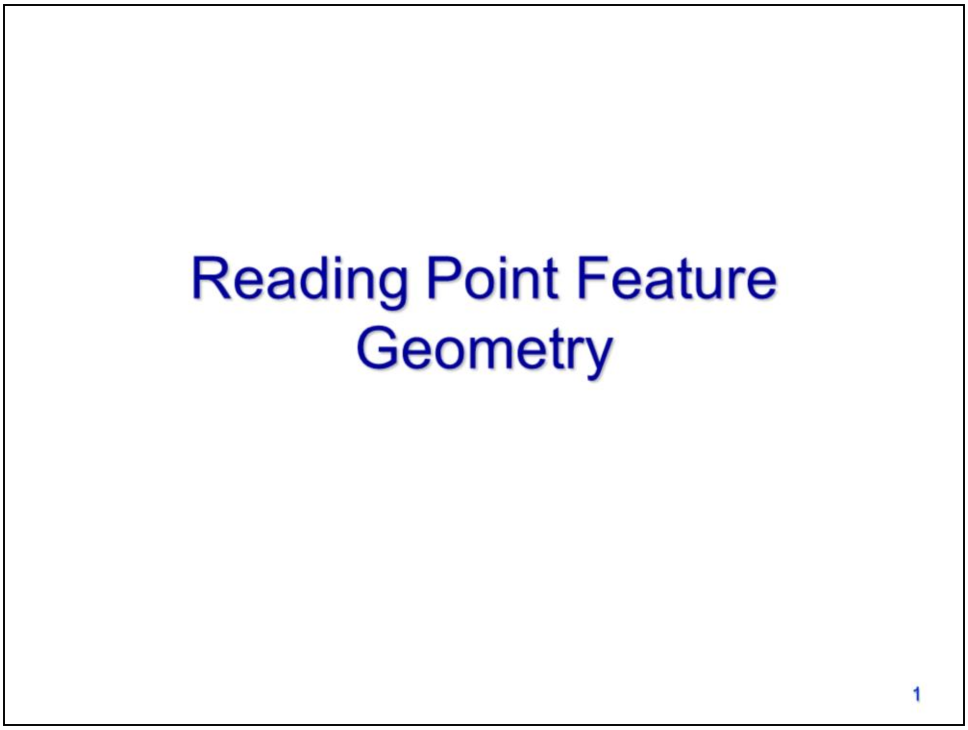
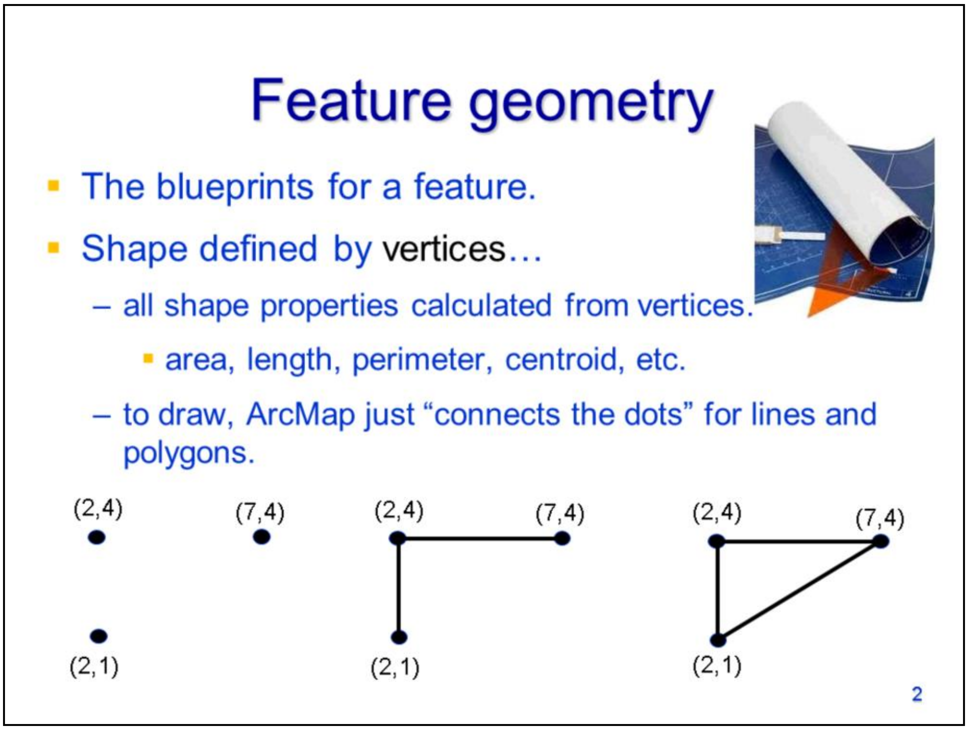


