LW-01. Creation ER Diagrams with Online CASE Tools.

1. Lab Target.

1.1. Learn to build ERD in various notations and with varying degrees of detail of the database model.

1.2. Gain practical experience using modern cloud-based CASE-tools App.diagrams.net and Lucid.co

2. Lab Assignment.

2.0. Select Your individual variant Nr.

2.0.1. Calculate your variant of Subject Area.

a) Write your LastName in English alphabet. Must be at least 6 letters, if not enough, then add the required number of letters from the FirstName (if not enough, then repeat LastName and FirstName).

For example, for student Yuriy Li there will be LIYURIY.

b) Replace the first 6 letters with their ordinal numbers in the alphabet, writing the numbers as two-digit decimal numbers.

For example, 12 09 25 21 18 09.

c) Consistently add modulo 23 these 6 numbers and add 1

For example, (12+09+25+21+18+09)mod23 + 1 = 94mod23 + 1 = 2 +1 = 3.

d) The resulting will be your variant Nr.

For example, 3.

See assignment variant bellow in this document.

Aa 1	Bb 2	Cc 3	Dd 4	Ee 5	Ff 6	Gg 7
Hh 8	Ii 9	Jj 10	Kk 11	Ll 12	Mm 13	Nn 14
Oo 15	Pp 16	Qq 17	Rr 18	Ss 19	Tt 20	Uu 21
Vv 22	Ww 23	Xx 24	Yy 25	Zz 26		

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2.2. Solution

2.2.1. Insert your variant Subject Area description (Task text).

2.2.2. Describe any assumptions and restrictions then you make on your variant of Enterprise information.

2.2.3. Create Basic Concept Model as ERD on Chen's notation with app.diagrams.net site.

2.2.3.1. Register on **Draw.io** site (https://app.diagrams.net/).

2.2.3.2. Create ERD **Chen's notation**, show entity names, primary keys, attributes, relationships and cardinality.

2.2.3.3. Export ERD **to PNG** and insert picture to your Report (File/Export as/PNG…).

2.2.4. Create Keys Concept Model as ERD on Crow's Foot notation with Lucid.co site.

2.2.4.1. Register on **Lucid.co** site (https://www.lucid.co/).

2.2.4.2. Create ERD **Crow's Foot** notation, show entity names, primary keys, foreign keys, attributes, relationships and cardinality.

2.2.4.3. Transform **many-to-many** relationship (m:n) to new Associative Entity.

2.2.4.4. If you think the **ERD is incomplete**, list other data the database should store & adjust your design to incorporate these additions.

2.2.4.5. Export ERD **to PNG** and insert picture to your Report (Menu/Export/PNG…).

2.2.5. Make a Publish Link to ERD and insert link-code to your Report.

2.2.5.1. Make a **Publish Link** to ERD for App.diagrams.net (File/Publish/Link… - Include a copy of my diagram/Create/Copy).

2.2.5.2. Make a **Publish Link** to ERD for Lucid.co (Menu/Share/Shareable link - On; Any logged in user - View).

2.2.6. Create Database Scheme on text notation.

2.2.6.1. **Show** entity names, attributes, primary keys, foreign keys, for each entity.

2.2.6.2. For each attribute, **determine** its domain of values, whether Null is an acceptable value, and, if acceptable, what Null indicates.

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3. Lab Report.

3.1. Report Blank.

The report is provided electronic form with Report Blank Form (docx).

The report includes:

1. Description of the Your Subject Area variant.
2. Assumptions and restrictions.
3. Basic Concept Model. ERD on Chen's notation with App.diagrams.net site.
4. Keys Concept Model. ERD on Crow's Foot notation with Lucid.co site.
5. Publish Links to ERD.
    a) Link to ERD for App.diagrams.net site.
    b) Link to ERD for Lucid.co site.
6. Databases Scheme on text notation.

3.2. Graduation.

Grade on 10 points: correctly make of all points.

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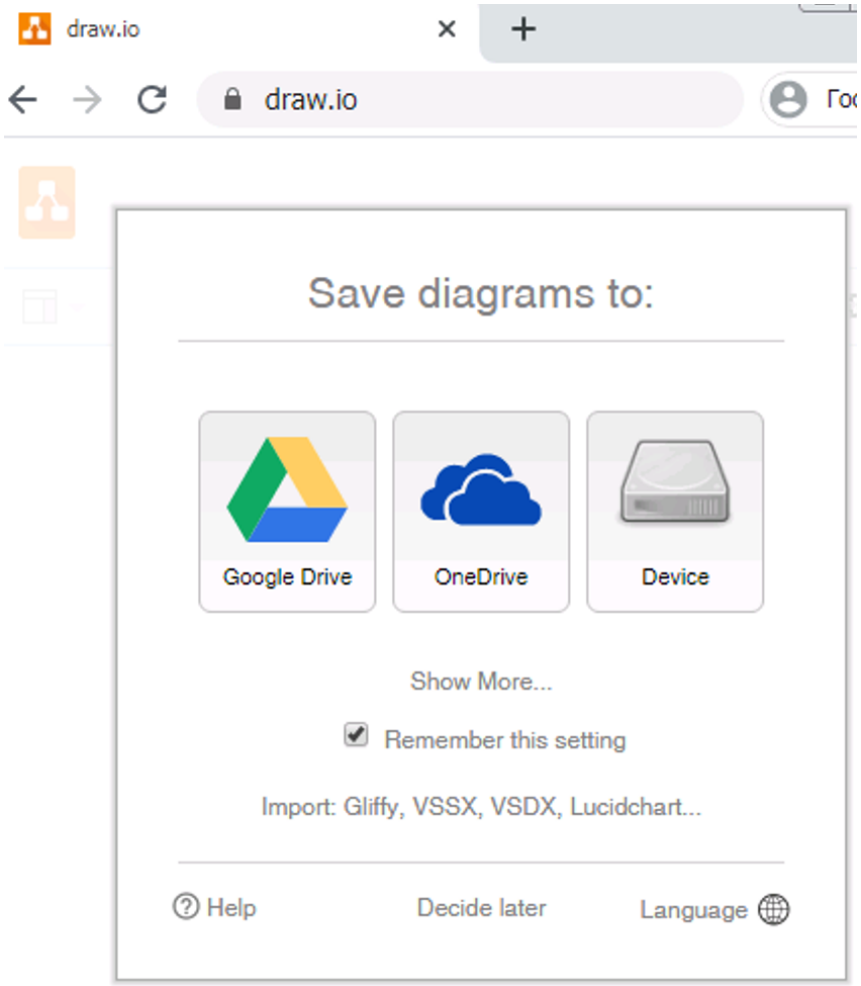
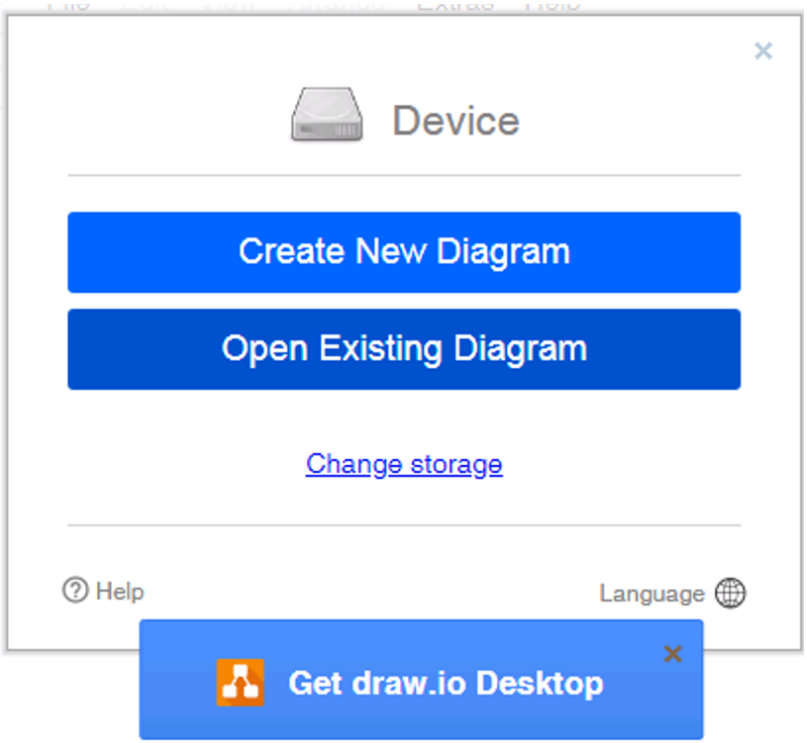
4. Lab Guidelines.

