Note: in MS Word for Windows, to type symbols, click on INSERT menu, and at the far right of the Ribbon, click on **Symbol** to choose the symbol that you want such as (π ρ σ × ÷ ⋈ ⋉ ⋊ ⋈ ⟵ ∪ − ∩ ℱ ≠ ≤ ≥) (or copy from here).

For conditions, to make text appear slightly above (superscript) or below (subscript) your regular text, you can use keyboard shortcuts or use the icons on the HOME menu, under font panel.

1. Select the text or number that you want to make it superscript or subscript.
2. For superscript, press Ctrl, Shift, and the Plus sign (+) at the same time. For subscript, press Ctrl and the Equal sign (=) at the same time.

Q1- Student Enrolment

1. List the CNos of courses in which at least one student is enrolled.

   π (CNo)(Enrolled)

2. List the CNos of courses in which no student is enrolled.

   If we assume R1 is the set of all CNos in the "Course" table and R2 is the set of CNos in the "Enrolled" table , then

   R1- R2 is the set of CNos of courses in which no student is enrolled. We need also to consider the compatibility, so we need to have two relations with same number of attributes and same attribute types, so

   R1 ⟵ π (CNo)(Course)

   R2 ⟵ π (CNo) (Enrolled)

   Result ⟵ R1-R2

3. List the names of students and the names of courses they enrolled to.

   π (Student.name, Course.CName)(σ (Student.StudID= Enrolled.StudID AND Course.CNo = Enrolled.CNo) (Student ⋈ Enrolled ⋈Course))

4. List the StudID of students who are enrolled for 'Database Systems' or 'Analysis of Algorithms'.

   R1 ⟵ π (CNo) (σ(CName = 'Database Systems' OR CName = 'Analysis of Algorithm') (Course))

   Result ⟵ π (StudID) (R1 ⋈ R2)

5. List the StudID of students who are enrolled for both 'Database Systems' and 'Analysis of Algorithms

   R1 ⟵ π (StudID) (σ(CName = 'Database Systems')(Course))

   R2 ⟵ π (StudID) (σ(CName = 'Analysis of Algorithm')(Course))

   Result ⟵ R1 ⋂ R2

6. List the CNos of courses in which all students are enrolled.
   Let's assume R2 is the "Enrolled" table

R1 ⟵ π (StudID) (Student)

Result ⟵ $\pi(\text{CNo})(\text{Course}) \div (\pi(\text{CNo, StudID})(\text{Enrolled}) \bowtie \text{R1})$

7. List the CNos of courses in which all 'COMP' major students are enrolled.

R1 ⟵ π(StudID)(σ(major = 'COMP')(Student))

Result ⟵ π(CNo)(Course) ÷ (π(CNo, StudID)(R2) - R1)

Q2. COMPANY database provided to you.

1. Retrieve the names of all employees in department 5 who work more than 10 hours per week on the 'ProductX' project.

R1 ⟵ π(Pnumber)(σ(Pname = 'ProductX')(PROJECT))

R2 ⟵ R1 ⋈ WORKS_ON

R3 ⟵ σ(Hours > 10) (R2)

Result ⟵ R3 ⋈ (σ(Dnumber = 5) (DEPARTMENT ⋈ EMPLOYEE)

2. Find the names of employees who are directly supervised by 'Franklin Wong'.

R1 ⟵ π (Ssn) (σ (Fname = 'Franklin' AND Lname = 'Wong') (EMPLOYEE))

R2 ⟵ σ (Super_ssn = (R1)) (EMPLOYEE)

Result ⟵ π (Fname, Minit, Lname) (R2)

3. For each project, list the project name and the total hours per week (by all employees) spent on that project.

R1 ⟵ ρ (Pno)(WORKS_ON)

R2 ⟵ PROJECT ⋈ R1

Result ⟵ π (Pname, SUM(Hours)) (R2)

4. Retrieve the names of employees who do not work on any project.

R1 ⟵ EMPLOYEE ⋈ WORKS_ON

R2 ⟵ σ (Pno IS NULL) (R1)

Result ⟵ π (Fname, Minit, Lname) (R2)

5. For each department, retrieve the department name, and the average salary of employees working in that department.

R1 ⟵ EMPLOYEE ⋈ (Dno = Dnumber) (DEPARTMENT)

Result ⟵ π (Dname, AVG(Salary)) (R1)

6. Retrieve the average salary of all female employees.

R1 ⟵ σ (Sex = ‘F’) (Employee)

Result ⟵ AVG (Salary) (R1)

7. Retrieve the names and addresses of all employees who work on at least one project located in Houston but whose department has no location in Houston.

R1 ⟵ π (Pnumber) (σ (Plocation = ‘Houston’) (Project))

R2 ⟵ π (Essn) (WORKS_ON ⋈ (Pno = Pnumber) (R1))

R3 ⟵ π (Dnumber) (σ (Dlocation = ‘Houston’) (DEPARTMENT))

R4 ⟵ π (Ssn)(EMPLOYEE) - π (Ssn)(EMPLOYEE ⋈ (Dnum=Dnumber)(R3))

Result ⟵ π (Fname, Minit, Lname, Address)(EMPLOYEE ⋈ (Ssn =Essn)(R2 ⋈ (Ssn= R4)))

8. Retrieve the last names of all department managers who have no dependents

R1 ⟵ π (Essn) (DEPENDENT)
R2 ⟵ π (Mgr_ssn) (DEPARTMENT)
R3 ⟵ R1 ⋈ R2
R4 ⟵ π (Mgr_ssn)(DEPARTMENT) -R3
Result ⟵ π (Lname) (EMPLOYEE ⋈ (Ssn =Mgr_ssn) (R4))