Probability and Risk Assessment Writing Task

In this assignment, you will explore how probability applies to risk assessment in everyday life. By analyzing mortality statistics, you'll gain insight into how probability calculations can inform our understanding of risk and help distinguish between perceived and actual dangers.

The Assignment

The table below shows the number of deaths in the U.S. in a year due to various causes. For this analysis, assume these values remain constant from year to year, and that the U.S. population is 312 million people.

Cause	Annual Deaths
Passenger car occupant	13,100
Motorcycle driver	4,500
Tornado	553
Skydiving	56

Part 1: Basic Probability Calculations

Answer the following questions in sequence (the order is important for building understanding):

1. Calculate the probability that an American chosen at random died as a passenger car occupant last year. Express your answer as both a fraction and in scientific notation.

2. What is the probability that *you* died as a passenger car occupant last year? Explain why this probability is what it is.
3. What is the probability that *you* will die as a passenger car occupant *next year*? Is this probability the same as your answer to question 2? Explain your reasoning.
4. Calculate the probability that an American chosen at random will die as the result of a tornado next year. Express your answer in scientific notation.
5. What is the probability that *you* will die as the result of a tornado next year? Explain how this might differ from the probability for a random American.

Part 2: Comparative Risk Analysis

6. Explain why your answers to questions 4 and 5 might differ. What factors beyond the raw statistics influence your personal risk assessment? Provide at least three specific factors and explain how each impacts probability calculations.
7. People sometimes claim skydiving is less dangerous than driving. Using the data provided:
    - Calculate the appropriate probabilities to evaluate this claim
    - Identify what additional information would be helpful for a more accurate comparison (consider exposure time, frequency, participant numbers, etc.)
    - Draw a reasoned conclusion based on your analysis
8. People sometimes claim motorcycle riding is less dangerous than driving.
    - Calculate relevant probabilities to assess this claim
    - Identify at least three additional pieces of information you would need to make a properly contextualized comparison
    - Explain how each piece of information would alter or refine your probability calculations

Part 3: Reflection on Risk Perception

9. In a paragraph, discuss why human risk perception often differs from statistical probability. Reference at least two cognitive biases that affect how people assess risk.
10. How can understanding probability help you make more informed decisions about activities that involve risk? Provide a specific example from your own life where probability calculations could or did influence a decision.

Your submission should include:

- Complete probability calculations with work shown
- Answers expressed to at least 2 significant figures
- Clear explanations that connect mathematical probabilities to real-world risk assessment

- Thoughtful analysis of how additional contextual information affects probability interpretations
- Proper mathematical notation throughout

This assignment is worth 20 points. Your work will be assessed on calculation accuracy, depth of analysis, clarity of explanations, and application of probability concepts to real-world risk assessment.

Rubric:

Criteria	Proficient	Developing	Not Evident	Points
Basic Probability Calculations	Correctly calculates all probabilities with clear work shown. Properly expresses results using scientific notation and appropriate significant figures. Thorough explanation of distinctions between different probability scenarios.	Most calculations are correct with minor errors. Some work shown but may lack clarity. Basic explanations of probability distinctions with some gaps in reasoning.	Multiple significant errors in calculations. Limited work shown or major conceptual misunderstandings. Minimal explanation of probability distinctions.	___/8
Comparative Risk Analysis	Thoroughly analyzes comparative risks with appropriate probability calculations. Identifies relevant additional factors that would impact risk assessment with clear explanation of how each would affect calculations. Draws well-reasoned conclusions based on available data.	Some analysis of comparative risks with partially correct calculations. Identifies some additional factors but with limited explanation of their impact. Conclusions follow from calculations but may lack nuance.	Limited or incorrect analysis of comparative risks. Few or irrelevant additional factors identified. Conclusions missing or unsupported by calculations.	___/8

Risk Perception Reflection	Insightful discussion of the gap between statistical probability and perceived risk. Accurately references cognitive biases with relevant examples. Personal example demonstrates meaningful application of probability to decision-making.	Basic discussion of risk perception with some connection to probability concepts. References to cognitive biases present but may lack depth. Personal example somewhat relevant to probability application.	Minimal or inaccurate discussion of risk perception. Little or no reference to cognitive biases. Personal example missing or unrelated to probability concepts.	___/4
Total				___/20