Part 1: Logical Reasoning

1. Series Completion:
    - Find the missing term: 2, 5, 10, 17,?
    - Answer: 26 (The difference between consecutive terms increases by 2: +3, +5, +7, +9)
2. Coding-Decoding:
    - If "MASTER" is coded as "NBTUFS", then how will "DEGREE" be coded?
    - Answer: EFHSFF (Each letter is shifted one position forward in the alphabet)
3. Direction Sense:
    - A person walks 10 meters towards the east, then turns left and walks 5 meters, then turns left again and walks 10 meters. In which direction is he from his starting point?
    - Answer: North
4. Logical Deduction:
    - Statements: All pens are pencils. Some pencils are erasers.
    - Conclusions:
        - I. Some pens are erasers.
        - II. No pen is an eraser.
    - Which conclusion(s) follow?
    - Answer: Neither I nor II (The relationship between pens and erasers is not definitively established.)
5. Analogy:
    - "Bird: Feather:: Dog: ?"
    - Answer: Fur

Part 2: Mathematics

1. Algebra:
    - If x+x1=3, then find the value of x2+x21.
    - Answer: 7 (Square the given equation: (x+x1)2=x2+2+x21=9, then x2+x21=7)
2. Geometry:
    - The length of a rectangle is increased by 20% and the breadth is decreased by 20%. What is the percentage change in its area?
    - Answer: 4% decrease.
3. Trigonometry:
    - If sin(θ)=53, find cos(θ) when θ is in the first quadrant.
    - Answer: 54

4. Coordinate Geometry:
    - Find the equation of the line passing through the points (1, 2) and (3, 4).
    - Answer: y=x+1
5. Calculus:
    - Find the derivative of f(x)=x3−2x2+5x−7.
    - Answer: f′(x)=3x2−4x+5

Part 3: Science (Physics, Chemistry, Biology)

1. Physics:
    - A body is thrown vertically upwards with a velocity of 20 m/s. What is the maximum height it reaches? (Assume g=10 m/s2)
    - Answer: 20 meters.
2. Chemistry:
    - What is the pH of a solution with a hydrogen ion concentration of 10−3 M?
    - Answer: 3
3. Biology:
    - Which part of the human eye controls the size of the pupil?
    - Answer: Iris
4. Physics:
    - What is the SI unit of power?
    - Answer: Watt
5. Chemistry:
    - What is the chemical formula of baking soda?
    - Answer: NaHCO3

Logical Reasoning:

- 1. Seating Arrangement:
    - Five friends A, B, C, D, and E, are sitting in a row facing north. A sits to the left of B, but not to the immediate left. D sits to the right of E. C sits between B and D. Who is sitting in the middle of the row?
    - Answer: C.
- 2. Figure Series:
    - (Questions involving patterns in sequences of shapes, rotations, and changes in design elements.)
    - (These are very visual, so I can't write one out, but be sure to practice these from visual reasoning books or online practice tests.)
- 3. Blood Relations:
    - "Pointing to a photograph, a man said, 'I have no brother or sister, but that man's father is my father's son.' Whose photograph was it?

    - Answer: His son.
- 4. Syllogisms:
    - Statements: Some books are magazines. All magazines are newspapers.
    - Conclusions:
        - I. Some books are newspapers.
        - II. No book is a newspaper.
    - Which conclusion(s) follow?
    - Answer: Only conclusion I can follow.
- 5. Odd One Out:
    - Choose the word that is different from the rest: Apple, Banana, Carrot, Orange.
    - Answer: Carrot.

