old traditions of scientific writing. This approach is associated with Edward Tufte, author of several seminal works on information design. He is a proponent of minimalist design, in which everything that is not essential for the presentation of data is removed, and the data itself is presented as accurately as possible. The exploratory approach to creating infographics is preferred in the fields of scientific activity, data analysis, and business analytics.

Another approach is the narrative approach, which is characteristic of the work of graphic designer Nigel Holmes, who is known for his "explanatory" illustrations (English: explanation graphics) in the American edition of *Time*. This approach is characterised by the desire to create images that are attractive to the reader, with expressive design and illustrative quality. The narrative approach is metaphorical, i.e. it is not just a graph or diagram based on a large amount of data, but a graph to which visual information, analogies from life, and topics of discussion are added.

Educational infographics is a way of presenting a large amount of educational material using simple and understandable visual methods. It is a modern teaching method, a form of information design, a type of educational creativity that involves combining graphics with text in a wide variety of proportions.

Educational infographics are used not only to illustrate and present educational material, but also to encourage reflection, analysis, comparison, research, and conclusions.

The technology of creating infographics:

1) defining the goals and objectives to be achieved with the help of infographics;

2) structuring information into sections, parts, and points; each section, part, and point is presented with an image or graph, and the necessary visual images are selected that will be understandable to the audience;

3) creating a story based on a visual metaphor around which the infographic will be created; it should be simple and easy to understand.

Creating bright, interesting infographics is a real art. It can be created using professional graphic editors or numerous web services that are available to ordinary users. These services offer collections of ready-made templates and decorative elements, as well as many examples to inspire you to realise your own creative ideas.

When to use infographics?

- A quick overview of a topic.
- Explanation of a complex process.
- Presentation of research results or survey data.
- Summarising a long blog post or report.
- Comparing and contrasting several opinions.
- Drawing attention to a problem or idea, etc.

Examples of online services for creating infographics

	Canva https://www.canva.com/uk_ua/
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Features:

- Over 500 ready-made themed templates, including for designing documents, presentations, creating logos, posters, social media posts, etc.
- a wide range of editing options (the ability to add or remove individual elements from existing templates, change their colour, size, position and fonts);
- the interface is localised in several dozen languages, including Ukrainian;

- up to 10 people can work on a project design as a team;
- finished projects can be downloaded to your computer in convenient file formats with the extensions PNG, JPEG or PDF;
- free use of the platform's options for 30 days, most templates are free.

	<p>Infogram https://infogram.com/</p>
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Features:

- Interactive infographics.
- service available in five languages;
- integration with social networks, publication on other resources;
- The free version offers 37 interactive chart types, up to 10 projects, 5 pages per project, and 13 map types.
- Data import.

	<p>Visme https://www.visme.co</p>
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Features

- ability to create vivid infographics, presentations, web graphics, and posters for social networks;
- Huge library of templates and templates (over 800 templates on various topics, over 6,000 icons, 20 types of charts and graphs, maps of the world, individual continents, countries and regions);
- each template has 10 colour options;
- the ability to edit any element of the template – change the size, placement, colour and font;
- integration of ready-made elements from the library into your own project or uploading your own;
- animation of individual elements of the overall infographic;
- adding audio and video files with the option to use a specific fragment from the entire file;
- saving projects in JPG, PNG, PDF, HTML5 formats.



Piktochart

<https://piktochart.com/>

Features:

- library of 800 templates sorted by format: infographics (12 free templates), reports, banners, and presentations.
- Project editing takes place within each individual block.
- Convenient text editing (text is aligned with other blocks at the click of a button).
- Many fonts that adapt to Cyrillic.
- Unlimited infographics (you can add as many separate blocks as you need).
- Each template offers at least 5 colour options.
- There is a six-part video tutorial, where the basic principles of the platform are demonstrated in a few seconds of video.
- Maps, graphs, videos, and images from your computer can be embedded into the ready-made template.
- The "Map" tool provides free access to maps of the world or individual continents with population and territory statistics.
- In the "Charts" tool, you can build any type of chart using one of 14 template types. To do this, you need to enter data into a convenient form similar to an Excel table.
- Ready-made projects are available for free download.

2.2. Creating interactive images using the Thinglink online service

An *interactive image* is a photograph or drawing that contains several areas that, when clicked or hovered over with the mouse, trigger a specific event. For example, following a link, displaying a tooltip, additional text, showing a photo, video, audio accompaniment, etc.

Such images can be used to create many interesting projects: a single drawing can contain a story on a specific topic, biographies of famous people, timelines, experiment results, the content and history of mathematical and physical formulas, etc.

