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# C# program to find convex hull of a set of points. Refer
# https://www.geeksforgeeks.org/orientation-3-ordered-points/
# for explanation of orientation()

# point class with x, y as point
class Point:
    def __init__(self, x, y):
        self.x = x
        self.y = y

def Left_index(points):
    '''
    Finding the left most point
    '''
    minn = 0
    for i in range(1, len(points)):
        if points[i].x < points[minn].x:
            minn = i
        elif points[i].x == points[minn].x:
            if points[i].y > points[minn].y:
                minn = i
    return minn

def orientation(p, q, r):
    '''
    To find orientation of ordered triplet (p, q, r).
    The function returns following values
    0 --> p, q and r are colinear
    1 --> Clockwise
    2 --> Counterclockwise
    '''
    val = (q.y - p.y) * (r.x - q.x) - \
          (q.x - p.x) * (r.y - q.y)

    if val == 0:
        return 0
    elif val > 0:
        return 1
    else:
        return 2

def convexHull(points, n):
    # There must be at least 3 points
    if n < 3:
        return

    # Find the leftmost point
    l = Left_index(points)

    hull = []

    '''
    Start from leftmost point, keep moving counterclockwise
    until reach the start point again. This loop runs O(h)
    times where h is number of points in result or output.
    '''

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'''
p = 1
q = 0
while(True):

    # Add current point to result
    hull.append(p)

    '''
    Search for a point 'q' such that orientation(p, q,
    x) is counterclockwise for all points 'x'. The idea
    is to keep track of last visited most counterclock-
    wise point in q. If any point 'i' is more
counterclock-
wise than q, then update q.
    '''
    q = (p + 1) % n

    for i in range(n):

        # If i is more counterclockwise
        # than current q, then update q
        if(orientation(points[p],points[i], points[q])
== 2):

            q = i

    '''
    Now q is the most counterclockwise with respect to p
    Set p as q for next iteration, so that q is added to
    result 'hull'
    '''
    p = q

    # While we don't come to first point
    if(p == 1):
        break

    return_points=[]
    # Print Result
    for each in hull:
        return_points.append(points[each])
        print(points[each].x, points[each].y)

    return return_points

# Driver Code
'''
points = []
points.append(Point(6, 8))
points.append(Point(1, 6))
points.append(Point(4, 8))
points.append(Point(6, 7))

convexHull(points, len(points))

# This code is contributed by

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# Akarsh Somani, IIIT Kalyani  
'''
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