

Problem Statement: Expense Policy Rules Engine

You are tasked with designing a system that evaluates **business expenses** submitted by employees.

Managers can define **policies (rules)** to control expenses, ensuring employees do not misuse corporate cards or exceed allowances.

Your goal is to build a rules engine that:

1. Evaluates individual expenses against a set of rules.
 2. Evaluates aggregated trip-level expenses against a set of rules.
 3. Flags any violations clearly.
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Input Format

- A list of **expenses**, where each expense is represented as a dictionary/map of string keys and values.

Example keys:

- "expense_id"
- "trip_id"
- "amount_usd"
- "expense_type" (e.g., "restaurant", "airfare", "entertainment")
- "vendor_type"

- "vendor_name"
 - A list of **rules** to evaluate. Rules can be applied at:
 - **Expense level** (per individual expense).
 - **Trip level** (across all expenses belonging to a trip).
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Basic Rules

Start with the following rules:

1. **No restaurant expense can exceed \$75.**
 2. **No airfare expenses are allowed.**
 3. **No entertainment expenses are allowed.**
 4. **No single expense can exceed \$250.**
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Extended Rules

Later, add support for **trip-level rules** such as:

5. **A trip cannot exceed \$2000 in total expenses.**
 6. **Total meal (restaurant) expenses per trip cannot exceed \$1000.**
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Output Format

- For each **expense**, return whether it is **APPROVED** or **REJECTED**, with reasons for rejection.
 - For each **trip**, return whether it is **OK** or has **VIOLATIONS**, with reasons.
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Example Input

```
expenses = [  
  {  
    "expense_id": "001",  
    "trip_id": "trip1",  
    "amount_usd": "80",  
    "expense_type": "restaurant",  
    "vendor_name": "Outback Roadhouse"  
  },  
  {  
    "expense_id": "002",  
    "trip_id": "trip1",  
    "amount_usd": "120",  
    "expense_type": "supplies",  
    "vendor_name": "Staples"  
  },  
  {  
    "expense_id": "003",  
    "trip_id": "trip1",  
    "amount_usd": "199",  
    "expense_type": "airfare",  
    "vendor_name": "Delta Airlines"  
  },  
  {  
    "expense_id": "004",  
    "trip_id": "trip1",  
    "amount_usd": "260",  
    "expense_type": "hotel",  
    "vendor_name": "Marriott"  
  },  
  {  
    "expense_id": "005",  
    "trip_id": "trip1",  
    "amount_usd": "100",  
    "expense_type": "gas",  
    "vendor_name": "Shell"  
  }  
]
```

```
[
  {
    "expense_id": "005",
    "trip_id": "trip1",
    "amount_usd": "70",
    "expense_type": "restaurant",
    "vendor_name": "Chipotle"
  },
  {
    "expense_id": "006",
    "trip_id": "trip1",
    "amount_usd": "40",
    "expense_type": "entertainment",
    "vendor_name": "AMC Theaters"
  }
]
```

Expected Output

Expense Violations:

001 -> REJECTED: [Restaurant expense exceeds \$75]
002 -> APPROVED
003 -> REJECTED: [Airfare expenses not allowed]
004 -> REJECTED: [Expense exceeds \$250 limit]
005 -> APPROVED
006 -> REJECTED: [Entertainment expenses not allowed]

Trip Violations:

trip1 -> VIOLATIONS: [Total trip expenses \$769 exceed \$2000? NO, so OK here
But total meal expenses \$150 exceed \$1000? NO, so OK here]

(If the trip total crossed \$2000 or meal total \$1000, those rules would trigger.)

Additional Notes

- The system should be **extensible**: managers may eventually have **hundreds of rules**, so adding rules should not require rewriting the core evaluation logic.
- The same framework should support **future custom rules** (e.g., weekend-only expenses, vendor blacklists, monthly budget caps).