

SQL Cheat-Sheet – Quick Reference

Erweiterte Referenz basierend auf Lectures 7-10, 13-15 Themen: SELECT, DDL/DML, Normalisierung, Joins, SET Operations, Views, Transaktionen, Functions, Trigger

Wie nutze ich dieses Cheat-Sheet?

Dieses Dokument ist eine **erweiterte Referenz** für die wichtigsten SQL-Konzepte:

Grundlagen:

- L7: SELECT, WHERE, ORDER BY, GROUP BY, Aggregation
- L8: CREATE TABLE, ALTER, DROP, INSERT, UPDATE, DELETE, Constraints
- L9: Normalisierung (1NF, 2NF, 3NF), ER-Diagramme
- L10: Joins (INNER, LEFT, RIGHT, FULL, CROSS), Subqueries

Fortgeschritten:

- L13: SET Operations (UNION, INTERSECT, EXCEPT), Views
- L14: Transaktionen (BEGIN, COMMIT, ROLLBACK), ACID, Isolation Levels
- L15: Stored Functions (IF, CASE, RAISE), Trigger (BEFORE/AFTER)

Navigation:

- Nutze das **Inhaltsverzeichnis** (☰ links oben)
- Springe direkt zum gewünschten Thema
- Alle Code-Beispiele sind **interaktiv** – probiere sie aus!

1. DDL – Tabellen definieren (L8)

1.1 CREATE TABLE

```
1  -- Grundstruktur
2  CREATE TABLE customers (
3      customer_id INTEGER PRIMARY KEY,
4      first_name TEXT NOT NULL,
5      last_name TEXT NOT NULL,
6      email TEXT UNIQUE,
7      created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP
8  );
```



```
-- Grundstruktur
CREATE TABLE customers (
  customer_id INTEGER PRIMARY KEY,
  first_name TEXT NOT NULL,
  last_name TEXT NOT NULL,
  email TEXT UNIQUE,
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP
)
```

ok

1.2 Datentypen

| Typ | Verwendung | Beispiel |
|--------------|-----------------------|----------------------|
| INTEGER | Ganzzahlen | age INTEGER |
| BIGINT | Große Ganzzahlen | user_id BIGINT |
| DECIMAL(p,s) | Präzise Dezimalzahlen | price DECIMAL(10,2) |
| FLOAT/DOUBLE | Approximative Zahlen | latitude FLOAT |
| TEXT | Unbegrenzter Text | description TEXT |
| VARCHAR(n) | Text mit Längenlimit | email VARCHAR(255) |
| CHAR(n) | Festlängen-Text | country_code CHAR(2) |
| DATE | Datum | birth_date DATE |
| TIMESTAMP | Datum + Uhrzeit | created_at TIMESTAMP |
| BOOLEAN | Wahr/Falsch | is_active BOOLEAN |
| JSON | JSON-Objekte | metadata JSON |

1.3 Constraints

```
1 CREATE TABLE orders (
2   order_id INTEGER PRIMARY KEY,
3   customer_id INTEGER NOT NULL,
  -- Eindeutig + NOT
  -- Pflichtfeld
```

```

4 total DECIMAL(10,2) CHECK (total >= 0),           -- Validierung
5 status TEXT CHECK (status IN ('pending', 'shipped', 'delivered')),
6 created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP, -- Standardwert
7 FOREIGN KEY (customer_id) REFERENCES customers(customer_id)
8 );

```

```

CREATE TABLE orders (
  order_id INTEGER PRIMARY KEY,           -- Eindeutig + NOT NULL
  customer_id INTEGER NOT NULL,           -- Pflichtfeld
  total DECIMAL(10,2) CHECK (total >= 0), -- Validierung
  status TEXT CHECK (status IN ('pending', 'shipped', 'delivered')),
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP, -- Standardwert
  FOREIGN KEY (customer_id) REFERENCES customers(customer_id)
)

```

ok

Constraint-Übersicht:

| Constraint | Zweck | Beispiel |
|--------------------|--------------------------|--|
| PRIMARY KEY | Eindeutig + NOT NULL | <code>user_id INTEGER PRIMARY KEY</code> |
| FOREIGN KEY | Referenzielle Integrität | <code>FOREIGN KEY (user_id) REFERENCES users(user_id)</code> |
| UNIQUE | Eindeutig (NULL erlaubt) | <code>email TEXT UNIQUE</code> |
| NOT NULL | Pflichtfeld | <code>name TEXT NOT NULL</code> |
| CHECK | Benutzerdefiniert | <code>age INTEGER CHECK (age >= 18)</code> |
| DEFAULT | Standardwert | <code>status TEXT DEFAULT 'active'</code> |

1.4 Foreign Keys

```

1 -- Mit ON DELETE / ON UPDATE
2 CREATE TABLE order_items (
3   item_id INTEGER PRIMARY KEY,
4   order_id INTEGER,
5   product_id INTEGER,
6   quantity INTEGER,

```



```

7  FOREIGN KEY (order_id) REFERENCES orders(order_id)
8  ON DELETE CASCADE,           -- Löscht Items, wenn Order gelöscht
9  FOREIGN KEY (product_id) REFERENCES products(product_id)
10 ON DELETE RESTRICT           -- Verhindert Löschen, wenn Items
                                existieren
11 );

```

```

-- Mit ON DELETE / ON UPDATE
CREATE TABLE order_items (
  item_id INTEGER PRIMARY KEY,
  order_id INTEGER,
  product_id INTEGER,
  quantity INTEGER,
  FOREIGN KEY (order_id) REFERENCES orders(order_id)
    ON DELETE CASCADE,           -- Löscht Items, wenn Order gelöscht wird
  FOREIGN KEY (product_id) REFERENCES products(product_id)
    ON DELETE RESTRICT          -- Verhindert Löschen, wenn Items existieren
)

```

relation "products" does not exist

ON DELETE Optionen:

| Option | Verhalten |
|-----------|------------------------------------|
| CASCADE | Abhängige Zeilen werden gelöscht |
| SET NULL | Foreign Key wird auf NULL gesetzt |
| RESTRICT | Löschen wird verhindert (Standard) |
| NO ACTION | Wie RESTRICT |

1.5 ALTER TABLE

```

1  -- Spalte hinzufügen
2  ALTER TABLE customers
3  ADD COLUMN phone TEXT;
4
5  -- Spalte ändern (nicht alle DBs unterstützen alle Operationen)
6  ALTER TABLE customers
7  ALTER COLUMN email SET NOT NULL;
8
9  -- Spalte umbenennen (PostgreSQL)
10 ALTER TABLE customers

```

```
11 RENAME COLUMN phone TO mobile;
12
13 -- Tabelle umbenennen
14 ALTER TABLE customers RENAME TO clients;
15
16 -- Spalte löschen
17 ALTER TABLE clients
18 DROP COLUMN mobile;
```

```
-- Spalte hinzufügen
ALTER TABLE customers
ADD COLUMN phone TEXT
```

ok

```
-- Spalte ändern (nicht alle DBs unterstützen alle Operationen)
ALTER TABLE customers
ALTER COLUMN email SET NOT NULL
```

ok

```
-- Spalte umbenennen (PostgreSQL)
ALTER TABLE customers
RENAME COLUMN phone TO mobile
```

ok

```
-- Tabelle umbenennen
ALTER TABLE customers RENAME TO clients
```

ok

```
-- Spalte löschen
ALTER TABLE clients
DROP COLUMN mobile
```

ok

1.6 DROP TABLE

```
1 -- Einfach
2 DROP TABLE IF EXISTS temp_table;
3
4 -- Mit CASCADE (löscht auch abhängige Objekte)
5 DROP TABLE products CASCADE;
6
```



```
7 -- Mit RESTRICT (verhindert Löschen bei Abhängigkeiten)
8 DROP TABLE products RESTRICT;
```

```
-- Einfach
DROP TABLE IF EXISTS temp_table
```

ok

```
-- Mit CASCADE (löscht auch abhängige Objekte)
DROP TABLE products CASCADE
```

```
table "products" does not exist
```

2. DML – Daten manipulieren (L8)

2.1 INSERT

```
1 -- Einzelne Zeile
2 INSERT INTO customers (customer_id, first_name, last_name, email)
3 VALUES (1, 'Alice', 'Anderson', 'alice@email.com');
4
5 -- Mehrere Zeilen (Bulk Insert)
6 INSERT INTO customers (customer_id, first_name, last_name, email) VAL
7 (2, 'Bob', 'Brown', 'bob@email.com'),
8 (3, 'Carol', 'Clark', 'carol@email.com'),
9 (4, 'David', 'Davis', 'david@email.com');
10
11 -- INSERT ... SELECT (Daten kopieren)
12 INSERT INTO customers_backup (customer_id, first_name, last_name, ema
13 SELECT customer_id, first_name, last_name, email
14 FROM customers
15 WHERE email IS NOT NULL;
16
17 -- INSERT ... ON CONFLICT (Upsert)
18 INSERT INTO customers (customer_id, first_name, last_name, email)
19 VALUES (1, 'Alice Updated', 'alice_new@email.com')
20 ON CONFLICT (customer_id) DO UPDATE
21 SET
22 first_name = EXCLUDED.first_name,
23 email = EXCLUDED.email;
```

-- Einzelne Zeile

```
INSERT INTO customers (customer_id, first_name, last_name, email)
VALUES (1, 'Alice', 'Anderson', 'alice@email.com')
```

relation "customers" does not exist

2.2 UPDATE

```
1  -- Einzelne Zeile
2  UPDATE customers
3  SET email = 'alice_new@email.com'
4  WHERE customer_id = 1;
5
6  -- Mehrere Spalten
7  UPDATE customers
8  SET
9      first_name = 'Alice',
10     last_name = 'Smith',
11     email = 'alice.smith@email.com'
12 WHERE customer_id = 1;
13
14 -- Berechnete Updates
15 UPDATE products
16 SET price = price * 1.10; -- 10% Preiserhöhung
17
18 -- UPDATE mit Subquery
19 UPDATE products
20 SET price = price * (1 - (
21     SELECT discount_percent / 100
22     FROM categories
23     WHERE categories.category_id = products.category_id
24 ));
```

-- Einzelne Zeile

```
UPDATE customers
SET email = 'alice_new@email.com'
WHERE customer_id = 1
```

relation "customers" does not exist

⚠ Immer WHERE nutzen! Ohne WHERE werden ALLE Zeilen geändert!

2.3 DELETE

```
1  -- Einzelne Zeile
```

```

1  -- Einzelne Zeile
2  DELETE FROM customers
3  WHERE customer_id = 5;
4
5  -- Mehrere Zeilen
6  DELETE FROM customers
7  WHERE email IS NULL;
8
9  -- DELETE mit Subquery
10 DELETE FROM customers
11 WHERE customer_id NOT IN (
12     SELECT DISTINCT customer_id FROM orders
13 );

```

```

-- Einzelne Zeile
DELETE FROM customers
WHERE customer_id = 5

```

relation "customers" does not exist

⚠ Immer WHERE nutzen! Ohne WHERE werden ALLE Zeilen gelöscht!

2.4 TRUNCATE vs DELETE

```

1  -- DELETE: Selektiv, in Transaktion reversibel
2  DELETE FROM products WHERE price < 50;
3
4  -- TRUNCATE: Löscht alle Zeilen, schneller, meist nicht reversibel
5  TRUNCATE TABLE products;

```

```

-- DELETE: Selektiv, in Transaktion reversibel
DELETE FROM products WHERE price < 50

```

relation "products" does not exist

| Feature | DELETE | TRUNCATE |
|----------------|--------------------|--------------------|
| WHERE-Klausel | ✓ Ja | ✗ Nein |
| Performance | Langsamer | Schneller |
| Rollback | ✓ Möglich | ⚠ DB-abhängig |
| Triggers | ✓ Werden ausgelöst | ✗ Meist nicht |
| Auto-Increment | Bleibt | Wird zurückgesetzt |

3. SELECT – Daten abfragen (L7)

3.1 Grundstruktur

```
SELECT spalte1, spalte2, ...
FROM tabelle
WHERE bedingung
ORDER BY spalte [ASC|DESC]
LIMIT anzahl;
```



3.2 Beispieldatenbank laden

```
1  INSTALL httpfs;
2  LOAD httpfs;
3
4  CREATE TEMP TABLE products_raw AS
5  SELECT *
6  FROM read_json('https://raw.githubusercontent.com/andre-dietrich
   /Datenbankensysteme-Vorlesung/refs/heads/main/assets/dat/products.j
7
8  CREATE TABLE products (
9    product_id INTEGER PRIMARY KEY,
10   name TEXT,
11   category TEXT,
12   brand TEXT,
13   price REAL,
14   stock INTEGER,
15   rating REAL,
16   created_at DATE
17 );
18
19 INSERT INTO products
```



```
20 SELECT
21     CAST(product_id AS INTEGER),
22     name::TEXT,
23     category::TEXT,
24     brand::TEXT,
25     CAST(price AS REAL),
26     CAST(stock AS INTEGER),
27     CAST(rating AS REAL),
28     CAST(created_at AS DATE)
29 FROM products_raw;
```

```
INSTALL httpfs
```

No data

```
LOAD httpfs
```

No data

```
CREATE TEMP TABLE products_raw AS
SELECT *
FROM read_json('https://raw.githubusercontent.com/andre-
dietrich/Datenbankensysteme-
Vorlesung/refs/heads/main/assets/dat/products.json')
```

| | Count |
|---|-------|
| 1 | 932 |

```
CREATE TABLE products (
  product_id INTEGER PRIMARY KEY,
  name TEXT,
  category TEXT,
  brand TEXT,
  price REAL,
  stock INTEGER,
  rating REAL,
  created_at DATE
)
```

No data

```
INSERT INTO products
SELECT
  CAST(product_id AS INTEGER),
  name::TEXT,
  category::TEXT,
  brand::TEXT,
  CAST(price AS REAL),
  CAST(stock AS INTEGER),
  CAST(rating AS REAL),
  CAST(created_at AS DATE)
FROM products_raw
```

| | Count |
|---|-------|
| 1 | 932 |

3.3 Spalten auswählen

```
1  -- Alle Spalten
2  SELECT * FROM products LIMIT 5;
3
4  -- Spezifische Spalten
5  SELECT name, price, category FROM products LIMIT 5;
6
7  -- Mit Alias
8  SELECT
9      name AS product_name,
10     price AS price_eur,
11     category
12 FROM products LIMIT 5;
```

```
-- Alle Spalten
SELECT * FROM products LIMIT 5
Catalog Error: Table with name products does not exist!
Did you mean "pg_proc"?
LINE 2: SELECT * FROM products LIMIT 5
                        ^

-- Spezifische Spalten
SELECT name, price, category FROM products LIMIT 5

No data

-- Mit Alias
SELECT
    name AS product_name,
    price AS price_eur,
    category
FROM products LIMIT 5
```

| | product_name | price_eur | category |
|---|--------------------|-------------------|-------------|
| 1 | Laptop 14" 2.0 | 1399.030029296875 | Electronics |
| 2 | Portable SSD Max M | 805.9299926757812 | Electronics |
| 3 | 4K Monitor - Green | 522.47998046875 | Electronics |
| 4 | Tablet 10 | 985.75 | Electronics |
| 5 | Portable SSD Lite | 508.2300109863281 | Electronics |