Reading Point Feature Geometry

1

This video will discuss how feature geometry data are stored in a GIS dataset and how these data can be read using arcpy’s cursor tools.



Feature geometry

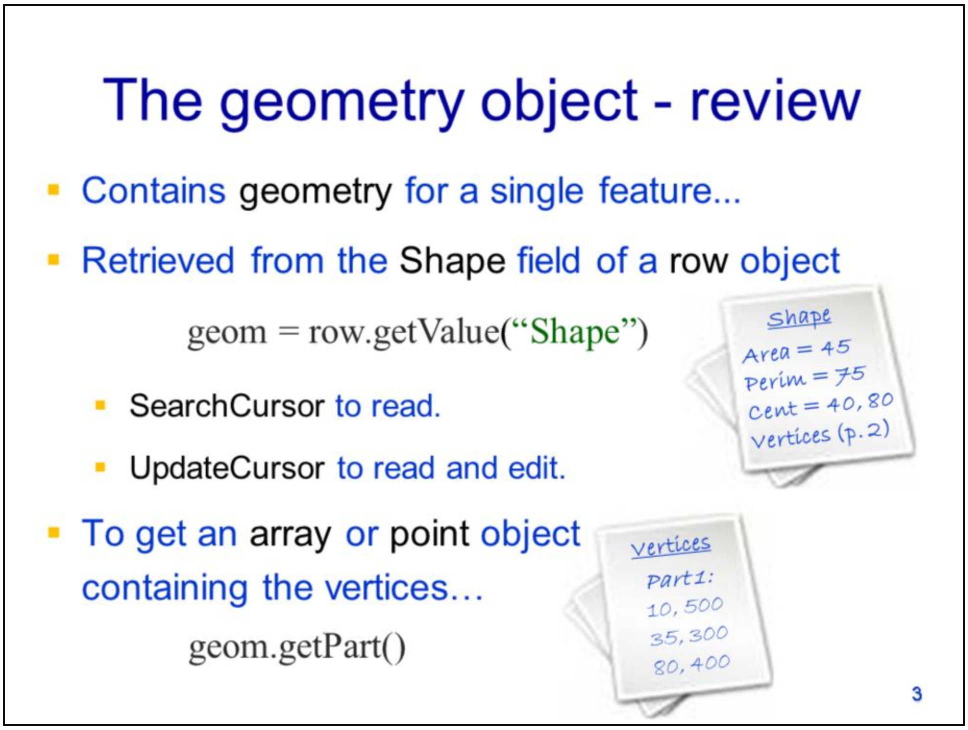
- The blueprints for a feature.
- Shape defined by vertices…
  - all shape properties calculated from vertices.
    - area, length, perimeter, centroid, etc.
  - to draw, ArcMap just “connects the dots” for lines and polygons.

(2,4)
(7,4)
(2,1)
(2,4)
(7,4)
(2,1)
(2,4)
(7,4)
(2,1)
2

A feature’s geometry can be though of as the blueprints needed to draw the feature.

