**Project Title:**

**Risk Assessment by Insurance Firms: An Applied Mathematical Approach**

**Objective:**

The goal of this project is to understand how insurance firms use mathematical models to assess risks and determine premiums. You'll explore the factors influencing risk, types of risks, and the mathematical tools used in the industry.

**Project Outline:**

**1. Introduction:**

* **What is Risk Assessment?**
  + Definition of risk assessment in the context of insurance.
  + Importance of risk assessment for insurance firms.
* **Types of Insurance**:
  + Life insurance, health insurance, car insurance, etc.
  + How risks differ for each type of insurance.
* **Purpose of Risk Assessment in Insurance**:
  + To calculate premiums.
  + To ensure that insurance firms remain profitable while offering competitive prices.

**2. Mathematical Concepts Used in Risk Assessment:**

* **Probability**:
  + Introduction to probability and how it's used to assess risk.
  + Basic probability concepts (e.g., likelihood of events).
  + Simple examples of calculating probability (e.g., probability of a car accident or natural disaster).
* **Statistics**:
  + Importance of data in risk assessment.
  + Collecting and analyzing past data on incidents (accidents, deaths, etc.).
  + Concepts of mean, variance, and standard deviation.
* **Expected Value**:
  + Explanation of expected value in insurance.
  + Formula: E(X)=∑(xi×pi)E(X) = \sum (x\_i \times p\_i)E(X)=∑(xi​×pi​), where xix\_ixi​ is the outcome and pip\_ipi​ is the probability.
  + Example: Calculating the expected value for an insurance policy (e.g., life insurance).
* **Mortality Tables**:
  + Explanation of what mortality tables are.
  + How these tables are used to estimate the likelihood of death at various ages.
* **Premium Calculation**:
  + Introduction to premium and how insurance companies use the above concepts to calculate it.
  + Formula: Premium=Expected Loss+Load for Expenses+ProfitPremium = Expected \, Loss + Load \, for \, Expenses + ProfitPremium=ExpectedLoss+LoadforExpenses+Profit.
  + Example: Calculating a premium based on risk (you can use simple data or hypothetical examples).

**3. Risk Categories:**

* **Low Risk vs. High Risk**:
  + Explanation of how individuals and assets are categorized into low, medium, and high risk.
  + How this affects premiums.
  + Real-life examples: Why a young driver or someone with a pre-existing medical condition might pay more for insurance.
* **Case Study**:
  + Present a real or hypothetical case study comparing different individuals or properties with varying levels of risk.
  + Show how the insurance premium changes with the level of risk.

**4. Real-World Application:**

* **Case Study 1: Car Insurance**:
  + Factors: Driving record, age, location, type of car, etc.
  + Mathematical model: Estimate the probability of an accident based on the driver's profile.
* **Case Study 2: Life Insurance**:
  + Factors: Age, health, occupation, lifestyle.
  + How mortality rates are calculated and used to determine premiums.

**5. Conclusion:**

* Summarize how mathematical models help insurance firms assess risk.
* Importance of accurate data in risk assessment.
* Limitations of the models (e.g., unpredictability of certain events like natural disasters).

**Project Report Format:**

1. **Title Page**:
   * Project title, your name, class, and submission date.
2. **Table of Contents**:
   * List of sections with page numbers.
3. **Introduction**:
   * Provide a brief overview of the project and the importance of risk assessment in insurance.
4. **Body**:
   * The sections as outlined above (e.g., Risk Assessment, Mathematical Models, Real-World Applications).
5. **Conclusion**:
   * Summarize key findings and insights.
6. **References**:
   * List any books, websites, or articles you used.

**Tips:**

* **Use Visuals**: Incorporate graphs, charts, or tables to make the data and mathematical models easier to understand.
* **Keep it Simple**: Since it's for a 12th-grade class, explain concepts in a straightforward and clear way.
* **Interactive Element**: If possible, you could create a small survey or dataset (e.g., ask classmates their driving habits) and show how risk would be assessed for them.
* **Software Tools**: You could use simple tools like Excel or Google Sheets to calculate probabilities and expected values.