4.1. Register on App.diagrams.net site

4.1.1. Go to the https://app.diagrams.net/ page.
Select place of diagram saving: Device.



4.1.2. Select Create New Diagram
(or Open Existing Diagram)



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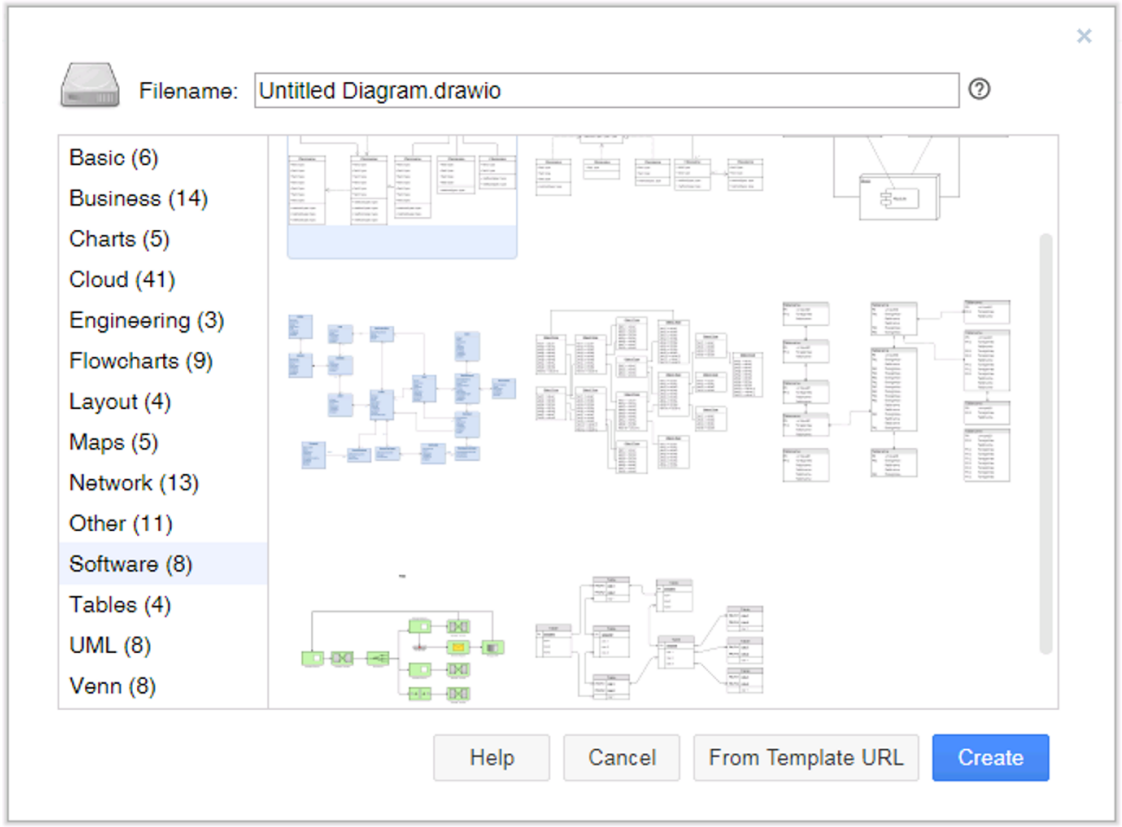
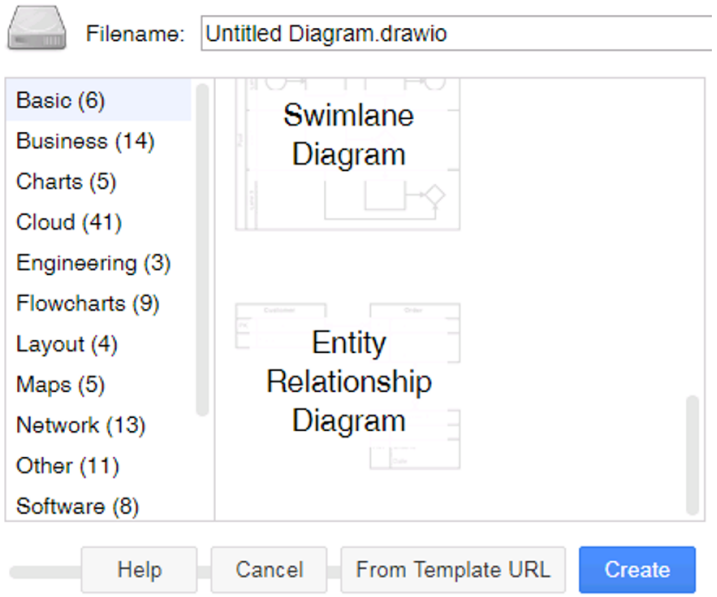
4.1.3.a. Select Template
Basic → Entity Relationship Diagram→ Create