Instructions for working in Thinglink

1. Open the website at <https://www.thinglink.com/>
2. Click the Start Now button (see Fig. 16).

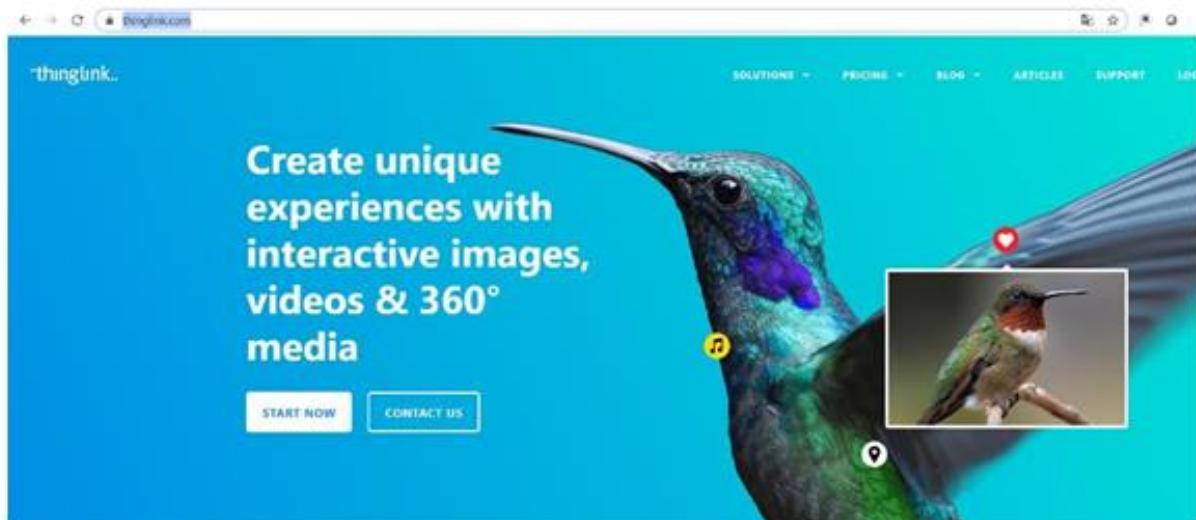


Figure 16 – Thinglink service home page

3. To continue working with the programme, you need to create an account, i.e. register on the website. You can register using your email address (Create Account) or automatically log in using your Google, Microsoft or Facebook account, etc. When registering, indicate that you will be using the service for personal purposes or as a teacher (but not for commercial purposes or for work for a specific organisation). Depending on the purpose of use, there will be a different set of features available for free in your account.
4. After authorisation and login, your page will open (see Fig. 17).

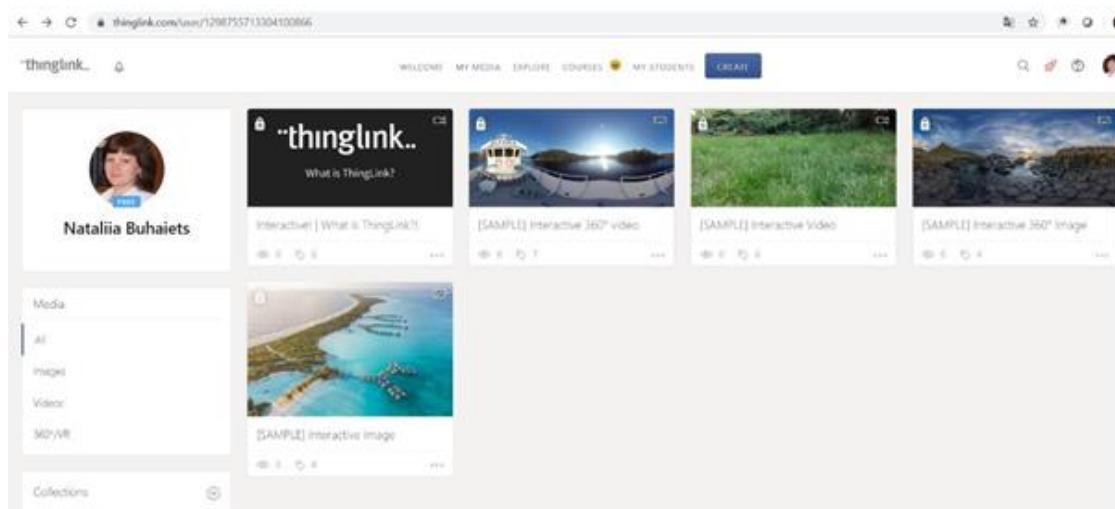


Figure 17 – Personal page in the Thinglink service

5. On the main page of your account, you will find an explanation of what Thinglink is, as well as templates for standard interactive images, videos, and panoramic images. In the EXPLORE section, you can view projects created by other users. To create your own interactive image, select CREATE/Upload Image.
6. You need to add special markers to the uploaded image, which will provide additional information about the elements of your image. To do this, select Add tag (see Fig. 18).

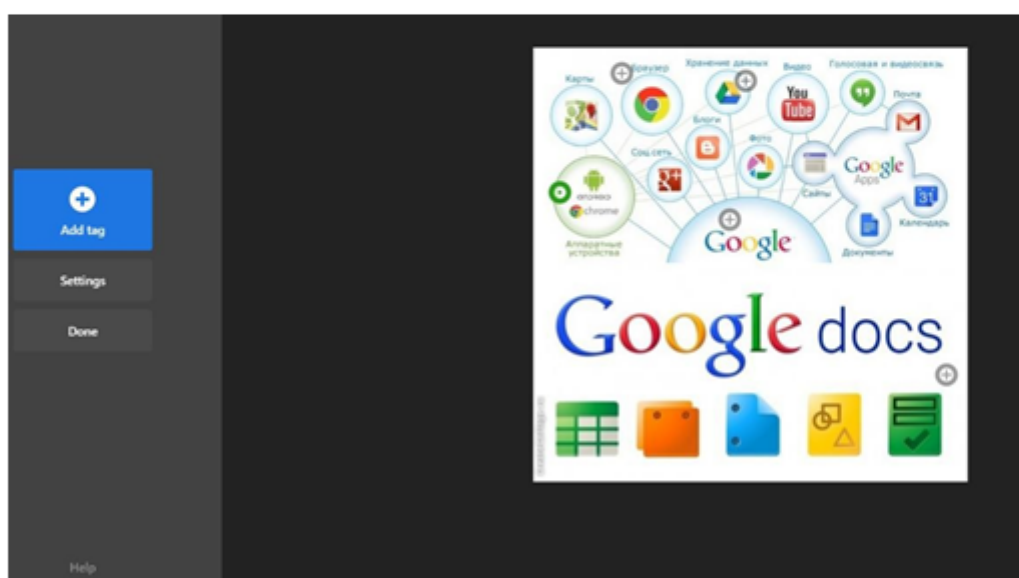


Figure 18 – Adding markers to an uploaded image

7. Next, enter the text that will appear when you hover the mouse pointer over a particular marker (Add text label). You can also link the marker to information from a specific web page (Add content from website) or a media file, i.e. an image, video or audio file (Add text and media).
8. To share the created image with other users, publish it on shared electronic resources or embed it on a website, click SHARE (see Fig. 19) and, for example, copy the link to your image to the clipboard (Copy Link). You can insert the drawing into an electronic resource using the Ctrl+V key combination.
9. Sometimes it is quite difficult to find a base image with only one picture. In this case, it is advisable to create a photo collage from several different images and use it as a base. To create a photo collage, you can use, for example, the Fotor service <https://www.fotor.com/create/collage/>, etc.

