# The Relational Concepts

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A Relation is a mathematical concept based on the ideas of sets

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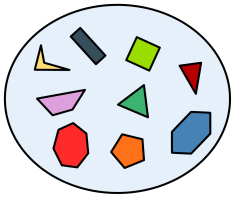
# What is a set?

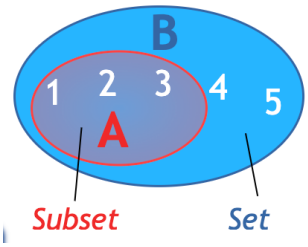
Simply, it's **a collection**.
We specify a common property among "things" (we define this word later) and then we gather up all the "things" that have this common property.

Example 1,
- the items you wear: hat, shirt, jacket, pants, and so on. This is known as a **set**.

Example 2:

- {2, 3, 6, 828, 3839, 8827}
- {4, 4, 6, 10, 22}= {4, 6, 10 ,22 }
  ( duplicates are ignored)



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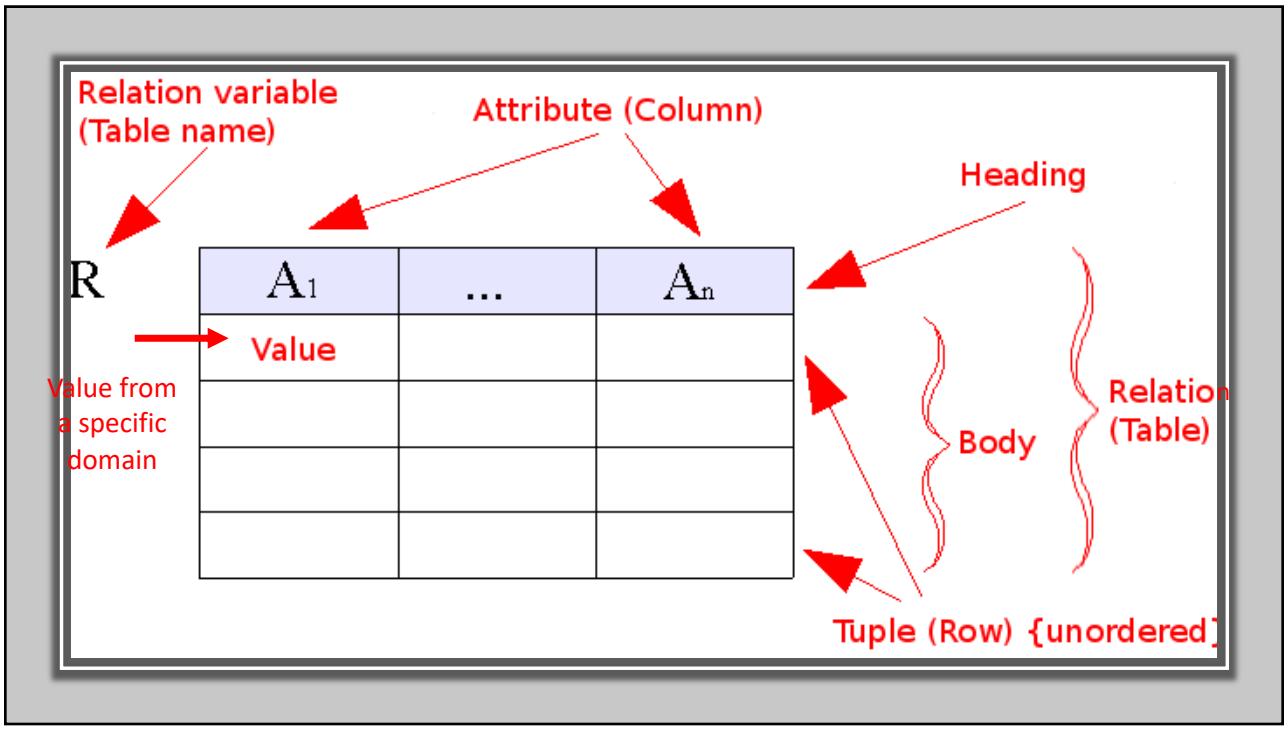