4.1.3.b. Select Template
Software → database…→ Create



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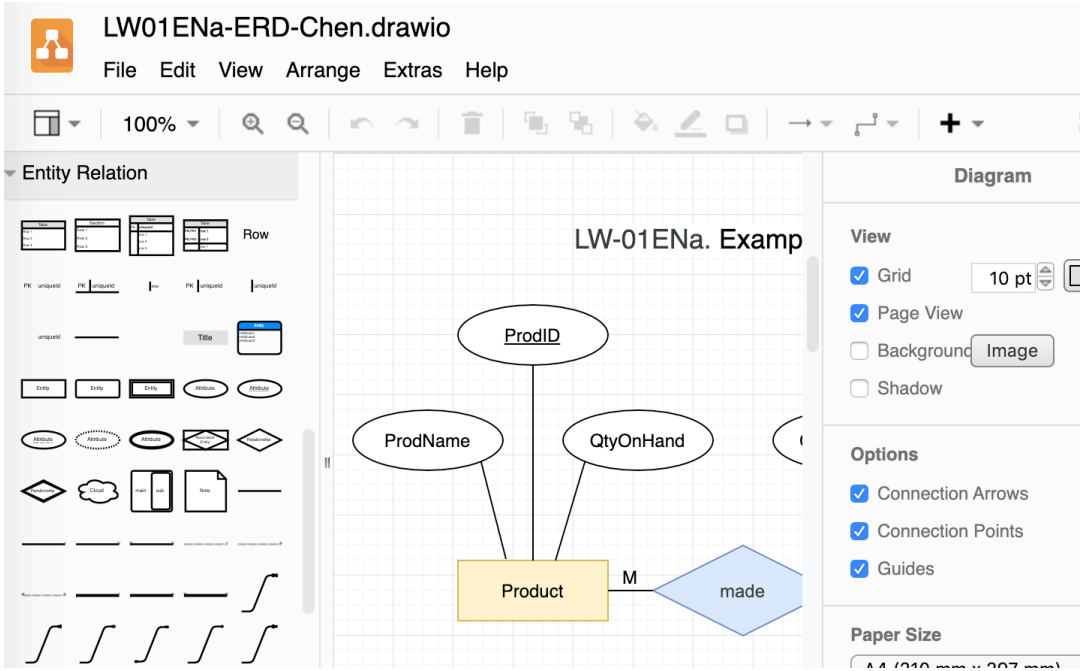
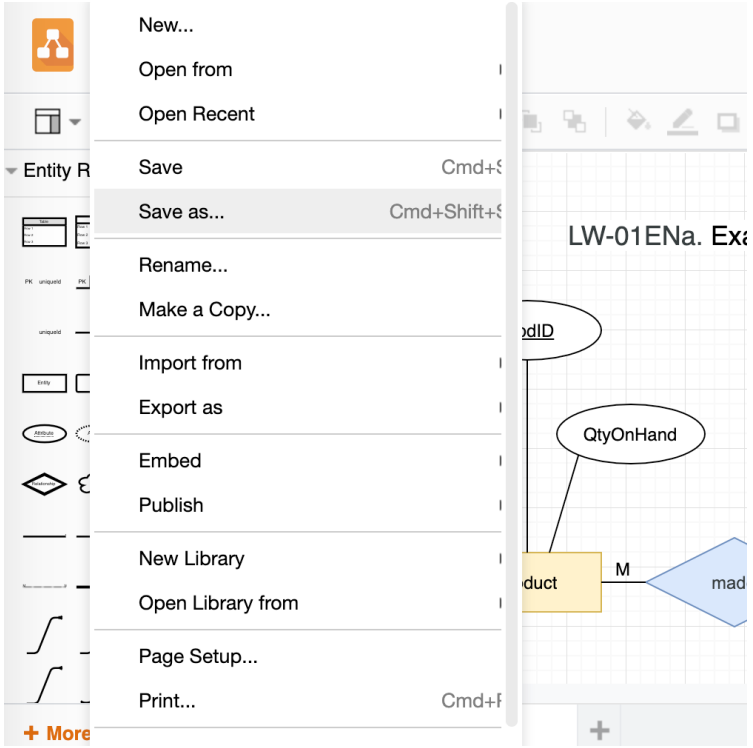
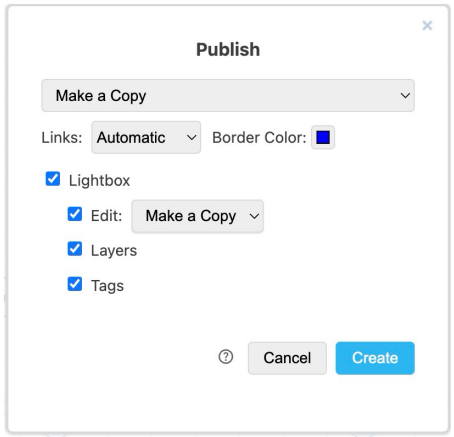
4.1.4. Create ERD with Entity Relation tools using



