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```
% MATLAB Code for Knowledge Representation in AI
clc;
clear;
close all;
```

Part 1: Propositional Logic

We will represent some simple facts and use logical operators for reasoning.

```
% Define propositions
% p: "It is raining."
% q: "The ground is wet."
% r: "There is a rainbow."

% Initial Facts
raining = true;    % It is raining
wet_ground = false; % Initially, the ground is not wet
rainbow = false;   % Initially, no rainbow

% Represent the logical relationships:
% If it rains, the ground becomes wet.
if raining
    wet_ground = true; % If it's raining, the ground is wet
end

% If the ground is wet, and it's raining, there is a rainbow.
if wet_ground && raining
    rainbow = true; % If both conditions hold, there is a rainbow
end

% Display the facts
fprintf('Is it raining? %s\n', mat2str(raining));
fprintf('Is the ground wet? %s\n', mat2str(wet_ground));
fprintf('Is there a rainbow? %s\n', mat2str(rainbow));

Is it raining? true
Is the ground wet? true
Is there a rainbow? true
```

Part 2: Semantic Network (Objects and Relationships)

% Let's create a simple semantic network using a structure array to represent objects and their properties.

```
% Define some objects in the environment
objects = struct();
```

```
% Define objects
objects.house = struct('type', 'building', 'hasWindows', true, 'hasRoof', true);
objects.tree = struct('type', 'plant', 'hasLeaves', true, 'height', 20); % height in meters
objects.car = struct('type', 'vehicle', 'hasWheels', true, 'color', 'red');
objects.person = struct('type', 'human', 'hasEyes', true, 'height', 1.75); % height in meters
```

```
% Query about relationships (e.g., Does the person have eyes?)
fprintf('\nDoes the person have eyes? %s\n', mat2str(objects.person.hasEyes));
```

```
% Query about the tree's height
fprintf('The height of the tree is %.2f meters.\n', objects.tree.height);
```

```
% Query about the car's color
fprintf('The color of the car is %s.\n', objects.car.color);
```

```
% Display object properties in the command window
fprintf('\nObject Properties:\n');
fields = fieldnames(objects);
for i = 1:length(fields)
    fprintf('\nObject: %s\n', fields{i});
    obj = objects.(fields{i});
    disp(obj);
end
```

```
Does the person have eyes? true
The height of the tree is 20.00 meters.
The color of the car is red.
```

```
Object Properties:
```

```
Object: house
      type: 'building'
hasWindows: 1
  hasRoof: 1
```

```
Object: tree
      type: 'plant'
hasLeaves: 1
```

```
height: 20
```

```
Object: car
      type: 'vehicle'
      hasWheels: 1
      color: 'red'
```

```
Object: person
      type: 'human'
      hasEyes: 1
      height: 1.7500
```

Part 3: Simple Logical Reasoning

We will add some simple reasoning based on relationships in our semantic network.

```
% For example:
% If the person has eyes, we can reason that the person can see.
if objects.person.hasEyes
    canSee = true; % The person can see because they have eyes
else
    canSee = false; % The person cannot see
end

fprintf('\nCan the person see? %s\n', mat2str(canSee));

% Another reasoning example:
% If the car has wheels, we can infer that the car can move.
if objects.car.hasWheels
    canMove = true; % The car can move because it has wheels
else
    canMove = false; % The car cannot move
end

fprintf('Can the car move? %s\n', mat2str(canMove));
```

```
Can the person see? true
Can the car move? true
```

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