# Database Basics MS SQL Exam – 22 Oct 2017

Exam problems for the [“Database Basics” course @ SoftUni](https://softuni.bg/courses/databases-basics-ms-sql-server).

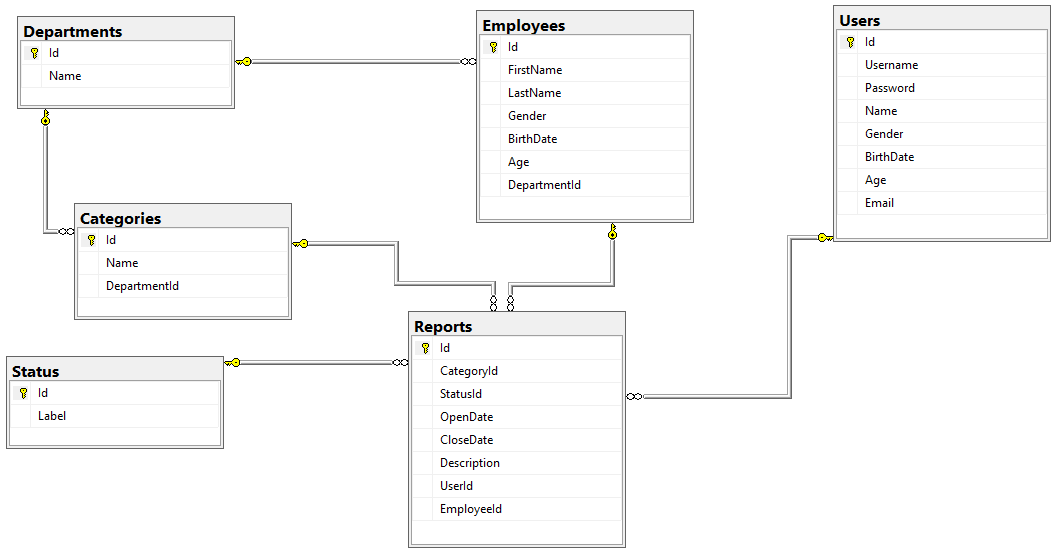
Submit your solutions in the SoftUni Judge system at <https://judge.softuni.bg/Contests/819>

# Report Service

*--Mrs. F.Y, the city’s mayor, came up with the idea to create an online platform where all the citizens can report about different problems and a special organization will work to resolve all the incoming reports. This organization has a few departments each of which is responsible for a set of problem’s categories in which users can submit a report. In each department there are employees who get assigned to a report. Of course, this huge platform needs a reliable database to store and process the information and Mrs. Y has asked for the best specialist in this area. That’s why you got chosen! Congratulations and good luck!*

# Section 1. DDL (30 pts)

You have been given the E/R Diagram of the Report Service:



Crеate a database called **ReportService**. You need to create **6 tables**:

* **Users** – contains information about the people who submit reports
* **Reports** - contains information about the submitted problems
* **Employees** – contains information about the people employees who work on reports
* **Departments** – contains information about the departments
* **Categories** – contains information about categories inside the departments.
* **Status** - contains information about the possible statuses of a report

**Users**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| Id | **Integer** from **0** to **2,147,483,647** | Unique table **identificator**, **Identity** |
| Username | **String** up to 30 symbols, Unicode | **NULL** is **not** allowed, **Unique** values only |
| Password | **String** up to 50 symbols, Unicode | **NULL** is **not** allowed |
| Name | **String** up to **50** symbols, Unicode |  |
| Gender | **Character** with **exactly** **1** symbol | Could be: '***M***' or '***F*'** |
| BirthDate | DateTime |  |
| Age | **Integer** from **0** to **2,147,483,647** |  |
| Email | **String** up to **50** symbols, Unicode | **NULL** is **not** allowed |

**Departments**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| Id | **Integer** from **0** to **2,147,483,647** | Unique table **identificator**, **Identity** |
| Name | **String** up to **50** symbols, Unicode | **NULL** is **not** allowed |

