

The Point Class

```
classdef Point < handle
% A point has an x and y coordinate

properties
    x
    y
end

methods
% Construct a point object
function P = Point(x,y)
    if nargin==2
        P.x = x;
        P.y = y;
    end
end

function Q = Rotate(ThisPoint,angle)
% Rotates ThisPoint by angle degrees counterclockwise.
theta = angle*pi/180;
c = cos(theta);
s = sin(theta);
x = ThisPoint.x;
y = ThisPoint.y;
if nargin == 1
    Q = Point(c*x - s*y, s*x + c*y);
else
    ThisPoint.x = c*x - s*y;
    ThisPoint.y = s*x + c*y;
end
end

function d = Dist(ThisPoint,Q)
% The distance from ThisPoint to object Q.
% Q must be either a Point or a Circle
if strcmp(class(Q), 'Point')
    d = sqrt((ThisPoint.x-Q.x)^2 + (ThisPoint.y-Q.y)^2);
elseif strcmp(class(Q), 'Circle')
    d = abs(ThisPoint.Dist(Q.center) - Q.r);
end
end

function Show(ThisPoint,color)
% Display ThisPoint in the current figure window with
% color c. The value of c is one of the characters in
% 'kwrghbmcy'.
plot(ThisPoint.x,ThisPoint.y,['.' color], 'Markersize',30)
end

end %methods
end %classdef
```

The PointSet Class

```
classdef PointSet < handle
    % A PointSet object represents a collection of points in the plane.
    properties
        v = Point.empty();      % A vector of Point objects.
        n                                % The number of points
    end

    methods
        % Creates a PointSet Object...
        function P = PointSet(n,x,y)
            % x and y are length-n vectors
            P.n = n;
            for k=1:n
                if nargin==3
                    P.v(k) = Point(x(k),y(k));
                else
                    P.v(k) = Point(-5+10*rand(),-5+10*rand());
                end
            end
        end

        % Represents the centroid of the PointSet as a Point
        function C = Centroid(ThisPointSet)
            sx = 0; sy = 0;
            n = ThisPointSet.n;
            for k=1:n
                sx = sx + ThisPointSet.v(k).x;
                sy = sy + ThisPointSet.v(k).y;
            end
            C = Point(sx/n,sy/n);
        end

        function AddPoint(ThisPointSet,P)
            % Adds Point P to ThisPointSet.
            n = ThisPointSet.n;
            ThisPointSet.v(n+1) = P;
            ThisPointSet.n = n+1;
        end

        function Show(ThisPointSet,c)
            % Displays ThisPointSet in color c where c is a character
            % from 'kwrghbcmy'
            n = ThisPointSet.n;
            for k=1:n
                ThisPointSet.v(k).Show(c)
            end
        end
    end
end

end

end
```

x

The Circle Class

```
classdef Circle < handle
    % A Circle object has a center and a radius.
    % The center is a Point object.

    properties
        center = Point();
        r
    end

    methods
        function C = Circle(x,y,r)
            % Creates a circle object
            if nargin>0
                C.center = Point(x,y);
                C.r = r;
            end
        end

        function d = Dist(ThisCircle,P)
            % The distance from ThisCircle to Point P
            d = abs(P.Dist(ThisCircle.center) - ThisCircle.r);
        end

        function Show(ThisCircle,c)
            % Display ThisCircle in the current figure window with
            % color c. The value of c is one of the characters in
            % 'kwrghbmcy'.
            theta = linspace(0,2*pi);
            xc = ThisCircle.center.x;
            yc = ThisCircle.center.y;
            r = ThisCircle.r;
            plot(xc+r*cos(theta),yc+r*sin(theta),c)
        end
    end
end
```