4.1.5. Save ERD with File→ Save as..



4.1.6. File→Publish→Link…→Create→Copy



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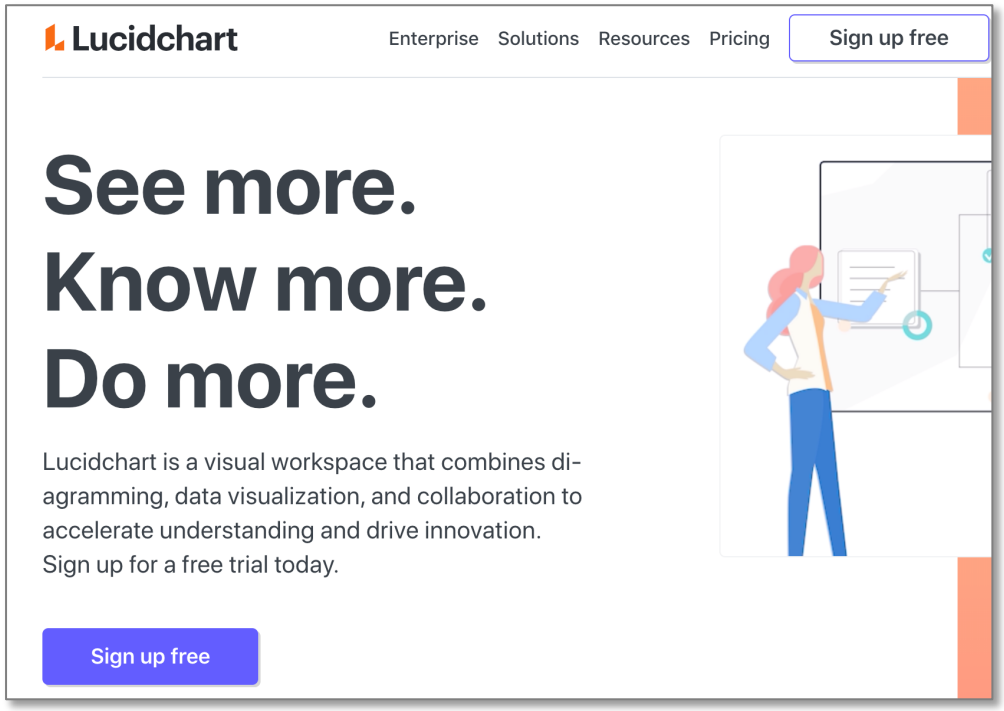
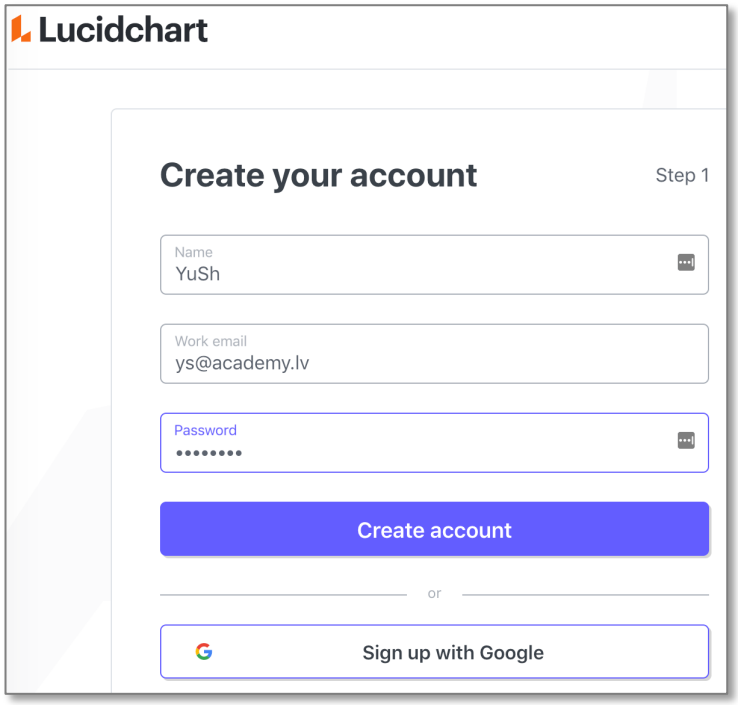
4.2. REGISTER ON LUCID.CO SITE

4.2.1. Go to the https://www.lucid.co/ page and select “Sign up free”



4.2.2. Create your free account



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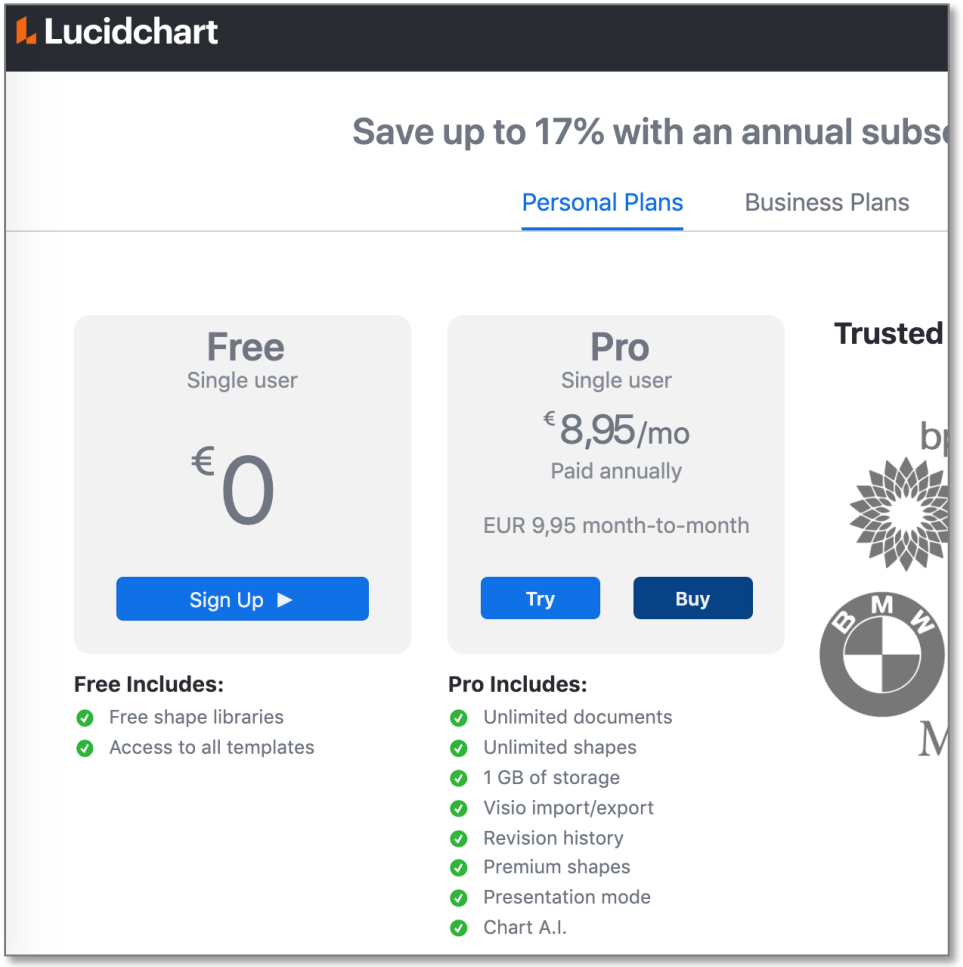
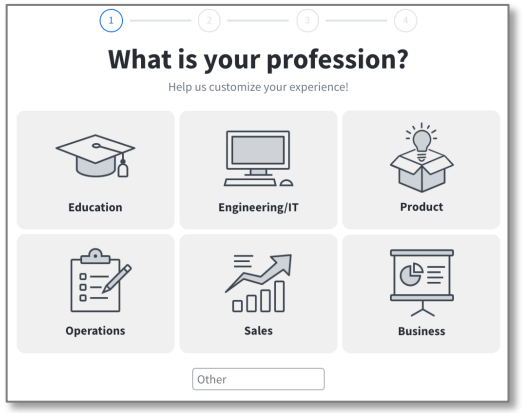
4.2.3. Select “Personal Plans” and “Free”

