i. **Methods of Ration Formulation**:

1. **Pearson's Square Method**:
    - A graphical method used to determine the proportion of two or more feed ingredients needed to achieve a desired nutrient ratio.
    - Requires knowledge of the nutrient composition of each ingredient and the desired nutrient ratio.
    - Involves drawing a square divided into four quadrants and performing simple arithmetic calculations to find the appropriate mixture ratio.
2. **Algebraic Method**:
    - Involves setting up equations based on nutrient requirements, ingredient composition, and cost constraints.
    - Utilizes algebraic formulas to solve for the amount of each ingredient needed to meet the desired nutrient specifications.
    - Requires accurate nutrient analysis of feed ingredients and knowledge of mathematical principles.
3. **Computerized Formulation Software**:
    - Utilizes specialized software programs designed for formulating animal rations.
    - Allows users to input nutrient requirements, ingredient composition, cost data, and other parameters.
    - Automatically generates optimized ration formulations based on user-defined criteria and constraints.
4. **Least-Cost Formulation**:
    - A commonly used method that aims to formulate rations with the lowest possible cost while meeting specified nutrient requirements.
    - Involves comparing the cost of different feed ingredients and selecting the most cost-effective combination to achieve the desired nutrient levels.

ii. **Identification of Ingredients for Ration Formulation**:

1. **Blood Meal**:
    - High-protein byproduct obtained from the slaughter of animals.
    - Rich source of essential amino acids and nitrogen.
    - Used as a protein supplement in animal feed.

2. **Fish Meal**:
    - Protein-rich ingredient made from ground, dried fish.
    - Contains essential amino acids, minerals, and omega-3 fatty acids.
    - Used as a high-quality protein source in animal diets, particularly for young animals and high-performance livestock.
3. **Cottonseed Meal**:
    - Byproduct of cottonseed oil extraction.
    - Contains moderate levels of protein and fiber.
    - Used as a protein supplement in ruminant diets but may require heat treatment to reduce gossypol content, which can be toxic to non-ruminant animals.
4. **Bone Meal**:
    - Ground and processed animal bones.
    - Rich source of calcium and phosphorus.
    - Used as a mineral supplement to support bone health and overall mineral balance in animal diets.
5. **Oyster Shell**:
    - Crushed shells from oysters or other shellfish.
    - High in calcium carbonate.
    - Used as a source of calcium to support bone development and eggshell formation in poultry.
6. **Groundnut Cake (Peanut Meal)**:
    - Byproduct of peanut oil extraction.
    - Contains protein, fat, and fiber.
    - Used as a protein supplement in livestock and poultry diets.
7. **Maize Grain**:
    - Common cereal grain rich in carbohydrates.
    - Used as an energy source in animal diets, particularly for ruminants and monogastric animals.
8. **Palm Kernel Cake**:
    - Byproduct of palm oil extraction.
    - Contains protein, fiber, and residual oil.
    - Used as a protein and energy supplement in livestock and poultry diets.

iii. **Factors to Consider in Formulation of Animal Ration**:

1. Nutrient Requirements: Consider the specific nutritional needs of the animal based on factors such as species, age, weight, growth stage, and physiological status.
2. Feed Ingredient Composition: Analyze the nutrient content of available feed ingredients to determine their suitability for meeting nutrient requirements.
3. Cost: Evaluate the cost-effectiveness of different feed ingredients and formulate rations that balance nutrient adequacy with affordability.
4. Palatability: Select ingredients that are palatable to the animal and encourage proper intake and utilization of the ration.
5. Availability and Seasonality: Consider the availability and seasonal variations of feed ingredients to ensure consistent ration formulation throughout the year.
6. Digestibility: Assess the digestibility of feed ingredients to optimize nutrient utilization and minimize waste.
7. Environmental Impact: Consider the environmental sustainability of feed ingredients and aim to minimize their ecological footprint in ration formulation.
8. Health and Safety: Ensure that feed ingredients are free from contaminants, toxins, and harmful substances that may pose risks to animal health and food safety.