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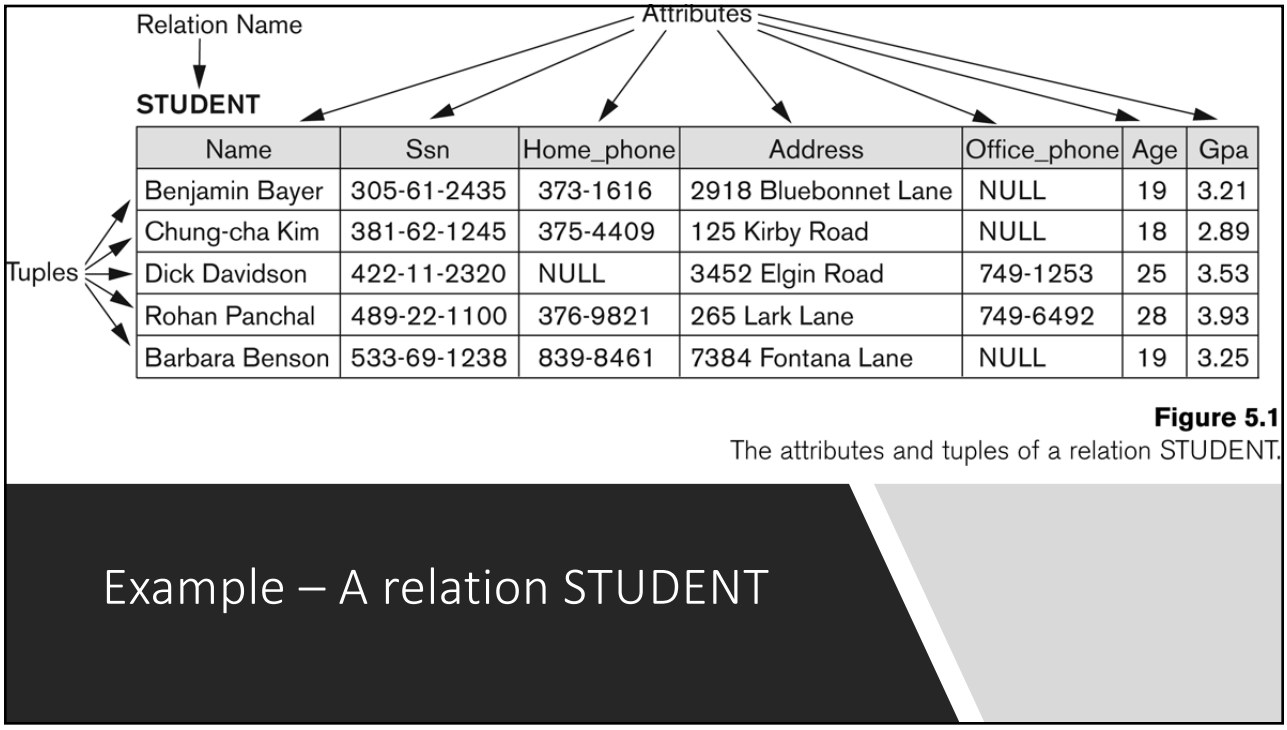


| Name | Ssn | Home_phone | Address | Office_phone | Age | Gpa |
|---|---|---|---|---|---|---|
| Benjamin Bayer | 305-61-2435 | 373-1616 | 2918 Bluebonnet Lane | NULL | 19 | 3.21 |
| Chung-cha Kim | 381-62-1245 | 375-4409 | 125 Kirby Road | NULL | 18 | 2.89 |
| Dick Davidson | 422-11-2320 | NULL | 3452 Elgin Road | 749-1253 | 25 | 3.53 |
| Rohan Panchal | 489-22-1100 | 376-9821 | 265 Lark Lane | 749-6492 | 28 | 3.93 |
| Barbara Benson | 533-69-1238 | 839-8461 | 7384 Fontana Lane | NULL | 19 | 3.25 |