3.4 WHERE – Filtern

```
1  -- Vergleichsoperatoren: =, <>, <, >, <=, >=
2  SELECT name, price FROM products
3  WHERE price < 50;
4
5  -- Logische Operatoren: AND, OR, NOT
6  SELECT name, price, category FROM products
7  WHERE category = 'Electronics' AND price < 100;
8
9  -- BETWEEN
10 SELECT name, price FROM products
11 WHERE price BETWEEN 100 AND 500;
12
13 -- IN
14 SELECT name, category FROM products
15 WHERE category IN ('Electronics', 'Office', 'Groceries');
```

```
16
17 -- LIKE (Pattern Matching)
18 SELECT name FROM products
19 WHERE name LIKE '%Laptop%'; -- % = beliebig viele Zeichen
20
21 -- NULL-Werte
22 SELECT name, rating FROM products
23 WHERE rating IS NULL;
```

```
-- Vergleichsoperatoren: =, <>, <, >, <=, >=  
SELECT name, price FROM products  
WHERE price < 50
```

| | name | price |
|----|---------------------------|--------------------|
| 1 | 4K Monitor | 24.920000076293945 |
| 2 | Basic T-Shirt Max | 24.34000015258789 |
| 3 | Jacket | 44 |
| 4 | Jacket L | 29.280000686645508 |
| 5 | Raincoat | 43.810001373291016 |
| 6 | Jeans - Silver | 34.15999984741211 |
| 7 | Leggings L | 18.100000381469727 |
| 8 | Jeans | 35.779998779296875 |
| 9 | Cap Lite | 35.54999923706055 |
| 10 | Dress Shirt - Blue | 39.970001220703125 |
| 11 | Chinos | 8.640000343322754 |
| 12 | Leggings L | 11.569999694824219 |
| 13 | Polo Shirt Pro XL | 14.930000305175781 |
| 14 | Sneakers | 9.789999961853027 |
| 15 | Leggings | 31.280000686645508 |
| 16 | Hoodie Lite L - White | 30.030000686645508 |
| 17 | Jeans Max | 12.520000457763672 |
| 18 | Dress Shirt 2.0 S | 6.130000114440918 |
| 19 | Hoodie | 34.900001525878906 |
| 20 | Leggings | 40.04999923706055 |
| 21 | Chinos Max M | 38.029998779296875 |
| 22 | Jacket Plus M | 40.52000045776367 |
| 23 | Granola 750g | 31.600000381469727 |
| 24 | Olive Oil 1L - Silver | 26.729999542236328 |
| 25 | Tomato Sauce 400g Max XL | 34.119998931884766 |
| 26 | Olive Oil 1L M | 36.099998474121094 |
| 27 | Green Tea 50 bags M | 26.450000762939453 |
| 28 | Green Tea 50 bags - Black | 20.040000915527344 |
| 29 | Arabica Coffee Beans 1kg | 0.8999999761581421 |
| 30 | Pasta Fusilli 500g Plus | 38.16999816894531 |
| 31 | Olive Oil 1L M - Green | 18.639999389648438 |

| | | |
|----|--|---------------------|
| 32 | Green Tea 50 bags Max | 35.939998626708984 |
| 33 | Arabica Coffee Beans 1kg Plus | 19.87999991607666 |
| 34 | Sea Salt 500g | 19.3999999618530273 |
| 35 | Green Tea 50 bags | 38.52000045776367 |
| 36 | Arabica Coffee Beans 1kg | 37.90999984741211 |
| 37 | Pasta Fusilli 500g Max M | 4.489999771118164 |
| 38 | Basmati Rice 1kg L - White | 18.389999389648438 |
| 39 | Tomato Sauce 400g | 10.350000381469727 |
| 40 | Dark Chocolate 85% 100g XL - Green | 30.329999923706055 |
| 41 | Tomato Sauce 400g | 29.100000381469727 |
| 42 | Basmati Rice 1kg Plus - White | 33.7900000915527344 |
| 43 | Basmati Rice 1kg Max L | 4.760000228881836 |
| 44 | Basmati Rice 1kg Lite S | 38.29999923706055 |
| 45 | Granola 750g Plus - Green | 16.09000015258789 |
| 46 | Organic Oat Milk 1L | 19.229999542236328 |
| 47 | Dark Chocolate 85% 100g | 37.93000030517578 |
| 48 | Sea Salt 500g Max - Blue | 29.719999313354492 |
| 49 | Tomato Sauce 400g - Black | 5.71999979019165 |
| 50 | Olive Oil 1L | 29.25 |
| 51 | Organic Oat Milk 1L | 6.03000020980835 |
| 52 | Green Tea 50 bags - Silver | 23.989999771118164 |
| 53 | Honey 500g 2.0 - White | 34.7599983215332 |
| 54 | Sea Salt 500g - White | 34.369998931884766 |
| 55 | Olive Oil 1L | 34.5400000915527344 |
| 56 | Green Tea 50 bags S - Red | 8.079999923706055 |
| 57 | Organic Oat Milk 1L | 26.049999237060547 |
| 58 | Arabica Coffee Beans 1kg Pro XL - Blue | 33.56999969482422 |
| 59 | Honey 500g 2.0 M | 13.140000343322754 |
| 60 | Olive Oil 1L M | 15.430000305175781 |
| 61 | Arabica Coffee Beans 1kg Lite | 21.65999984741211 |
| 62 | Granola 750g Max | 6.110000133514404 |
| 63 | Basmati Rice 1kg Pro | 4.389999866485596 |

| | | |
|----|--|--------------------|
| 64 | Almonds 200g Lite XL | 2.4800000190734863 |
| 65 | Pasta Fusilli 500g Max XL | 7.199999809265137 |
| 66 | Basmati Rice 1kg | 14.489999771118164 |
| 67 | Organic Oat Milk 1L | 13.609999656677246 |
| 68 | Sea Salt 500g | 38.40999984741211 |
| 69 | Dark Chocolate 85% 100g Lite L - Green | 23.610000610351562 |
| 70 | Pasta Fusilli 500g Lite M | 13.270000457763672 |
| 71 | Sea Salt 500g Lite - Graphite | 3.069999933242798 |
| 72 | Organic Oat Milk 1L Lite S - Red | 2.25 |
| 73 | Honey 500g Lite S | 8.130000114440918 |
| 74 | Tomato Sauce 400g | 23.399999618530273 |
| 75 | Basmati Rice 1kg 2.0 - Red | 5.320000171661377 |
| 76 | Green Tea 50 bags Plus | 39.84000015258789 |
| 77 | Almonds 200g - Green | 31.09000015258789 |
| 78 | Granola 750g XL - Graphite | 1.9900000095367432 |
| 79 | Green Tea 50 bags | 29.260000228881836 |
| 80 | Tomato Sauce 400g - White | 27.360000610351562 |
| 81 | Pasta Fusilli 500g - Black | 32.2599983215332 |
| 82 | Arabica Coffee Beans 1kg - Green | 18.68000030517578 |
| 83 | Sea Salt 500g - Green | 13.100000381469727 |
| 84 | Green Tea 50 bags XL | 15.170000076293945 |
| 85 | Honey 500g - Black | 1.7300000190734863 |
| 86 | Almonds 200g | 3.5899999141693115 |
| 87 | Granola 750g - White | 30.3799991607666 |
| 88 | Dark Chocolate 85% 100g - White | 15.75 |
| 89 | Dark Chocolate 85% 100g - White | 22.690000534057617 |
| 90 | Pasta Fusilli 500g - Silver | 38.970001220703125 |
| 91 | Tomato Sauce 400g L - Black | 16.030000686645508 |
| 92 | Sea Salt 500g | 26.670000076293945 |
| 93 | Almonds 200g Max | 26.280000686645508 |
| 94 | Olive Oil 1L - Silver | 5.409999847412109 |
| 95 | Tomato Sauce 400g Max | 10.800000190734863 |

| | | |
|-----|--|--------------------|
| 96 | Almonds 200g - Graphite | 28.170000076293945 |
| 97 | Granola 750g Plus | 32.529998779296875 |
| 98 | Granola 750g | 39.65999984741211 |
| 99 | Almonds 200g Max - White | 7.199999809265137 |
| 100 | Sea Salt 500g - White | 24.15999984741211 |
| 101 | Honey 500g | 13.029999732971191 |
| 102 | Arabica Coffee Beans 1kg | 3.0899999141693115 |
| 103 | Honey 500g Max | 34.66999816894531 |
| 104 | Arabica Coffee Beans 1kg | 36.58000183105469 |
| 105 | Dark Chocolate 85% 100g L - Red | 20.34000015258789 |
| 106 | Organic Oat Milk 1L Max | 5.329999923706055 |
| 107 | Green Tea 50 bags | 3.680000066757202 |
| 108 | Green Tea 50 bags | 32.880001068115234 |
| 109 | Sea Salt 500g | 16.290000915527344 |
| 110 | Organic Oat Milk 1L 2.0 | 6.860000133514404 |
| 111 | Green Tea 50 bags | 38.06999969482422 |
| 112 | Honey 500g Max S | 36.369998931884766 |
| 113 | Honey 500g - Black | 28.209999084472656 |
| 114 | Basmati Rice 1kg | 2.3299999237060547 |
| 115 | Granola 750g 2.0 - Blue | 37.529998779296875 |
| 116 | Dark Chocolate 85% 100g M - Black | 28.280000686645508 |
| 117 | Sea Salt 500g Max XL - Silver | 37.43000030517578 |
| 118 | Green Tea 50 bags - Black | 17.030000686645508 |
| 119 | Arabica Coffee Beans 1kg Plus - Blue | 17.31999969482422 |
| 120 | Organic Oat Milk 1L Plus M | 15.989999771118164 |
| 121 | Arabica Coffee Beans 1kg Max XL - Silver | 22.3799991607666 |
| 122 | Dark Chocolate 85% 100g Max S - Silver | 10.670000076293945 |
| 123 | Office Scissors | 13.710000038146973 |
| 124 | Sticky Notes (12 pads) Lite | 11.960000038146973 |
| 125 | Ergonomic Chair Plus | 15.399999618530273 |
| 126 | A4 Copy Paper 500 sheets | 33.79999923706055 |
| 127 | Ergonomic Chair | 11.920000076293945 |

| | | |
|-----|--|--------------------|
| 128 | Whiteboard Markers (8-pack) Max - Blue | 33.04999923706055 |
| 129 | Whiteboard Markers (8-pack) | 30.940000534057617 |
| 130 | Gel Pens (10-pack) Lite | 10.020000457763672 |
| 131 | Binder 5cm | 23.209999084472656 |
| 132 | Laptop Stand Lite | 7.53000020980835 |
| 133 | Air Fryer 4L | 27.290000915527344 |
| 134 | Toaster 2-slice Lite | 32.65999984741211 |
| 135 | Cutlery Set (24 pcs) Lite - White | 15.220000267028809 |
| 136 | Remote Control Car Plus L | 12.180000305175781 |
| 137 | Science Kit - Volcano XL | 7.480000019073486 |
| 138 | Plush Bear 30cm - Silver | 20.1299991607666 |
| 139 | Remote Control Car XL - Green | 30.920000076293945 |
| 140 | Marble Run 2.0 | 6.849999904632568 |
| 141 | RC Drone Mini S | 43.599998474121094 |
| 142 | Plush Bear 30cm | 24.15999984741211 |
| 143 | Building Blocks Set Max - Blue | 27.860000610351562 |
| 144 | Remote Control Car Plus XL | 26.950000762939453 |
| 145 | STEM Robot Kit | 28.110000610351562 |
| 146 | Building Blocks Set L | 21.34000015258789 |
| 147 | RC Drone Mini Plus | 40.650001525878906 |
| 148 | RC Drone Mini | 41.189998626708984 |
| 149 | Wooden Train Set S - Blue | 29.25 |
| 150 | Building Blocks Set Lite | 44.119998931884766 |
| 151 | Building Blocks Set Max | 46.45000076293945 |
| 152 | Puzzle 1000 pieces Pro - Blue | 7.699999809265137 |
| 153 | Puzzle 1000 pieces Pro L - White | 36.349998474121094 |
| 154 | Remote Control Car Pro | 30.729999542236328 |
| 155 | Wooden Train Set M | 37.599998474121094 |
| 156 | Bike Helmet L | 32.13999938964844 |
| 157 | Basketball Max M | 40.439998626708984 |
| 158 | Compression Shirt | 43.619998931884766 |
| 159 | Bike Helmet | 24.809999465942383 |

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| 160 | Tennis Racket Pro | 42.029998779296875 |
| 161 | Dumbbells Pair 2x5kg | 44.63999938964844 |
| 162 | Running Shoes 2.0 S | 37.63999938964844 |
| 163 | Football Size 5 Plus S | 31.270000457763672 |
| 164 | Cycling Gloves Pro - Blue | 30.440000534057617 |
| 165 | Moisturizing Cream 50ml L - Black | 41.900001525878906 |
| 166 | Face Serum 30ml Max | 31.690000534057617 |
| 167 | Hair Oil 100ml - Green | 12.15999984741211 |
| 168 | Lip Balm Plus XL | 5.570000171661377 |
| 169 | Face Serum 30ml XL | 39.400001525878906 |
| 170 | Body Lotion 250ml Pro S - Graphite | 4.489999771118164 |
| 171 | Lip Balm Max - Black | 38.77000045776367 |
| 172 | Conditioner 300ml 2.0 | 47.0099983215332 |
| 173 | Face Mask Sheet XL | 9.920000076293945 |
| 174 | Moisturizing Cream 50ml Max | 31.440000534057617 |
| 175 | Body Lotion 250ml | 25.170000076293945 |
| 176 | Hair Oil 100ml | 30.290000915527344 |
| 177 | Face Serum 30ml Plus M | 29.360000610351562 |
| 178 | Micellar Water 400ml Max XL | 29.65999984741211 |
| 179 | Moisturizing Cream 50ml Pro - Green | 48.63999938964844 |
| 180 | Conditioner 300ml XL | 32.34000015258789 |
| 181 | Facial Cleanser 200ml Max | 49.540000915527344 |
| 182 | Face Mask Sheet | 22.299999237060547 |
| 183 | Lip Balm Max | 30.829999923706055 |
| 184 | Facial Cleanser 200ml | 31.850000381469727 |
| 185 | Body Lotion 250ml | 16.459999084472656 |
| 186 | Facial Cleanser 200ml | 19.850000381469727 |
| 187 | Conditioner 300ml L | 38.5099983215332 |
| 188 | Lip Balm | 24.459999084472656 |
| 189 | Face Mask Sheet | 16.059999465942383 |
| 190 | Sunscreen SPF50 100ml | 39.84000015258789 |
| 191 | Facial Cleanser 200ml S | 46.029998779296875 |

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| 192 | Paperback Novel Lite M | 16.389999389648438 |
| 193 | Poetry Collection Pro - White | 27.969999313354492 |
| 194 | Poetry Collection Pro | 42.52000045776367 |
| 195 | Poetry Collection - Green | 29.3799991607666 |
| 196 | Cookbook - Quick Meals Plus | 15.600000381469727 |
| 197 | Short Stories Plus | 44.93000030517578 |
| 198 | Short Stories Max S - Blue | 9.479999542236328 |
| 199 | Travel Guide: Japan Max | 17.829999923706055 |
| 200 | History of Art M - Green | 37.959999084472656 |
| 201 | Business Strategy 101 - Red | 9.579999923706055 |
| 202 | Beginners German Lite | 48.86000061035156 |
| 203 | History of Art Pro | 13.640000343322754 |
| 204 | Cookbook - Quick Meals XL | 30.979999542236328 |
| 205 | Short Stories L - Graphite | 13.130000114440918 |
| 206 | Paperback Novel Pro S | 44.72999954223633 |
| 207 | Poetry Collection M | 19.6200008392334 |
| 208 | Short Stories - Graphite | 17.450000762939453 |
| 209 | Beginners German Lite | 29.290000915527344 |
| 210 | Travel Guide: Japan Pro - Graphite | 6.190000057220459 |
| 211 | Cookbook - Quick Meals Lite | 36.86000061035156 |
| 212 | Data Science Handbook | 37.349998474121094 |
| 213 | Travel Guide: Japan | 16.190000534057617 |
| 214 | Poetry Collection - Silver | 7.059999942779541 |
| 215 | Travel Guide: Japan Plus - Black | 42.15999984741211 |
| 216 | Short Stories Max M | 33.40999984741211 |
| 217 | Travel Guide: Japan 2.0 | 39.20000076293945 |
| 218 | Business Strategy 101 Pro M | 25.579999923706055 |
| 219 | Data Science Handbook | 22.209999084472656 |
| 220 | Data Science Handbook | 49.91999816894531 |
| 221 | Business Strategy 101 XL - Blue | 26.110000610351562 |
| 222 | Travel Guide: Japan M - White | 12.729999542236328 |
| 223 | Business Strategy 101 - Green | 27.65999984741211 |