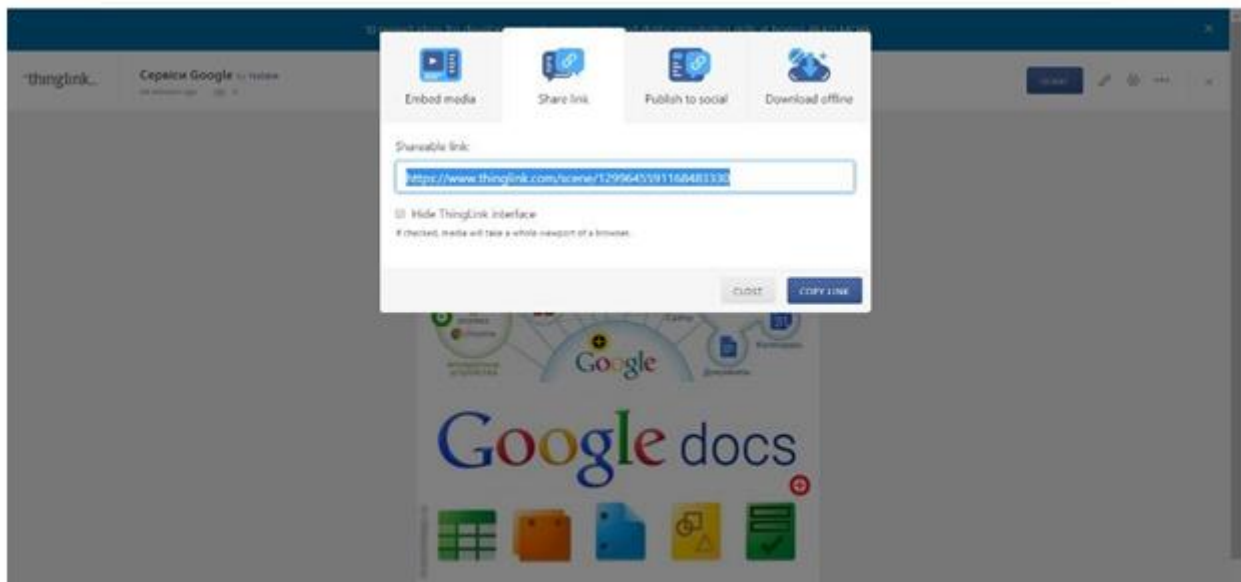


Figure 19 – Shared access in the Thinglink service

2.3. Practical work assignment

1. Study the theoretical material and familiarise yourself with the web services described for creating infographics.

2. Create an infographic on any topic related to your speciality using one of the services (Canva, Infogram, Visme, etc.), publish the link on your slide-business card in a shared presentation.

3. Create an interactive drawing on any topic related to your field of study using the Thinglink service.

2. Publish this drawing on a shared virtual board in Padlet <https://padlet.com/anatashika/itznna41>.

3. Write a comment on the interactive drawing about which web service you like and why. What difficulties did you encounter when working with online services?

4. Explore another service for creating interactive drawings on your own – Glogster <https://edu.glogster.com/>

Examples of infographics

Women's suffrage <https://www.thinglink.com/scene/1170086312816934914>

Movie Vocabulary <https://cutt.ly/nXoP4fu>

Oleksandr Dovzhenko <https://infogram.com/biografiya-1h7j4d9wrgrd2nr?live>

Ostern in Deutschland <https://infogram.com/timeline-dark-1hxj48q951dq4vg?live>

Area of a triangle <https://cutt.ly/CXoShI1>

Practical work No. 4

Topic: Microsoft PowerPoint services for creating presentations

Objective: to review the basic requirements for designing presentations, to learn how to use MS PowerPoint services for creating presentations with quizzes.

3.1. Creating and customising presentations

Electronic presentations are a means of creating interesting multimedia projects to accompany lessons, reports, informational advertising videos, and various educational and reference courses.

Before creating a presentation using software tools, it is necessary to design it. In particular, determine for whom it will be created, specify the level of preparation of the audience and the purpose of the presentation. It is necessary to prepare information material for creating presentations in advance: separate text fragments, drawings, diagrams, graphs, etc.

Recommendations for the structure, content, and design of educational presentations are well known:

- 1) concise and succinct presentation of material with maximum informativeness of the proposed text;
- 2) use of terms, abbreviations, etc. that are familiar to students;
- 3) avoid cluttering the slide with symbols and images;
- 4) adherence to a clear order of structuring and presenting the material as a whole and on each slide in particular;
- 5) use short and meaningful headings, marked and numbered lists as needed;
- 6) use large fonts for important messages, highlighting them and placing them in the upper left corner of the screen;
- 7) place secondary information at the bottom of the page;
- 8) allocate a separate paragraph (new slide) for each point (idea);
- 9) present the main idea of the slide in the first lines of the paragraph;
- 10) compact and clear illustration of important facts, using tables, diagrams, charts, etc. as needed;
- 11) use graphics that logically complement the text;
- 12) placement of explanations as close as possible to the illustrations with which they should appear simultaneously on the screen;
- 13) carefully check the information for spelling, grammatical and stylistic errors;
- 14) appropriate and judicious use of sound accompaniment, photographs, drawings, and computer animation of processes and phenomena for text and graphic images.

