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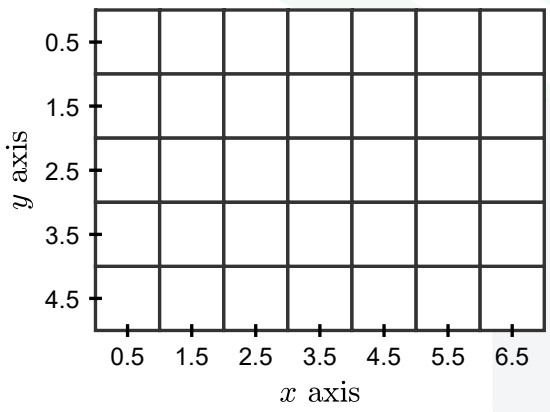
Computational Science:
Computational Methods in Engineering

Meshgrids

What is the Desired Grid?




```
% DEFINE GRID
Nx = 7;
Ny = 5;
dx = 1;
dy = 1;
```

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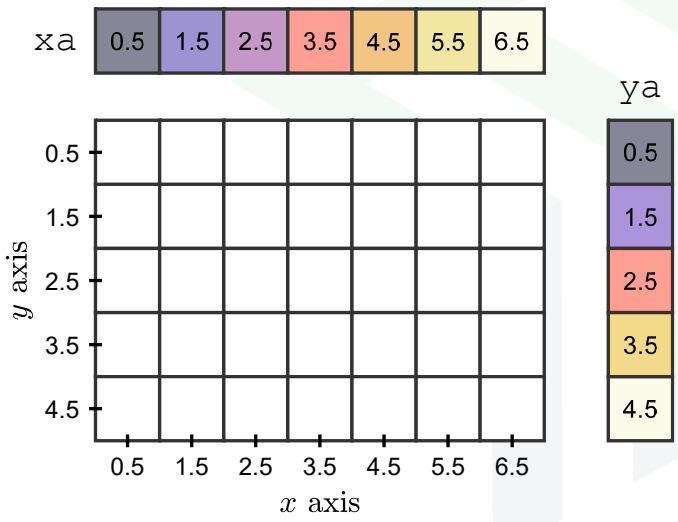
Calculate the Axis Vectors (xa & ya)




```
% DEFINE GRID
Nx = 7;
Ny = 5;
dx = 1;
dy = 1;

% AXIS VECTORS
xa = [0.5:Nx-0.5]*dx;
ya = [0.5:Ny-0.5]*dy;
```

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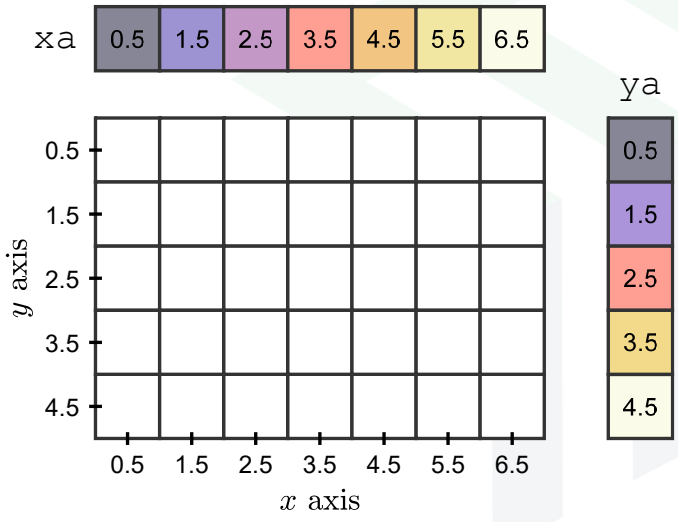
Calculate the Meshgrid (X & Y)




```
% DEFINE GRID
Nx = 7;
Ny = 5;
dx = 1;
dy = 1;

% AXIS VECTORS
xa = [0.5:Nx-0.5]*dx;
ya = [0.5:Ny-0.5]*dy;

% MESHGRID
[Y,X] = meshgrid(ya,xa);
```

