IS-664 Database Programming
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Class Exercise

Class Exercise 2

STORED PROGRAMS FOR THE ASTEROIDS DATABASE

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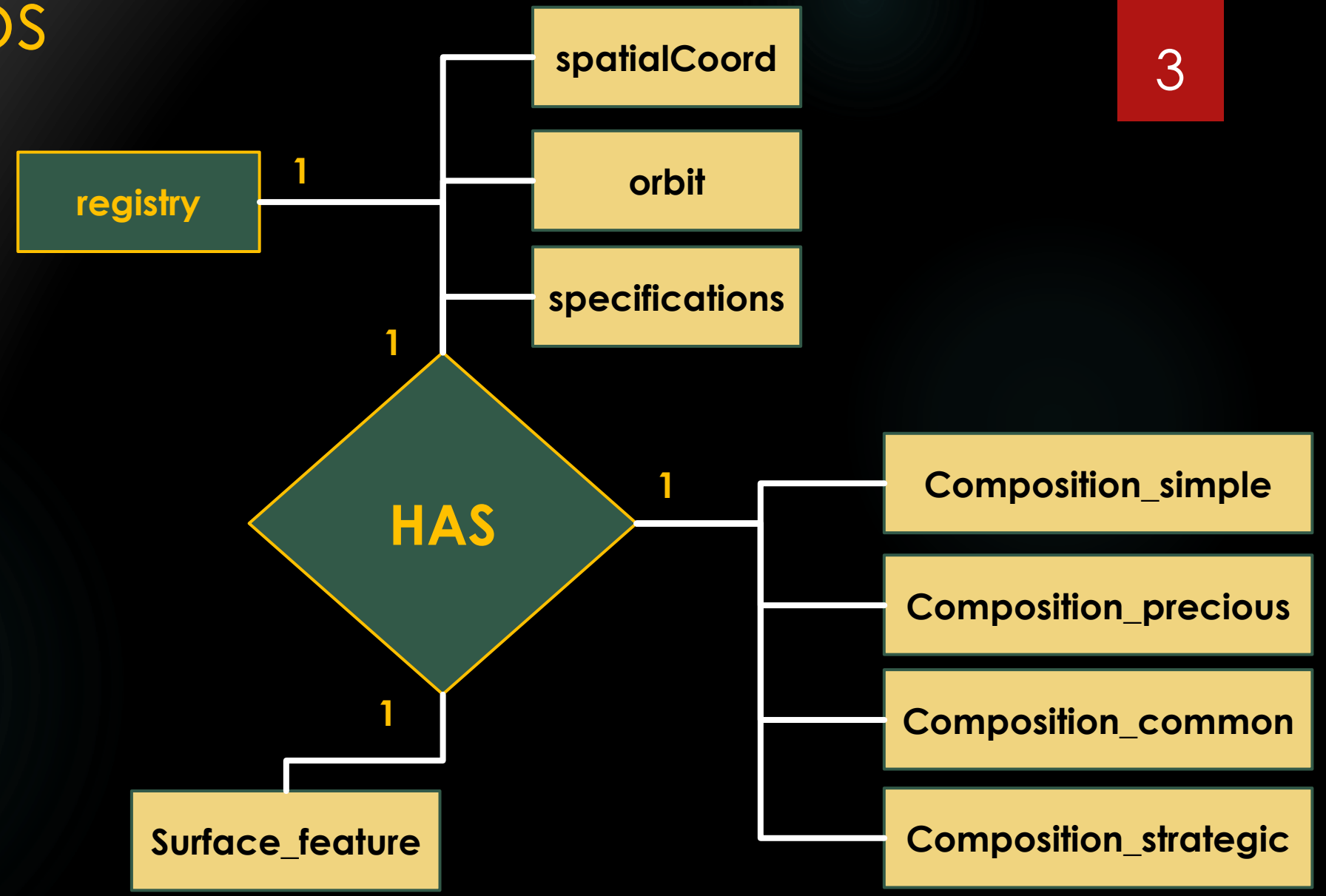
Asteroids

- **C-Type** (Carbonaceous) asteroids are the most common variety, forming around 75% of known asteroids. They are volatile-rich and distinguished by a very low albedo because their composition includes a large amount of carbon, in addition to rocks and minerals. They occur most frequently at the outer edge of the asteroid belt, 3.5 AU from the Sun, where 80% of the asteroids are of this type, whereas only 40% of asteroids at 2 AU from the Sun are C-type.