**Figure 5.1**
The attributes and tuples of a relation STUDENT.

## Example – A relation STUDENT

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## Definition Summary

| Informal Terms | | Formal Terms |
|---|---|---|
| Table | | Relation |
| Column Header | | Attribute |
| All possible Column Values | | Domain |
| Row | | Tuple |
| | | |
| Table Definition | | Schema of a Relation |
| Populated Table | | State of the Relation |

Slide 5- 8

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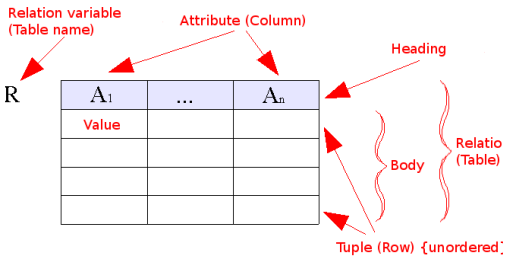
# Characteristics of Relations

- Ordering of tuples in a relation r(R):
- Ordering of attributes in a relation schema R (and of values within each tuple):
- Values in a tuple:
  - All values are considered atomic (indivisible).
  - Each value in a tuple must be from the domain of the attribute for that column
    - If tuple t = <v1, v2, …, vn> is a tuple (row) in the relation state r of R(A1, A2, …, An)
    - Then each *vi* must be a value from *dom(Ai)*
- A special **null** value is used to represent values that are unknown or not available or inapplicable in certain tuples.
- t= { <name, "John" >, <SSN, 123456789> }




| HOMEWORKS | | | | |
|---|---|---|---|---|
| NO | TOPIC | MAXPOINTS | SOLVED_BY | |
| | | | STUDENT | POINTS |
| 1 | Rel. Alg. | 10 | Ann Smith | 10 |
| | | | Michael Jones | 9 |
| 2 | SQL | 10 | Ann Smith | 8 |
| | | | Michael Jones | 9 |
| | | | Richard Turner | 10 |

Not Atomic - Wrong

Relational model does not permit to introduce structured and multi-valued column values.

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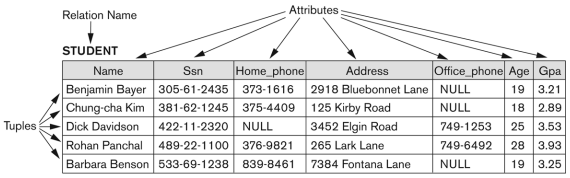
# Example – A relation STUDENT




**STUDENT**

| Name | Ssn | Home_phone | Address | Office_phone | Age | Gpa |
|---|---|---|---|---|---|---|
| Benjamin Bayer | 305-61-2435 | 373-1616 | 2918 Bluebonnet Lane | NULL | 19 | 3.21 |
| Chung-cha Kim | 381-62-1245 | 375-4409 | 125 Kirby Road | NULL | 18 | 2.89 |
| Dick Davidson | 422-11-2320 | NULL | 3452 Elgin Road | 749-1253 | 25 | 3.53 |
| Rohan Panchal | 489-22-1100 | 376-9821 | 265 Lark Lane | 749-6492 | 28 | 3.93 |
| Barbara Benson | 533-69-1238 | 839-8461 | 7384 Fontana Lane | NULL | 19 | 3.25 |

The relation STUDENT from Figure 5.1 with a different order of tuples.

**STUDENT**

| Name | Ssn | Home_phone | Address | Office_phone | Age | Gpa |
|---|---|---|---|---|---|---|
| Dick Davidson | 422-11-2320 | NULL | 3452 Elgin Road | 749-1253 | 25 | 3.53 |
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| Chung-cha Kim | 381-62-1245 | 375-4409 | 125 Kirby Road | NULL | 18 | 2.89 |
| Benjamin Bayer | 305-61-2435 | 373-1616 | 2918 Bluebonnet Lane | NULL | 19 | 3.21 |

**Same state**

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