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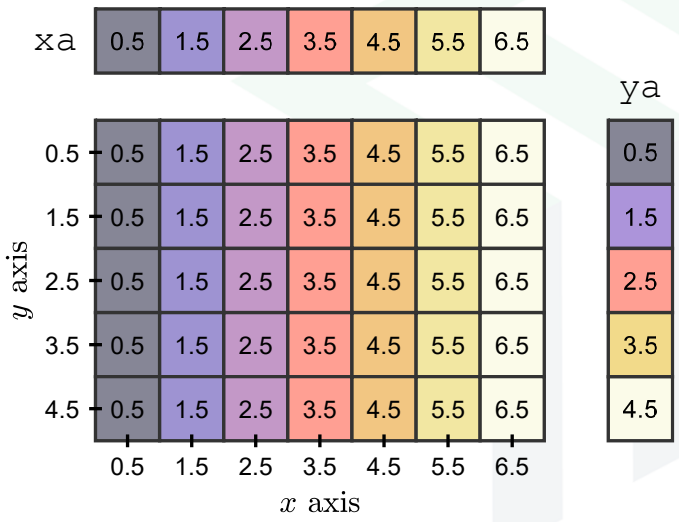
What is X?




```
% DEFINE GRID
Nx = 7;
Ny = 5;
dx = 1;
dy = 1;

% AXIS VECTORS
xa = [0.5:Nx-0.5]*dx;
ya = [0.5:Ny-0.5]*dy;

% MESHGRID
[Y,X] = meshgrid(ya,xa);
```

X is an array the same size as the grid where the data in the array are the x positions of each cell.

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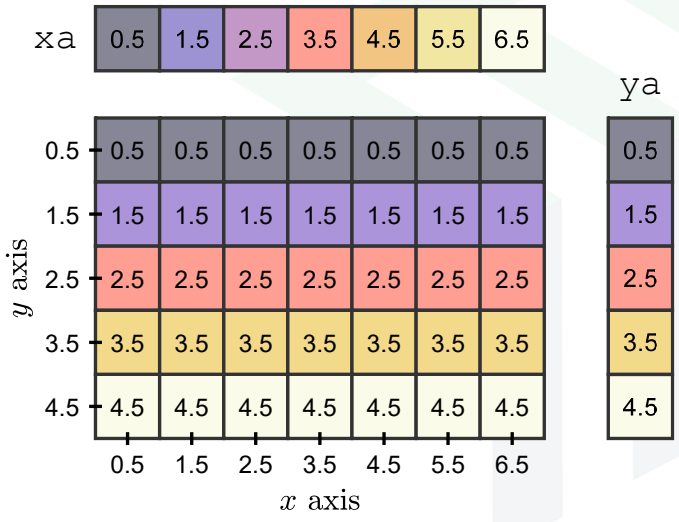
What is Y?




```
% DEFINE GRID
Nx = 7;
Ny = 5;
dx = 1;
dy = 1;

% AXIS VECTORS
xa = [0.5:Nx-0.5]*dx;
ya = [0.5:Ny-0.5]*dy;

% MESHGRID
[Y,X] = meshgrid(ya,xa);
```

Y is an array the same size as the grid where the data in the array are the y positions of each cell.

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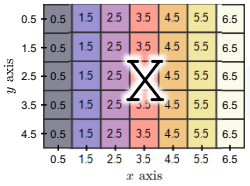
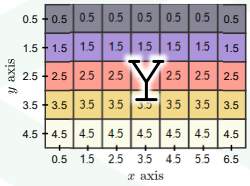
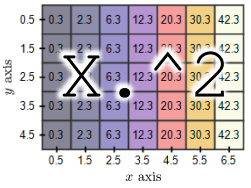
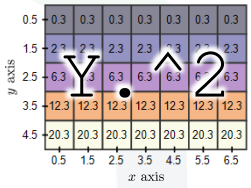
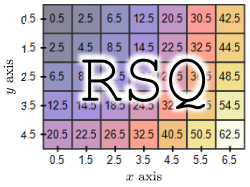
Why is a Meshgrid Useful? (1 of 2)












```
% DEFINE GRID
Nx = 7;
Ny = 5;
dx = 1;
dy = 1;

% AXIS VECTORS
xa = [0.5:Nx-0.5]*dx;
ya = [0.5:Ny-0.5]*dy;

% MESHGRID
[Y,X] = meshgrid(ya,xa);

% RADIAL GRID
RSQ = X.^2 + Y.^2;
```