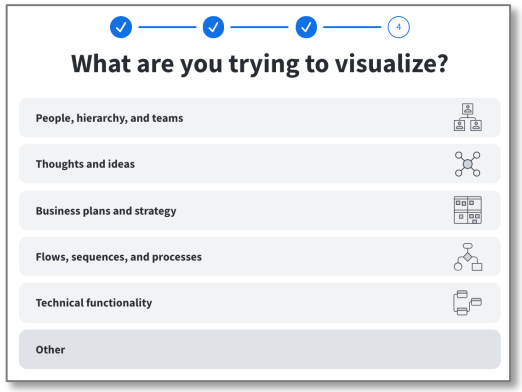
Restrictions of free account:

- 25MiB;
- 3 active documents with 60 objects per every document;
- no Import;
- unlimited collaborators.



4.2.4. Customize your experience





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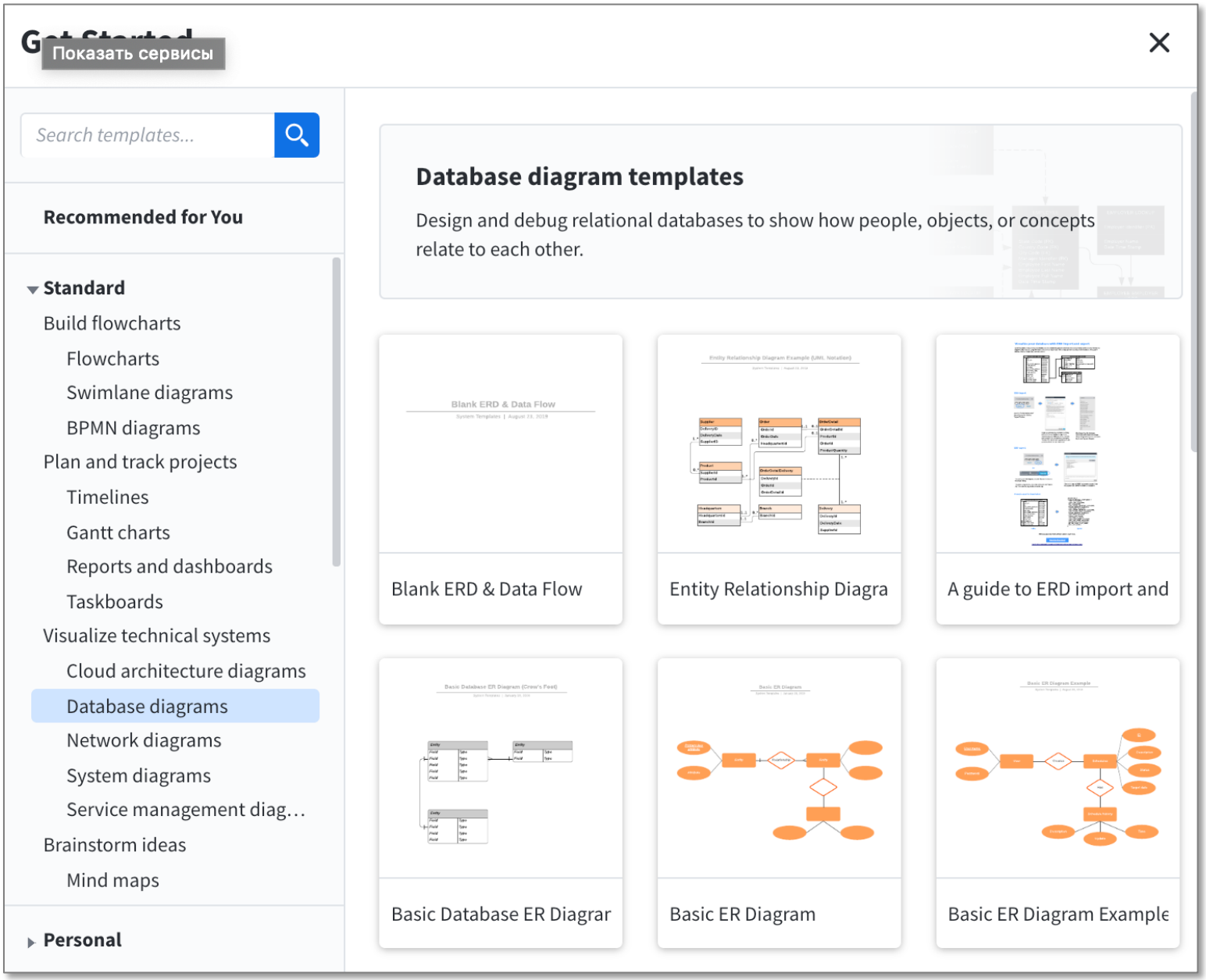
4.2.5. Select “Database diagrams” → “Entity Relationship Diagram”, → “Create Document”