All features are defined by their vertices and all properties of a feature’s shape are calculated based on the vertices. When viewing features, GIS software simply connects the dots following a sets of rules that is determined by the type of features in the dataset.

There are 3 basic types of features that can be included in GIS datasets: points, lines, and polygons.



The geometry object - review

- Contains geometry for a single feature...
- Retrieved from the Shape field of a row object

```
geom = row.getValue("Shape")
```

  - SearchCursor to read.
  - UpdateCursor to read and edit.
- To get an array or point object containing the vertices...

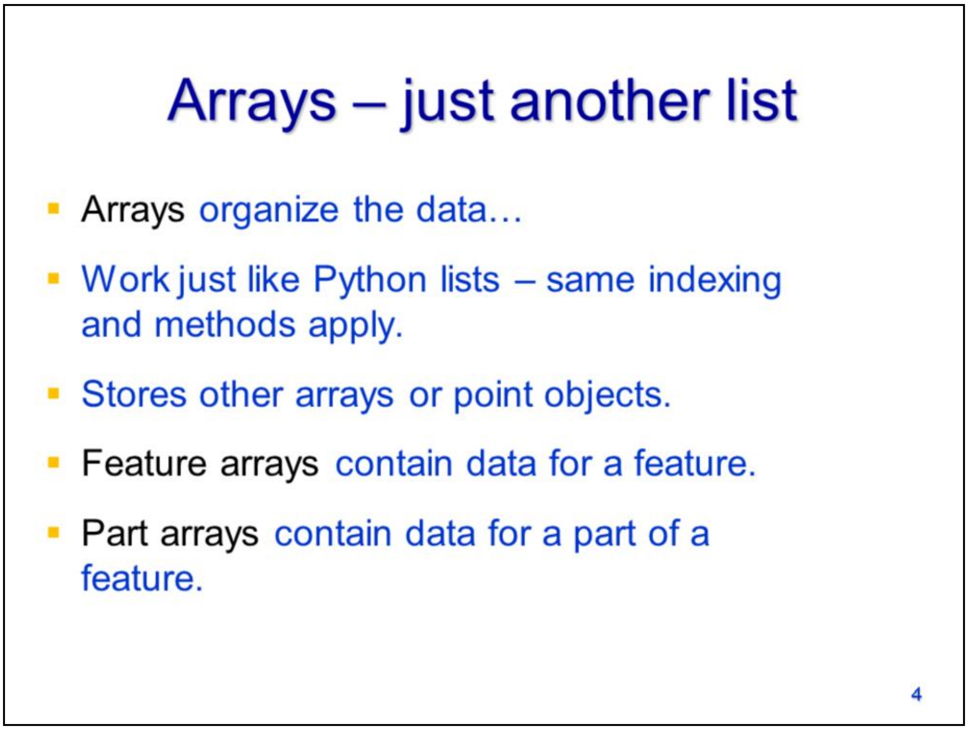
```
geom.getPart()
```

Shape
Area = 45
Perim = 75
Cent = 40, 80
Vertices (p.2)
Vertices
Part1:
10, 500
35, 300
80, 400

Last week, we learned that the geometry object contains all the spatial information for a given feature – this includes the feature's geometry.

Recall that the geometry object is retrieved from a row object by using the row object's getValue method of the "Shape" field.

The vertices that define a feature's shape can be retrieved by using the geometry object's **getPart** method. This method will return an array, for polygons and lines features, and a point object for point features.



Arrays – just another list

- Arrays organize the data…
- Work just like Python lists – same indexing and methods apply.
- Stores other arrays or point objects.
- Feature arrays contain data for a feature.
- Part arrays contain data for a part of a feature.

