Finding the Optimal Location for an Art-o-mat® with Location Analytics

Your Name: _____

Summary
What is the optimal location for an Art-o-mat® machine in central Philadelphia? This activity uses location analytics, specifically, ArcGIS Online, a Web-based Geographic Information System (GIS) (https://bao.arcgis.com) as a tool for determining these locations.

Art-o-mat® art vending machines (courtesy of https://artomat.org).

Description. This activity is written for the university level but can be used at the upper secondary level. It can be used in formal or informal educational settings and in an independent or whole-class format. It can be used in other locations besides Philadelphia.

Time to complete: 3 class periods of 50 minutes each. No previous experience with GIS is necessary but (1) the geographic perspective is important, and (2) background in the topic investigated would be helpful; at a minimum, a short discussion on the processes and phenomenon studied in each investigation should be held at the beginning; such as "What factors are important for locating a good or

Map and analysis of the study area that you will create using Business Analyst Web as part of this activity.

service? How does the type of good or service influence the factors considered?" Ideally, this activity could be used as an introductory unit in a location analytics, business marketing, communications, or geography course.
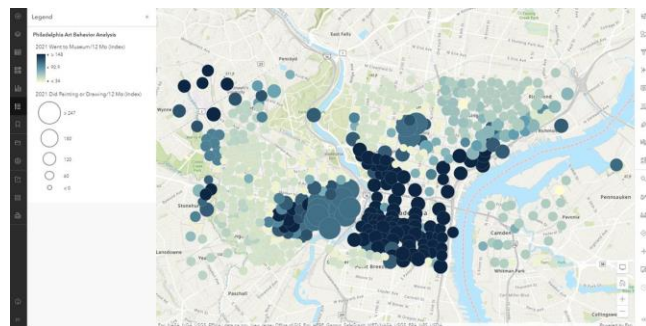
Technology requirements: (1) A modern edition of a Web browser. (2) A robust Internet connection. (3) A subscription to ArcGIS Online (free via developers.arcgis.com) or via your educational institution.

Instructional Format: This lesson can be run in a computer lab setting using equipment provided by the host institution or with students bringing their own tablets/laptops/devices, or simply using 1 computer in front of the class with a projector **or** it could be used in hybrid or fully online courses.

Problem Statement. Art-o-mat® machines are retired cigarette vending machines that have been converted to vend art. Over 100 active machines exist in locations throughout the USA. Hearing about your excellent GIS skills, Philadelphia Arts Council has hired you to recommend 2 sites in the central part of the city for a machine. To understand how GIS has been effectively used in past site selection, read this article describing how PETCO used GIS to improve its store

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locating decision-making process: https://www.esri.com/content/dam/esrisites/sitecore-archive/Files/Pdfs/library/articles/petco-case-study.pdf

Learn how other businesses use location analytics via these case studies on: http://www.esri.com/industries/business/index.html to prepare you for your investigation.
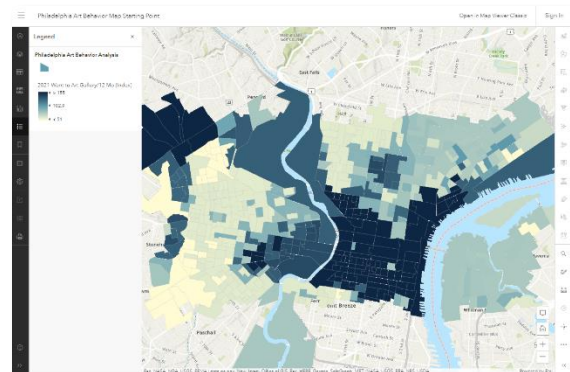
Analysis

1) Considering what you read in the articles about GIS and businesses, and your own previous knowledge, provide 3 reasons why location is important to business.

Because of these and a whole host of other reasons, the geographic perspective is critical to understanding business site location. GIS allows the geographic perspective to be applied to business decisions, and ArcGIS Online provides a toolkit and rich set of data that allows you to conduct investigations easily and powerfully.

Access and sign in to Esri's *ArcGIS Online (www.arcgis.com)* so that you will be able to locate the machine in the optimal site*.* You decide to consider the following 4 behavioral variables in your consideration on where to recommend Art-o-Mat locations:

1. Ordered from Etsy website in the past 12 months.
2. Went to a museum in the past 12 months.
3. Went to an art gallery in the past 12 months.
4. Did any painting or drawing in the past 12 months.