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| 224 | Poetry Collection XL | 30.1200008392334 |
| 225 | Data Science Handbook | 47.290000915527344 |
| 226 | Business Strategy 101 - Silver | 22.309999465942383 |
| 227 | History of Art XL | 22.030000686645508 |
| 228 | Data Science Handbook Pro | 7.800000190734863 |
| 229 | Paperback Novel Pro S | 48.380001068115234 |
| 230 | Short Stories - Black | 11.819999694824219 |
| 231 | History of Art | 31.450000762939453 |
| 232 | Data Science Handbook L | 29.709999084472656 |
| 233 | Childrens Stories M | 15.600000381469727 |
| 234 | Poetry Collection - Green | 26.690000534057617 |
| 235 | Mystery Thriller - Silver | 38.540000915527344 |
| 236 | Paperback Novel | 23.780000686645508 |
| 237 | Beginners German | 46.689998626708984 |
| 238 | Mystery Thriller Lite | 47.529998779296875 |
| 239 | Short Stories | 21.190000534057617 |
| 240 | History of Art - Silver | 28.010000228881836 |
| 241 | Childrens Stories 2.0 S | 11.010000228881836 |
| 242 | Fantasy Epic Vol. 1 | 27.100000381469727 |
| 243 | History of Art | 36.849998474121094 |
| 244 | Data Science Handbook S | 28.540000915527344 |
| 245 | Childrens Stories Plus | 43.09000015258789 |
| 246 | Travel Guide: Japan | 19.700000762939453 |
| 247 | Poetry Collection Max S | 28.489999771118164 |
| 248 | Data Science Handbook | 28.219999313354492 |
| 249 | Beginners German XL | 22.43000030517578 |
| 250 | Paperback Novel - Blue | 6.539999961853027 |
| 251 | Travel Guide: Japan XL | 48.869998931884766 |
| 252 | Pet Treats Mixed 500g Lite XL - Red | 19.700000762939453 |
| 253 | Bird Seed 1kg 2.0 - Blue | 23.3799991607666 |
| 254 | Pet Treats Mixed 500g Pro | 13.420000076293945 |
| 255 | Dog Leash Nylon Plus - Green | 21.559999465942383 |

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| 256 | Aquarium Filter | 48.619998931884766 |
| 257 | Bird Seed 1kg | 13.520000457763672 |
| 258 | Aquarium Filter | 29.239999771118164 |
| 259 | Pet Treats Mixed 500g M | 10.529999732971191 |
| 260 | Pet Shampoo 250ml Pro - Red | 26.75 |
| 261 | Pet Shampoo 250ml XL - Black | 38.939998626708984 |
| 262 | Pet Bed Medium Max XL | 42.11000061035156 |
| 263 | Pet Bed Medium Plus | 3.950000047683716 |
| 264 | Bird Seed 1kg Pro S - Silver | 4.980000019073486 |
| 265 | Pet Bed Medium | 18.260000228881836 |
| 266 | Dog Leash Nylon - Silver | 17.139999389648438 |
| 267 | Aquarium Filter XL | 47.83000183105469 |
| 268 | Aquarium Filter - Blue | 5.789999961853027 |
| 269 | Pet Shampoo 250ml M | 45.09000015258789 |
| 270 | Fish Flakes 200g Max XL | 31.030000686645508 |
| 271 | Small Animal Hay 1kg L - Silver | 32.189998626708984 |
| 272 | Cat Scratching Post Plus | 5.829999923706055 |
| 273 | Bird Seed 1kg | 4.300000190734863 |