Mathematics:

- 1. Permutations and Combinations:
    - In how many ways can the letters of the word "ARRANGE" be arranged?
    - Answer: 1260
- 2. Probability:
    - A bag contains 5 red balls and 3 blue balls. Two balls are drawn at random. What is the probability that both balls are red?
    - Answer: 5/14
- 3. Series and Progressions:
    - Find the sum of the first 20 terms of the arithmetic progression 2, 5, 8, 11, ...
    - Answer: 590
- 4. Functions:
    - If f(x) = x^2 + 1, what is f(f(x))?
    - answer: x^4 + 2x^2 + 2
- 5. Matrices:
    - If A = [[1, 2], [3, 4]], find the determinant of A.
    - Answer: -2

Science (Physics, Chemistry, Biology):

- Physics:
    - What is the relationship between kinetic energy and momentum?
    - Answer: Kinetic energy = (momentum^2) / (2 * mass)
- Chemistry:
    - What is the process of converting a solid directly into a gas called?
    - Answer: Sublimation.
- Biology:
    - What is the function of the ribosomes in a cell?
    - Answer: Protein synthesis.
- Physics:
    - What is the law of conservation of momentum?
    - Answer: In a closed system, the total momentum remains constant.
- Chemistry:
    - What are allotropes? Give an example.

- Answer: Different structural modifications of an element. Examples: diamond and graphite (allotropes of carbon).

Logical Reasoning (Advanced):

1. Complex Seating Arrangement:
   - Eight people (P, Q, R, S, T, U, V, W) are sitting around a circular table facing the center. P sits third to the right of W. Q sits second to the left of P. R sits opposite to W. T is not an immediate neighbor of P. U sits between S and V. Who is sitting second to the right of T?
   - (This requires careful tracking of spatial relationships and can be time-consuming.)
2. Critical Reasoning:
   - "A recent study concluded that people who exercise regularly have a lower risk of heart disease. However, the study also found that many people who exercise regularly also maintain a healthy diet. Therefore, it is impossible to conclude whether exercise or diet is the primary factor in reducing heart disease risk."
   - Which of the following, if true, most strengthens the argument?
     - (A) People who maintain a healthy diet but do not exercise still have a lower risk of heart disease.
     - (B) The study controlled for factors such as age, gender, and family history.
     - (C) Exercise has been shown to improve cardiovascular health in numerous other studies.
     - (D) The study included a large and diverse sample of participants.
   - Answer: (A)
3. Data Interpretation:
   - (Questions involving analyzing charts, graphs, and tables to draw logical conclusions.)
   - (Again, these are heavily visual, so search for data interpretation practice questions online.)
4. Logical Puzzles:
   - "There are three boxes. One contains only apples, one contains only oranges, and one contains both apples and oranges. The boxes are labeled incorrectly. You are allowed to pick one fruit from one box. What is the minimum number of fruits you need to pick to correctly label all the boxes?"
   -
   - Answer: 1. (Pick from the box labeled "Apples and Oranges". If you get an apple, that box is apples, and so on.)
5. Statement and Assumptions:
   - Statement: "The government has decided to increase the price of petrol."
   - Assumptions:
     - I. The demand for petrol will decrease.
     - II. The price of other commodities will also increase.
   - Which assumption(s) is/are implicit in the statement?

Mathematics (Advanced):

1. Complex Numbers:
    - If $z=\frac{1-i}{1+i}$, then find z^{100}.
    - Answer: 1
2. Inequalities:
    - Solve the inequality: $\frac{x+2}{x-1}>1$.
    - Answer: (-2, -1/2)
3. Integration:
    - Evaluate: $\int x \cdot e^x dx$.
    - Answer: $xe^x - e^x + C$
4. Probability (Conditional):
    - A bag contains 4 red balls and 6 black balls. Two balls are drawn without replacement. What is the probability that the second ball is red, given that the first ball was black?
    -
    - Answer: 4/9
5. Number Theory:
    - Find the number of positive integer solutions for the equation $x+y+z=10$.
    - Answer: 36

Science (Advanced):

1. Physics (Modern Physics):
    - Explain the photoelectric effect and its significance.
2. Chemistry (Organic Chemistry):
    - Describe the mechanism of SN1 and SN2 reactions.
3. Biology (Genetics):
    - Explain the process of transcription and translation in protein synthesis.
4. Physics (Electromagnetism):
    - Derive the expression for the magnetic field due to a long, straight, current-carrying wire.
5. Chemistry (Chemical Equilibrium):
    - Explain Le Chatelier's principle and its applications.