

## Contents

---

### ■ Problem statement

---

```
function [y,n] = sigadd(x1,n1,x2,n2)
% Implements y(n) = x1(n) + x2(n)
% -----
% [y,n] = sigadd(x1,n1,x2,n2)
%   y = sum sequence over n, which includes n1 and n2
%   x1 = first sequence over n1
%   x2 = second sequence over n2 (n2 can be different from n1)
%
n = min(min(n1), min(n2)):max(max(n1), max(n2)); % duration of y(n)
y1 = zeros(1,length(n));
y2 = zeros(1,length(n)); % initialization
y1(ismember(n, n1)) = x1; % x1 with duration of y
y2(ismember(n, n2)) = x2; % x2 with duration of y
y = y1 + y2; % sequence addition
end

function [y,n] = sigmult(x1,n1,x2,n2)
% Implements y(n) = x1(n) * x2(n)
% -----
% [y,n] = sigmult(x1,n1,x2,n2)
% y = product sequence over n, which includes n1 and n2
% x1 = first sequence over n1
% x2 = second sequence over n2 (n2 can be different from n1)
%
n = min(min(n1), min(n2)):max(max(n1), max(n2)); % Duration of y(n)
y1 = zeros(1,length(n));
y2 = zeros(1,length(n));

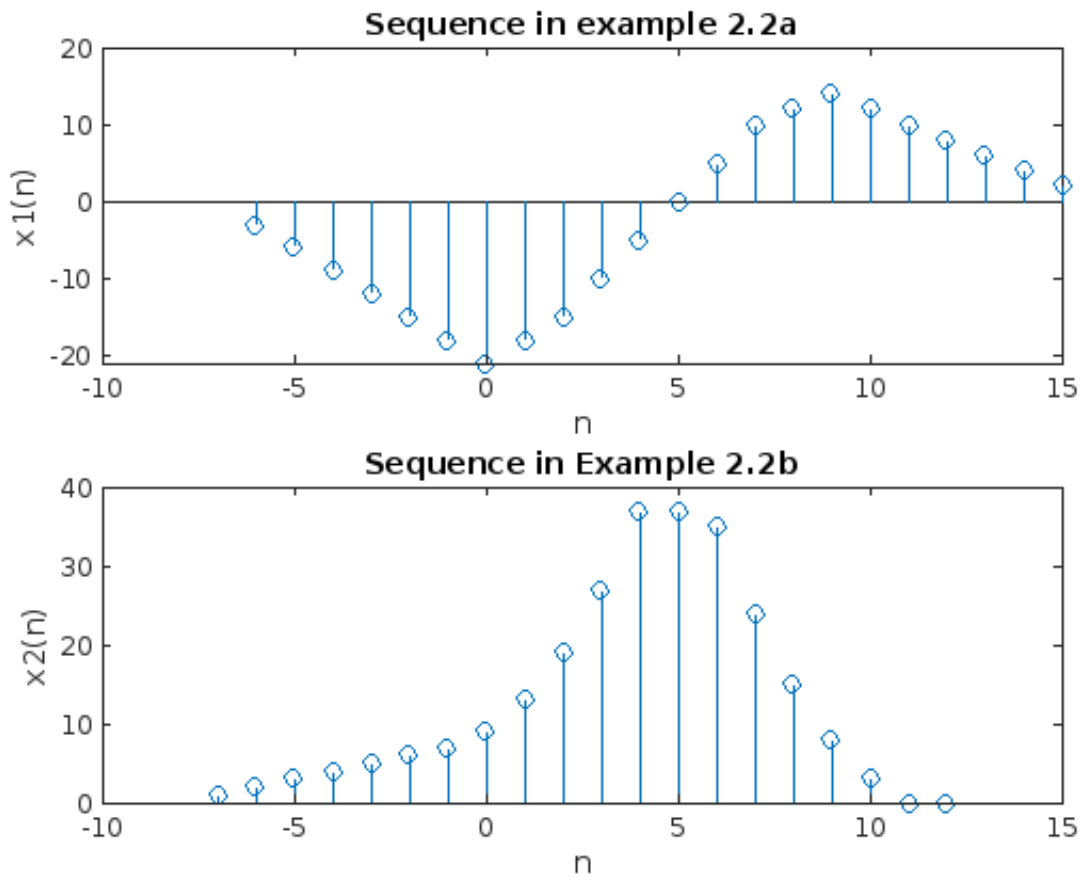
[~, ind1] = ismember(n1, n); % Find the indices within n that correspond to n1
[~, ind2] = ismember(n2, n); % Find the indices within n that correspond to n2

y1(ind1) = x1; % Place x1 values in y1
y2(ind2) = x2; % Place x2 values in y2
y = y1 .* y2; % Element-wise multiplication
end

function [y,n] = sigshift(x,m,k)
% Implements y(n) = x(n - k)
% -----
% [y,n] = sigshift(x,m,k)
%
n = m + k;
y = x;
end

function [y,n] = sigfold(x,n)
% Implements y(n) = x(-n)
% -----
% [y,n] = sigfold(x,n)
%
y = fliplr(x);
```

```
n = -fliplr(n);
end
```



## Problem statement

```
% a.  $x_1(n) = 2x(n-5) - 3x(n+4)$ 
n = -2:10; x = [1:7,6:-1:1];
[x11,n11] = sigshift(x, n, 5);
[x12,n12] = sigshift(x, n, -4);
[x1,n1] = sigadd(2*x11, n11, -3*x12, n12);
subplot(2,1,1); stem(n1, x1); title('Sequence in example 2.2a');
xlabel('n'); ylabel('x1(n)');

% b.  $x_2(n) = x(3-n) + x(n)x(n-2)$ 
n = -2:10; x = [1:7,6:-1:1];
[x21,n21] = sigfold(x, n);
[x21,n21] = sigshift(x21, n21, 3);
[x22,n22] = sigshift(x, n, 2);
[x22,n22] = sigmult(x, n, x22, n22);
[x2,n2] = sigadd(x21, n21, x22, n22);
subplot(2,1,2); stem(n2, x2); title('Sequence in Example 2.2b');
xlabel('n'); ylabel('x2(n)');
```

*Published with MATLAB® R2024a*