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-- Logische Operatoren: AND, OR, NOT
SELECT name, price, category FROM products
WHERE category = 'Electronics' AND price < 100
```

| | name | price | category |
|---|--------------------|--------------------|-------------|
| 1 | 4K Monitor | 24.920000076293945 | Electronics |
| 2 | Smartwatch - White | 61.61000061035156 | Electronics |
| 3 | 4K Monitor | 62.900001525878906 | Electronics |
| 4 | Gaming Mouse | 92.52999877929688 | Electronics |

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-- BETWEEN
SELECT name, price FROM products
WHERE price BETWEEN 100 AND 500
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| | name | price |
|----|-----------------------------|--------------------|
| 1 | Laptop 14" Pro S | 481.5299987792969 |
| 2 | USB-C Hub - Red | 317.3299865722656 |
| 3 | Wireless Headphones | 377.20001220703125 |
| 4 | Tablet 10" - Black | 128.33999633789062 |
| 5 | Gaming Mouse Lite S | 486.9700012207031 |
| 6 | 4K Monitor | 226.25999450683594 |
| 7 | Bluetooth Speaker XL | 215.55999755859375 |
| 8 | Gaming Mouse Pro S | 270.9700012207031 |
| 9 | Smartwatch Pro L - Graphite | 394.2200012207031 |
| 10 | Portable SSD Plus | 271.3699951171875 |
| 11 | Laptop 14" 2.0 - White | 132.35000610351562 |
| 12 | Portable SSD | 289.75 |
| 13 | USB-C Hub S | 298.1099853515625 |
| 14 | Soundbar Plus | 146.52999877929688 |
| 15 | Soundbar 2.0 | 231.8699951171875 |
| 16 | Soundbar Max M | 317.1400146484375 |
| 17 | Tablet 10" S - Black | 192.97999572753906 |
| 18 | Gaming Mouse | 317.3800048828125 |
| 19 | Gaming Mouse Pro | 415.4700012207031 |
| 20 | Action Camera - White | 129.1699981689453 |
| 21 | USB-C Hub Plus | 408.9200134277344 |
| 22 | Leggings Max - Silver | 245.35000610351562 |
| 23 | Jacket Max XL | 110.7699966430664 |
| 24 | Hoodie - Black | 106.25 |
| 25 | Hoodie | 184.1300048828125 |
| 26 | Raincoat 2.0 | 131.5399932861328 |
| 27 | Jeans XL | 113.5199966430664 |
| 28 | Jeans | 104.87000274658203 |
| 29 | Chinos Pro - Red | 195.07000732421875 |
| 30 | Polo Shirt | 121.05999755859375 |
| 31 | Jacket | 140.52999877929688 |

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|----|-----------------------------|--------------------|
| 32 | Jacket | 223.66000366210938 |
| 33 | Sneakers Pro XL | 185.7899932861328 |
| 34 | Polo Shirt 2.0 | 235.5 |
| 35 | Chinos L - Silver | 205.42999267578125 |
| 36 | Hoodie - Green | 237.97999572753906 |
| 37 | Chinos | 138.47999572753906 |
| 38 | Raincoat | 143.42999267578125 |
| 39 | Cap - Black | 205.25999450683594 |
| 40 | Dress Shirt Plus - Graphite | 198.6699981689453 |
| 41 | Socks (5-pack) | 159.63999938964844 |
| 42 | Polo Shirt - Red | 243.7100067138672 |
| 43 | Hoodie | 108.48999786376953 |
| 44 | Hoodie Plus L | 129.17999267578125 |
| 45 | Jacket 2.0 | 143.66000366210938 |
| 46 | Socks (5-pack) | 116.91000366210938 |
| 47 | Socks (5-pack) Max S | 127.87999725341797 |
| 48 | Jeans | 141.0399932861328 |
| 49 | Cap - Green | 193.14999389648438 |
| 50 | Jacket - Green | 122.69999694824219 |
| 51 | Basic T-Shirt | 102.4000015258789 |
| 52 | Polo Shirt - Silver | 227.75 |
| 53 | Leggings Max S | 233.5 |
| 54 | Jeans Plus L | 223.6199951171875 |
| 55 | Basic T-Shirt Lite | 146.1199951171875 |
| 56 | Dress Shirt Max | 151.33999633789062 |
| 57 | Leggings 2.0 - Green | 222.35000610351562 |
| 58 | Raincoat Pro | 103.93000030517578 |
| 59 | Chinos | 214.4199981689453 |
| 60 | Hoodie 2.0 XL - Blue | 152.3800048828125 |
| 61 | Jacket | 155.19000244140625 |
| 62 | Chinos | 135.27999877929688 |
| 63 | Dress Shirt | 103.5999984741211 |
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| 64 | Jeans 2.0 - Blue | 164.42999267578125 |
| 65 | Hoodie - Black | 196.66000366210938 |
| 66 | Chinos Lite | 126.12999725341797 |
| 67 | Hoodie | 204.27000427246094 |
| 68 | Polo Shirt | 240.1699981689453 |
| 69 | Jeans Pro - Graphite | 171.82000732421875 |
| 70 | Jacket Lite L - Red | 222.7100067138672 |
| 71 | Sneakers L | 177.36000061035156 |
| 72 | Dress Shirt Pro | 198.33999633789062 |
| 73 | Jeans | 231.74000549316406 |
| 74 | Wireless Mouse XL | 375.2699890136719 |
| 75 | Whiteboard Markers (8-pack) Plus XL | 325.4800109863281 |
| 76 | Wireless Mouse S | 291.3800048828125 |
| 77 | A4 Copy Paper 500 sheets - Silver | 417.1000061035156 |
| 78 | Ergonomic Chair Lite M | 255.1999969482422 |
| 79 | Gel Pens (10-pack) | 345.1600036621094 |
| 80 | Binder 5cm | 107.18000030517578 |
| 81 | Laptop Stand XL | 374.7799987792969 |
| 82 | Laptop Stand | 113.69999694824219 |
| 83 | Gel Pens (10-pack) | 106.06999969482422 |
| 84 | Ergonomic Chair XL | 157.0399932861328 |
| 85 | Ergonomic Chair - Red | 383.0400085449219 |
| 86 | Fountain Pen | 470.7300109863281 |
| 87 | Fountain Pen | 283.19000244140625 |
| 88 | Laptop Stand | 402.7200012207031 |
| 89 | Binder 5cm Pro | 179.74000549316406 |
| 90 | Desk Lamp LED - White | 254.80999755859375 |
| 91 | Fountain Pen 2.0 - Blue | 299.239990234375 |
| 92 | Wireless Mouse | 377.42999267578125 |
| 93 | Laptop Stand - Blue | 474 |
| 94 | Whiteboard Markers (8-pack) L | 442.4100036621094 |
| 95 | Laptop Stand | 289.7699890136719 |

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| 96 | Fountain Pen | 444 |
| 97 | Laptop Stand Max L | 223.74000549316406 |
| 98 | Notebook A5 Dotted | 293.5400085449219 |
| 99 | Whiteboard Markers (8-pack) Lite | 180.91000366210938 |
| 100 | Binder 5cm L | 322.8699951171875 |
| 101 | Whiteboard Markers (8-pack) Max | 140.72000122070312 |
| 102 | Ergonomic Chair S | 436.5899963378906 |
| 103 | Ergonomic Chair | 140.77000427246094 |
| 104 | Laptop Stand | 407.7699890136719 |
| 105 | Binder 5cm Pro | 483.7200012207031 |
| 106 | Desk Lamp LED Pro - Blue | 361.2300109863281 |
| 107 | Laptop Stand | 301.6300048828125 |
| 108 | Laptop Stand | 487.1000061035156 |
| 109 | A4 Copy Paper 500 sheets | 159.02000427246094 |
| 110 | Notebook A5 Dotted - Green | 215.47000122070312 |
| 111 | A4 Copy Paper 500 sheets - Blue | 407.6099853515625 |
| 112 | Sticky Notes (12 pads) 2.0 | 432.6300048828125 |
| 113 | Notebook A5 Dotted Lite - Black | 303.510009765625 |
| 114 | Office Scissors - Black | 280.92999267578125 |
| 115 | Sticky Notes (12 pads) | 111.7699966430664 |
| 116 | Fountain Pen S - Red | 128.9499969482422 |
| 117 | Fountain Pen - Red | 320.5299987792969 |
| 118 | Desk Lamp LED | 353.4700012207031 |
| 119 | Sticky Notes (12 pads) 2.0 | 478.1300048828125 |
| 120 | Sticky Notes (12 pads) - White | 363.32000732421875 |
| 121 | Ergonomic Chair | 281.69000244140625 |
| 122 | Notebook A5 Dotted Plus | 214.25999450683594 |
| 123 | Laptop Stand - Blue | 149.0399932861328 |
| 124 | Laptop Stand Max | 278.5899963378906 |
| 125 | Whiteboard Markers (8-pack) | 440.3900146484375 |
| 126 | Desk Lamp LED Pro | 479.6700134277344 |
| 127 | A4 Copy Paper 500 sheets | 461.9100036621094 |

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| 128 | Fountain Pen Lite | 212.89999389648438 |
| 129 | Binder 5cm | 210.97000122070312 |
| 130 | Desk Lamp LED L - Red | 258.07000732421875 |
| 131 | Notebook A5 Dotted 2.0 | 369.42999267578125 |
| 132 | Fountain Pen | 235.6300048828125 |
| 133 | Sticky Notes (12 pads) Pro | 172.52000427246094 |
| 134 | Wireless Mouse | 240.2100067138672 |
| 135 | Ergonomic Chair - Graphite | 290.3599853515625 |
| 136 | Gel Pens (10-pack) 2.0 | 162.49000549316406 |
| 137 | Laptop Stand Plus XL | 425.239990234375 |
| 138 | Binder 5cm - Graphite | 424.25 |
| 139 | Ergonomic Chair | 159.5399932861328 |
| 140 | Gel Pens (10-pack) Max - Blue | 338.79998779296875 |
| 141 | Wireless Mouse - Green | 376.69000244140625 |
| 142 | Sticky Notes (12 pads) | 369.5 |
| 143 | Office Scissors | 186.82000732421875 |
| 144 | Wireless Mouse Plus XL | 189.27000427246094 |
| 145 | Laptop Stand - White | 476.8599853515625 |
| 146 | Wireless Mouse Plus | 364.4800109863281 |
| 147 | Whiteboard Markers (8-pack) | 415.8699951171875 |
| 148 | Gel Pens (10-pack) XL | 271.7900085449219 |
| 149 | Notebook A5 Dotted | 174.57000732421875 |
| 150 | Gel Pens (10-pack) - Silver | 262.6700134277344 |
| 151 | Ergonomic Chair S | 301.6600036621094 |
| 152 | Notebook A5 Dotted 2.0 | 202.17999267578125 |
| 153 | A4 Copy Paper 500 sheets M - Black | 290.1099853515625 |
| 154 | Ergonomic Chair | 437.2900085449219 |
| 155 | Toaster 2-slice | 439.2900085449219 |
| 156 | Water Filter Jug 2.5L - Blue | 454.510009765625 |
| 157 | Pressure Cooker 6L | 356.45001220703125 |
| 158 | Vacuum Cleaner Lite S | 185.72999572753906 |
| 159 | Glass Storage Set (10 pcs) Lite L - Blue | 498.4800109863281 |

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| 160 | Vacuum Cleaner Lite | 187.6300048828125 |
| 161 | Cutlery Set (24 pcs) | 402.0799865722656 |
| 162 | Cutlery Set (24 pcs) | 462.70001220703125 |
| 163 | Water Filter Jug 2.5L Plus | 173.86000061035156 |
| 164 | Pressure Cooker 6L | 180.17999267578125 |
| 165 | Glass Storage Set (10 pcs) | 275.4700012207031 |
| 166 | Vacuum Cleaner Plus | 199.47999572753906 |
| 167 | Stainless Steel Pan 28cm | 166.74000549316406 |
| 168 | Stainless Steel Pan 28cm Pro | 422.1300048828125 |
| 169 | Ceramic Mug 350ml | 279.6000061035156 |
| 170 | Glass Storage Set (10 pcs) | 174.7100067138672 |
| 171 | Pressure Cooker 6L - Green | 445.1499938964844 |
| 172 | Toaster 2-slice | 205.92999267578125 |
| 173 | Glass Storage Set (10 pcs) | 308.1600036621094 |
| 174 | Blender 1.5L Plus | 356.0799865722656 |
| 175 | Blender 1.5L Lite | 145.8300018310547 |
| 176 | Stainless Steel Pan 28cm L | 297.1000061035156 |
| 177 | Toaster 2-slice Max L | 148.36000061035156 |
| 178 | Cutlery Set (24 pcs) 2.0 | 143.94000244140625 |
| 179 | Blender 1.5L | 453.8800048828125 |
| 180 | Cutlery Set (24 pcs) | 365.79998779296875 |
| 181 | Toaster 2-slice M | 170.10000610351562 |
| 182 | Pressure Cooker 6L Pro S | 318.1400146484375 |
| 183 | Glass Storage Set (10 pcs) XL | 100.37000274658203 |
| 184 | Cutlery Set (24 pcs) | 228.94000244140625 |
| 185 | Cutlery Set (24 pcs) Lite - Silver | 386.3699951171875 |
| 186 | Vacuum Cleaner | 432.95001220703125 |
| 187 | Electric Kettle 1.7L | 120.8499984741211 |
| 188 | Vacuum Cleaner Pro | 270.2900085449219 |
| 189 | Toaster 2-slice - White | 241.97000122070312 |
| 190 | Toaster 2-slice L | 475.19000244140625 |
| 191 | Chef Knife 20cm | 465.7799987792969 |

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| 192 | Chef Knife 20cm Plus | 245.5 |
| 193 | Air Fryer 4L Pro M | 268.5199890136719 |
| 194 | Chef Knife 20cm - Silver | 499.6099853515625 |
| 195 | Water Filter Jug 2.5L Plus L | 387.17999267578125 |
| 196 | Stainless Steel Pan 28cm Lite | 279.80999755859375 |
| 197 | Ceramic Mug 350ml | 300.95001220703125 |
| 198 | Air Fryer 4L - Black | 327.1199951171875 |
| 199 | Blender 1.5L - Green | 356.5199890136719 |
| 200 | Cutlery Set (24 pcs) | 320.3599853515625 |
| 201 | Electric Kettle 1.7L S | 432.7699890136719 |
| 202 | Toaster 2-slice Plus | 308.19000244140625 |
| 203 | Air Fryer 4L Lite - White | 388.20001220703125 |
| 204 | Ceramic Mug 350ml Pro - Red | 398.8699951171875 |
| 205 | Toaster 2-slice Plus | 182.22000122070312 |
| 206 | Electric Kettle 1.7L - Graphite | 242.41000366210938 |
| 207 | Vacuum Cleaner | 463.2099914550781 |
| 208 | Cutlery Set (24 pcs) | 415.4599914550781 |
| 209 | Water Filter Jug 2.5L M | 347.7200012207031 |
| 210 | Air Fryer 4L - Red | 169.55999755859375 |
| 211 | Art Set 150 pcs | 112.2300033569336 |
| 212 | Wooden Train Set | 139.1699981689453 |
| 213 | STEM Robot Kit L - Green | 197.49000549316406 |
| 214 | Puzzle 1000 pieces Max M | 146.49000549316406 |
| 215 | STEM Robot Kit Lite XL | 148.57000732421875 |
| 216 | RC Drone Mini Max | 122.91999816894531 |
| 217 | Wooden Train Set 2.0 XL | 126.62999725341797 |
| 218 | Marble Run Plus | 121.41999816894531 |
| 219 | Building Blocks Set | 194.47999572753906 |
| 220 | Puzzle 1000 pieces Lite | 107.08999633789062 |
| 221 | Wooden Train Set Plus | 158.75 |
| 222 | Board Game Classic | 122.75 |
| 223 | RC Drone Mini | 171.97999572753906 |

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| 224 | Puzzle 1000 pieces XL | 128.1199951171875 |
| 225 | RC Drone Mini - Green | 144.57000732421875 |
| 226 | Remote Control Car 2.0 M | 130.7899932861328 |
| 227 | RC Drone Mini M - Blue | 130.5 |
| 228 | Art Set 150 pcs 2.0 - Graphite | 190.97999572753906 |
| 229 | STEM Robot Kit | 133.63999938964844 |
| 230 | Remote Control Car 2.0 - Black | 138.25 |
| 231 | Wooden Train Set 2.0 - Silver | 154.50999450683594 |
| 232 | STEM Robot Kit XL - Green | 191.16000366210938 |
| 233 | RC Drone Mini - Graphite | 111.83999633789062 |
| 234 | Puzzle 1000 pieces Max S | 171.7100067138672 |
| 235 | Marble Run - Silver | 107.87000274658203 |
| 236 | Building Blocks Set | 188.4499969482422 |
| 237 | STEM Robot Kit | 144.77000427246094 |
| 238 | Building Blocks Set - White | 183.8699951171875 |
| 239 | Marble Run Plus - Blue | 129.41000366210938 |
| 240 | Remote Control Car S | 167.5 |
| 241 | Board Game Classic 2.0 - Red | 147.94000244140625 |
| 242 | Remote Control Car L - Blue | 149.72000122070312 |
| 243 | Marble Run Pro L | 120.20999908447266 |
| 244 | Science Kit - Volcano - Green | 199.2899932861328 |
| 245 | Building Blocks Set | 193.1699981689453 |
| 246 | Plush Bear 30cm Plus | 113.45999908447266 |
| 247 | STEM Robot Kit | 189.36000061035156 |
| 248 | Building Blocks Set | 158.77999877929688 |
| 249 | Science Kit - Volcano S | 181.1999969482422 |
| 250 | Building Blocks Set XL | 107.63999938964844 |
| 251 | RC Drone Mini Lite - Silver | 156.22999572753906 |
| 252 | Marble Run | 157.80999755859375 |
| 253 | Art Set 150 pcs Max M | 133.27000427246094 |
| 254 | Remote Control Car Pro | 193.25 |
| 255 | Puzzle 1000 pieces Max | 119.26000213623047 |

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| 256 | Wooden Train Set Max L - Graphite | 127.01000213623047 |
| 257 | Board Game Classic Plus - Blue | 180.36000061035156 |
| 258 | RC Drone Mini | 103.86000061035156 |
| 259 | Science Kit - Volcano | 126 |
| 260 | Puzzle 1000 pieces - Graphite | 131.27000427246094 |
| 261 | Building Blocks Set Lite | 140.49000549316406 |
| 262 | STEM Robot Kit | 136.91000366210938 |
| 263 | Building Blocks Set | 127.01000213623047 |
| 264 | Bike Helmet Pro S | 165.61000061035156 |
| 265 | Compression Shirt | 262.3699951171875 |
| 266 | Basketball | 250.92999267578125 |
| 267 | Compression Shirt M - Graphite | 313.5799865722656 |
| 268 | Basketball | 265.510009765625 |
| 269 | Fitness Tracker Pro | 142.49000549316406 |
| 270 | Cycling Gloves Pro | 113.62000274658203 |
| 271 | Fitness Tracker XL | 228.42999267578125 |
| 272 | Fitness Tracker | 172.1199951171875 |
| 273 | Compression Shirt - Silver | 128.94000244140625 |
| 274 | Water Bottle 1L Pro M | 323.9599914550781 |
| 275 | Water Bottle 1L - White | 207.02999877929688 |
| 276 | Running Shoes | 157.35000610351562 |
| 277 | Compression Shirt | 157.58999633789062 |
| 278 | Bike Helmet | 217.6199951171875 |
| 279 | Basketball Lite L | 317.1700134277344 |
| 280 | Compression Shirt | 220.2899932861328 |
| 281 | Running Shoes - Green | 196.77000427246094 |
| 282 | Running Shoes | 322.1600036621094 |
| 283 | Water Bottle 1L Pro | 291.04998779296875 |
| 284 | Football Size 5 Lite L | 310.3699951171875 |
| 285 | Jump Rope XL | 158.82000732421875 |
| 286 | Cycling Gloves | 199.8000030517578 |
| 287 | Cycling Gloves - Red | 249.38999938964844 |

| | | |
|-----|---------------------------------|--------------------|
| 288 | Fitness Tracker Max | 285.70001220703125 |
| 289 | Dumbbells Pair 2x5kg 2.0 | 186.9499969482422 |
| 290 | Fitness Tracker | 249.69000244140625 |
| 291 | Water Bottle 1L Pro | 273.5400085449219 |
| 292 | Compression Shirt 2.0 - Black | 118.0199966430664 |
| 293 | Cycling Gloves S | 110.51000213623047 |
| 294 | Tennis Racket S | 309.010009765625 |
| 295 | Running Shoes | 123.13999938964844 |
| 296 | Water Bottle 1L | 286.07000732421875 |
| 297 | Tennis Racket Lite - Graphite | 157.58999633789062 |
| 298 | Cycling Gloves L - Blue | 104.26000213623047 |
| 299 | Running Shoes Pro - Green | 287.260009765625 |
| 300 | Football Size 5 Plus M | 132.22000122070312 |
| 301 | Cycling Gloves S | 224.5800018310547 |
| 302 | Yoga Mat 6mm Lite - Blue | 165.61000061035156 |
| 303 | Cycling Gloves | 109.41999816894531 |
| 304 | Basketball | 253.86000061035156 |
| 305 | Basketball Pro | 229.67999267578125 |
| 306 | Yoga Mat 6mm Max | 111.70999908447266 |
| 307 | Water Bottle 1L | 207.52999877929688 |
| 308 | Jump Rope | 204.47999572753906 |
| 309 | Compression Shirt Plus | 218.3300018310547 |
| 310 | Dumbbells Pair 2x5kg | 294.42999267578125 |
| 311 | Running Shoes Plus | 299.6000061035156 |
| 312 | Compression Shirt Pro | 103.9800033569336 |
| 313 | Dumbbells Pair 2x5kg | 261.3800048828125 |
| 314 | Running Shoes Max M | 101.02999877929688 |
| 315 | Dumbbells Pair 2x5kg Pro - Blue | 108.66999816894531 |
| 316 | Fitness Tracker Pro | 162.89999389648438 |
| 317 | Tennis Racket Pro | 164.08999633789062 |
| 318 | Football Size 5 Pro | 135.6699981689453 |
| 319 | Basketball Lite | 322.0799865722656 |

| | | |
|-----|-----------------------------------|--------------------|
| 320 | Fitness Tracker Lite - Graphite | 162.27999877929688 |
| 321 | Basketball - Blue | 193.2899932861328 |
| 322 | Water Bottle 1L Lite | 166.00999450683594 |
| 323 | Dumbbells Pair 2x5kg L | 291.5799865722656 |
| 324 | Cycling Gloves - Green | 236.3000030517578 |
| 325 | Dumbbells Pair 2x5kg Max M | 339.05999755859375 |
| 326 | Tennis Racket Lite | 267.80999755859375 |
| 327 | Cycling Gloves 2.0 | 322.3299865722656 |
| 328 | Tennis Racket 2.0 - Black | 320.3399963378906 |
| 329 | Football Size 5 Pro - Graphite | 318.4700012207031 |
| 330 | Shampoo 300ml Plus L | 107.01000213623047 |
| 331 | Hand Cream 75ml Plus XL - Red | 136.27000427246094 |
| 332 | Body Lotion 250ml Pro - Black | 126.13999938964844 |
| 333 | Face Mask Sheet Max | 138.5 |
| 334 | Conditioner 300ml | 130.1699981689453 |
| 335 | Micellar Water 400ml Pro | 129.8000030517578 |
| 336 | Micellar Water 400ml Pro | 100.05999755859375 |
| 337 | Moisturizing Cream 50ml Lite | 134.05999755859375 |
| 338 | Hair Oil 100ml Lite S | 120.61000061035156 |
| 339 | Face Mask Sheet L | 131.33999633789062 |
| 340 | Body Lotion 250ml Pro | 111.37000274658203 |
| 341 | Hair Oil 100ml 2.0 - White | 127.30999755859375 |
| 342 | Conditioner 300ml Pro L | 105.44000244140625 |
| 343 | Sunscreen SPF50 100ml 2.0 - Green | 135.2100067138672 |
| 344 | Moisturizing Cream 50ml | 120.47000122070312 |
| 345 | Moisturizing Cream 50ml | 124.66000366210938 |
| 346 | Facial Cleanser 200ml Plus | 134.25 |
| 347 | Sunscreen SPF50 100ml | 114.51000213623047 |
| 348 | Hand Cream 75ml Plus | 139.5800018310547 |
| 349 | Face Mask Sheet | 135.27999877929688 |
| 350 | Aquarium Filter S - White | 104.36000061035156 |
| 351 | Pet Bed Medium L | 120.69999694824219 |

| | | |
|-----|---------------------------------|--------------------|
| 352 | Pet Shampoo 250ml | 180.44000244140625 |
| 353 | Pet Shampoo 250ml M | 141.08999633789062 |
| 354 | Dog Leash Nylon | 172.75999450683594 |
| 355 | Pet Treats Mixed 500g M - White | 147.8300018310547 |
| 356 | Pet Shampoo 250ml Plus - Blue | 102.16999816894531 |
| 357 | Pet Shampoo 250ml 2.0 - Silver | 141.82000732421875 |
| 358 | Cat Litter 10L - Graphite | 116.62000274658203 |
| 359 | Cat Scratching Post Pro | 100.86000061035156 |
| 360 | Cat Litter 10L 2.0 S | 160.8300018310547 |
| 361 | Cat Litter 10L | 113.45999908447266 |
| 362 | Aquarium Filter Pro | 172.0500030517578 |
| 363 | Cat Litter 10L M - Green | 194.52999877929688 |
| 364 | Pet Bed Medium | 136.77000427246094 |
| 365 | Dog Leash Nylon | 140.6199951171875 |
| 366 | Bird Seed 1kg Plus | 132.10000610351562 |
| 367 | Pet Shampoo 250ml | 178.36000061035156 |
| 368 | Fish Flakes 200g S - Blue | 184.89999389648438 |
| 369 | Bird Seed 1kg | 199.0800018310547 |
| 370 | Cat Scratching Post Plus | 147.8800048828125 |
| 371 | Cat Litter 10L M | 121.4800033569336 |
| 372 | Pet Shampoo 250ml - Red | 173.8000030517578 |
| 373 | Dry Dog Food 5kg | 111.94000244140625 |
| 374 | Pet Treats Mixed 500g | 183.4199981689453 |
| 375 | Pet Bed Medium L | 108.12000274658203 |
| 376 | Cat Toys (6-pack) | 189.38999938964844 |
| 377 | Bird Seed 1kg S - Silver | 142.55999755859375 |
| 378 | Pet Shampoo 250ml Max - Green | 177.80999755859375 |
| 379 | Aquarium Filter | 193.86000061035156 |
| 380 | Pet Bed Medium | 104.2699966430664 |
| 381 | Cat Litter 10L 2.0 XL | 185.24000549316406 |
| 382 | Cat Scratching Post - Red | 162.25999450683594 |
| 383 | Pet Bed Medium Pro - Red | 144.36000061035156 |

| | | |
|-----|-------------------------------------|--------------------|
| 384 | Fish Flakes 200g M | 120.55999755859375 |
| 385 | Dog Leash Nylon Lite | 104.69000244140625 |
| 386 | Pet Bed Medium - Silver | 193.47999572753906 |
| 387 | Small Animal Hay 1kg | 111.22000122070312 |
| 388 | Bird Seed 1kg 2.0 - Blue | 124.9800033569336 |
| 389 | Bird Seed 1kg - White | 113.43000030517578 |
| 390 | Small Animal Hay 1kg Plus | 136.5399932861328 |
| 391 | Pet Treats Mixed 500g Pro S - Black | 181.9600067138672 |
| 392 | Pet Treats Mixed 500g | 143.77999877929688 |
| 393 | Cat Litter 10L | 196 |
| 394 | Aquarium Filter L | 189.22999572753906 |
| 395 | Pet Shampoo 250ml Plus - White | 111.93000030517578 |
| 396 | Dog Leash Nylon XL | 148.2899932861328 |