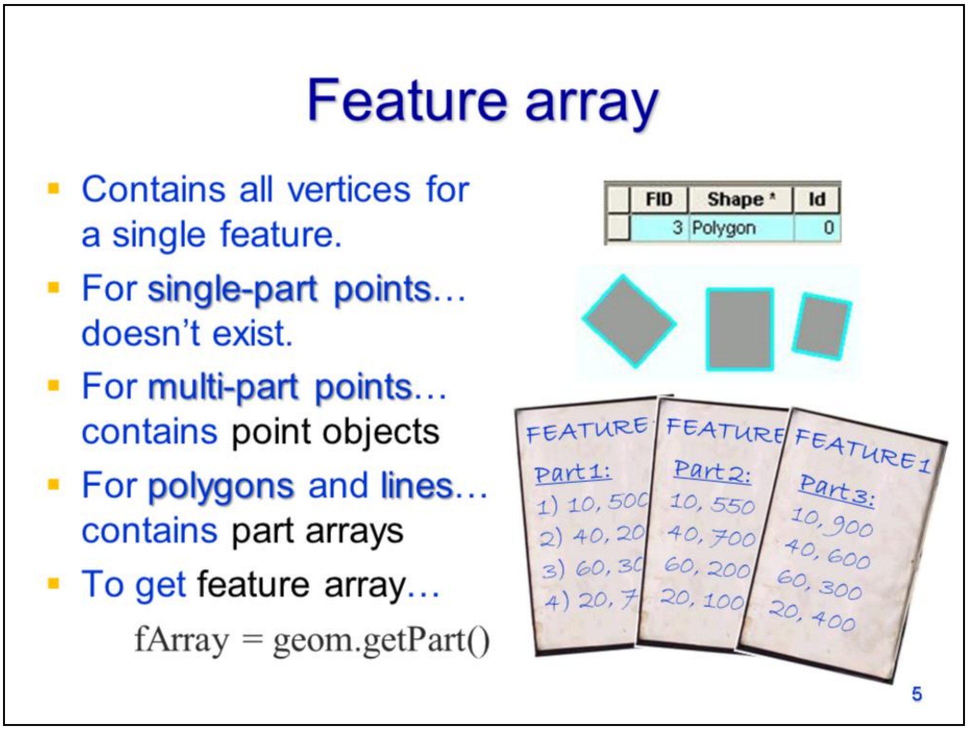
An array is a type of data collection in Python.

Arrays are similar to lists in the way that items are retrieved and added.

Arrays returned by the **getPart** method will either contain other arrays or point objects.

A **feature array** contains data for a feature.

A **part array** contains the data for a single part of a feature.



Feature array

- Contains all vertices for a single feature.
- For single-part points… doesn't exist.
- For multi-part points… contains point objects
- For polygons and lines… contains part arrays
- To get feature array…

  fArray = geom.getPart()

	FID	Shape *	Id
	3	Polygon	0

FEATURE
Part1:
1) 10, 50C
2) 40, 20
3) 60, 3C
4) 20, 7
FEATURE
Part2:
10, 550
40, 700
60, 200
20, 100
FEATURE1
Part3:
10, 900
40, 600
60, 300
20, 400

The **feature array** contains all the vertices for a single feature.