- **S-Type** (Siliceous) asteroids are asteroids with a spectral type that is indicative of a siliceous (i.e., stony) mineralogical composition. They are dominant in the inner part of the asteroid belt within 2.2 AU, common in the central belt within about 3 AU, but become rare farther out.

- **M-Type** (Metallic) asteroids are a spectral class of asteroids which appear to contain higher concentrations of metal phases (e.g., iron-nickel) than other asteroid classes, and are widely thought to be the source of iron meteorites.

Relationships



Relations

registry			
Designation	AType	Country	DDate

spatialCoord			
Designation	X	Y	Z

specifications					
Designation	Diameter	Mass	Density	Inclination	Rotation

surface_feature		
Designation	Surface	Water

orbit					
Designation	Aphelion	Perihelion	Eccentricity	Period_Orbit	Radius_Orbit

composition_simple		
Designation	Content_Rock	Content_Metal

composition_common				
Designation	Nickel	Molybdenum	Iron	Zinc

composition_precious							
Designation	Gold	Silver	Platinum	Palladium	Rhodium	Ruthenium	Iridium	Osmium

composition_strategic				
Designation	Chromium	Cobalt	Tungsten	Uranium

Units of Measure

Attribute	Unit of Measure
Diameter	Meters
Mass	Kilograms
Density	Kilograms per Cubic Meter
Inclination	Degrees
Rotation	Hours
Aphelion	Astronomical Units
Perihelion	Astronomical Units
Eccentricity	Ratio
Period_Orbit	Years
Radius Orbit	Astronomical Units
X,Y, and Z	Number (Ordinate)
All Composition Attributes	Percentages of Mass
Water and Rock	Percentages

Stored Procedure 4

Create the Stored Procedure specLambda which accepts a JSON array *(of any length)* of asteroid designations and creates the table lambdaAnalysis as defined below based on the analysis procedures listed on the next slide.

The lambdaAnalysis table must maintain referential integrity with the registry table.

MySQL 8.0 Command Line Client

```
mysql> describe lambdaanalysis;
+-------------+-----------------------------------------------------------------------------------+------+-----+---------+-------------------+
| Field       | Type                                                                              | Null | Key | Default | Extra             |
+-------------+-----------------------------------------------------------------------------------+------+-----+---------+-------------------+
| Designation | varchar(50)                                                                       | NO   | PRI | NULL    |                   |
| Country     | enum('United States','United Kingdom','Russian Federation','People''s Republic of China') | YES  |     | NULL    |                   |
| CountryCode | varchar(20)                                                                       | YES  |     | NULL    | STORED GENERATED  |
| Specs       | json                                                                              | YES  |     | NULL    |                   |
| TimeLambda  | json                                                                              | YES  |     | NULL    |                   |
| MDLambda    | json                                                                              | YES  |     | NULL    |                   |
+-------------+-----------------------------------------------------------------------------------+------+-----+---------+-------------------+
6 rows in set (0.02 sec)
```

Must be generated column

JSON Objects

ALL DATA required to create the **lambdaAnalysis** table **must be** retrieved using functions and/or one or more cursors which utilize a loop.