**Employees**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| Id | **Integer** from **0** to **2,147,483,647** | Unique table identificator, **Identity** |
| FirstName | **String** up to **25** symbols, Unicode |  |
| LastName | **String** up to **25** symbols, Unicode |  |
| Gender | **Character** with **exactly** 1 symbol | Could be: '***M***' or '***F***' |
| BirthDate | DateTime |  |
| Age | **Integer** from **0** to **2,147,483,647** |  |
| DepartmentId | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Relationship with table Departments |

**Categories**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| Id | **Integer** from **0** to **2,147,483,647** | Unique table **identificator**, **Identity** |
| Name | **String** up to **50** symbols | **NULL** is **not** allowed |
| DepartmentId | **Integer** from **0** to **2,147,483,647** | Relationship with table Departments |

**Status**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| Id | **Integer** from **0** to **2,147,483,647** | Unique table identificator, **Identity** |
| Label | **String** up to **30** symbols | **NULL** is **not** allowed |

**Reports**

|  |  |  |
| --- | --- | --- |
| **Column Name** | **Data Type** | **Constraints** |
| Id | **Integer** from **0** to **2,147,483,647** | Unique table identificator, **Identity** |
| CategoryId | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Relationship with table Categories |
| StatusId | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Relationship with table Status |
| OpenDate | DateTime | **NULL** is **not** allowed |
| CloseDate | DateTime |  |
| Description | **String** up to **200** symbols |  |
| UserId | **Integer** from **0** to **2,147,483,647** | **NULL** is **not** allowed, Relationship with table Users |
| EmployeeId | **Integer** from **0** to **2,147,483,647** | Relationship with table Employees |

## Database design

Submit all of yours **create** **statements** to Judge (only creation of tables).

# Section 2. DML (10 pts)

**Before you start you have to import “DataSet-ReportService.sql”. If you have created the structure correctly the data should be successfully inserted.**

In this section, you have to do some data manipulations:

## Insert

Let’s **insert** some sample data into the database. Write a query to add the following records into the corresponding tables. All Id’s should be auto-generated. Replace names that relate to other tables with the appropriate ID (look them up manually, there is no need to perform table joins).

**Emlpoyees**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **FirstName** | **LastName** | **Gender** | **Birthdate** | **Department Id** |
| Marlo | O’Malley | M | 9/21/1958 | Infrastructure |
| Niki | Stanaghan | F | 11/26/1969 | Emergency |
| Ayrton | Senna | M | 03/21/1960 | Event Management |
| Ronnie | Peterson | M | 02/14/1944 | Event Management |
| Giovanna | Amati | F | 07/20/1959 | Roads Maintenance |

**Reports**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **CategoryId** | **StatusId** | **OpenDate** | **CloseDate** | **Description** | **UserId** | **EmployeeId** |
| Snow Removal | waiting | 04/13/2017 |  | Stuck Road on Str.133 | 6 | 2 |
| Sports Events | completed | 09/05/2015 | 12/06/2015 | Charity trail running | 3 | 5 |
| Dangerous Building | in progress | 09/07/2015 |  | Falling bricks on Str.58 | 5 | 2 |
| Streetlight | completed | 07/03/2017 | 07/06/2017 | Cut off streetlight on Str.11 | 1 | 1 |

## Update

Switch **all report’s** **status** to “**in progress**” where it is **currently** “**waiting**” for the “**Streetlight**” **category** (look up the category ID and status ID’s manually, there is no need to use table joins).

## Delete

Delete **all reports** who have a **status** “**blocked**”.

# Section 3. Querying (40 pts)

**You need to start with a fresh dataset, so recreate your DB and import the sample data again (DataSet\_ReportService.sql).**

**If not specified the ordering will be ascending.**

## Users by Age

Select all **Usernames** with their **age** ordered by **age** (**ascending**) then by **username** (**descending**).

Required columns:

* Username
* Age

### Example:

|  |  |
| --- | --- |
| **Username** | **Age** |
| 5omarkwelleyc | 19 |
| Bkaasg | 21 |
| dfinicj5 | 24 |
| … | … |

## Unassigned Reports

Find all **reports** that **don’t** have an **assigned employee**. **Order** the results by **open date** in **ascending** order, then by **description** (**ascending**).