```
-- IN
SELECT name, category FROM products
WHERE category IN ('Electronics', 'Office', 'Groceries')
```

| | name | category |
|----|------------------------------|-------------|
| 1 | Laptop 14" 2.0 | Electronics |
| 2 | Portable SSD Max M | Electronics |
| 3 | 4K Monitor - Green | Electronics |
| 4 | Tablet 10 | Electronics |
| 5 | Portable SSD Lite | Electronics |
| 6 | Soundbar - Red | Electronics |
| 7 | Mechanical Keyboard - Black | Electronics |
| 8 | Laptop 14" Plus | Electronics |
| 9 | Action Camera - Green | Electronics |
| 10 | Soundbar | Electronics |
| 11 | 4K Monitor | Electronics |
| 12 | Action Camera XL | Electronics |
| 13 | Gaming Mouse Plus M | Electronics |
| 14 | Bluetooth Speaker Plus | Electronics |
| 15 | Noise-Canceling Earbuds Lite | Electronics |
| 16 | Action Camera - Blue | Electronics |
| 17 | Laptop 14" Pro S | Electronics |
| 18 | Gaming Mouse | Electronics |
| 19 | USB-C Hub - White | Electronics |
| 20 | USB-C Hub - Red | Electronics |
| 21 | Wireless Headphones | Electronics |
| 22 | Laptop 14" 2.0 - Black | Electronics |
| 23 | Wireless Headphones M | Electronics |
| 24 | Tablet 10" - Green | Electronics |
| 25 | Soundbar Plus | Electronics |
| 26 | USB-C Hub Plus | Electronics |
| 27 | Noise-Canceling Earbuds Max | Electronics |
| 28 | Tablet 10" - Black | Electronics |
| 29 | Mechanical Keyboard - Blue | Electronics |
| 30 | Action Camera | Electronics |
| 31 | Tablet 10" Plus | Electronics |
| | | |

| | | |
|----|------------------------------------|-------------|
| 32 | Noise-Canceling Earbuds | Electronics |
| 33 | Smartwatch - White | Electronics |
| 34 | Bluetooth Speaker M | Electronics |
| 35 | 4K Monitor | Electronics |
| 36 | Tablet 10 | Electronics |
| 37 | Action Camera Plus | Electronics |
| 38 | Bluetooth Speaker Pro | Electronics |
| 39 | Portable SSD Lite S | Electronics |
| 40 | Gaming Mouse - Graphite | Electronics |
| 41 | Portable SSD Lite - Graphite | Electronics |
| 42 | Wireless Headphones Pro S - Silver | Electronics |
| 43 | Gaming Mouse M | Electronics |
| 44 | Bluetooth Speaker Lite M | Electronics |
| 45 | Gaming Mouse Lite S | Electronics |
| 46 | 4K Monitor - White | Electronics |
| 47 | 4K Monitor | Electronics |
| 48 | 4K Monitor | Electronics |
| 49 | Bluetooth Speaker XL | Electronics |
| 50 | Gaming Mouse Pro S | Electronics |
| 51 | Smartwatch Pro L - Graphite | Electronics |
| 52 | Portable SSD Plus | Electronics |
| 53 | Tablet 10 | Electronics |
| 54 | 4K Monitor | Electronics |
| 55 | USB-C Hub | Electronics |
| 56 | Wireless Headphones Max | Electronics |
| 57 | USB-C Hub Pro | Electronics |
| 58 | 4K Monitor | Electronics |
| 59 | Action Camera 2.0 | Electronics |
| 60 | Mechanical Keyboard | Electronics |
| 61 | Action Camera | Electronics |
| 62 | Laptop 14" 2.0 - White | Electronics |
| 63 | Portable SSD | Electronics |
| | | |

| | | |
|----|----------------------------|-------------|
| 64 | USB-C Hub S | Electronics |
| 65 | Gaming Mouse Plus S | Electronics |
| 66 | Soundbar Plus | Electronics |
| 67 | Smartwatch Pro - Blue | Electronics |
| 68 | 4K Monitor L | Electronics |
| 69 | Gaming Mouse M | Electronics |
| 70 | Smartwatch S | Electronics |
| 71 | Soundbar Pro S | Electronics |
| 72 | Soundbar 2.0 | Electronics |
| 73 | Soundbar Max M | Electronics |
| 74 | USB-C Hub - Black | Electronics |
| 75 | 4K Monitor | Electronics |
| 76 | USB-C Hub XL | Electronics |
| 77 | Tablet 10" S - Black | Electronics |
| 78 | Mechanical Keyboard 2.0 XL | Electronics |
| 79 | Smartwatch | Electronics |
| 80 | Bluetooth Speaker | Electronics |
| 81 | Wireless Headphones | Electronics |
| 82 | Gaming Mouse | Electronics |
| 83 | Portable SSD 2.0 | Electronics |
| 84 | 4K Monitor XL | Electronics |
| 85 | Portable SSD | Electronics |
| 86 | Tablet 10" Pro - Black | Electronics |
| 87 | Laptop 14 | Electronics |
| 88 | Laptop 14" Lite | Electronics |
| 89 | Tablet 10" - Graphite | Electronics |
| 90 | Tablet 10" Max | Electronics |
| 91 | Gaming Mouse Pro | Electronics |
| 92 | Smartwatch | Electronics |
| 93 | Bluetooth Speaker - Blue | Electronics |
| 94 | Wireless Headphones | Electronics |
| 95 | Gaming Mouse | Electronics |

| | | |
|-----|-------------------------------------|-------------|
| 96 | Bluetooth Speaker | Electronics |
| 97 | Action Camera - White | Electronics |
| 98 | Soundbar Max | Electronics |
| 99 | USB-C Hub Plus | Electronics |
| 100 | USB-C Hub S | Electronics |
| 101 | Wireless Mouse XL | Office |
| 102 | Whiteboard Markers (8-pack) Plus XL | Office |
| 103 | Whiteboard Markers (8-pack) Plus | Office |
| 104 | Wireless Mouse S | Office |
| 105 | Office Scissors | Office |
| 106 | A4 Copy Paper 500 sheets - Silver | Office |
| 107 | Ergonomic Chair Lite M | Office |
| 108 | Gel Pens (10-pack) | Office |
| 109 | Binder 5cm | Office |
| 110 | Laptop Stand XL | Office |
| 111 | Laptop Stand | Office |
| 112 | Gel Pens (10-pack) | Office |
| 113 | Ergonomic Chair XL | Office |
| 114 | Ergonomic Chair - Red | Office |
| 115 | Fountain Pen | Office |
| 116 | Fountain Pen | Office |
| 117 | Laptop Stand | Office |
| 118 | Binder 5cm Pro | Office |
| 119 | Sticky Notes (12 pads) Lite | Office |
| 120 | Desk Lamp LED - White | Office |
| 121 | Fountain Pen 2.0 - Blue | Office |
| 122 | Wireless Mouse | Office |
| 123 | Laptop Stand - Blue | Office |
| 124 | Whiteboard Markers (8-pack) L | Office |
| 125 | Laptop Stand | Office |
| 126 | Ergonomic Chair Plus | Office |
| 127 | Fountain Pen | Office |

| | | |
|-----|--|--------|
| 128 | Laptop Stand Max L | Office |
| 129 | Wireless Mouse M | Office |
| 130 | Notebook A5 Dotted | Office |
| 131 | Whiteboard Markers (8-pack) Lite | Office |
| 132 | A4 Copy Paper 500 sheets | Office |
| 133 | Binder 5cm L | Office |
| 134 | Whiteboard Markers (8-pack) Max | Office |
| 135 | Ergonomic Chair S | Office |
| 136 | Ergonomic Chair | Office |
| 137 | Ergonomic Chair | Office |
| 138 | Laptop Stand | Office |
| 139 | Binder 5cm Pro | Office |
| 140 | Desk Lamp LED Pro - Blue | Office |
| 141 | Laptop Stand | Office |
| 142 | Laptop Stand | Office |
| 143 | A4 Copy Paper 500 sheets | Office |
| 144 | Office Scissors Pro | Office |
| 145 | Notebook A5 Dotted - Green | Office |
| 146 | A4 Copy Paper 500 sheets - Blue | Office |
| 147 | Sticky Notes (12 pads) 2.0 | Office |
| 148 | Notebook A5 Dotted Lite - Black | Office |
| 149 | Office Scissors - Black | Office |
| 150 | Sticky Notes (12 pads) | Office |
| 151 | Fountain Pen S - Red | Office |
| 152 | Fountain Pen - Red | Office |
| 153 | Desk Lamp LED | Office |
| 154 | Sticky Notes (12 pads) 2.0 | Office |
| 155 | Sticky Notes (12 pads) - White | Office |
| 156 | Ergonomic Chair | Office |
| 157 | Notebook A5 Dotted Plus | Office |
| 158 | Whiteboard Markers (8-pack) Max - Blue | Office |
| 159 | Laptop Stand - Blue | Office |

| | | |
|-----|-------------------------------|--------|
| 160 | Whiteboard Markers (8-pack) | Office |
| 161 | Laptop Stand Max | Office |
| 162 | Whiteboard Markers (8-pack) | Office |
| 163 | Desk Lamp LED Pro | Office |
| 164 | A4 Copy Paper 500 sheets | Office |
| 165 | Fountain Pen Lite | Office |
| 166 | Binder 5cm | Office |
| 167 | Gel Pens (10-pack) Lite | Office |
| 168 | Desk Lamp LED L - Red | Office |
| 169 | Notebook A5 Dotted 2.0 | Office |
| 170 | Fountain Pen | Office |
| 171 | Sticky Notes (12 pads) Pro | Office |
| 172 | Wireless Mouse | Office |
| 173 | Ergonomic Chair - Graphite | Office |
| 174 | Gel Pens (10-pack) 2.0 | Office |
| 175 | Binder 5cm | Office |
| 176 | Laptop Stand Lite | Office |
| 177 | Laptop Stand Plus XL | Office |
| 178 | Binder 5cm - Graphite | Office |
| 179 | Ergonomic Chair | Office |
| 180 | Gel Pens (10-pack) Max - Blue | Office |
| 181 | Wireless Mouse - Green | Office |
| 182 | Sticky Notes (12 pads) | Office |
| 183 | Office Scissors | Office |
| 184 | Wireless Mouse Plus XL | Office |
| 185 | Laptop Stand - White | Office |
| 186 | Wireless Mouse Plus | Office |
| 187 | Whiteboard Markers (8-pack) | Office |
| 188 | Gel Pens (10-pack) XL | Office |
| 189 | Notebook A5 Dotted | Office |
| 190 | Gel Pens (10-pack) - Silver | Office |
| 191 | Ergonomic Chair S | Office |

| | | |
|-----|------------------------------------|-----------|
| 192 | Notebook A5 Dotted 2.0 | Office |
| 193 | A4 Copy Paper 500 sheets M - Black | Office |
| 194 | Ergonomic Chair | Office |
| 195 | Granola 750g | Groceries |
| 196 | Olive Oil 1L - Silver | Groceries |
| 197 | Tomato Sauce 400g Max XL | Groceries |
| 198 | Olive Oil 1L M | Groceries |
| 199 | Green Tea 50 bags M | Groceries |
| 200 | Green Tea 50 bags - Black | Groceries |
| 201 | Arabica Coffee Beans 1kg | Groceries |
| 202 | Pasta Fusilli 500g Plus | Groceries |
| 203 | Olive Oil 1L M - Green | Groceries |
| 204 | Green Tea 50 bags Max | Groceries |
| 205 | Arabica Coffee Beans 1kg Plus | Groceries |
| 206 | Sea Salt 500g | Groceries |
| 207 | Green Tea 50 bags | Groceries |
| 208 | Arabica Coffee Beans 1kg | Groceries |
| 209 | Pasta Fusilli 500g Max M | Groceries |
| 210 | Basmati Rice 1kg L - White | Groceries |
| 211 | Tomato Sauce 400g | Groceries |
| 212 | Dark Chocolate 85% 100g XL - Green | Groceries |
| 213 | Tomato Sauce 400g | Groceries |
| 214 | Basmati Rice 1kg Plus - White | Groceries |
| 215 | Basmati Rice 1kg Max L | Groceries |
| 216 | Basmati Rice 1kg Lite S | Groceries |
| 217 | Granola 750g Plus - Green | Groceries |
| 218 | Organic Oat Milk 1L | Groceries |
| 219 | Dark Chocolate 85% 100g | Groceries |
| 220 | Sea Salt 500g Max - Blue | Groceries |
| 221 | Tomato Sauce 400g - Black | Groceries |
| 222 | Olive Oil 1L | Groceries |
| 223 | Organic Oat Milk 1L | Groceries |

| | | |
|-----|--|-----------|
| 224 | Green Tea 50 bags - Silver | Groceries |
| 225 | Honey 500g 2.0 - White | Groceries |
| 226 | Sea Salt 500g - White | Groceries |
| 227 | Olive Oil 1L | Groceries |
| 228 | Green Tea 50 bags S - Red | Groceries |
| 229 | Organic Oat Milk 1L | Groceries |
| 230 | Arabica Coffee Beans 1kg Pro XL - Blue | Groceries |
| 231 | Honey 500g 2.0 M | Groceries |
| 232 | Olive Oil 1L M | Groceries |
| 233 | Arabica Coffee Beans 1kg Lite | Groceries |
| 234 | Granola 750g Max | Groceries |
| 235 | Basmati Rice 1kg Pro | Groceries |
| 236 | Almonds 200g Lite XL | Groceries |
| 237 | Pasta Fusilli 500g Max XL | Groceries |
| 238 | Basmati Rice 1kg | Groceries |
| 239 | Organic Oat Milk 1L | Groceries |
| 240 | Sea Salt 500g | Groceries |
| 241 | Dark Chocolate 85% 100g Lite L - Green | Groceries |
| 242 | Pasta Fusilli 500g Lite M | Groceries |
| 243 | Sea Salt 500g Lite - Graphite | Groceries |
| 244 | Organic Oat Milk 1L Lite S - Red | Groceries |
| 245 | Honey 500g Lite S | Groceries |
| 246 | Tomato Sauce 400g | Groceries |
| 247 | Basmati Rice 1kg 2.0 - Red | Groceries |
| 248 | Green Tea 50 bags Plus | Groceries |
| 249 | Almonds 200g - Green | Groceries |
| 250 | Granola 750g XL - Graphite | Groceries |
| 251 | Green Tea 50 bags | Groceries |
| 252 | Tomato Sauce 400g - White | Groceries |
| 253 | Pasta Fusilli 500g - Black | Groceries |
| 254 | Arabica Coffee Beans 1kg - Green | Groceries |
| 255 | Sea Salt 500g - Green | Groceries |

| | | |
|-----|---------------------------------|-----------|
| 256 | Green Tea 50 bags XL | Groceries |
| 257 | Honey 500g - Black | Groceries |
| 258 | Almonds 200g | Groceries |
| 259 | Granola 750g - White | Groceries |
| 260 | Dark Chocolate 85% 100g - White | Groceries |
| 261 | Dark Chocolate 85% 100g - White | Groceries |
| 262 | Pasta Fusilli 500g - Silver | Groceries |
| 263 | Tomato Sauce 400g L - Black | Groceries |
| 264 | Sea Salt 500g | Groceries |
| 265 | Almonds 200g Max | Groceries |
| 266 | Olive Oil 1L - Silver | Groceries |
| 267 | Tomato Sauce 400g Max | Groceries |
| 268 | Almonds 200g - Graphite | Groceries |
| 269 | Granola 750g Plus | Groceries |
| 270 | Granola 750g | Groceries |
| 271 | Almonds 200g Max - White | Groceries |
| 272 | Sea Salt 500g - White | Groceries |
| 273 | Honey 500g | Groceries |
| 274 | Arabica Coffee Beans 1kg | Groceries |
| 275 | Honey 500g Max | Groceries |
| 276 | Arabica Coffee Beans 1kg | Groceries |
| 277 | Dark Chocolate 85% 100g L - Red | Groceries |
| 278 | Organic Oat Milk 1L Max | Groceries |
| 279 | Green Tea 50 bags | Groceries |
| 280 | Green Tea 50 bags | Groceries |
| 281 | Sea Salt 500g | Groceries |
| 282 | Organic Oat Milk 1L 2.0 | Groceries |
| 283 | Green Tea 50 bags | Groceries |
| 284 | Honey 500g Max S | Groceries |
| 285 | Honey 500g - Black | Groceries |
| 286 | Basmati Rice 1kg | Groceries |
| 287 | Granola 750g 2.0 - Blue | Groceries |

| | | |
|-----|--|-----------|
| 288 | Dark Chocolate 85% 100g M - Black | Groceries |
| 289 | Sea Salt 500g Max XL - Silver | Groceries |
| 290 | Green Tea 50 bags - Black | Groceries |
| 291 | Arabica Coffee Beans 1kg Plus - Blue | Groceries |
| 292 | Organic Oat Milk 1L Plus M | Groceries |
| 293 | Arabica Coffee Beans 1kg Max XL - Silver | Groceries |
| 294 | Dark Chocolate 85% 100g Max S - Silver | Groceries |