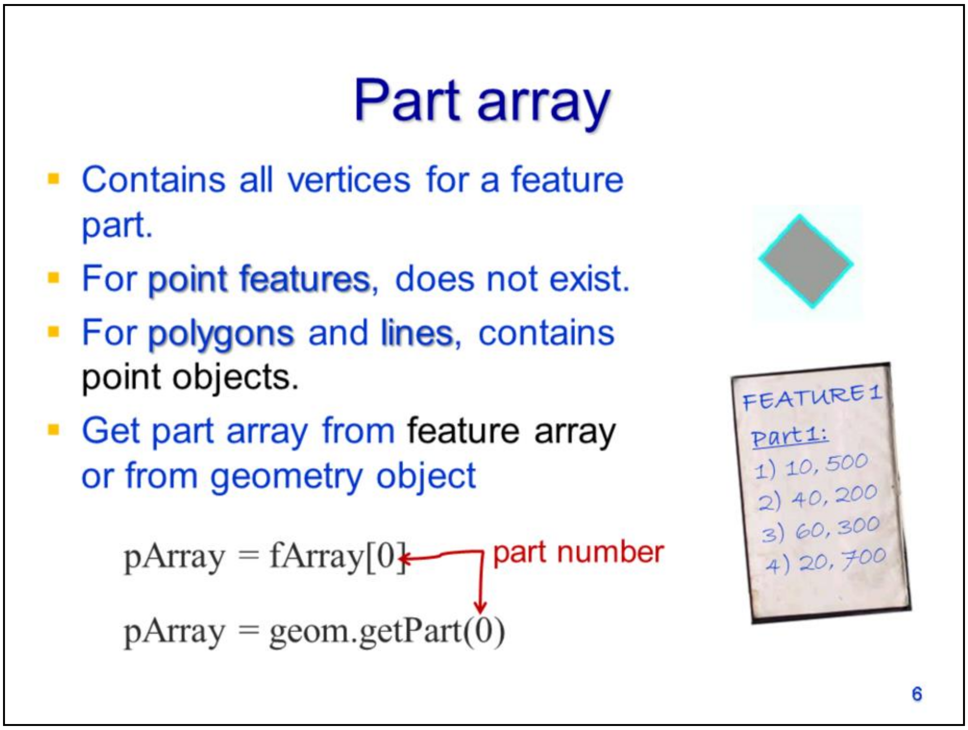
Features can contain one or more parts. Multi-part features have multiple separate parts that all correspond to a single FID and row in the dataset's attribute table.

The feature array doesn't exist for single-part point features – these features contain a single vertex which is stored in a point object.

For multi-part point features, the feature array contains point objects.

For polygons and lines, the feature array contains one or more part arrays.

To get the feature array, use the geometry object's **getPart** method.



Part array

- Contains all vertices for a feature part.
- For point features, does not exist.
- For polygons and lines, contains point objects.
- Get part array from feature array or from geometry object

```
pArray = fArray[0]

pArray = geom.getPart(0)
```

part number

FEATURE1
Part1:
1) 10, 500
2) 40, 200
3) 60, 300
4) 20, 700

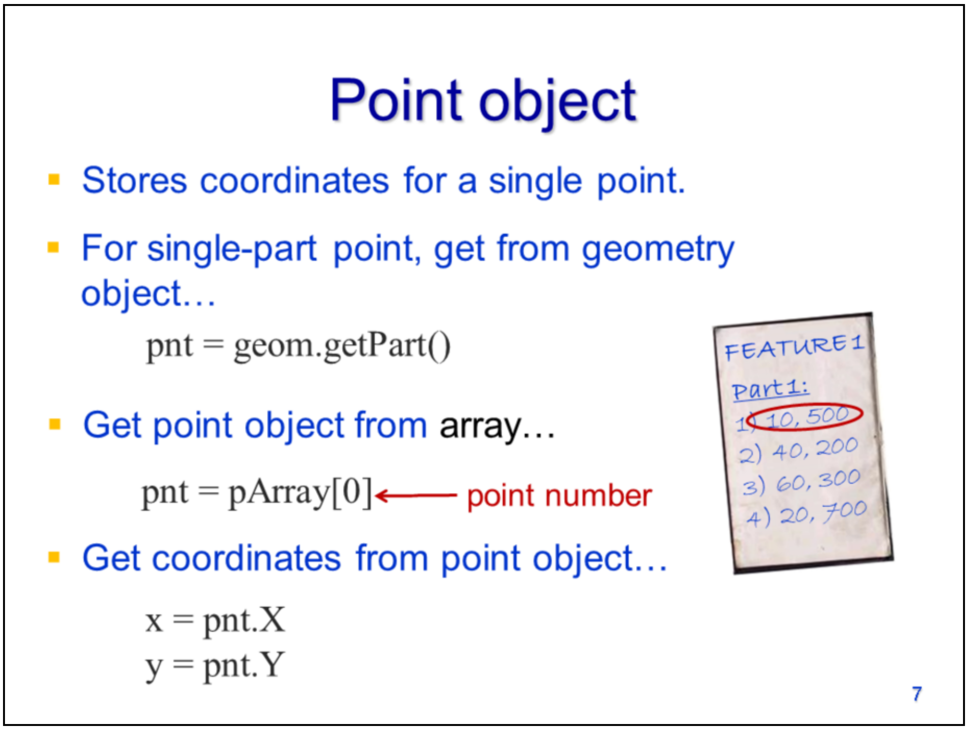
The **part array** contains all the vertices for a single part of a feature.