The above requirements are balanced and reinforced by the requirements for presentations by D. Lewis [4], which focus, in particular, on the content of text and other objects, and font size:

- Each slide should convey a single idea.
- The text should consist of short words and simple sentences.
- Depending on the length and font, a line should contain 6–8 words.
- There should be 6–8 lines on the slide in total.
- The total number of words should not exceed 50.
- Verbs should be in the same tense.
- Headings should attract the the and summarise the main points of the slide.
- Headings should contain both upper and lower case letters.
- Slides should not be too bright in terms of the use of colours, objects, and animations.
- The number of information blocks on a single slide should not exceed four.
- Captions for illustrations should be placed below them, not above them.
- All slides in a presentation should be consistent in style.

The choice of font and its size is important for reading, perceiving and understanding the text on the slides. On the one hand, it reflects the author's preferences, and on the other hand, it must comply with sanitary, hygienic, physiological and psychological standards. The text on the slide should be easy to read. The main ideas, positions and facts on it can be emphasised with font and colour.

In addition to the general rules for using fonts and the principles for selecting them, which were not listed earlier, it is advisable to include the following:

1. Each font (typeface and spelling) throughout the presentation should have the same purpose. Bold font is usually used for document titles, sections, subsections, highlighting key phrases, concepts, etc. At the same time, it is considered that bold italics are higher in hierarchy than bold regular font. Italics are used to highlight "emphases" and accents in the text of a slide, in particular when formulating rules, definitions, introducing new concepts and dependencies.

2. Do not use more than three or four font types (in terms of typeface and font size) on a single slide. Frequent font changes can lead to inconsistency, a lack of uniformity in the information on the slides, and difficulty in perceiving them.

3. A slide should not be "colourful" due to a large number of different fonts and colours. A variety of colours and fonts can negatively affect the nervous system, tire the eyes, and therefore inhibit the quality of perception of the messages presented on the slide.

4. Avoid placing light-coloured fonts on a dark background.

5. The font size (in printing – point size) used when creating a slide should not be less than 20 pt for Times New Roman or 31 pt for Arial.

6. Serif fonts (such as Times New Roman) are easy to read, so they are best used for slides with a lot of text. Sans serif fonts (such as Arial) are simpler and look better in headings and footers.

7. Text written on a slide for the purpose of testing knowledge, skills and abilities should be presented in simplified fonts and typefaces without unnecessary lines, underlining, etc., for example, Arial.

8. All mathematical formulas are presented in a font similar to Times New Roman, with all variables in italics and the rest of the symbols (numbers, operation signs, established function names, brackets) in regular font.

It is widely accepted that colour has one of the greatest emotional impacts on humans [5]. Johann Wolfgang von Goethe was the first to attempt to systematise the role of individual colours in human feelings and emotions. In particular, he believed that yellow creates a warm impression and a good-natured mood. In his understanding, blue was the colour of shadows – cold and dark. (This fact explains why blue objects seem more distant when viewed). The poet attributed qualities such as seriousness and dignity, grace and charm to the colour red.

The influence of colour on human perception has been repeatedly confirmed by research and experiments conducted by physiologists and psychologists. M. Derebire describes the influence of colour on the human psyche and physical condition as follows:

- green is soothing and hypnotic; it affects the nervous system, relieving irritability, insomnia and fatigue, lowering blood pressure and boosting vitality;
- blue is antiseptic; it is effective for inflammation and suppuration; blue helps sensitive people more than green, but an "overdose" of it can cause some fatigue and depression;
- Yellow stimulates the senses and accelerates blood circulation without affecting blood pressure. It has a strong stimulating effect, creating a feeling of well-being and joy, but prolonged exposure to it can be tiring.

– Yellow affects brain function and is therefore effective in cases of mental fatigue and deficiency.

– Red has warmth; like yellow, it stimulates brain activity and is effective for melancholy, but at the same time irritates the nervous system.

– Purple delays the onset of fatigue and has a positive effect on the heart, lungs and blood vessels.

It is important to take into account the physiological characteristics of humans in their perception of colours and shapes in the educational process. When creating presentations, the following should be taken into account:

1. Stimulating (warm) colours promote excitement and act as irritants (in order of increasing intensity of influence: yellow – contactive, radiant; orange – warm, cosy; red – strong-willed, life-affirming).

2. Disintegrating (cool) colours calm, induce sleepiness (in order of increasing intensity of impact: bright blue, green – leads into space, directs; blue-green emphasises movement, changeability; light blue, blue – emphasises distance; purple – deep, heavy).

3. Pastel (neutral) colours (in order of increasing intensity): pastel green – gentle, soft; lilac – closed, isolated; pink – delicate, has an effect of mystery; greyish blue – restrained).

4. Static colours balance and distract from other stimulating factors (in order of increasing intensity of influence: purple – sophisticated, pretentious; yellow-green – refreshing, liberating; olive – calming, soothing; pure green – demanding, refreshing).

5. Warm dark tones (browns) stabilise irritation and have a sluggish, inert effect: dark brown – softens excitability; brown, earthy – stabilising; ochre – softens irritation;

6. Cold dark colours isolate and suppress sensations: dark grey, black-blue, dark green-blue.

7. Muted colours: grey – does not cause irritation, white – extinguishes it, black – helps to concentrate.

Taking into account the purpose, objectives, structure, type of lesson, etc., the teacher should select colours for the presentation so that their effect on the senses enhances the positive effect of perceiving the content of the slide and contributes to the high-quality and in-depth assimilation of the educational material.

In doing so, it is advisable to consider the following factors:

1) the combination of two colours on a slide – the colour of the symbol and the background colour – significantly affects visual comfort; it should be noted that some colour combinations not only tire the eyes, but can also cause stress (for example, green symbols on a red background);

2) The best combination of font and background colours: white font on a dark blue background, black font on a white background, yellow font on a blue background.