Asteroid Analysis

Item	Protocol
Country	**US = 'United States' UK = 'United Kingdom RUS = 'Russian Federation CH = People's Republic of China**
CountryCode	First two characters of Country name concatenated with an '*' and the first 7 characters of the asteroid designation
Specs	'M' = Mass 'DEN' = Density 'DIA' = Diameter 'INC' = Inclination 'ROT' = Rotation
TimeLambda	Time between the DDate of the asteroid and Jan 1, 2022, in total days, total weeks, total months, and total years
MDLambda	A = Diameter Lambda if the diameter of the asteroid is more than four times greater than the asteroid's mass then then A = 125% of the asteroids mass. Otherwise, it is 225% of the asteroid's mass
	B = Density Lambda if the density of the asteroid is greater than 1.5 then B = 25% of the asteroids mass. Otherwise, it is 75% of the asteroid's mass
	C = Inclination Lambda if the inclination of the asteroid is greater than 15 then C = 5% of the asteroids mass. Otherwise, it is 15% of the asteroid's mass
	D = Rotation Lambda if the rotation of the asteroid is greater than 48 then D = 1% of the asteroids mass. Otherwise, it is 2% of the asteroid's mass

Sample Output

MySQL 8.0 Command Line Client

```
Query OK, 0 rows affected, 1 warning (0.00 sec)

+-------------+---------------+-------------+-----------------------------------------------------------------------------+-----------------------------------------------------------------------------------------+-----------------------------------------------------------------------------------------+
| Designation | Country       | CountryCode | Specs                                                                       | TimeLambda                                                                              | MDLambda                                                                                |
+-------------+---------------+-------------+-----------------------------------------------------------------------------+-----------------------------------------------------------------------------------------+-----------------------------------------------------------------------------------------+
| C-a1872-l   | United States | UN*C-A1872  | {"M:": 106.93, "DEN:": 1.05, "DIA:": 630.43, "INC:": 26.33, "ROT:": 12.74} | {"TIME": {"Days:": "5235", "Weeks:": 748, "Years:": 14, "Months:": 187}}                | {"MDLAMBDA": {"A:": 133.66, "B:": 80.20, "C:": 5.35, "D:": 2.14}}                       |
| C-a2151-m   | United Kingdom | UN*C-A2151  | {"M:": 689.17, "DEN:": 1.20, "DIA:": 694.95, "INC:": 28.10, "ROT:": 11.50} | {"TIME": {"Days:": "10008", "Weeks:": 1430, "Years:": 27, "Months:": 358}}              | {"MDLAMBDA": {"A:": 1550.63, "B:": 516.88, "C:": 34.46, "D:": 13.78}}                   |
| C-a2440-j   | United Kingdom | UN*C-A2440  | {"M:": 265.54, "DEN:": 1.74, "DIA:": 69.38, "INC:": 27.44, "ROT:": 24.09}  | {"TIME": {"Days:": "11024", "Weeks:": 1575, "Years:": 30, "Months:": 394}}              | {"MDLAMBDA": {"A:": 597.47, "B:": 66.39, "C:": 13.28, "D:": 5.31}}                      |
| C-a279-j    | United Kingdom | UN*C-A279-  | {"M:": 755.00, "DEN:": 1.70, "DIA:": 670.69, "INC:": 23.81, "ROT:": 2.28}  | {"TIME": {"Days:": "2550", "Weeks:": 364, "Years:": 7, "Months:": 91}}                 | {"MDLAMBDA": {"A:": 1698.75, "B:": 188.75, "C:": 37.75, "D:": 15.10}}                   |
| C-a39-l     | United Kingdom | UN*C-A39-L  | {"M:": 272.58, "DEN:": 1.42, "DIA:": 846.33, "INC:": 12.22, "ROT:": 14.99} | {"TIME": {"Days:": "3057", "Weeks:": 437, "Years:": 8, "Months:": 109}}                 | {"MDLAMBDA": {"A:": 613.31, "B:": 204.44, "C:": 40.89, "D:": 5.45}}                     |
+-------------+---------------+-------------+-----------------------------------------------------------------------------+-----------------------------------------------------------------------------------------+-----------------------------------------------------------------------------------------+
5 rows in set (0.04 sec)
```

```
CALL specLambda(JSON_ARRAY('C-a1872-l','C-a2151-m','C-a2440-j','C-a279-j','C-a39-l'));
```