The part array does not exist for any point features – the geometry of point features is not complex enough to need a part array.

For lines and polygons, the part array will contain point objects. These point objects correspond to the vertices of a single contiguous feature part.

The part array can be retrieved from the feature array by specifying the feature array name followed by the position of the part in the array.

The part array can also be retrieved directly from the geometry object’s getPart method.



Point object

- Stores coordinates for a single point.
- For single-part point, get from geometry object…

```
pnt = geom.getPart()
```

- Get point object from array…

```
pnt = pArray[0]
```

← point number

- Get coordinates from point object…

```
x = pnt.X
y = pnt.Y
```

FEATURE 1
Part 1:
1) 10, 500
2) 40, 200
3) 60, 300
4) 20, 700

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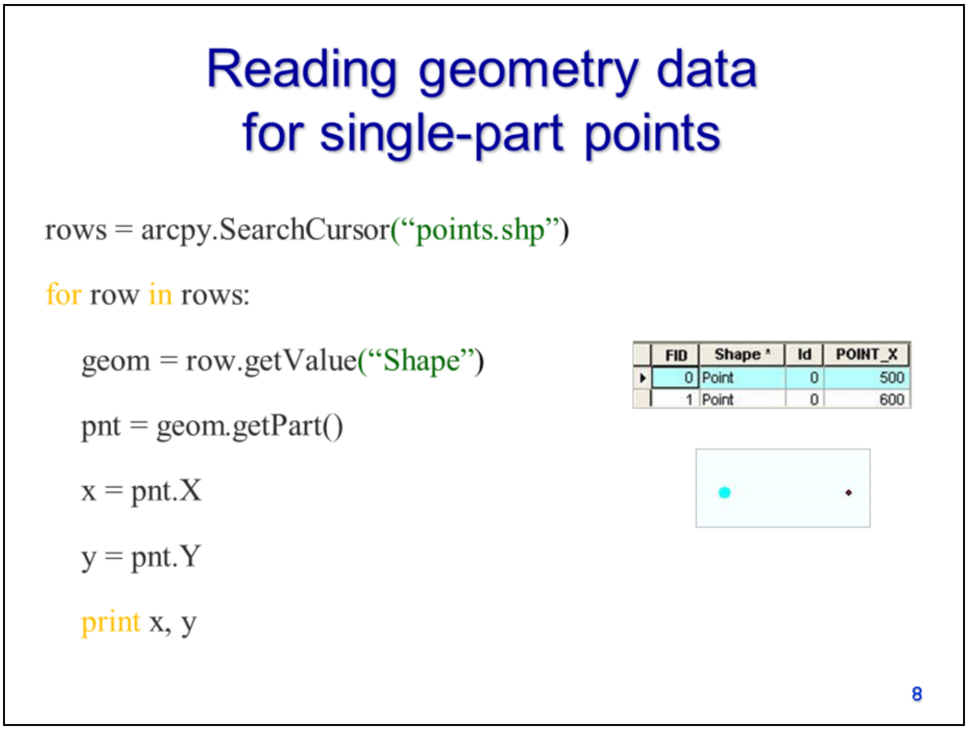
The **point object** stores the coordinates of a single point.