3) the colour scheme should be the same for all slides;

4) background images on slides that are not related to learning tire the eyes and reduce the effectiveness of message perception;

5) clear, bright images, even if there are many of them, but they change quickly, are easily perceived by the subconscious and are quickly remembered;

6) secondary objects, especially moving (animated) ones, reduce the speed and quality of perception of the material, distract attention and disrupt its dynamics;

7) The colour contrast between the image and the background should be at the highest level, in particular, the image contrast should be over 60%. At the same time, it is necessary to take into account that bright red is best perceived only at high image brightness, green shades – in the middle brightness range, yellow – in a wide range, and blue – at low brightness.

Color Harmonies

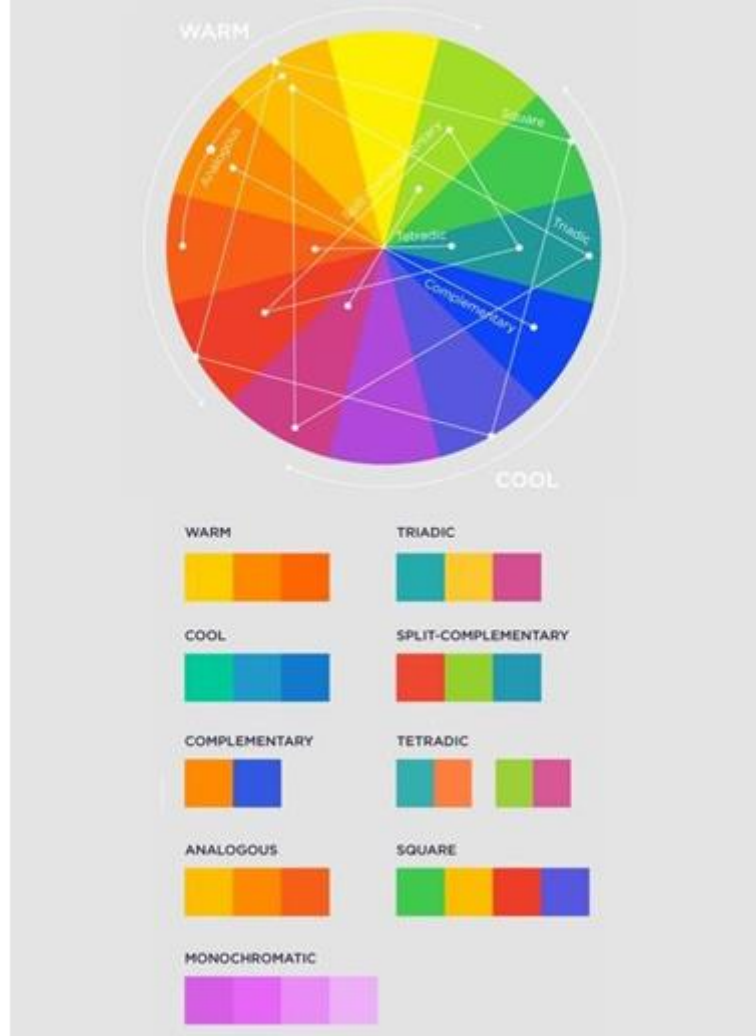


Figure 20 – Colour harmony

3.2. Triggers in Microsoft PowerPoint. Creating quizzes

Let's consider how to create a quiz using Microsoft PowerPoint. Suppose that there are several images on the slide, among which you need to identify the odd one out. For example, all images are fruits, except for one, which is a vegetable. Therefore, the vegetable is the odd image out. Let's set up this interactive game using animations.

First, let's determine what will happen when we select (click on) a particular image:

1) if the answer is correct, when we select the vegetable, the image will gradually disappear;

2) if the answer is incorrect, i.e. we select a picture with fruit, the picture will move but remain on the slide.

For the image that will disappear, we do the following:

1. *Animation/Add Animation/Exit...* (select the effect).
2. In the *Animation Area* window on the right, right-click on the corresponding image and select *Time* from the drop-down menu (see Fig. 21).

We configure the animation effect specifically for a particular image, i.e. the result is not just a mouse click on the slide, but a mouse click on a specific image. Set *Start: On Click*, enable *Switches* and select the option *Start effect on click* for the corresponding image, then click *OK*. This creates an image trigger – an action that will occur when you click on the image.

Similarly, configure the animation of other images that are not the correct answer. However, these images should not disappear. Therefore, add the animation *Highlight...* / (select an effect, for example, *Swing*) (see Fig. 22).

In order for the drawings to be rearranged after the excess has been removed, we add the *Movement Paths* animation, in which we specify how the drawings should be moved on the slide.

3.3. Practical work assignment

1. Familiarise yourself with the recommendations for creating presentations. Download the PowerPoint presentation provided on the course page (in UNiCOM), review the interactive test and quiz in view mode.
2. Create a presentation in PowerPoint on a topic related to your specialisation (you can choose a topic related to your master's thesis in order to prepare some of the materials for a presentation at a conference, seminar, preliminary defence or defence), taking into account the general recommendations and rules for placing data on the slide.
3. The presentation should consist of 12-15 slides:
 - 1 slide – title page: presentation topic, basic information about the author, year of creation of the presentation;
 - 2 slide – presentation plan, each point of the plan is a hyperlink to the corresponding slide;
 - subsequent slides – *main part of the presentation*, factual material, disclosure of the presentation topic;
 - last slide* – list of information sources used.The presentation should contain hyperlinks and navigation elements in the form of buttons, images and clip art without backgrounds (pictures in .png format; you can use Google image search or the **pngtree** website https://pngtree.com/freepng/the-right-amount-of-ppt-element-information-label-material_2334806.html), a diagram or a graph.
4. Create an interactive test or quiz (at least 5 questions) in the presentation using hyperlinks and animation effects. Apply animation effects with colour, set the trajectory of the object on the slide, use triggers.
5. Upload the presentation to the course for the corresponding assignment.

Practical work No. 5

Topic: Working with structured documents. Using Microsoft Office Word to format scientific texts

Objective: to review the basic technical requirements for formatting scientific papers, scientific articles and other publications, to learn how to use MS Word services for formatting structured documents and formatting individual elements of scientific texts.