```
-- LIKE (Pattern Matching)
SELECT name FROM products
WHERE name LIKE '%Laptop%'
```

| | name |
|----|------------------------|
| 1 | Laptop 14" 2.0 |
| 2 | Laptop 14" Plus |
| 3 | Laptop 14" Pro S |
| 4 | Laptop 14" 2.0 - Black |
| 5 | Laptop 14" 2.0 - White |
| 6 | Laptop 14 |
| 7 | Laptop 14" Lite |
| 8 | Laptop Stand XL |
| 9 | Laptop Stand |
| 10 | Laptop Stand |
| 11 | Laptop Stand - Blue |
| 12 | Laptop Stand |
| 13 | Laptop Stand Max L |
| 14 | Laptop Stand |
| 15 | Laptop Stand |
| 16 | Laptop Stand |
| 17 | Laptop Stand - Blue |
| 18 | Laptop Stand Max |
| 19 | Laptop Stand Lite |
| 20 | Laptop Stand Plus XL |
| 21 | Laptop Stand - White |

```
-- % = beliebig viele Zeichen
```

```
-- NULL-Werte
```

```
SELECT name, rating FROM products  
WHERE rating IS NULL
```

| | name | rating |
|---|-----------------------|--------|
| 1 | Action Camera | null |
| 2 | Hoodie M | null |
| 3 | Childrens Stories Pro | null |
| 4 | Dog Leash Nylon L | null |
| 5 | Cat Litter 10L | null |

3.5 ORDER BY – Sortieren

```
1  -- Aufsteigend (Standard)  
2  SELECT name, price FROM products  
3  ORDER BY price ASC  
4  LIMIT 10;  
5  
6  -- Absteigend  
7  SELECT name, price FROM products  
8  ORDER BY price DESC  
9  LIMIT 10;  
10  
11 -- Nach mehreren Spalten  
12 SELECT category, name, price FROM products  
13 ORDER BY category ASC, price DESC  
14 LIMIT 10;  
15  
16 -- NULL-Behandlung  
17 SELECT name, rating FROM products  
18 ORDER BY rating DESC NULLS LAST  
19 LIMIT 10;
```



-- Aufsteigend (Standard)

```
SELECT name, price FROM products
ORDER BY price ASC
LIMIT 10
```

| | name | price |
|----|----------------------------------|--------------------|
| 1 | Arabica Coffee Beans 1kg | 0.8999999761581421 |
| 2 | Honey 500g - Black | 1.7300000190734863 |
| 3 | Granola 750g XL - Graphite | 1.9900000095367432 |
| 4 | Organic Oat Milk 1L Lite S - Red | 2.25 |
| 5 | Basmati Rice 1kg | 2.3299999237060547 |
| 6 | Almonds 200g Lite XL | 2.4800000190734863 |
| 7 | Sea Salt 500g Lite - Graphite | 3.069999933242798 |
| 8 | Arabica Coffee Beans 1kg | 3.0899999141693115 |
| 9 | Almonds 200g | 3.5899999141693115 |
| 10 | Green Tea 50 bags | 3.680000066757202 |

-- Absteigend

```
SELECT name, price FROM products
ORDER BY price DESC
LIMIT 10
```

| | name | price |
|----|--------------------------|--------------------|
| 1 | Bluetooth Speaker | 1493.8199462890625 |
| 2 | Mechanical Keyboard | 1462.4000244140625 |
| 3 | 4K Monitor | 1445.8599853515625 |
| 4 | Tablet 10 | 1433.699951171875 |
| 5 | Soundbar Pro S | 1425.739990234375 |
| 6 | Bluetooth Speaker Lite M | 1425.0899658203125 |
| 7 | Gaming Mouse | 1402.1300048828125 |
| 8 | Laptop 14" 2.0 | 1399.030029296875 |
| 9 | 4K Monitor - White | 1390.68994140625 |
| 10 | 4K Monitor XL | 1389.72998046875 |

-- Nach mehreren Spalten

```
SELECT category, name, price FROM products
ORDER BY category ASC, price DESC
LIMIT 10
```

| | category | name | price |
|----|----------|-----------------------------------|--------------------|
| 1 | Beauty | Hand Cream 75ml Plus | 139.5800018310547 |
| 2 | Beauty | Face Mask Sheet Max | 138.5 |
| 3 | Beauty | Hand Cream 75ml Plus XL - Red | 136.27000427246094 |
| 4 | Beauty | Face Mask Sheet | 135.27999877929688 |
| 5 | Beauty | Sunscreen SPF50 100ml 2.0 - Green | 135.2100067138672 |
| 6 | Beauty | Facial Cleanser 200ml Plus | 134.25 |
| 7 | Beauty | Moisturizing Cream 50ml Lite | 134.05999755859375 |
| 8 | Beauty | Face Mask Sheet L | 131.33999633789062 |
| 9 | Beauty | Conditioner 300ml | 130.1699981689453 |
| 10 | Beauty | Micellar Water 400ml Pro | 129.8000030517578 |

-- NULL-Behandlung

```
SELECT name, rating FROM products
ORDER BY rating DESC NULLS LAST
LIMIT 10
```

| | name | rating |
|----|-------------------------|--------|
| 1 | 4K Monitor - Green | 5 |
| 2 | Soundbar - Red | 5 |
| 3 | Action Camera - Green | 5 |
| 4 | Wireless Headphones M | 5 |
| 5 | Noise-Canceling Earbuds | 5 |
| 6 | Bluetooth Speaker M | 5 |
| 7 | USB-C Hub Pro | 5 |
| 8 | Gaming Mouse | 5 |
| 9 | Action Camera - White | 5 |
| 10 | Socks (5-pack) 2.0 M | 5 |

3.6 DISTINCT – Duplikate entfernen

```
1  -- Eindeutige Kategorien
2  SELECT DISTINCT category
3  FROM products
4  ORDER BY category;
5
6  -- Eindeutige Kombinationen
7  SELECT DISTINCT category, brand
8  FROM products
9  ORDER BY category, brand;
```



```
-- Eindeutige Kategorien
SELECT DISTINCT category
FROM products
ORDER BY category
```

| | category |
|----|----------------|
| 1 | Beauty |
| 2 | Books |
| 3 | Clothing |
| 4 | Electronics |
| 5 | Groceries |
| 6 | Home & Kitchen |
| 7 | Office |
| 8 | Pets |
| 9 | Sports |
| 10 | Toys |

```
-- Eindeutige Kombinationen
SELECT DISTINCT category, brand
FROM products
ORDER BY category, brand
```

| | category | brand |
|----|-------------|-----------------|
| 1 | Beauty | AurumCare |
| 2 | Beauty | LunaLeaf |
| 3 | Beauty | OceanMist |
| 4 | Beauty | PureGlow |
| 5 | Beauty | SilkAura |
| 6 | Beauty | VelvetSkin |
| 7 | Books | Atlas Editions |
| 8 | Books | Northwind Press |
| 9 | Books | OpenPage |
| 10 | Books | Orion Leaf |
| 11 | Books | Silver Quill |
| 12 | Books | Sunset House |
| 13 | Clothing | AeroLoom |
| 14 | Clothing | Cotton&Co |
| 15 | Clothing | Meridian Wear |
| 16 | Clothing | Nordline |
| 17 | Clothing | PureThread |
| 18 | Clothing | Seaside |
| 19 | Clothing | UrbanTrail |
| 20 | Electronics | Auralite |
| 21 | Electronics | BlueWave |
| 22 | Electronics | Neutrino |
| 23 | Electronics | OrbiTech |
| 24 | Electronics | PixelPeak |
| 25 | Electronics | Voltix |
| 26 | Electronics | ZenCore |
| 27 | Groceries | DailyChoice |
| 28 | Groceries | Everfarm |
| 29 | Groceries | FreshField |
| 30 | Groceries | GreenVale |
| 31 | Groceries | Pure&Simple |
| | | |

| | | |
|----|----------------|----------------|
| 32 | Groceries | SunHarvest |
| 33 | Home & Kitchen | AquaPure |
| 34 | Home & Kitchen | BrightGlow |
| 35 | Home & Kitchen | CasaNova |
| 36 | Home & Kitchen | CozyNest |
| 37 | Home & Kitchen | Hearthstone |
| 38 | Home & Kitchen | KitchenCrafter |
| 39 | Office | DeskPro |
| 40 | Office | ErgoCraft |
| 41 | Office | InkFlow |
| 42 | Office | PaperMint |
| 43 | Office | StapleStar |
| 44 | Office | WriteRight |
| 45 | Pets | AquaPets |
| 46 | Pets | FurryFriends |
| 47 | Pets | HappyTail |
| 48 | Pets | Paw&Co |
| 49 | Pets | PetNest |
| 50 | Pets | WildFeast |
| 51 | Sports | AeroFlex |
| 52 | Sports | CoreAthlete |
| 53 | Sports | FitFoundry |
| 54 | Sports | PeakMotion |
| 55 | Sports | TrailRunner |
| 56 | Sports | WaveRider |
| 57 | Toys | HappyBlocks |
| 58 | Toys | KiddyLab |
| 59 | Toys | PlayVerse |
| 60 | Toys | RoboPal |
| 61 | Toys | SunnyPlay |
| 62 | Toys | WonderWorks |

3.7 GROUP BY & Aggregation



```
1  -- Anzahl pro Kategorie
2  SELECT
3      category,
4      COUNT(*) AS product_count
5  FROM products
6  GROUP BY category
7  ORDER BY product_count DESC;
8
9  -- Mehrere Aggregate
10 SELECT
11     category,
12     COUNT(*) AS products,
13     ROUND(AVG(price), 2) AS avg_price,
14     MIN(price) AS cheapest,
15     MAX(price) AS most_expensive,
16     SUM(stock) AS total_stock
17 FROM products
18 GROUP BY category;
19
20 -- HAVING - Gruppen filtern
21 SELECT
22     category,
23     COUNT(*) AS count,
24     ROUND(AVG(price), 2) AS avg_price
25 FROM products
26 GROUP BY category
27 HAVING COUNT(*) > 50
28 ORDER BY count DESC;
29
30 -- WHERE + GROUP BY + HAVING
31 SELECT
32     brand,
33     COUNT(*) AS products,
34     ROUND(AVG(price), 2) AS avg_price
35 FROM products
36 WHERE category = 'Electronics'
37 GROUP BY brand
38 HAVING COUNT(*) > 5
39 ORDER BY products DESC;
```

```
-- Anzahl pro Kategorie
SELECT
    category,
    COUNT(*) AS product_count
FROM products
GROUP BY category
ORDER BY product_count DESC
```

| | category | product_count |
|----|----------------|---------------|
| 1 | Electronics | 100 |
| 2 | Groceries | 100 |
| 3 | Pets | 98 |
| 4 | Books | 95 |
| 5 | Office | 94 |
| 6 | Toys | 93 |
| 7 | Clothing | 92 |
| 8 | Sports | 91 |
| 9 | Home & Kitchen | 90 |
| 10 | Beauty | 79 |

```
-- Mehrere Aggregate
SELECT
    category,
    COUNT(*) AS products,
    ROUND(AVG(price), 2) AS avg_price,
    MIN(price) AS cheapest,
    MAX(price) AS most_expensive,
    SUM(stock) AS total_stock
FROM products
GROUP BY category
```


| | category | products | avg_price | cheapest | most_expensive | total_ |
|----|----------------|----------|-----------|--------------------|--------------------|--------|
| 1 | Electronics | 100 | 814.81 | 24.920000076293945 | 1493.8199462890625 | 15703 |
| 2 | Clothing | 92 | 116.83 | 6.130000114440918 | 245.35000610351562 | 38229 |
| 3 | Groceries | 100 | 21.12 | 0.8999999761581421 | 39.84000015258789 | 10498 |
| 4 | Office | 94 | 266.53 | 7.53000020980835 | 487.1000061035156 | 41501 |
| 5 | Home & Kitchen | 90 | 370.11 | 15.220000267028809 | 691.3400268554688 | 27883 |
| 6 | Toys | 93 | 106.07 | 6.849999904632568 | 199.2899932861328 | 39661 |
| 7 | Sports | 91 | 172.76 | 24.809999465942383 | 339.05999755859375 | 45667 |
| 8 | Beauty | 79 | 73.31 | 4.489999771118164 | 139.5800018310547 | 44206 |
| 9 | Books | 95 | 41.27 | 6.190000057220459 | 78.86000061035156 | 23920 |
| 10 | Pets | 98 | 97.91 | 3.950000047683716 | 199.0800018310547 | 31533 |

```
-- HAVING - Gruppen filtern
SELECT
    category,
    COUNT(*) AS count,
    ROUND(AVG(price), 2) AS avg_price
FROM products
GROUP BY category
HAVING COUNT(*) > 50
ORDER BY count DESC
```

| | category | count | avg_price |
|----|----------------|-------|-----------|
| 1 | Electronics | 100 | 814.81 |
| 2 | Groceries | 100 | 21.12 |
| 3 | Pets | 98 | 97.91 |
| 4 | Books | 95 | 41.27 |
| 5 | Office | 94 | 266.53 |
| 6 | Toys | 93 | 106.07 |
| 7 | Clothing | 92 | 116.83 |
| 8 | Sports | 91 | 172.76 |
| 9 | Home & Kitchen | 90 | 370.11 |
| 10 | Beauty | 79 | 73.31 |

```
-- WHERE + GROUP BY + HAVING
SELECT
    brand,
    COUNT(*) AS products,
    ROUND(AVG(price), 2) AS avg_price
FROM products
WHERE category = 'Electronics'
GROUP BY brand
HAVING COUNT(*) > 5
ORDER BY products DESC
```

| | brand | products | avg_price |
|---|-----------|----------|-----------|
| 1 | Voltix | 20 | 875.83 |
| 2 | Auralite | 17 | 923.31 |
| 3 | ZenCore | 16 | 698.99 |
| 4 | OrbiTech | 15 | 773.56 |
| 5 | Neutrino | 14 | 736.94 |
| 6 | PixelPeak | 9 | 954.7 |
| 7 | BlueWave | 9 | 730.2 |

3.8 LIMIT & OFFSET – Paginierung

```
1  -- Top 10
2  SELECT name, price FROM products
3  ORDER BY price DESC
4  LIMIT 10;
5
6  -- Seite 2 (Zeilen 11-20)
7  SELECT name, price FROM products
8  ORDER BY name
9  LIMIT 10 OFFSET 10;
10
11 -- Cursor-basierte Paginierung (besser bei großen Offsets)
12 SELECT product_id, name, price FROM products
13 WHERE product_id > 'P00010'
14 ORDER BY product_id
15 LIMIT 10;
```



-- Top 10