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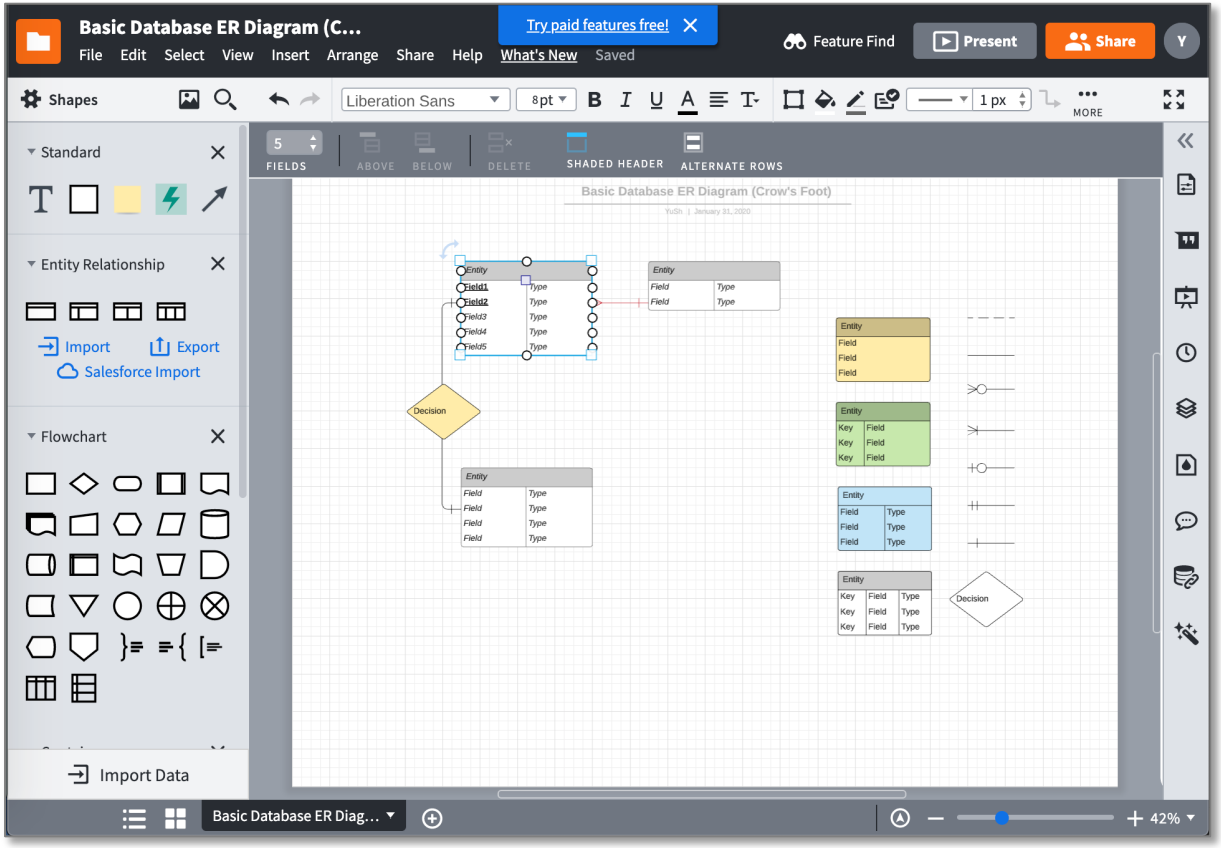
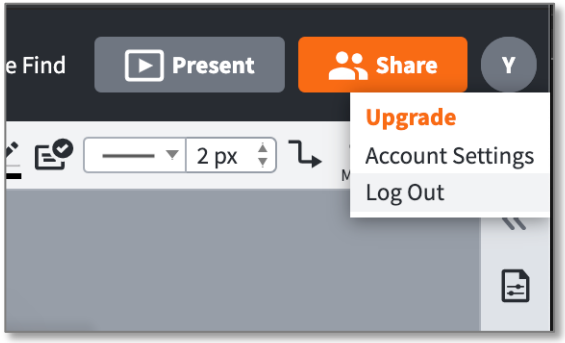
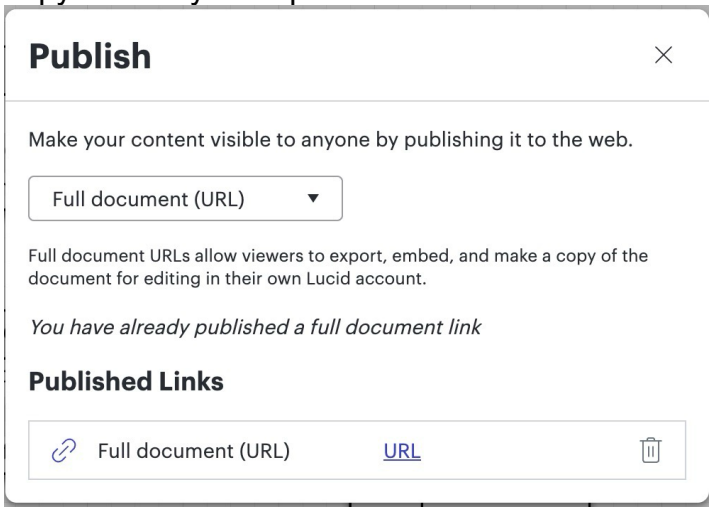
4.2.6. Create, Save (Menu→File→Move To..) and Export (Menu→Export→PNG)diagram



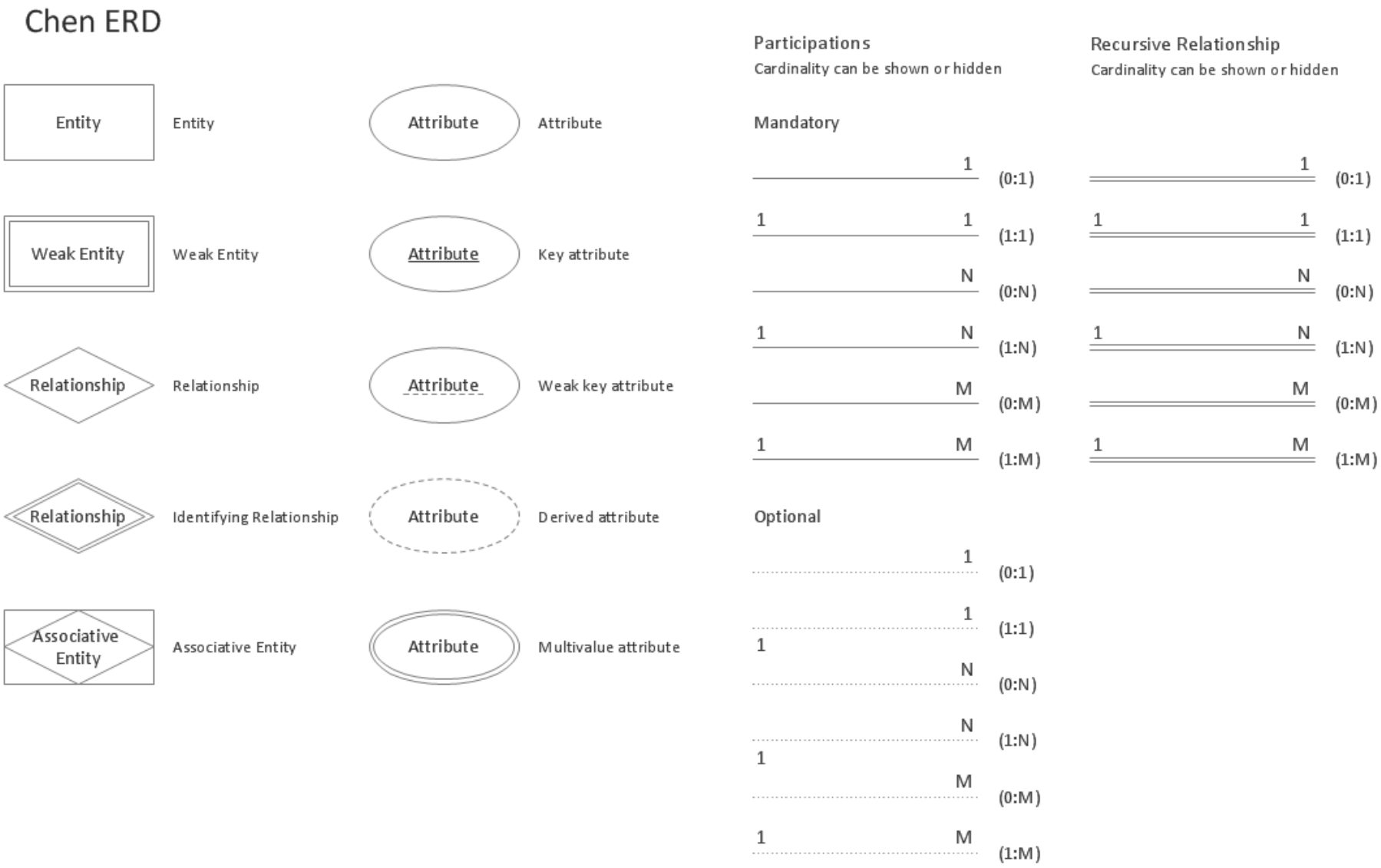
4.2.7. For exit from your account select Log Out on Right-Up corner



