

Career Challenge! – Math at Work

Examine Existing Housing Patterns

- 1) Look at the map of the current housing neighborhoods in Astland. Complete the table below:

Population by Housing Type

Housing Type	Number of Squares	Population of Each Square	Total Population of Each Housing Type	Percent of Population in each Housing Type
High-rise Apartments		5,200 people		
3-Story Apartments		2,400 people		
Row Homes		1,600 people		
Detached Single Family Homes		400 people		
			Total = 50,000 people	Total = 100 percent

- 2) Now make a pie chart of your percentage data.
- 3) Complete the table below:

Residential Area by Housing Type

Housing Type	Number of Squares	Percent of Residential Area by Housing Type
High-rise Apartments		
3-Story Apartments		
Row Homes		
Detached Single Family Homes		
Total Number of Housing Squares=		Total = 100 percent

- 4) Make a pie chart of this percentage data. Use the same color-coding as your previous chart.

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- 5) What do you notice when comparing the two charts?

- 6) Detached single family homes (DSFH) are expensive and many families can't afford to live in one. In Astland, zoning laws require that only DSFH can be built in about 80% of the neighborhoods. Consider the consequences of these laws. In what ways might this situation be considered unfair? What problems might it cause?

- 7) Consider the infrastructure (roads, sidewalks, sewers, water lines, electrical cables) required by a DSFH neighborhood, compared to the infrastructure required by an apartment neighborhood. Which is more costly to the city? Explain.

- 8) Now you must prepare a plan for housing the 50,000 new residents moving into Astland. Will you extend the zoning laws to the new housing neighborhoods, requiring 80% of new homes to be DSFH? Will you change that law? Explain your decision.

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Plan Your New Housing

- 9) Complete the tables below to show what types of housing squares you will build to accommodate the new citizens of Astland.

Housing Type	Number of Squares	Population of Each Square	Total Population of Each Housing Type	Percent of Population in each Housing Type
High-rise Apartments		5,200 people		
3-Story Apartments		2,400 people		
Row Homes		1,600 people		
Detached Single Family Homes		400 people		
			Total = 50,000+ people	Total = 100 percent

Housing Type	Number of Squares	Percent of City Area by Housing Type	Foam Color
High-rise Apartments			
3-Story Apartments			
Row Homes			
Detached Single Family Homes			
Total Number of Housing Squares=		Total = 100 percent	

- 10) Each of these housing squares will be modeled by a square of foam measuring 2.5 cm x 2.5 cm. Your pack of foam sheets has many colors. Choose one color for each type of housing you will use. Consider using a range of similar colors such as yellow, orange, red, and purple to showing housing from lowest density to highest density.

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- 11) Using scissors, cut out the number of squares you need of each type of housing. Don't glue these to the map yet. You have other foam shapes to add and you will want to experiment with their locations before deciding on a final design.

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Public Buildings

Public buildings include government offices, schools, libraries, police and fire stations, hospitals and clinics, utilities and storm shelters. There is a large cluster of these at the center of Astland, representing the city and county governments. Other public buildings are scattered across the city so they can be close to the people who need their services.

1. Using your map, calculate the total area (in cm^2) used for public buildings. Many of the public areas are squares of identical size, but some are oddly shaped and will require more work. Use the space below to show your calculations.

Type of block	Number of that type	Area of that type
Total Area of Public Buildings		cm^2

2. If that much area is needed for the original 50,000 residents, how much additional area will be needed for public buildings to serve the 50,000 new residents?

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3. Think about how you would want this total area to be broken-up and distributed around Astland. Use the space below to plan the number and size of your public building blocks.

4. Now chose one color to represent your public buildings and cut-out the required foam shapes. Don't attach them to the map yet. You will be adding other foam shapes and will want to experiment with different arrangements before choosing a final design.

Industrial and Commercial Areas

Looking at the map of Astland, you will see about 60 cm² of land devoted to Industrial use. Industry refers to the manufacturing of new items. Think of this as land for factories. Some factories are quite large and employ many people.

Another 60 cm² of land is marked as Commercial. These areas are filled with shops and stores where goods and services are sold. Whether you want to buy food, clothes, or a haircut, a commercial block will contain the business you need. A small commercial square might represent a shopping center. Larger commercial blocks might represent a mall or downtown shopping district.

While the areas above are large enough to serve the existing population, you must plan for a doubling of the population. As more people move to Astland, they will need additional goods and services as well as jobs. Existing businesses will expand and new businesses will be created. They will all need land.

- 1) Decide how much additional area you need for industrial and commercial blocks. Think about how these additional areas should be distributed around Astland to keep the citizens prosperous and happy. Record your decisions and your reasoning below:

- 2) Choose one color foam for Industrial areas and another color for commercial areas. Cut your foam into appropriate shapes, but don't glue anything to the map yet.

Open Areas

Open areas include outdoor playgrounds, athletic fields, parks, and nature preserves. These resources provide recreation for citizens and natural areas for plants and wildlife. While many other land uses are best shaped as rectangles, parks and nature preserves should include more creative shapes.

When planning for the expansion of Astland, you will need an additional 100 cm^2 of open lands to maintain the health and happiness of the new residents. This area must include:

- One park that is circular in shape
 - Two parks that are similar right triangles, but with different areas
 - Any other shapes as desired to yield a total of 100 cm^2 .
- 1) Use the space below to do some planning and sketching. Decide how much area to give your circular park, how much area for each triangular park, and how much is left over for other parks (which can be simple rectangles). Just try some ideas and see how they work. Your total area should be roughly 100 cm^2 .

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The circular park will be surrounded by a low, decorative stone wall.

2) Calculate the length of that wall in the space below:

The two triangular parks will be surrounded by decorative iron fences.

3) Calculate the length of these fences by finding the perimeter of each triangle. You can try drawing each triangle and measuring the lengths of the sides. If your teacher shows you the Pythagorean Formula, you may use that instead. Show your work below:

4) Select a color for your open spaces and cut-out the appropriate shapes.