```
SELECT name, price FROM products
ORDER BY price DESC
LIMIT 10
```

| | name | price |
|----|--------------------------|--------------------|
| 1 | Bluetooth Speaker | 1493.8199462890625 |
| 2 | Mechanical Keyboard | 1462.4000244140625 |
| 3 | 4K Monitor | 1445.8599853515625 |
| 4 | Tablet 10 | 1433.699951171875 |
| 5 | Soundbar Pro S | 1425.739990234375 |
| 6 | Bluetooth Speaker Lite M | 1425.0899658203125 |
| 7 | Gaming Mouse | 1402.1300048828125 |
| 8 | Laptop 14" 2.0 | 1399.030029296875 |
| 9 | 4K Monitor - White | 1390.68994140625 |
| 10 | 4K Monitor XL | 1389.72998046875 |

-- Seite 2 (Zeilen 11-20)

```
SELECT name, price FROM products
ORDER BY name
LIMIT 10 OFFSET 10
```

| | name | price |
|----|------------------------------------|--------------------|
| 1 | 4K Monitor XL | 1389.72998046875 |
| 2 | A4 Copy Paper 500 sheets | 461.9100036621094 |
| 3 | A4 Copy Paper 500 sheets | 159.02000427246094 |
| 4 | A4 Copy Paper 500 sheets | 33.79999923706055 |
| 5 | A4 Copy Paper 500 sheets - Blue | 407.6099853515625 |
| 6 | A4 Copy Paper 500 sheets - Silver | 417.1000061035156 |
| 7 | A4 Copy Paper 500 sheets M - Black | 290.1099853515625 |
| 8 | Action Camera | 1259.300048828125 |
| 9 | Action Camera | 1027.699951171875 |
| 10 | Action Camera - Blue | 1322.9000244140625 |

```
-- Cursor-basierte Paginierung (besser bei großen Offsets)
SELECT product_id, name, price FROM products
WHERE product_id > 'P00010'
ORDER BY product_id
LIMIT 10
Conversion Error: Could not convert string 'P00010' to INT32
LINE 3: WHERE product_id > 'P00010'
                        ^
```

4. Normalisierung (L9)

4.1 Normalformen-Übersicht

| Normalform | Regel | Beispiel-Problem |
|------------|--|---|
| 1NF | Alle Werte sind atomar (keine Listen) | Adresse = „Straße, PLZ, Stadt“ |
| 2NF | 1NF + keine partiellen Abhängigkeiten | Produktname hängt nur von product_id ab |
| 3NF | 2NF + keine transitiven Abhängigkeiten | Stadt hängt von PLZ ab |

4.2 1NF – Erste Normalform

Regel: Alle Attribute sind atomar (kein einziges Attribut enthält mehrere Werte).

```
1 -- ✗ Nicht 1NF (Adresse nicht atomar)
2 CREATE TABLE users_bad (
3     user_id INTEGER,
4     name TEXT,
5     address TEXT -- "Hauptstraße 12, 04109 Leipzig"
6 );
7
8 -- ✓ 1NF (Adresse aufgeteilt)
9 CREATE TABLE users_good (
10     user_id INTEGER,
11     name TEXT,
12     street TEXT,      -- "Hauptstraße 12"
13     zip TEXT,         -- "04109"
14     city TEXT         -- "Leipzig"
15 );
```

```
-- ✗ Nicht 1NF (Adresse nicht atomar)
CREATE TABLE users_bad (
  user_id INTEGER,
  name TEXT,
  address TEXT -- "Hauptstraße 12, 04109 Leipzig"
)
```

ok

```
-- ✓ 1NF (Adresse aufgeteilt)
CREATE TABLE users_good (
  user_id INTEGER,
  name TEXT,
  street TEXT,    -- "Hauptstraße 12"
  zip TEXT,       -- "04109"
  city TEXT       -- "Leipzig"
)
```

ok

4.3 2NF – Zweite Normalform

Regel: 1NF + jedes Nicht-Schlüssel-Attribut hängt vom gesamten Primärschlüssel ab (keine partiellen Abhängigkeiten).

```
1  -- ✗ Nicht 2NF (product_name hängt nur von product_id ab, nicht von
   order_id)
2  CREATE TABLE order_items_bad (
3    order_id INTEGER,
4    product_id INTEGER,
5    product_name TEXT,    -- Redundant! Hängt nur von product_id ab
6    quantity INTEGER,
7    PRIMARY KEY (order_id, product_id)
8  );
9
10 -- ✓ 2NF (Produktdaten ausgelagert)
11 CREATE TABLE products (
12   product_id INTEGER PRIMARY KEY,
13   product_name TEXT
14 );
15
16 CREATE TABLE order_items_good (
17   order_id INTEGER,
18   product_id INTEGER,
19   quantity INTEGER,
20   PRIMARY KEY (order_id, product_id),
21   FOREIGN KEY (product_id) REFERENCES products(product_id)
```

22);

```
-- ✗ Nicht 2NF (product_name hängt nur von product_id ab, nicht von order_id)
CREATE TABLE order_items_bad (
  order_id INTEGER,
  product_id INTEGER,
  product_name TEXT, -- Redundant! Hängt nur von product_id ab
  quantity INTEGER,
  PRIMARY KEY (order_id, product_id)
)
```

ok

```
-- ✓ 2NF (Produktdaten ausgelagert)
CREATE TABLE products (
  product_id INTEGER PRIMARY KEY,
  product_name TEXT
)
```

ok

```
CREATE TABLE order_items_good (
  order_id INTEGER,
  product_id INTEGER,
  quantity INTEGER,
  PRIMARY KEY (order_id, product_id),
  FOREIGN KEY (product_id) REFERENCES products(product_id)
)
```

ok

4.4 3NF – Dritte Normalform

Regel: 2NF + keine transitiven Abhängigkeiten (kein Nicht-Schlüssel-Attribut hängt von einem anderen Nicht-Schlüssel-Attribut ab).

```
1 -- ✗ Nicht 3NF (city hängt von zip ab → transitive Abhängigkeit)
2 CREATE TABLE customers_bad (
3   customer_id INTEGER PRIMARY KEY,
4   name TEXT,
5   zip TEXT,
6   city TEXT -- Hängt von zip ab!
7 );
8
9 -- ✓ 3NF (PLZ/Stadt ausgelagert)
10 CREATE TABLE locations (
11   location_id INTEGER PRIMARY KEY,
12   zip TEXT UNIQUE
```

```

12     zip TEXT UNIQUE,
13     city TEXT
14 );
15
16 CREATE TABLE customers_good (
17     customer_id INTEGER PRIMARY KEY,
18     name TEXT,
19     location_id INTEGER,
20     FOREIGN KEY (location_id) REFERENCES locations(location_id)
21 );

```

-- ✗ Nicht 3NF (city hängt von zip ab → transitive Abhängigkeit)

```

CREATE TABLE customers_bad (
    customer_id INTEGER PRIMARY KEY,
    name TEXT,
    zip TEXT,
    city TEXT -- Hängt von zip ab!
)

```

ok

-- ✓ 3NF (PLZ/Stadt ausgelagert)

```

CREATE TABLE locations (
    location_id INTEGER PRIMARY KEY,
    zip TEXT UNIQUE,
    city TEXT
)

```

ok

```

CREATE TABLE customers_good (
    customer_id INTEGER PRIMARY KEY,
    name TEXT,
    location_id INTEGER,
    FOREIGN KEY (location_id) REFERENCES locations(location_id)
)

```

ok

4.5 ER-Diagramm-Notation

Kardinalitäten:

- **1:1** (Eins-zu-Eins): `User ||--|| Profile` – Ein User hat genau ein Profil
- **1:N** (Eins-zu-Viele): `User ||--o{ Order` – Ein User kann viele Orders haben
- **N:M** (Viele-zu-Viele): `Product }o--o{ Order` – Viele Products in vielen Orders (via Junction Table)

Schlüssel:

- **PK** = Primary Key (unterstrichen)
- **FK** = Foreign Key (gestrichelt)

5. Joins (L10)

5.1 Testdaten erstellen

```

1  -- Locations
2  CREATE TABLE locations (
3      location_id INTEGER PRIMARY KEY,
4      city TEXT NOT NULL,
5      postal_code TEXT NOT NULL
6  );
7
8  INSERT INTO locations VALUES
9      (1, 'Berlin', '10115'),
10     (2, 'Hamburg', '20095'),
11     (3, 'Munich', '80331');
12
13  -- Customers
14  CREATE TABLE customers (
15      customer_id INTEGER PRIMARY KEY,
16      first_name TEXT NOT NULL,
17      last_name TEXT NOT NULL,
18      location_id INTEGER,
19      FOREIGN KEY (location_id) REFERENCES locations(location_id)
20  );
21
22  INSERT INTO customers VALUES
23      (1, 'Alice', 'Anderson', 1),
24      (2, 'Bob', 'Brown', 2),
25      (3, 'Carol', 'Clark', 3),
26      (4, 'David', 'Davis', NULL); -- Kein Standort
27
28  -- Orders
29  CREATE TABLE orders (
30      order_id INTEGER PRIMARY KEY,
31      customer_id INTEGER,
32      order_date DATE,
33      FOREIGN KEY (customer_id) REFERENCES customers(customer_id)

```



```
34 );  
35  
36 INSERT INTO orders VALUES  
37     (101, 1, '2024-01-15'),  
38     (102, 1, '2024-02-20'),  
39     (103, 2, '2024-01-22'),  
40     (104, 3, '2024-03-10');  
41 -- Kunde 4 hat keine Bestellung!
```

```
-- Locations
CREATE TABLE locations (
  location_id INTEGER PRIMARY KEY,
  city TEXT NOT NULL,
  postal_code TEXT NOT NULL
)
```

ok

```
INSERT INTO locations VALUES
(1, 'Berlin', '10115'),
(2, 'Hamburg', '20095'),
(3, 'Munich', '80331')
```

ok

```
-- Customers
CREATE TABLE customers (
  customer_id INTEGER PRIMARY KEY,
  first_name TEXT NOT NULL,
  last_name TEXT NOT NULL,
  location_id INTEGER,
  FOREIGN KEY (location_id) REFERENCES locations(location_id)
)
```

ok

```
INSERT INTO customers VALUES
(1, 'Alice', 'Anderson', 1),
(2, 'Bob', 'Brown', 2),
(3, 'Carol', 'Clark', 3),
(4, 'David', 'Davis', NULL)
```

ok

```
-- Kein Standort

-- Orders
CREATE TABLE orders (
  order_id INTEGER PRIMARY KEY,
  customer_id INTEGER,
  order_date DATE,
  FOREIGN KEY (customer_id) REFERENCES customers(customer_id)
)
```

ok

```
INSERT INTO orders VALUES
(101, 1, '2024-01-15'),
(102, 1, '2024-02-20'),
(103, 2, '2024-01-22'),
(104, 3, '2024-03-10')
```

ok

```
-- Kunde 4 hat keine Bestellung!
```

ok

5.2 INNER JOIN

Regel: Nur Zeilen, die in BEIDEN Tabellen übereinstimmen.

```
1 SELECT
2   c.first_name,
3   c.last_name,
4   o.order_id,
5   o.order_date
6 FROM customers c
7 INNER JOIN orders o ON c.customer_id = o.customer_id;
```

```
SELECT
  c.first_name,
  c.last_name,
  o.order_id,
  o.order_date
FROM customers c
INNER JOIN orders o ON c.customer_id = o.customer_id
```

| # | first_name | last_name | order_id | order_date |
|---|------------|-----------|----------|------------|
| 1 | Alice | Anderson | 101 | 2024-01-15 |
| 2 | Alice | Anderson | 102 | 2024-02-20 |
| 3 | Bob | Brown | 103 | 2024-01-22 |
| 4 | Carol | Clark | 104 | 2024-03-10 |

4 rows

Ergebnis: Nur Kunden MIT Bestellungen (Alice, Bob, Carol). David fehlt!

5.3 LEFT JOIN (LEFT OUTER JOIN)

Regel: Alle Zeilen aus der linken Tabelle + passende aus der rechten. Wenn keine Übereinstimmung → NULL.

```
1 SELECT
2     c.first_name,
3     c.last_name,
4     o.order_id,
5     o.order_date
6 FROM customers c
7 LEFT JOIN orders o ON c.customer_id = o.customer_id;
```

```
SELECT
  c.first_name,
  c.last_name,
  o.order_id,
  o.order_date
FROM customers c
LEFT JOIN orders o ON c.customer_id = o.customer_id
```

| # | first_name | last_name | order_id | order_date |
|---|------------|-----------|----------|------------|
| 1 | Alice | Anderson | 101 | 2024-01-15 |
| 2 | Alice | Anderson | 102 | 2024-02-20 |
| 3 | Bob | Brown | 103 | 2024-01-22 |
| 4 | Carol | Clark | 104 | 2024-03-10 |
| 5 | David | Davis | null | null |

5 rows

Ergebnis: Alle Kunden (auch David), aber bei David ist order_id = NULL.

Use Case: „Zeige alle Kunden, auch die ohne Bestellung.“

5.4 RIGHT JOIN (RIGHT OUTER JOIN)

Regel: Alle Zeilen aus der rechten Tabelle + passende aus der linken.

```
1 SELECT
2     c.first_name,
3     o.order_id
4 FROM customers c
5 RIGHT JOIN orders o ON c.customer_id = o.customer_id;
```

```
SELECT
  c.first_name,
  o.order_id
FROM customers c
RIGHT JOIN orders o ON c.customer_id = o.customer_id
```

| # | first_name | order_id |
|---|------------|----------|
| 1 | Alice | 101 |
| 2 | Alice | 102 |
| 3 | Bob | 103 |
| 4 | Carol | 104 |

4 rows

In der Praxis: Selten genutzt (kann durch LEFT JOIN ersetzt werden).

5.5 FULL OUTER JOIN

Regel: Alle Zeilen aus BEIDEN Tabellen. Wenn keine Übereinstimmung → NULL.

```
1 SELECT
2   c.first_name,
3   o.order_id
4 FROM customers c
5 FULL OUTER JOIN orders o ON c.customer_id = o.customer_id;
```



```
SELECT
  c.first_name,
  o.order_id
FROM customers c
FULL OUTER JOIN orders o ON c.customer_id = o.customer_id
```

| # | first_name | order_id |
|---|------------|----------|
| 1 | Alice | 101 |
| 2 | Alice | 102 |
| 3 | Bob | 103 |
| 4 | Carol | 104 |
| 5 | David | null |

5 rows

Ergebnis: Alle Kunden UND alle Bestellungen. Lücken werden mit NULL gefüllt.

Use Case: „Zeige alle Kunden UND alle Bestellungen, unabhängig von Beziehungen.“

5.6 CROSS JOIN (Kartesisches Produkt)

Regel: Jede Zeile der ersten Tabelle wird mit jeder Zeile der zweiten kombiniert.

```
1 SELECT
2   c.first_name,
3   l.city
4 FROM customers c
5 CROSS JOIN locations l;
```



```
SELECT
  c.first_name,
  l.city
FROM customers c
CROSS JOIN locations l
```

| # | first_name | city |
|----|------------|---------|
| 1 | Alice | Berlin |
| 2 | Alice | Hamburg |
| 3 | Alice | Munich |
| 4 | Bob | Berlin |
| 5 | Bob | Hamburg |
| 6 | Bob | Munich |
| 7 | Carol | Berlin |
| 8 | Carol | Hamburg |
| 9 | Carol | Munich |
| 10 | David | Berlin |
| 11 | David | Hamburg |
| 12 | David | Munich |


12 rows

Ergebnis: 4 Kunden × 3 Städte = 12 Zeilen.

Use Case: Selten! Z.B. für Preis-Matrices oder kombinatorische Abfragen.

5.7 Self Join

Regel: Tabelle mit sich selbst joinen (z.B. Hierarchien).



