



# Area and perimeter at the mall

from the Esri GeoInquiries™ collection for Mathematics

Target audience – Geometry learners

Time required – 15 minutes

## Activity

Use an aerial photograph to determine the perimeter and area of the mall; consider other shape permutations.

## Math Standards

**CCSS: MATH.CONTENT.HSG.MG.A.1.** Use geometric shapes, their measures, and their properties to describe objects.

**CCSS: MATH.CONTENT.HSG.MG.A.3.** Apply geometric methods to solve design problems.

## Learning Outcomes

- Students will find the perimeter and area of a shopping mall.
- Students will consider reasons for the actual configuration and weigh possible alternatives.

Map URL: <http://esriurl.com/mathGeoInquiry9>



## Engage

### How big is the mall?

- Click the URL above to launch the map.
- Chesterfield Commons is an outdoor or strip mall. It is bounded by roads at both ends. Length measures stop at the road. Width measures only include the mall buildings and not parking lots or satellite stores.
- ? How long would it take to walk around the entire mall? *[Answers will vary.]*
- ? Without measuring, how long does the mall appear? *[Answers will vary.]*
- ? How could this map be used to confirm these guesses? *[The Measure tool would allow for measuring the distance.]*



## Explore

### What are the mall's length and width?

- Click Measure and select distance in units of feet.
- Measuring several times and averaging your findings, what are the length and width of the mall? *[~3,520 feet at longest and ~460 feet at widest.]*



## Explain

### What are the mall's area and perimeter?

- ? What is the formula for calculating the perimeter of a rectangle? *[Add the distances of each side.]*
- ? What is the formula for calculating the area of a rectangle? *[Area = length x width]*
- ? What is the approximate perimeter using the data just collected? *[Answers will vary; example: ~7,960 feet]*
- ? What is the area of the mall? *[Answers will vary; example: ~1.6 million square feet]*



## Elaborate

### How do you maximize perimeter?

- ? In what other shapes could the mall be arranged to have the same square footage? *[Answers will vary.]*
- ? What would the perimeter be of these options (greater or less than)?
- ? Can you describe a general pattern in your results? *[Moving toward a square shape reduces the perimeter.]*



## Evaluate

### Is area or perimeter more important for shop owners?

- ? Are there specific features of this mall site that would cause owners or retailers to prefer a long, thin mall over a square-shaped one? *[The long edge facing the highway maximizes visibility to road traffic.]*

## USE THE MEASURE TOOL

- Click Measure, select the Distance button, and from the drop-down list, choose a unit of measurement.
- On the map, click once to start the measurement, click again to change direction, and double-click to stop measuring.
- Hint: Position the area of interest on the map so that it is not obscured by the Measure window.

## TURN A MAP LAYER ON AND OFF

- Make sure that the Details pane is selected, and click Show Contents Of Map.
- To show individual map layers, select the check boxes next to the layer names.
- Hint: If a map layer name is light gray, zoom in or out on the map until the layer name is black. The layer can now be turned on.

## Next Steps

**DID YOU KNOW?** ArcGIS Online is a mapping platform freely available to public, private, and home schools. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at <http://www.esri.com/schools>.

THEN TRY THIS...

- Explore other shopping malls with The Death and Rebirth of the Mall story map and learn more about the future of the mall at <http://esriurl.com/Geo41702>.
- Use the area measurement tool in this activity to compare calculated areas to measured ones.



## TEXT REFERENCES

This GIS map has been cross-referenced to material in sections of chapters from these high school texts.

- *Geometry by Holt, Rinehart & Winston — Chapter 9*
- *Geometry by Houghton — Chapter 11*
- *Geometry by Moise & Downs — Chapter 11*