Required columns:

* Description
* OpenDate

### Example:

|  |  |
| --- | --- |
| **Description** | **OpenDate** |
| Art exhibition on July 24 | 2014-12-17 00:00:00.000 |
| Stuck Road on Str.133 | 2015-06-20 00:00:00.000 |
| Burned facade on Str.560 | 2015-08-26 00:00:00.000 |
| … | … |

## Employees & Reports

Select **only employees** who **have** an **assigned** **report** and show **all reports** of **each** found **employee**. Show the open date column in the format “**yyyy-MM-dd**”. Order them by **employee id** (ascending) **then** by **open date** (ascending) and then by **report Id** (again ascending).

Required columns:

* FirstName
* LastName
* Description
* OpenDate

### Example:

|  |  |  |  |
| --- | --- | --- | --- |
| **FirstName** | **LastName** | **Description** | **OpenDate** |
| Marlo | O'Malley | Fallen streetlight columns on Str.14 | 2017-09-12 |
| Gregory | Stithe | Stuck Road on Str.14 | 2017-04-13 |
| Humphrey | Tamblyn | Burned facade on Str.793 | 2016-07-20 |
| … | … | … | … |

## Most reported Category

Select **ALL categories** and **order** them **by** the number of **reports** **per category** in **descending** order and then **alphabetically** by name.

Required columns:

* CategoryName
* ReportsNumber

### Example:

|  |  |
| --- | --- |
| **CategoryName** | **ReportsNumber** |
| Recycling | 8 |
| Snow Removal | 5 |
| Streetlight | 4 |
| … | … |

## Employees in Category

Select **ALL categories** and the number of employees in each category and **order** them **alphabetically** by category name.

Required columns:

* CategoryName
* Employees Number

### Example:

|  |  |
| --- | --- |
| **CategoryName** | **Employees Number** |
| Animal in Danger | 3 |
| Art Events | 5 |
| Dangerous Building | 1 |
| … | … |

## Users per Employee

Select **all** **employees** and show how many **unique** users each of them have served to.

Required columns:

* Employee’s name - Full name consisting of FirstName and LastName and a space between them
* User’s number

Order by Users Number **descending** and then by Name **ascending**.

### Example:

|  |  |
| --- | --- |
| **Name** | **Users Number** |
| Bron Ledur | 3 |
| Adelind Benns | 2 |
| Dick Wentworth | 2 |
| … | … |

## Emergency Patrol

Select **all** **reports** which **satisfy** **all** the following criteria:

* are **not** **closed** yet (they don’t have a CloseDate)
* the **description** is longer than **20 symbols** and the word “**str” is mentioned anywhere**
* are **assigned** to one of the **following** **departments**: “Infrastructure”, “Emergency”, “Roads Maintenance”

**Order** the results by **OpenDate** (ascending), **then** by **Reporter’s Email** (ascending)and then by **Report Id** (ascending).

Required columns:

* OpenDate
* Description
* Reporter Email

### Example:

|  |  |  |
| --- | --- | --- |
| **OpenDate** | **Description** | **Reporter Email** |
| 2015-06-20 00:00:00.000 | Stuck Road on Str.133 | bkaasg@g.co |
| 2015-08-26 00:00:00.000 | Burned facade on Str.560 | dpennid@arizona.edu |
| 2015-11-17 00:00:00.000 | Gigantic crater ?n Str.19 | ealpine0@squarespace.com |
| … | … | … |

## Birthday Report

Select **all categories** in which users have **submitted** a **report** on **their birthday**. Order them by name **alphabetically.**

Required columns:

* Category Name

### Example:

|  |
| --- |
| **Category Name** |
| Dangerous Trees |
| Homeless Elders |
| Snow Removal |

## Numbers Coincidence

Select all **unique usernames** which:

* **starts** with a **digit** and have reported in a **category** with **id equal** to the **digit**

**OR**

* **ends** with a **digit** and have reported in a **category** with **id equal** to the **digit**

Required columns:

* Username

Order them **alphabetically**.