```
1  -- Mitarbeiter-Hierarchie
2  CREATE TABLE employees (
3      emp_id INTEGER PRIMARY KEY,
4      name TEXT,
5      manager_id INTEGER,
6      FOREIGN KEY (manager_id) REFERENCES employees(emp_id)
7  );
8
9  INSERT INTO employees VALUES
10     (1, 'CEO', NULL),
11     (2, 'CTO', 1),
12     (3, 'Dev Lead', 2),
13     (4, 'Developer', 3);
14
15  -- Wer ist wessen Manager?
16  SELECT
17      e.name AS employee,
18      m.name AS manager
19  FROM employees e
20  LEFT JOIN employees m ON e.manager_id = m.emp_id;
```

```
-- Mitarbeiter-Hierarchie
CREATE TABLE employees (
  emp_id INTEGER PRIMARY KEY,
  name TEXT,
  manager_id INTEGER,
  FOREIGN KEY (manager_id) REFERENCES employees(emp_id)
)
```

ok

```
INSERT INTO employees VALUES
(1, 'CEO', NULL),
(2, 'CTO', 1),
(3, 'Dev Lead', 2),
(4, 'Developer', 3)
```

ok

```
-- Wer ist wessen Manager?
SELECT
  e.name AS employee,
  m.name AS manager
FROM employees e
LEFT JOIN employees m ON e.manager_id = m.emp_id
```

| # | employee | manager |
|---|-----------|----------|
| 1 | CEO | null |
| 2 | CTO | CEO |
| 3 | Dev Lead | CTO |
| 4 | Developer | Dev Lead |

4 rows

5.8 Mehrere Joins kombinieren

```
-- Kunde → Bestellung → Positionen → Produkte
SELECT
  c.first_name,
  o.order_id,
  oi.quantity,
  p.product_name,
  p.price
FROM customers c
INNER JOIN orders o ON c.customer_id = o.customer_id
INNER JOIN order_items oi ON o.order_id = oi.order_id
```




```
INNER JOIN products p ON oi.product_id = p.product_id;
```

Faustregel: Jeder JOIN braucht eine ON-Bedingung!

5.9 Join-Cheat-Sheet

| Join-Typ | Ergebnis | Use Case |
|-----------------|---|----------------------------------|
| INNER JOIN | Nur übereinstimmende Zeilen | Kunden MIT Bestellungen |
| LEFT JOIN | Alle aus links + passende aus rechts | Alle Kunden (auch ohne Orders) |
| RIGHT JOIN | Alle aus rechts + passende aus links | Selten (wie LEFT, nur umgekehrt) |
| FULL OUTER JOIN | Alle aus beiden (Lücken = NULL) | Alle Kunden UND alle Orders |
| CROSS JOIN | Kartesisches Produkt (alle Kombinationen) | Kombinatorik, Matrizen |
| SELF JOIN | Tabelle mit sich selbst | Hierarchien, Vergleiche |

6. SET Operations (L13)

SET Operations kombinieren Ergebnismengen zweier Queries – ähnlich wie Mengenoperationen in der Mathematik.

Wichtige Regeln:

- Beide SELECT-Statements müssen **gleich viele Spalten** haben
- Spaltentypen müssen **kompatibel** sein
- Spaltennamen werden aus der ersten Query übernommen

6.1 UNION – Vereinigung

Regel: Kombiniert beide Ergebnismengen und **entfernt Duplikate**.

```
1 -- Newsletter-Liste: Alle Personen (Kunden + Mitarbeiter)
2 SELECT first_name, last_name, 'Customer' AS type
3 FROM customers
4 UNION
5 SELECT first_name, last_name, 'Employee' AS type
```



```

5 SELECT first_name, last_name, 'Employee' AS type
6 FROM employees
7 ORDER BY last_name;

```

```

-- Newsletter-Liste: Alle Personen (Kunden + Mitarbeiter)
SELECT first_name, last_name, 'Customer' AS type
FROM customers
UNION
SELECT first_name, last_name, 'Employee' AS type
FROM employees
ORDER BY last_name

```

column "first_name" does not exist

UNION vs UNION ALL:

| Operation | Duplikate | Performance |
|------------------------|------------------|-------------|
| <code>UNION</code> | Werden entfernt | Langsamer |
| <code>UNION ALL</code> | Bleiben erhalten | Schneller |

```

1 -- UNION ALL: Behält alle Einträge (auch Duplikate)
2 SELECT first_name, last_name FROM customers
3 UNION ALL
4 SELECT first_name, last_name FROM employees;

```

```

-- UNION ALL: Behält alle Einträge (auch Duplikate)
SELECT first_name, last_name FROM customers
UNION ALL
SELECT first_name, last_name FROM employees

```

column "first_name" does not exist

Tipp: Nutze `UNION ALL`, wenn keine Duplikate existieren oder gewünscht sind!

6.2 INTERSECT – Schnittmenge

Regel: Nur Zeilen, die in **BEIDEN** Ergebnismengen vorkommen.

```

1 -- Mitarbeiter, die auch Kunden sind (basierend auf Name)
2 SELECT first_name, last_name
3 FROM customers
4 INTERSECT

```

```
4 INTERSECT
5 SELECT first_name, last_name
6 FROM employees
7 ORDER BY last_name;
```

-- Mitarbeiter, die auch Kunden sind (basierend auf Name)

```
SELECT first_name, last_name
FROM customers
INTERSECT
SELECT first_name, last_name
FROM employees
ORDER BY last_name
```

column "first_name" does not exist

Alternative mit JOIN:

```
-- Gleichwertig mit INNER JOIN
SELECT DISTINCT c.first_name, c.last_name
FROM customers c
INNER JOIN employees e
  ON c.first_name = e.first_name
  AND c.last_name = e.last_name;
```

Wann INTERSECT? Klarer Intent: „Zeig mir die Überschneidung!“

6.3 EXCEPT – Differenz

Regel: Zeilen aus der **ersten** Query, die **NICHT** in der zweiten vorkommen.

```
1 -- Kunden, die KEINE Mitarbeiter sind
2 SELECT first_name, last_name
3 FROM customers
4 EXCEPT
5 SELECT first_name, last_name
6 FROM employees
7 ORDER BY last_name;
```

```
-- Kunden, die KEINE Mitarbeiter sind
SELECT first_name, last_name
FROM customers
EXCEPT
SELECT first_name, last_name
FROM employees
ORDER BY last_name
```

column "first_name" does not exist

⚠ Reihenfolge zählt! `A EXCEPT B` ≠ `B EXCEPT A`

```
-- Umgekehrt: Mitarbeiter, die KEINE Kunden sind
SELECT first_name, last_name FROM employees
EXCEPT
SELECT first_name, last_name FROM customers;
```

Alternative mit LEFT JOIN:

```
-- Gleichwertig mit Anti-Join
SELECT c.first_name, c.last_name
FROM customers c
LEFT JOIN employees e
  ON c.first_name = e.first_name
  AND c.last_name = e.last_name
WHERE e.employee_id IS NULL;
```

6.4 SET Operations kombinieren

```
-- Komplexe Abfragen mit mehreren SET Operations
(SELECT first_name, last_name FROM customers WHERE location_id = 1
 UNION
 SELECT first_name, last_name FROM customers WHERE location_id = 2)
EXCEPT
SELECT first_name, last_name FROM employees;
```





Tipp: Nutze Klammern `()` für klare Gruppierung!

7. Views (L13)

7.1 Was sind Views?

Views sind gespeicherte Queries, die wie virtuelle Tabellen funktionieren. Sie speichern keine Daten, sondern nur die Query-Definition.

Vorteile:

-  **Wiederverwendbarkeit:** Komplexe Queries einmal definieren
-  **Abstraktion:** Versteckt Komplexität vor Nutzern
-  **Sicherheit:** Kontrollierter Zugriff auf Daten
-  **Konsistenz:** Eine Definition, überall nutzbar

7.2 CREATE VIEW

```
1  -- Einfache View: Aktive Kunden mit Standort
2  CREATE VIEW active_customers AS
3  SELECT
4      c.customer_id,
5      c.first_name,
6      c.last_name,
7      c.email,
8      l.city,
9      l.postal_code
10 FROM customers c
11 INNER JOIN locations l ON c.location_id = l.location_id
12 WHERE c.is_active = true;
13
14 -- View nutzen wie eine Tabelle
15 SELECT * FROM active_customers WHERE city = 'Berlin';
```

```
-- Einfache View: Aktive Kunden mit Standort
CREATE VIEW active_customers AS
SELECT
    c.customer_id,
    c.first_name,
    c.last_name,
    c.email,
    l.city,
    l.postal_code
FROM customers c
INNER JOIN locations l ON c.location_id = l.location_id
WHERE c.is_active = true
```

column c.email does not exist

7.3 Views mit Aggregation

```
1  -- Customer-Summary: Bestellungen pro Kunde
2  CREATE VIEW customer_summary AS
3  SELECT
4      c.customer_id
```

```

4      c.customer_id,
5      c.first_name || ' ' || c.last_name AS full_name,
6      COUNT(o.order_id) AS order_count,
7      COALESCE(SUM(o.total_amount), 0) AS total_spent,
8      MAX(o.order_date) AS last_order_date
9  FROM customers c
10 LEFT JOIN orders o ON c.customer_id = o.customer_id
11 GROUP BY c.customer_id, c.first_name, c.last_name;
12
13 -- VIP-Kunden finden
14 SELECT * FROM customer_summary
15 WHERE total_spent > 1000
16 ORDER BY total_spent DESC;

```

-- Customer-Summary: Bestellungen pro Kunde

CREATE VIEW customer_summary AS

SELECT

```

    c.customer_id,
    c.first_name || ' ' || c.last_name AS full_name,
    COUNT(o.order_id) AS order_count,
    COALESCE(SUM(o.total_amount), 0) AS total_spent,
    MAX(o.order_date) AS last_order_date

```

FROM customers c

LEFT JOIN orders o ON c.customer_id = o.customer_id

GROUP BY c.customer_id, c.first_name, c.last_name

column o.total_amount does not exist

7.4 Views aktualisieren

```

1  -- View ersetzen
2  CREATE OR REPLACE VIEW active_customers AS
3  SELECT
4      c.customer_id,
5      c.first_name,
6      c.last_name,
7      c.email,
8      l.city
9  FROM customers c
10 LEFT JOIN locations l ON c.location_id = l.location_id
11 WHERE c.is_active = true;

```

```
-- View ersetzen
CREATE OR REPLACE VIEW active_customers AS
SELECT
  c.customer_id,
  c.first_name,
  c.last_name,
  c.email,
  l.city
FROM customers c
LEFT JOIN locations l ON c.location_id = l.location_id
WHERE c.is_active = true
```

column c.email does not exist

7.5 Views löschen

```
1 -- View entfernen
2 DROP VIEW IF EXISTS customer_summary;
3
4 -- Mit CASCADE (löscht auch abhängige Views)
5 DROP VIEW customer_summary CASCADE;
```

```
-- View entfernen
DROP VIEW IF EXISTS customer_summary
```

ok

```
-- Mit CASCADE (löscht auch abhängige Views)
DROP VIEW customer_summary CASCADE
```

view "customer_summary" does not exist

7.6 Materialized Views (PostgreSQL)

Materialized Views speichern das Ergebnis physisch → schneller, aber nicht automatisch aktualisiert.

```
-- Materialized View erstellen
CREATE MATERIALIZED VIEW sales_stats AS
SELECT
  DATE_TRUNC('month', order_date) AS month,
  COUNT(*) AS orders,
  SUM(total_amount) AS revenue
FROM orders
GROUP BY month;
```

```
-- Daten aktualisieren (manuell)
REFRESH MATERIALIZED VIEW sales_stats;

-- Löschen
DROP MATERIALIZED VIEW sales_stats;
```

View vs Materialized View:

| Feature | VIEW | MATERIALIZED VIEW |
|---------------|-------------------------|------------------------|
| Speicherung | Nur Query-Definition | Physische Daten |
| Aktualität | Immer aktuell | Manuell refreshen |
| Performance | Query bei jedem Zugriff | Schnell (vorberechnet) |
| Speicherplatz | Minimal | Benötigt Platz |

Use Cases:

- **VIEW:** Einfache Abstraktion, Sicherheit, oft geänderte Daten
- **MATERIALIZED VIEW:** Komplexe Aggregationen, Reports, seltene Änderungen

8. Transaktionen & ACID (L14)

8.1 Was sind Transaktionen?

Transaktion = Logische Arbeitseinheit, die garantiert, dass entweder **alle** Operationen erfolgreich sind – oder **keine**.

Metapher: Ein Paket mit Garantiesiegel – entweder kommt alles an oder gar nichts.

8.2 Transaktionssteuerung

```
1  -- Transaktion starten
2  BEGIN TRANSACTION;  -- oder: START TRANSACTION;
3
4  -- Operationen ausführen
5  UPDATE accounts SET balance = balance - 100 WHERE id = 'A';
6  UPDATE accounts SET balance = balance + 100 WHERE id = 'B';
7
8  -- Bestätigen (Änderungen dauerhaft speichern)
9  COMMIT;
10
11 -- ODER: Rückgängig machen
```




```
11 -- ROLLBACK rückgängig machen  
12 ROLLBACK;
```

```
-- Transaktion starten  
BEGIN TRANSACTION
```

ok

```
-- oder: START TRANSACTION;
```

```
-- Operationen ausführen
```

```
UPDATE accounts SET balance = balance - 100 WHERE id = 'A'
```

```
relation "accounts" does not exist
```

Wichtig: Ohne `COMMIT` werden Änderungen **nicht** dauerhaft gespeichert!

8.3 SAVEPOINT – Partielle Rollbacks

```
1 BEGIN;  
2  
3 UPDATE accounts SET balance = balance - 100 WHERE id = 'A';  
4  
5 SAVEPOINT transfer_step1;  
6  
7 UPDATE accounts SET balance = balance + 100 WHERE id = 'B';  
8 -- ✗ Fehler! Konto B existiert nicht  
9  
10 ROLLBACK TO transfer_step1; -- Nur Schritt 2 rückgängig  
11 COMMIT; -- Schritt 1 bleibt bestehen
```

```
BEGIN
```

```
current transaction is aborted, commands ignored until end of transaction block
```

8.4 ACID-Eigenschaften

ACID = Vier Garantien, die jede Transaktion erfüllen sollte:

A – Atomicity (Atomarität)

C – Consistency (Konsistenz)

I – Isolation

D – Durability (Dauerhaftigkeit)

8.5 Isolation Levels

8.6 Transaktions-Probleme

Problem 1: Dirty Read

Problem 2: Lost Update

Problem 3: Deadlock

8.7 Best Practices

9. Functions & Trigger (L15)

9.1 Stored Functions

Grundsyntax (PostgreSQL)

Beispiel: Preisberechnung

9.2 Kontrollstrukturen

IF / THEN / ELSE

CASE

9.3 Fehlerbehandlung: RAISE

9.4 Trigger

Trigger-Function erstellen

BEFORE vs AFTER

Beispiel: Audit-Logging

Trigger löschen

9.5 Use Cases

10. Best Practices

7.1 Query-Optimierung

7.2 Schema-Design

7.3 Datenmanipulation

10. Best Practices

10.1 Query-Optimierung

10.2 Schema-Design

10.3 Datenmanipulation

10.4 Transaktionen & Concurrency

10.5 Functions & Trigger

11. Häufige Fehler & Lösungen

✗ Fehler: UPDATE ohne WHERE

✗ Fehler: Kartesisches Produkt

✗ Fehler: NULL-Vergleich mit =

✗ Fehler: Alias in WHERE

✗ Fehler: Transaktion nicht geschlossen

✗ Fehler: UNION ohne gleiche Spaltenanzahl

12. Weiterführende Themen

13. Quick-Links zur Vorlesung

 **Zusätzliche Ressourcen**