```
% ------------------------------------
% Arithmetic Coding - MATLAB
% ------------------------------------
% Author: Sandesh Jat
% Description:
% This program performs arithmetic encoding
% for a given symbol sequence and probability model.

clc;
clear;
```

Input symbols and probabilities

```
symbols = ['A', 'B', 'C'];          % Alphabet
prob    = [0.5, 0.3, 0.2];           % Probabilities (must sum to 1)
sequence = 'ABCA';                  % Message to encode
```

Step 1: Compute cumulative probability ranges

```
low  = zeros(1, length(prob));
high = zeros(1, length(prob));

low(1)  = 0;
high(1) = prob(1);

for i = 2:length(prob)
    low(i)  = high(i-1);
    high(i) = low(i) + prob(i);
end
```

Step 2: Arithmetic Encoding

```
L = 0;    % Initial lower bound
H = 1;    % Initial upper bound

for k = 1:length(sequence)
    idx = find(symbols == sequence(k));  % Symbol index

    range = H - L;
    H = L + range * high(idx);
    L = L + range * low(idx);

    fprintf('After symbol %c: [%.6f , %.6f)\n', sequence(k), L, H);
end
```

```
After symbol A: [0.000000 , 0.500000)
After symbol B: [0.250000 , 0.400000)
After symbol C: [0.370000 , 0.400000)
After symbol A: [0.370000 , 0.385000)
```

Step 3: Final code value

```
code = (L + H) / 2;

fprintf('\nFinal Arithmetic Code = %.6f\n', code);
```

```
Final Arithmetic Code = 0.377500
```

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