4.1. Formatting scientific texts using Microsoft Office Word

Scientific works in Ukraine are formatted in accordance with the standards of DSTU 3008:2015 "Documentation. Reports in the field of science and technology. Structure and formatting rules."

The requirements for formatting scientific works within the rules of this standard may vary depending on the type of scientific work. However, it is possible to identify general approaches to the formatting of scientific documentation.

Scientific papers are printed on one side of a sheet of white A4 paper (210*297 mm). The text of the work is typed in a text editor, with one and a half (1.5) spacing and margins: left margin – 25-30 mm, right margin – at least 10 mm, top and bottom margins – at least 20 mm (*Layout/Margins*).

The font should be clear with uniform text density and black in colour. The main text of the work can be divided into sections, subsections, paragraphs and subparagraphs. The headings of the sections usually have the following names:

CONTENTS

LIST OF ABBREVIATIONS

INTRODUCTION

SECTION

CONCLUSI

ONS

LIST OF REFERENCES APPENDICES.

They are printed in capital letters symmetrically to the main text. The indentation from the heading to the text should be 3-4 line spaces. Each new section begins on a new page.

The headings of sections (subsections) are printed in lowercase letters (except for the first capital letter) with a paragraph indent.

All pages and elements of the scientific work are numbered. The numbering of pages, sections, subsections, items, sub-items, figures, tables, and formulas is given in Arabic numerals without the symbol №.

Subdivisions are numbered within each section. The section number consists of the chapter number and the sequential number of the section, separated by a full stop. A full stop is placed at the end of the section number, for example: 2.3. (third section of the second chapter). Then, on the same line, the section title follows (see Fig. 24).

The main structural elements of a scientific work are illustrations (drawings, figures, graphs, diagrams, charts, photographs), tables, lists, notes, footnotes, formulas, equations, references, and appendices.

Illustrations (drawings, figures, graphs, diagrams, charts, photographs) should be placed in the scientific work immediately after the text where they are first mentioned, or on the following page. At the same time, all illustrations must be referenced in the scientific work.

4.4.1. Formatting of individual text elements

Lists are formatted as follows: numbered:

"1." – a number with a full stop, the text begins with a capital letter, followed by a full stop;

"1)" – a number with a bracket, the text begins with a lowercase letter, followed by a semicolon;

"a)" – letter with a bracket, text begins with a lowercase letter, followed by a semicolon;

Marked:

"–" – dash, text begins with a lowercase letter, followed by a semicolon;

"•" – a full stop, text begins with a lowercase letter, followed by a semicolon.

Tables are numbered within a section: the first digit indicates the section number, the second digit indicates the table number within the section. The word "Table" is written on a separate line, aligned to the right. The table heading is centred, in bold, and positioned above the table. Leave one blank line at the end of the table.

Table 2.1

List of evaluation criteria for the collection of tasks

<i>No</i>	<i>Assessment criteria</i>	<i>1 – 5 points</i>
1	An original title has been chosen for the collection, and it includes the names of all its authors.	
2.	The information provided in the collection of tasks is reliable and corresponds to the topic of the project.	
3.	The ideas for solving problems are clearly expressed, the method of solving the problem is easy to understand, and clear explanations and justifications are provided.	

Figures are numbered according to the section number and the order of the figure in the section. The format of the figure caption: centred, italics, position – below the figure. One blank line must be left before the figure and after its caption (see Fig. 25).

When writing the work, the student must refer to scientific sources, materials, ideas, conclusions, and results used in the course (thesis) work. This makes it possible to verify the information provided. References should be made to the latest editions of publications.

References to sources in the text of the work are indicated by a serial number in the list of references, enclosed in square brackets, for example, [3]. "... in works, [1; 7]...", where the numbers 1 and 7 correspond to the serial number of the work or source in the List of Sources Used. If there are references to sources in sequence from 1 to 7, then [1–7].

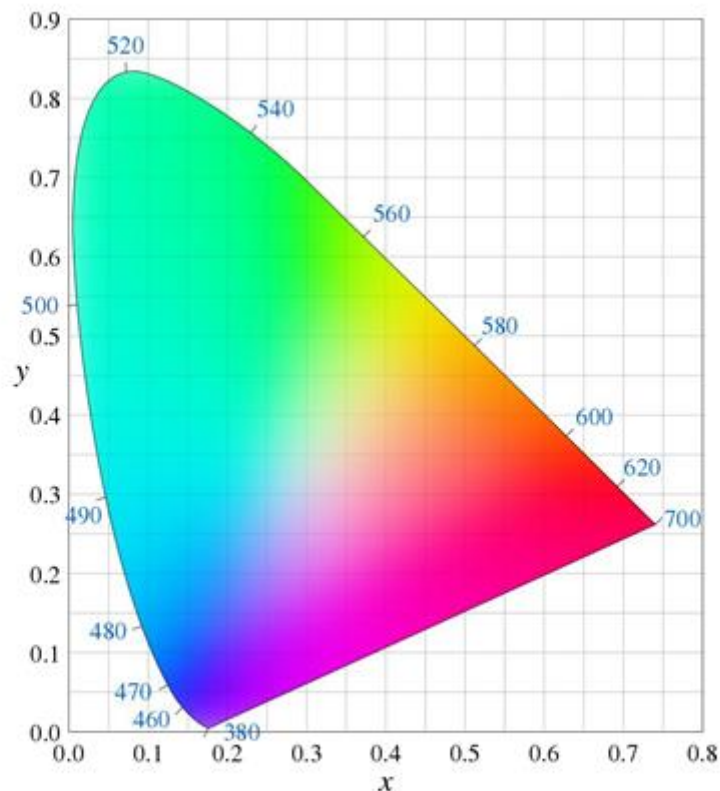


Figure 25 – Chromatic diagram with colour wavelengths

References to specific pages should be given after the source number, followed by a comma and the lowercase letter "p.", for example: [1, p. 5]. If there are references to several works, they are separated by a semicolon: [1, p. 5; 6, pp. 25–33].