Open the following web map: Philadelphia Art Behavior Map Starting Point. The map will look similar to that shown here, with attendance at an art gallery symbolized in yellow-to-purple tones. The data were pulled from Esri's Business Analyst Web and saved in this feature service. The data were gathered from surveys and aggregated by credit card purchases. The geography is by census block group (neighborhood) level. Note that clicking on each block group yields a popup that shows you the value of the 4 variables in each block group.

*Map of art gallery attendance in ArcGIS Online, central Philadelphia.*

2) Describe 2 characteristics of the pattern of art gallery attendance in central Philadelphia.

On the left, select the Philadelphia Art Behavior Analysis layer > Open Table. Show all fields in your table. Note that the above 4 variables are listed as numbers representing an index value, with 100 for the USA national average for each variable. Thus, if a block group shows a value of 200 for "went to an

art gallery in the past 12 months", the people living there, in aggregate, went to an art gallery twice the rate of the national average over the past year.

Your task is to use GIS to analyze all 4 of the variables to determine the optimal location for an Art-o-Mat. The following tools will be most important in your analysis. However, do not feel confined to *only* using these. If time permits, experiment with other tools!

    (1) Styles: Use styles together with "Fields" to map specific variables. You can add fields to make a bivariate or multi-variate map. You can also make maps showing predominance, relationships (see example above), comparisons, dot density, and many more. Under styles you can also change the color, the classification method, and the number of classes. Open the following web map to see an example of a bivariate map: Philadelphia Art Behavior Map (arcgis.com)

    (2) Filter: Use the filter tool to build expressions that allow you to clearly see only those block groups above a certain value for certain variables.

    (3) Charts: Creating charts might enable you to rank the neighborhoods and analyze them by attributes.
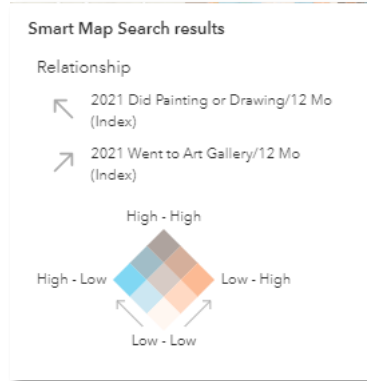
As you use these tools, remember to save your map often.

Once you have done your analysis, select 2 locations that you consider to be the ideal locations for your Art-o-Mat. Create a *sketch layer* on your map and place 2 symbols on your ideal locations, such as the 2 yellow-green markers shown in this map and at right.

3) Give the location of your 2 sites (along with the nearest cross streets (intersection) and give 2 reasons why you selected the 2 sites that you did.

Turn the behavioral layer off so that just your sketch with your 2 proposed locations are visible. Change the basemap to **imagery** and zoom to each of your proposed sites, examining the streetscape, example shown here. Next, change the base map to Open Street Map and consider other cultural layers in the city that might be important to your proposed locations.
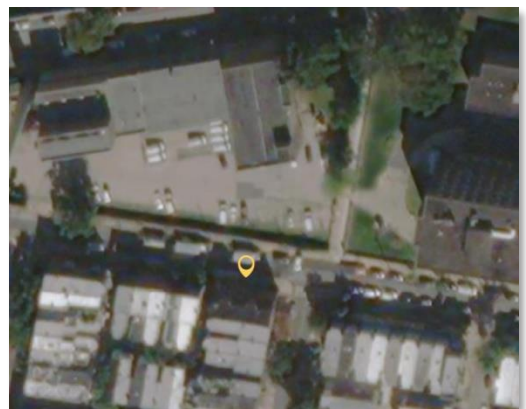
4) Based on this large-scale examination of the imagery and open street map layer, do you need to adjust the location of either your sites? Why or why not? If you need to adjust the locations, do so at this time.

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Zoom back out to your study area and turn your behavioral layer back on. Change the basemap back to Topographic.

Next, you will create a story map that contains your recommendations as well as your map. Before you create the story map, consider the symbology on your map one last time. Does it reflect what you want the reader of your recommendations to see? If not, make final adjustments to the symbology and variables you want to show. Make sure it contains 2 clear symbols in your sketch layer for your final proposed locations.