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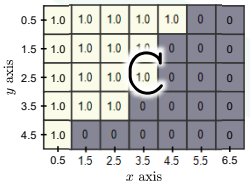
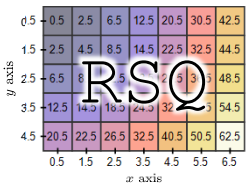
Why is a Meshgrid Useful? (2 of 2)






```
% DEFINE GRID
Nx = 7;
Ny = 5;
dx = 1;
dy = 1;

% AXIS VECTORS
xa = [0.5:Nx-0.5]*dx;
ya = [0.5:Ny-0.5]*dy;

% MESHGRID
[Y,X] = meshgrid(ya,xa);

% RADIAL GRID
RSQ = X.^2 + Y.^2;

% CREATE A CIRCLE
C = (RSQ <= r^2);
```

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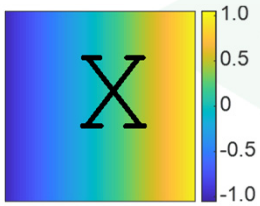
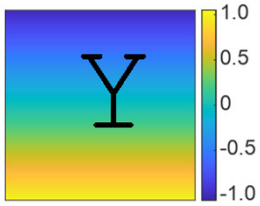
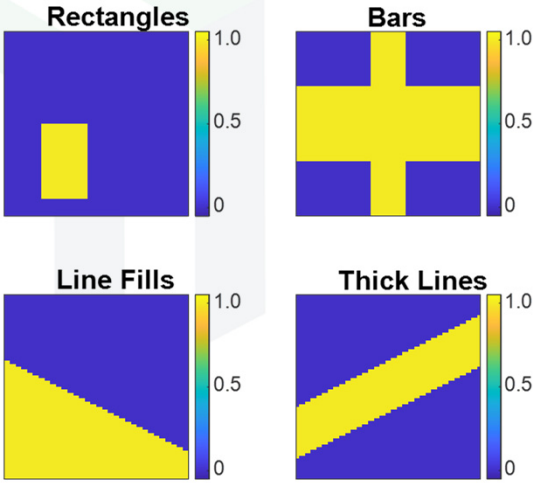
Linear Meshgrids

The Linear Meshgrid





Representative Geometries



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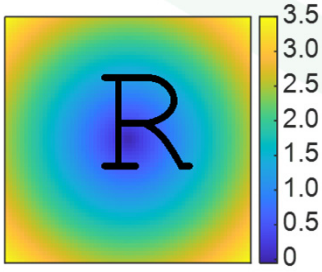
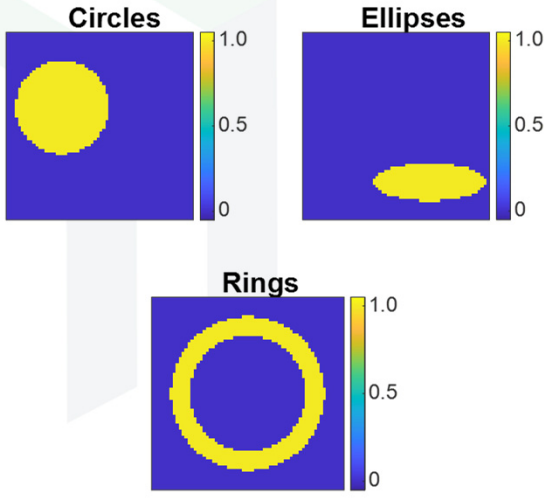
Radial Meshgrids

The Radial Meshgrid




```
% RADIAL MESHGRID
[Y,X] = meshgrid(ya,xa);
R     = sqrt(X.^2 + Y.^2);
```

Representative Geometries



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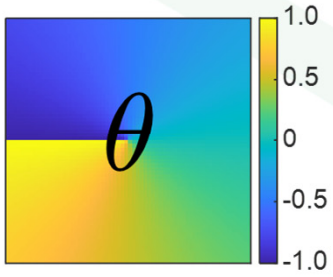
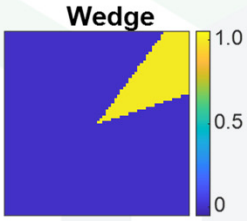
Azimuthal Meshgrids

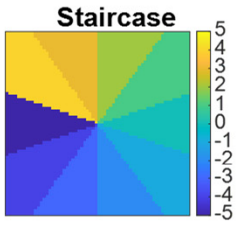
The Azimuthal Meshgrid

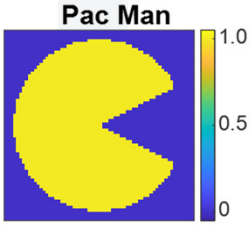



```
% AZIMUTHAL MESHGRID
[Y,X] = meshgrid(ya,xa);
THETA = atan2(Y,X);
```

Representative Geometries







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