If information, materials or statements from monographs, review articles or other sources with a large number of pages are used, then the reference must specify the page numbers, illustrations, tables, etc. from the source to which the reference is made.

References in the text are usually made at the end of a sentence.

Quotations are enclosed in quotation marks and must include a reference to the source with the page number indicated.

Quotations are usually used to support one's own arguments, as references to authoritative sources, for critical analysis of a particular statement. In other cases, it is better to use indirect quotations.

If it is necessary to refer to specific information in the text of the work, the quotation is placed in quotation marks, and the reference is placed in square brackets with an indication of the serial number of the source in the list of sources used and the corresponding page. For example: "... the acquisition of scientific knowledge involves the use of facts that characterise a particular phenomenon, the development of a scientific hypothesis (theory) that explains a particular phenomenon, and the design of an experiment to prove the proposed theory [8, p. 37]".

Footnotes are text placed at the bottom of the page and separated from the main text by a horizontal line.

A footnote symbol (a number with or without brackets) or an asterisk is placed next to a word or phrase that requires explanation or comment, and is repeated at the beginning of the footnote itself. The asterisk symbol is used when there are few footnotes in the work and they are mainly placed one per page. If Arabic numerals are used as footnote symbols, the footnotes can be numbered by page (within a single page) or consecutively (throughout the entire work). Footnote symbols must be consistent within a single work. Numbers and asterisks are written next to the word at the top, without indentation between the word and the symbol, but indentation is mandatory after the footnote. Punctuation marks are placed after the footnote symbol.

Rules for formatting footnote text:

1. The main text is separated from the footnote text by a horizontal line of 15 characters.
2. The separating line is separated from the main text by one and a half or two spaces, depending on the spacing of the text itself.
3. The text of the footnote is separated from the separating line by two spaces.
4. The text of the footnote is written one space away from the paragraph.
5. If there are several footnotes on a page, each footnote is separated by two spaces.
6. All footnotes are printed on the page to which they refer. It is not advisable to break footnotes and move them to another page.

If you are using Microsoft Office Word 97-2003, follow these steps to add a footnote:

1. Place the cursor where you want to insert the footnote.
2. Select the *Insert/Reference/Footnote* menu item (see Fig. 27).
3. In the *Footnotes* window, select the type of footnote you want:
 - footnote at the bottom of the page or text, **CTRL+ALT+F**;
 - endnote at the end of a section or document (postscript), **CTRL+ALT+D**.

Select the footnote format – numbers or symbols.

4. A line will appear at the bottom of the page where you can write the footnote text.

5. Place the cursor where you want the next footnote to appear and repeat steps 1–4.

If, as a result of increasing or decreasing the text, the footnotes are moved to another page, they are moved and numbered automatically.

4.2. Practical work assignment

1. Familiarise yourself with the state standards for the formatting of scientific documentation.
2. Prepare a layout for a scientific paper in Microsoft Office Word. The document should consist of a title page, table of contents, introduction, two or three sections with paragraphs and subparagraphs, a list of references, and appendices. (!!! This is a layout of a scientific paper, so the main task is to create a structure and correctly format the various elements of the paper in accordance with the standards. It is not necessary to write the full text of the paper).
3. The text of the work must contain a figure, table, or formula. Create a standard footnote on one of the pages.
4. Set the document margins: top and bottom margins – 20 mm each, left margin – 30 mm, right margin – 10–15 mm. Number the pages. The page number should be in the upper right corner. Numbering starts from the title page, but the page number is not displayed on the title page.
5. Set *up* and apply *styles for* document headings. Introduction, Table of Contents, Section Headings, Conclusions, List of References, Appendices – font size 14, bold, Times New Roman, all letters capitalised, centred alignment, paragraph spacing – 18 pt. Subheadings – font size 14, bold, Times New Roman, centred alignment. Captions for figures and diagrams – font size 14, italics, Times New Roman, centred alignment. Table captions – font size 14, italics, Times New Roman, right-aligned. Table titles – font size 14, bold italics, Times New Roman, centred alignment.
6. The main text should be formatted according to the following requirements: paragraph indentation 15 mm, justified alignment, line spacing 1.5, font size 14, Times New Roman.
7. Compile a list of references (at least 5 sources) and format it in accordance with the requirements of the state standard DSTU 8302:2015.
8. Insert a page break between sections and main structural elements of the work.
9. One of the appendices should be submitted in the form of a sheet with landscape orientation.
10. Automatically generate the table of contents.
11. The use of hyphens instead of dashes is not permitted in the text; surnames with initials, dates, references to figures, tables, pages, etc. must be formatted using a non-breaking space.
12. Upload a text document with the layout of your research paper to the corresponding assignment on the course page.

Practical work No. 6

Topic: Microsoft Excel services for processing and analysing data in spreadsheets

Objective: to learn how to use MS Excel services for processing and analysing data in spreadsheets (functions, nested functions, charts, graphs, etc.).

5.1. Processing and analysing data in Microsoft Excel spreadsheets

A spreadsheet is a programme for mathematical, statistical and graphical processing of arrays of text and numerical data presented in the form of tables. Spreadsheet programmes are also called table processors. Such programmes include Microsoft Excel, OpenCalc, the online service Google Sheets and others.

A spreadsheet allows you to store a large amount of input data, results, and the relationships between them in tabular form. When the input data changes, all results are automatically recalculated and entered into the table. Such tables can be viewed, modified, saved to external storage media, and printed.

The main advantage of spreadsheets is the ability to instantly recalculate all data linked by formula dependencies when the value of any component of the table changes.

The idea of creating spreadsheets arose in 1979. The first spreadsheet was designed for rational economic calculations and did not differ in the variety of functions. Nowadays, Microsoft Excel has become the most popular spreadsheet processor.