For a **single part** point, the point object is retrieved using the **getPart** method.

For more complex features, the point objects are retrieved from either the feature array (multi-part points) or the part array (polygons and lines).

The X and Y coordinates of a point are retrieved as properties from the point object.

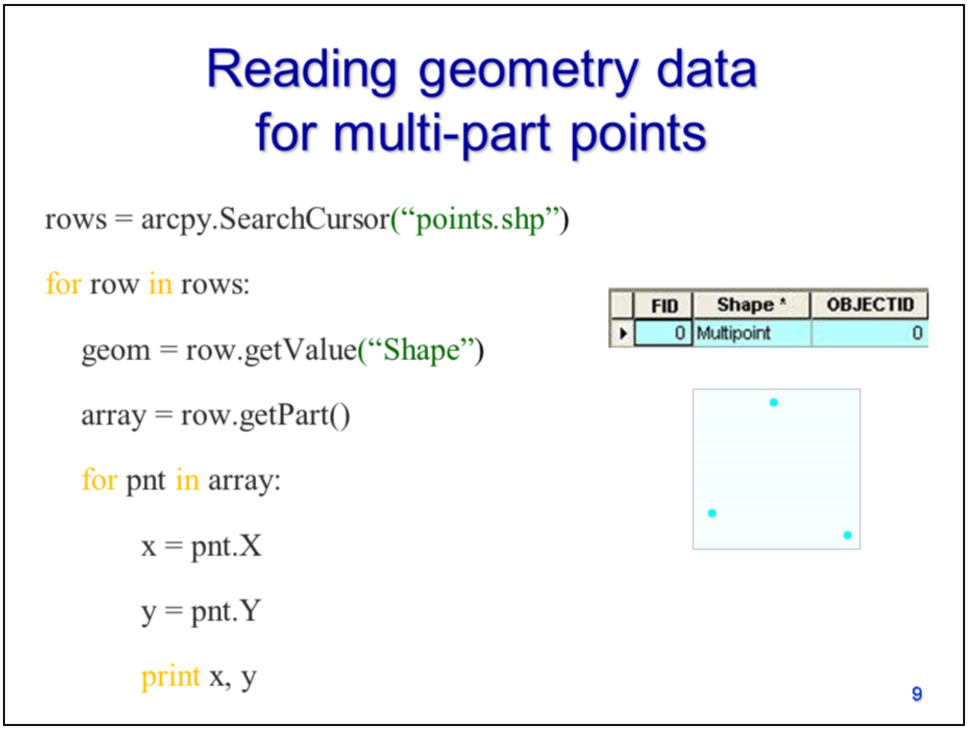


Reading geometry data for single-part points

```
rows = arcpy.SearchCursor("points.shp")

for row in rows:

    geom = row.getValue("Shape")

    pnt = geom.getPart()

    x = pnt.X

    y = pnt.Y

    print x, y
```

FID	Shape *	Id	POINT_X
0	Point	0	500
1	Point	0	600

This example script reads the X and Y coordinates from features in a single-part point shapefile. The SearchCursor is used to access the geometry object for each feature. The geometry object's getPart method is used to retrieve the feature's point object and the X and Y coordinates are retrieved from the point object.



Reading geometry data for multi-part points

```
rows = arcpy.SearchCursor(“points.shp”)
for row in rows:
    geom = row.getValue(“Shape”)
    array = row.getPart()
    for pnt in array:
        x = pnt.X
        y = pnt.Y
        print x, y
```

FID	Shape *	OBJECTID
0	Multipoint	0

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This script demonstrates how to print the X and Y coordinates of features in a multi-part point shapefile. For multi-part point features, there are multiple points that correspond to a single FID value. The getPart method returns the feature array. For multi-part point features, the feature array contains point objects. A for loop can be used to retrieve each point object from the feature array and the coordinates can be retrieved from the point object.