1. What is the concept of human learning? Please give two examples.

2. What different forms of human learning are there? Are there any machine learning equivalents?

3. What is machine learning, and how does it work? What are the key responsibilities of machine learning?

4. Define the terms "penalty" and "reward" in the context of reinforcement learning.

5. Explain the term "learning as a search"?

6. What are the various goals of machine learning? What is the relationship between these and human learning?

7. Illustrate the various elements of machine learning using a real-life illustration.

8. Provide an example of the abstraction method.

9. What is the concept of generalization? What function does it play in the machine learning process?

What is classification, exactly? What are the main distinctions between classification and regression?

11. What is regression, and how does it work? Give an example of a real-world problem that was solved using regression.

12. Describe the clustering mechanism in detail.

13. Make brief observations on two of the following topics:

i. Machine learning algorithms are used

ii. Studying under supervision

iii. Studying without supervision

iv. Reinforcement learning is a form of learning based on positive reinforcement.

**Answers**

1. **Human learning concept**: The process of acquiring knowledge, skills, or behaviors through experience or teaching.  
   **Examples**:
   * Learning to ride a bicycle.
   * Memorizing a poem.
2. **Forms of human learning**:
   * **Supervised learning**: Learning with guidance (like a teacher).
   * **Unsupervised learning**: Learning patterns without guidance.
   * **Reinforcement learning**: Learning from rewards and penalties.  
     **ML equivalents**: Yes — supervised, unsupervised, and reinforcement learning.
3. **Machine learning**: Systems learn patterns from data to make predictions or decisions without explicit programming.  
   **How it works**: Train a model on data, evaluate, and make predictions.  
   **Key responsibilities**: Detect patterns, make predictions, automate tasks, improve performance over time.
4. **Penalty & reward (Reinforcement Learning)**:
   * **Reward**: Positive feedback for desirable actions.
   * **Penalty**: Negative feedback for undesirable actions.
5. **Learning as a search**: Viewing learning as exploring possible models or solutions to find the one that best fits the data.
6. **Goals of ML**:
   * Predict outcomes
   * Classify objects
   * Discover patterns
   * Optimize performance  
     **Relation to human learning**: Humans also learn to predict, categorize, and make decisions based on experience.
7. **ML elements (real-life example)**:
   * **Data**: Past customer purchase records
   * **Features**: Age, location, purchase history
   * **Model**: Recommendation algorithm
   * **Training**: Algorithm learns patterns
   * **Prediction**: Suggests products for new customers
8. **Abstraction example**: Representing a car as “vehicle with wheels and engine” instead of describing every part in detail.
9. **Generalization**: The ability of a model to perform well on new, unseen data.  
   **Function**: Ensures ML models are useful beyond the training dataset.
10. **Classification**: Assigning data to discrete categories.  
    **Distinction from regression**:
    * Classification → categories (e.g., spam/not spam)
    * Regression → continuous values (e.g., predicting house price)
11. **Regression**: Predicting a continuous outcome based on input variables.  
    **Example**: Predicting real estate prices from area, number of rooms, and location.
12. **Clustering**: Grouping similar data points together without pre-labeled outputs.  
    **Mechanism**:
    * Compute similarity/distance
    * Assign points to clusters based on similarity
    * Adjust clusters iteratively (e.g., K-Means)
13. **Brief observations**:  
    i. **ML algorithms**: Automate pattern recognition and predictions.  
    ii. **Studying under supervision**: Learns from labeled data, guidance is provided.  
    iii. **Studying without supervision**: Learns patterns and structure from unlabeled data.  
    iv. **Reinforcement learning**: Learns optimal actions through rewards and penalties.