DECISION MODEL SPECIFICATION

Loan Pre-Qualification Decision Model

This model evaluates whether an applicant qualifies for a loan based on their financial profile, the requested loan product, and their credit score.

Overview

This model evaluates whether an applicant qualifies for a loan based on their financial profile, the requested loan product, and their credit score.

Input Data

Credit Score

- **FICO Score:** A number between 300 and 850 representing the applicant's credit rating.

Applicant Data

Field	Definition
Age	Applicant's age in years.
Marital Status	One of: Married (M), Divorced (D), or Single (S).
Employment Status	One of: Unemployed, Employed, Self-employed, or Student.
Existing Customer	Boolean indicating whether the applicant is already a customer.

Monthly Financial Information

Income	Gross monthly income in dollars.
Repayments	Current monthly debt repayment obligations.
Expenses	Monthly living expenses.
Tax	Monthly tax withholding.
Insurance	Monthly insurance costs.

Requested Product

Type	Either Standard Loan or Special Loan.
Rate	Annual interest rate as a percentage.
Term	Loan term in months.
Amount	Requested loan amount in dollars.

Supporting Calculations

Two fixed benchmarks and two ratio calculations feed the assessments below.

LENDER ACCEPTABLE DTI

36%

Maximum acceptable debt-to-income ratio.

LENDER ACCEPTABLE PITI

28%

Maximum acceptable payment-to-income ratio.

DTI Calculation (Debt-to-Income Ratio)

```
(Monthly Repayments + Monthly Expenses) / Monthly Income
```

This measures what percentage of income goes toward debt and living expenses.

PITI Calculation (Payment-to-Income Ratio)

```
(Monthly Mortgage Payment + Monthly Tax + Monthly Insurance) / Monthly Income
```

Where Monthly Mortgage Payment is calculated as:

```
(Loan Amount × (Annual Rate / 100 / 12)) / (1 - 1 / (1 + Annual Rate / 100 / 12)^(-Loan Term))
```

This measures what percentage of income would go toward the new mortgage payment plus housing-related costs.

Decision Steps

Step 1. Credit Score Rating

Converts the FICO score into a rating category.

750 or above	**Excellent**
700 to 749	**Good**
650 to 699	**Fair**
600 to 649	**Poor**
Below 600	**Bad**

Step 2. Back End Ratio (Debt-to-Income Assessment)

Compares the applicant's calculated DTI against the lender's acceptable threshold (36%).

✓ If DTI ≤ 36%: **Sufficient**

✗ If DTI > 36%: **Insufficient**

Step 3. Front End Ratio (Payment-to-Income Assessment)

Compares the calculated PITI, including the new loan payment, against the lender's acceptable threshold (28%).

✓ If PITI ≤ 28%: **Sufficient**

✗ If PITI > 28%: **Insufficient**

Step 4. Loan Pre-Qualification (Final Decision)

Combines all three assessments to produce a qualification outcome and reason.

Credit Score Rating	Back End Ratio	Front End Ratio	Result	Reason
Poor or Bad	Any	Any	**Not Qualified**	Credit Score too low.
Any	Insufficient	Sufficient	**Not Qualified**	Debt to income ratio is too high.
Any	Sufficient	Insufficient	**Not Qualified**	Mortgage payment to income ratio is too high.
Any	Insufficient	Insufficient	**Not Qualified**	Debt to income ratio is too high AND mortgage payment to income ratio is too high.
Fair, Good, or Excellent	Sufficient	Sufficient	**Qualified**	The borrower has been successfully prequalified for the requested loan.

Output

Loan Qualification containing:

- **Qualification Status:** Either "Qualified" or "Not Qualified"
- **Reason:** A text explanation of the decision

Model Logic Summary

The applicant is **Qualified** only when:

1. Their credit score is Fair or higher (650+), and
2. Their debt-to-income ratio is acceptable (≤ 36%), and
3. Their housing payment-to-income ratio is acceptable (≤ 28%).

> Any failure in these areas results in a disqualification with a specific business reason provided.