2.2.5.7. Create Share Link. Share → Publish and copy URL to your report



4.3. RECOMMENDATION FOR USING ERD NOTATIONS.



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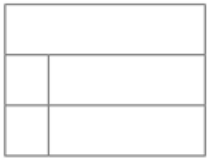
Crow's Foot ERD

Entity
(with no attributes)

Entity
(with attributes field)

Entity
(attributes field with columns)



Entity
(attributes field with columns and variable number of rows)

Relationships
(Cardinality and Modality)

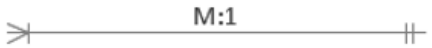
Zero or More

One or More

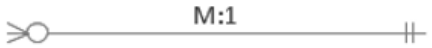
One and only One

Zero or One

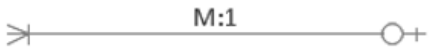
Many - to - One



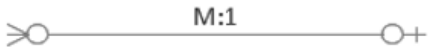
a one through many notation on one side of a relationship and a one and only one on the other



a zero through many notation on one side of a relationship and a one and only one on the other



a one through many notation on one side of a relationship and a zero or one notation on the other



a zero through many notation on one side of a relationship and a zero or one notation on the other

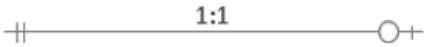
Many-to-Many

a zero through many on both sides of a relationship

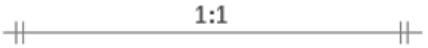
a one through many on both sides of a relationship

a zero through many on one side and a one through many on the other

One - to - One



a one and only one notation on one side of a relationship and a zero or one on the other



a one and only one notation on both sides

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5. Variants of Description of the Subject Area.

0. Manufacture.

A manufacturing company produces products. The following product information is stored: product name, product ID and quantity on hand. These products are made up of many components. Each component can be supplied by one or more suppliers. The following component information is kept: component ID, name, description, suppliers who supply them, and products in which they are used.

1. Chemistry Department.

A chemistry department wants to have a database of all chemicals in the stockroom. The information includes the name, molecular formula, amount on hand, date purchased, supplier, and supplier contact information.

2. Space Agency.

A space agency wants to develop a database of all satellites that humans have launched into space. Data includes the satellite identification, date of launch, destruction date, purpose, maximum orbital altitude, launching location, launching agency, and contact information for agency.

3. Environmental Agency.

An environmental agency wants to catalogue all the plants in an area that is susceptible to acid rain. Data should include genus, species, quantity, date, quadrant identification number, quadrant location, average altitude of quadrant, and botanist.

4. Consulting company.

Imagine that you work in a consulting company that needs to monitor the execution of orders of its clients. The company has many customers and for each of them zero, one or several orders are executed. You will need to take into account the usual information in such cases - the name of the client, his address, phone numbers, description of the order, the deadline, mark of execution, the announced price, who is working on the order (this can be one or more consultants, each of which can participate in different projects). Your management wants to receive various reports: who is working on a specific order, what orders were carried out for a given client, what consultants a particular consultant is working on, what is the profit on orders completed in the last quarter, etc.

Hint: “order” and “consultant” are two entities between which there is a relationship.

5. Psychological Study.

A psychological study requires participants to answer a number of questions related to personality. The database should store the multiple choice answers (A, B, C, D) to the questions and information about each participant, such as participant id, age, and sex. The database should compute a score based on the individual's answers. The score indicates one of 8 personality categories. Each category has an identifying name and specifies that each of three qualities is either true or false.

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6. Radio Station.

Imagine that you are working on a large radio station and want to tidy up a collection of CDs that are stored in special numbered boxes that have numbered cells (so 12-34 means 34 disk of 12 boxes). Sometimes you need to find a specific artist, sometimes you need to pick up disks by style (jazz, rock, pop, etc.), year of release, sometimes you need to find discs containing a specific musical composition. In addition, the leadership of the radio station wants to know the cost of each disc, how often the composition of one artist or another or one genre sound on the air.

Hint: “disk” and “composition” are two entities between which there is a relationship.

7. Stock broker.

Imagine that you manage several packages of client stocks, in each of which from 10 to 100 different stocks. You collect stock prices every day and save this information to conduct various market analyzes. Some of your customers have a demand - what specific industries are they interested in (for example, some of them may say that he is interested in stocks of oil and tobacco enterprises). You need to store information on dividends for each type of stocks, print reports for each client on the status of his package, as well as data on the prices of individual stocks, information on stocks of enterprises belonging to different industries.

Tips: do not select the entity “stock portfolio”, the corresponding table in the database schema would appear when you converted your E-R chart to the relational database schema. Instead, consider a relationship called “ownership”. In the same way, consider the interests of clients with the help of the relationship of “interest”, and not with the help of a separate entity.