To store a new document, Excel creates a file called a workbook. A workbook consists of elements called worksheets or sheets. A worksheet in a workbook is a window containing a table. Only one worksheet can be displayed at a time. Columns are vertical objects in a table, numbered with Latin letters from A to Z, then from AA to AZ, from BA to BZ, and finally from IA to IV. There are 16,384 of them in total.

Rows are horizontal elements of the table, numbered with numbers, for example, row 2, row 17, row 28. The maximum possible number is 1,048,576.

A cell is an element formed at the intersection of a column and a row. Each cell has its own name (address), consisting of the column and row designations at the intersection of which it is located.

Calculations or other actions with data on a sheet are performed using formulas. A formula always begins with an equal sign (=), which may be followed by numbers, mathematical operators (such as "plus" or "minus"), and functions that can greatly expand the capabilities of the formula.

Functions are predefined formulas that perform calculations in a specific order using special values called arguments. Functions can be used to perform simple or complex calculations. All Excel functions can be viewed on the Formulas tab (see Fig. 31).

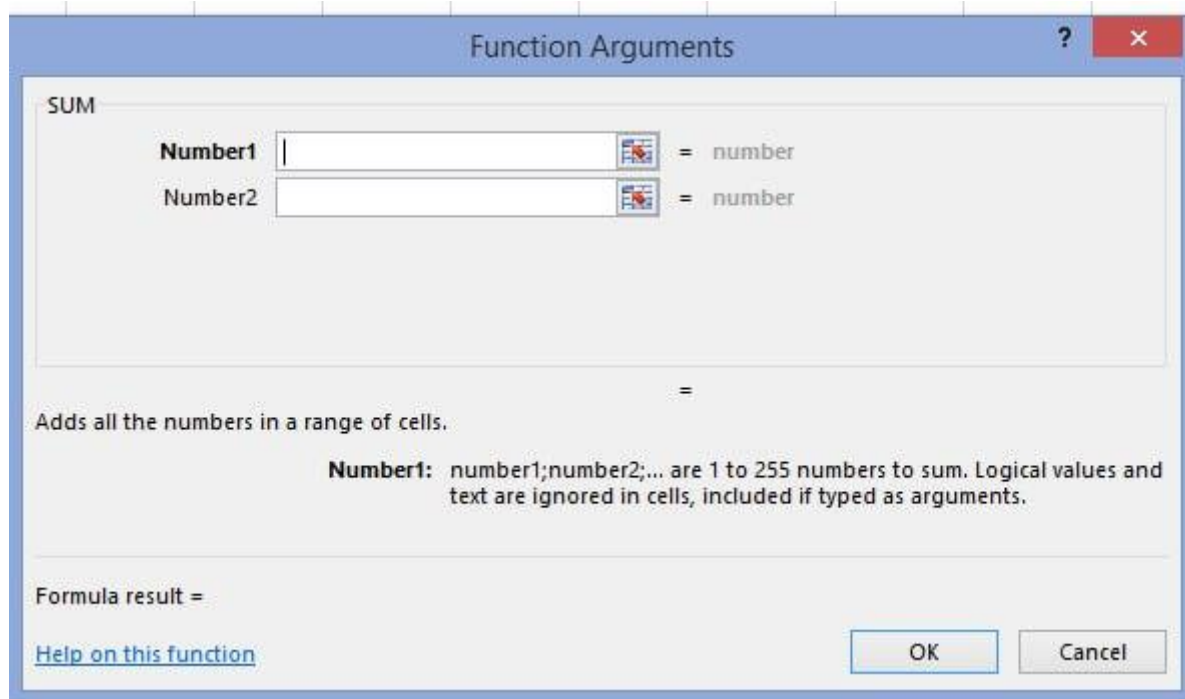


Figure 31 – Formulas tab

When creating a formula that contains a function, you can use the *Insert Function* dialogue box to enter the function into the worksheet. After selecting a function in the *Insert Function* dialogue box, Excel will launch the Function Wizard, which displays the name of the function, each of its arguments, a description of the function and each argument, the current result of the function, and the current result of the entire formula (see Figure 32).

Charts and graphs are used to visualise data in Microsoft Excel. To insert a chart or graph into a spreadsheet, do the following:

- 1) select the cells with the data you want to represent graphically;
 - 2) Go to the Insert tab, select Recommended Charts in the Charts section.
 - 3) if the recommended charts are not suitable, the user can select the chart type themselves (bar chart, line chart, pie chart, line chart, area chart, scatter chart, stock chart, surface chart, petal chart, combination chart);
 - 4) To insert the selected chart, select it and click the OK button.
- OK button.



5.2. Practical work assignment

1. Create an electronic book "Achievement Journal" in MS Excel spreadsheet (see Fig. 31). On sheet 1, place data on students' learning in mathematics in the form of a table according to the sample (see appendix). Enter grades, dates, and surnames yourself. Format the table.
2. Calculate the average score for each student using the `AVERAGE()` function. In the *Subject* column, display the scores based on the average value using the `ROUND()` function.
3. Analyse the learning outcomes: determine the number of students with a beginner, intermediate, sufficient, or advanced level using the `COUNTIF()` function.
4. Determine the average score (on a 12-point scale), the overall average score for the subject, and the absolute success and quality indicators, expressed as percentages and displayed in a chart.
5. Create a diagram showing the student's performance in the subject. This diagram is created based on the data in the *Full Name* and *Subject* columns. To select these two separate columns, select them while holding down the **Ctrl** key and select *Insert/Histogram*.

Tasks for laboratory work

- ✓ create a book, name it with your surname
- ✓ create a table on the first page of the book to evaluate the relevance and importance of knowledge in the subjects of this semester
- ✓ create a table like the one on the slide
- ✓ fill in the text fields, and then rate each discipline according to the appropriate level from 1-lowest level to 5-highest level (as in the example)
- ✓ then you need to align the font and text (get creative)
- ✓ and calculate the average score in the discipline
- ✓ if you do not get an integer, then use rounding