Because this map will be included in the story map that you will make next, it is important to make these final adjustments now. Again, be sure to save!

Communications

Now that you have conducted your analysis, now you will create a story map containing your results as well as any other information that you deem necessary to explain why your 2 sites should be considered. A story map should include your web map showing your results, It can also contain audio, video, photographs, and text.

Go to > Create App as shown here > choose "Story Map", which will launch the story map builder.
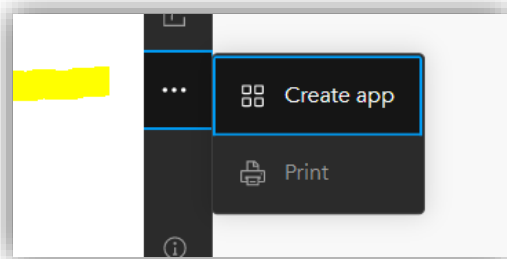
In the story map builder, you will see your final map that you have just been working on. You can use Edit Map at this point to adjust the position and scale of the map, but anything further will need to be done in the ArcGIS Online stage as you were doing earlier (and you can certainly return to that stage, at any time).

Use the + (add) tool (as shown here) to add the following to your storymap:

1. A title and subtitle.

2. Text that explains the methods that you used to determine the optimal sites for the machine, and any other information you think is relevant.

3. A photo of one of these machines. Make sure you have permission to use it and be sure to jot down where you obtained the photo from.

4. In the credits section at the bottom of the map, add statements that the data came from Business Analyst Web and the US Census Bureau, along with

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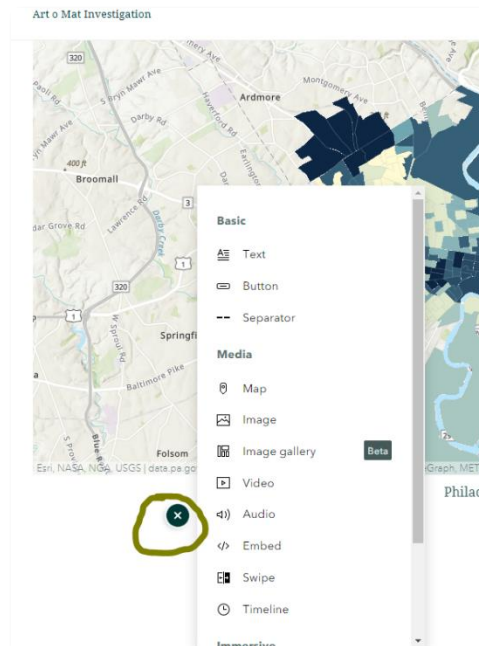
where you obtained your photo and/or any other information, and your name for the analysis.

5. Make **certain that** your story map includes your ArcGIS Online map with the variables and symbology you wish to show, and your 2 proposed Art-o-Mat locations. An [example story map is here.](#)

5) Give a live or recorded 5-minute presentation using your story map as one of the primary sources for your presentation, for your peers, instructor, and/or others.

Synthesis

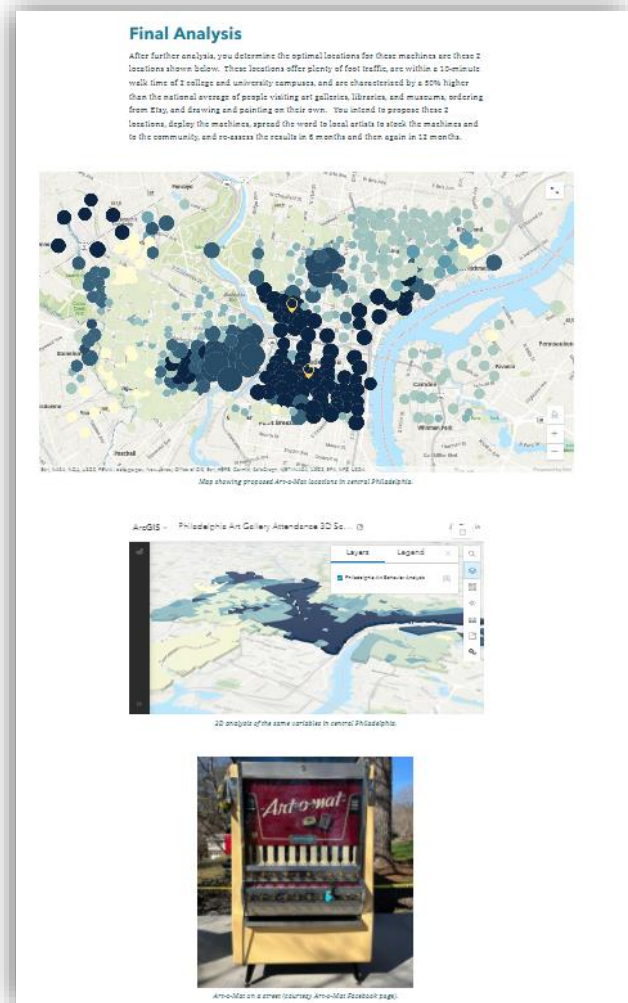6) Name 3 things you have learned about site location through the use of GIS.

