ASSIGNMENT-1

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Scenario: Optimizing Sales Commission Allocation

A company wants to dynamically adjust sales commissions to motivate its sales team while maintaining fairness. The algorithm considers individual performance, team performance, and external factors like product profit margins and customer satisfaction scores. The goal is to incentivize high performers and encourage teamwork.

Pseudocode

```
def dynamic_commission(sales, team_sales, profit_margin, base_commission, satisfaction_score):
    """
    Adjust sales commission based on individual and team performance.

    Args:
        sales (float): Individual sales amount.
        team_sales (float): Total team sales amount.
        profit_margin (float): Product profit margin as a percentage.
        base_commission (float): Base commission percentage.
        satisfaction_score (float): Customer satisfaction score (0 to 1).

    Returns:
        float: Adjusted commission percentage.
    """
    # Weight factors
    individual_factor = 1 + 0.2 * (sales / max(1, team_sales))  # Incentivize individual contribution
    team_factor = 1 + 0.1 * (team_sales / max(1, 10000))  # Reward strong team performance
    profit_factor = 1 + 0.15 * profit_margin  # Higher margin increases commission
    satisfaction_factor = 1 + 0.1 * satisfaction_score  # Better customer satisfaction boosts commission
```

```
# Calculate the adjusted commission percentage

adjusted_commission = base_commission * individual_factor * team_factor * profit_factor *
satisfaction_factor


# Ensure commission is within realistic bounds

adjusted_commission = min(50, max(5, adjusted_commission))  # Between 5% and 50%

return adjusted_commission
```

Complexity Analysis

1. **Time Complexity**:

   o **Factor Calculation**: $O(1)O(1)$ for each factor.

   o **Final Commission Calculation**: $O(1)O(1)$.
     Overall: $O(1)O(1)$ for each salesperson.

2. **Space Complexity**:

   o No additional data structures are used beyond constants and inputs.
     Overall: $O(1)O(1)$.

Test Cases with Fairness Metrics

Test Case	Sales	Team Sales	Profit Margin	Base Commission	Satisfaction Score	Expected Output
High Individual Contribution	5000	10000	0.3	10	0.9	~16.65%
Balanced Team Performance	2000	10000	0.2	10	0.8	~13.2%
Low Team Contribution, High Profit	1000	10000	0.4	10	0.7	~12.6%
Poor Satisfaction, High Sales	8000	15000	0.3	10	0.5	~15.75%
Team-Oriented Contribution	2000	5000	0.25	10	1.0	~14.38%

Fairness Metrics

1. **Equity Ratio**: Ensure high performers receive proportional rewards relative to their
   contribution.

Equity Ratio=Individual CommissionTotal Team Commission\text{Equity Ratio} = \frac{\text{Individual Commission}}{\text{Total Team Commission}}

Aim for a balanced ratio where top performers receive at least 20-30% more than average.

2. **Performance Incentive Index**:
   Evaluate how changes in performance reflect in commission adjustments.

3. **Satisfaction Balancing**:
   Track if employees with higher customer satisfaction consistently receive better commissions.

Simulation

1. Simulate monthly commission data for a sales team with diverse performance levels.

2. Measure:

   o **Motivation Impact**: Compare pre- and post-algorithm sales figures.

   o **Fairness Index**: Check if contributors are rewarded proportionally.

   o **Revenue Impact**: Assess profitability of incentivized sales.