### Example:

|  |
| --- |
| **Username** |
| 1qiskowf |
| 5omarkwelleyc |
| fdenrico3 |
| … |

## Open/Closed Statistics

Select **all** **employees** whohave **at** **least** **one** assignedclosed **or** openreport **through** year **2016** and **their total sum**. Open reports don’t have a **CloseDate**. Reports that have been **opened before** 2016 but were **closed in** 2016 are counted as **closed only**! Order by **Name** (ascending), and then by employee Id

Required columns:

* Name - name - Full name consisting of FirstName and LastName and a space between them
* Closed /Open reports number

### Example:

|  |  |
| --- | --- |
| **Name** | **Closed Open Reports** |
| Dick Wentworth | 1/1 |
| Eldon Gaze | 0/1 |
| Hewet Juschke | 0/1 |
| … | … |

## Average Closing Time

Select **all** **departments** that have been reported in and **the average time** for **closing** a **report** for each department rounded to the closest integer part**.** If there is **no information** (e.g. none closed reports) about any **department** fill in the Average Duration column “**no info**”.

Required columns:

* Department Name
* Average Duration - in days

Order them by department name.

### Example:

|  |  |
| --- | --- |
| **Department Name** | **Average Duration** |
| Aged Care | no info |
| Animals Care | 17 |
| Emergency | no info |
| … | …. |

## Favorite Categories

Select **all** **departments** with **their categories** where **users** have **submitted** a **report**. Show the **distribution** of reports **among** the **categories** of each department in **percentages** without decimal part.

Required columns:

* Department Name
* Category Name
* Percentage

Order them by **department** name, then by **category** name and **then** by **percentage** (all in **ascending** order).

### Example:

|  |  |  |
| --- | --- | --- |
| **Department Name** | **Category Name** | **Percentage** |
| Aged Care | Homeless Elders | 100 |
| Animals Care | Animal in Danger | 75 |
| Animals Care | Street animal | 25 |
| … | … | … |

# Section 4. Programmability (14 pts)

## Employee’s Load

Create a **user defined function** with the name **udf\_GetReportsCount(@employeeId, @statusId)** that receives an **employee’s Id** and a **status Id** returns the sum of the reports he is assigned to with the given status.

Parameters:

* Employee’s Id
* Status Id

### Example usage:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Query** | | | | |
| **SELECT** **Id,** **FirstName, Lastname, dbo.udf\_GetReportsCount(Id, 2) AS ReportsCount**  **FROM Employees**  **ORDER BY Id** | | | | |
| **Id** | **FirstName** | **LastName** | **ReportsCount** |
| 1 | Marlo | O'Malley | 0 |
| 2 | Nolan | Meneyer | 0 |
| 3 | Tarah | McWaters | 0 |
| … | … | … | … |

## Assign Employee

Create a **user defined stored procedure** with the name **usp\_AssignEmployeeToReport(@employeeId, @reportId)** that receives an **employee’s Id** and a **report’s Id** and assigns the employee to the report **only if** the department of the employee and the department of the report’s category are the same. If the assigning is not successful **rollback** any changes and throw an **exception** with message: “Employee doesn't belong to the appropriate department!”.

Parameters:

* Employee’s Id
* Report’s Id

### Example usage:

|  |
| --- |
| **Query** |
| **EXEC usp\_AssignEmployeeToReport 17, 2;**  **SELECT EmployeeId FROM Reports WHERE id = 2** |
| **Response** |
| 17 |

## Close Reports

Create a **trigger** which changes the StatusId to “**completed**” of each report after a **CloseDate** is **entered** for the report.

### Example usage:

|  |
| --- |
| **Query** |
| **UPDATE Reports**  **SET CloseDate = GETDATE()**  **WHERE EmployeeId = 5;** |
| **Response** |
| (1 row affected)  (1 row affected) |

# Section 5. Bonus (10 pts)

## Categories Revision

Select **all categories** which have **reports** with **status** “**waiting**” or “**in** **progress**” and show their **total number** in the column “**Reports Number**”. In the **third** **column** fill the **main** status **type** of reports for the category (e.g. **2** reports with status “**waiting**” and **3** reports with status “**in progress**” **result** **in** value “**in progress**”). If they are equal just fill in “**equal**”. Order by category **Name**, then by **Reports Number** and then by **Main Status.**

Required columns:

* Category Name
* Reports Number
* Main Status

### Example:

|  |  |  |
| --- | --- | --- |
| **Category Name** | **Reports Number** | **Main Status** |
| Animal in Danger | 1 | in progress |
| Art Events | 2 | equal |
| Dangerous Building | 1 | waiting |
| … | … | … |