7) You have explored a few aspects of site location from a spatial perspective, but much more could be done. Name 2 additional variables that you might wish to consider. How might these variables affect your chosen location for your machine?

Extensions

If time permits, consider pursuing the following activities to extend your learning.

Using ArcGIS Online > Add Data > use Popular Demographics to add additional information that might influence your final decision. This could include median age, median income, or other demographic variables. After choosing, mapping, and classifying 2 additional variables, consider how the spatial pattern of these 2 additional variables influenced your final site selection location recommendations. Remember that *more data* is not always *better*. Consider how the spatial pattern of these 2 additional variables may **not** have influenced your final site selection.

Using ArcGIS Online, create a route for a person visiting your 2 proposed Art-o-Mat locations. How long would it take, on foot, for a person to visit both locations?

Final Analysis

After further analysis, you determine the optimal locations for these machines are these 2 locations shown below. These locations offer plenty of foot traffic, are within a 10-minute walk time of 2 college and university campuses, and are characterized by a 50% higher than the national average of people visiting art galleries, libraries, and museums, ordering from Etsy, and drawing and painting on their own. You intend to propose these 2 locations, deploy the machines, spread the word to local artists to stock the machines and to the community, and re-assess the results in 6 months and then again in 12 months.

Map showing proposed Art-o-Mat locations in central Philadelphia.

3D analysis of the same variables in central Philadelphia.

Art-o-Mat on a street (courtesy Art-o-Mat Facebook page).

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Create a 3D scene of a few of your variables in ArcGIS Online 3D scene viewer (example [here](#)) to gain additional insight.

The activity that you used here made use of ArcGIS Online. To dig deeper into additional demographic and behavior variables, use Business Analyst Web to explore 2 additional variables.   Business Analyst Web was the original source for the 4 behavioral variables that you analyzed in this activity.   After choosing, mapping, and classifying 2 additional variables, consider how the spatial pattern of these 2 additional variables influenced or did not influence your final site selection location recommendations.
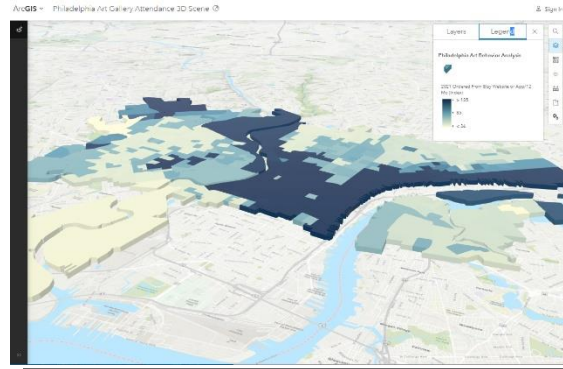
3D scene of art gallery attendance in ArcGIS Online, central Philadelphia.

Use Business Analyst Web to also map the locations of art galleries, libraries, museums, concert halls, and additional relevant locations.   Consider how the proximity of these locations might influence where you might locate your art machines. Create 5-10-15 minute drive time or walk time buffers around these locations to further guide you in your analysis. After mapping these locations and their drive and walk times, consider how the spatial pattern of these drive-and-walk times influenced or did not influence your final site selection location recommendations.

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