8. Auto repair workshop.

In order to track the background of each car, a system for recording inspections and repairs is created in the auto repair shop of a large motor transport enterprise. For each brand of car, there is a certain set of operations that can be performed (inspection of individual components, replacement of parts, etc.). Some of these operations are performed when servicing cars, when they call at the workshop. You want to receive information about what operations were done for each car and when it happened, how often a particular brand of cars breaks, what parts are required more often than others, etc.

Tips: do not highlight the entity "inspection results" or "replacement parts". "Operation" and "service" are two entities with which honey is related. Under the service refers to the operations performed with the car in the workshop.

9. Art Gallery.

Design an E-R Diagram for an Art Gallery. Gallery keeps information about "Artist" their Name, Birthplace, Age & Style of Art about "Art Work," Artist, the year it was made, Unique title, Type of art & Prices must be stored. The piece of artwork is classified into various kind like Poetess, Work of the 19th century still life, etc. Gallery keeps information about Customers as their Unique name, Address, Total amount of Dollar, they spent on Gallery and liking of Customers.

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10. Construction Project Company.

Company organized into department. Each department has unique name and a particular employee who manages the department. Start date for the manager is recorded. Department may have several locations. A department controls a number of project. Projects have a unique name, number and a single location. Company's employee name, ssno - social security number, address, salary, sex and birth date are recorded. An employee is assigned to one department, but may work for several projects (not necessarily controlled by her department). Number of hours/week an employee works on each project is recorded. Employee's dependent (children and other) are tracked for health insurance purposes (dependent name, birthdate, relationship to employee).

11. Hairdressing Network.

You are dealing with a hairdressing system, the management of which decided to automate the processes of reception, accounting and settlement with visitors to collect information about the activities of the enterprise and improve decision-making and service. To do this, it is proposed to install a computer at each hairdresser at the entrance, which plays the role of a cash register terminal and registers the name, phone, client address provided to him when visiting the service (haircut, styling, painting, manicure, etc.) and their prices, to which of masters, he got to the service, arrival time and the start time of the service. In order not to force the client to call the address at each visit, it was decided during the second visit to ask only the phone number, then to quickly select his record from the results of the query to the database. Turning to the databases of hairdressing salons, the management wants to have information on which hairdressing salons from which areas of the city people come from, what is the recent revenue, what is the intensity of visits at different times of the day, how long clients have to wait for their turn.

Hint: "service" and "visit" are two entities between which there is a relationship.

12. Human Resources.

Suppose, in a large enterprise with a large number of departments and employees, it was decided to create a database for personnel records in order to better monitor the state of affairs. The database should contain such ordinary things as the name, number and series of the passport, dates of birth and employment, address, phone number, career advancement (i.e. the sequence of appointments), salary, list of children, the name of the unit, skills (knowledge of languages, computer programs, work specialties, etc.). We want to quickly receive various kinds of reference reports: about each employee - containing all the information about him, summary reports on various indicators - reviews of wage levels for different departments and positions, lists of employees who will retire next year, lists that speak a specific language or a specific computer program, etc.

Hint: "employee" and "skill" are two entities between which there is a relationship.

13. Railway Project.

You can keep the record of stations, trains, their time of arrival and departure (train schedules), and connecting stations through this project. You can also assign each train a unique ID.

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14. Warehouse

The company has several warehouses for temporary storage of stocks of a large number of different types of components. In order to collect and use information about the operation of warehouses, quickly find and evaluate stocks of parts, an accounting system is created. Each of the components can be stored in different warehouses. Each warehouse has numbered storage locations that can be occupied by any one of the types of components. In each such place at each moment there may be a different number of parts, however, they all have the same capacity. When a batch of parts arrives at the enterprise (a certain amount of a certain type of component arrives on a certain day), it is distributed among warehouses and storage locations. Released storage locations may be occupied by some other type of component. Parts are also removed from the warehouse in batches. You want to quickly receive information about the dynamics of deliveries and withdrawals from the warehouse, where and how many parts of each type are available, what is available at a particular warehouse, etc.

Hint: central place allot the entity "storage location".

15. Car-insurance company.

Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car owner has associated with it zero to any number of recorded accidents. The cost of insurance depends on the age of the owner, the number of incidents, type of insurance, type and age of the car.

16. Library

The main activities of the library include accounting and storage of the library stock; readers and staff working with catalogs; collecting orders for books, magazines, newspapers, video and audio disks; issuing readers and receiving storage units.

17. Delivery company MyDeliv.

The organization carries out courier delivery of goods. The organization's branches - points of acceptance and issue of shipments - are located in several cities. To send goods, the client can personally come to the organization's branch and send the goods after paying the cost of delivery; or call a courier who will pick up the parcel after paying for the courier services and the delivery service. The cost of courier services is fixed. The cost of delivery is different for each pair of cities. The goods can be delivered to the point of issue or to the address received. The recipient and sender can have several addresses for receiving goods for delivery and receipt.

18. Advanced training Courses.

Advanced training courses are organized for university employees. The course is also taught by a university employee. The course is characterized by a start date, end date, and name. Each university employee can attend several courses. Upon completion of the course, a certificate is issued.

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19. Scooter rental.

The scooter rental company has branches in several cities. Each branch has a fleet of several hundred scooters of three different brands. To rent scooters, customers use a mobile application, which specifies the customer's name and a bank card linked to the application. Each type of scooter has its own cost per hour of rental, which also depends on the city where the branch is located. The information system takes into account the duration of the rental, the cost of the service (after returning the scooter).

20. Pizzeria “Tortilla”.

The pizzeria delivers pizzas to customers who order them by phone or online. There is a limited selection of pizza types. Each type of pizza has its own set of ingredients for production and cost. The order is delivered by courier to the address specified by the customer. The order includes one or more pizzas of different types. When ordering more than 3 pizzas, delivery is free.

21. Session.

Students, examiners (teachers), grade sheets, exams, tests.

22. Furniture (meubles – fr.) store “Korobka”.

The online furniture store allows the buyer to select a product on the website, pay for it, order delivery of the product, if necessary, pay for it on the website (payment method) or after delivery, order assembly of the product.

23. A&B Hotel Chain.

A hotel chain consists of many hotel branches all over the country. Each hotel has different rooms. Each room has its own price depending on the type. A&B stores information about its guests so that they can send them letters and emails about special offers. Reservation information must be stored. This information includes the date the guest booked the room and the date of departure. The number of days must be known.

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