Airport Impact Study

Airport_Impact_Study.tns

Name _____

Class _____

Residents of a town near an airport are concerned that the noise levels in their community are not safe. They have hired you to perform an impact study to address their concerns. You will develop a model of the intensity of the noise in different areas surrounding the airport and use it to map safe and unsafe zones.

Problem 1 – Creating the model

Law of Physics: The intensity of sound varies inversely with the square of its distance from the source.

Inverse Variation: Two variables *vary inversely* if, for a constant k,

$$yx = k.$$

We say that one variable y varies inversely with the square of another variable x if, for a constant k,

$$yx^2 = k.$$

1. Calculate the square of the distance in Column C on page 1.5. Then calculate the square of the distance times the intensity in Column D on page 1.5. What do you notice?

2. What is the constant of variation, k?

3. Record your model: $I(d)$ =

Problem 2 – Applying the model

The community association has defined of 3 noise-level zones.

Zone 1: Intensity < 0.000001 W/m^2

Zone 2: 0.000001 < Intensity < 0.0001 W/m^2

Zone 3: Intensity > 0.0001 W/m^2

1. One zone is unsafe for houses; another is an impact zone, where people will be allowed to live if they aware of the risks, and another is safe for houses. Which is which?

Unsafe zone: Impact Zone: Safe Zone:

2. Describe the shape of each zone.

Use your model to write and solve an equation to find the boundaries of each zone. You need to find the distance from the airport center that will define the zone boundary. Round your answers to the nearest meter. For example, to find the boundary of Zone 1, solve:

$$0.000001 = \frac{10}{d^2}$$

3. Boundary of Zone 1:

4. Equation for Zone 3:

5. Boundary for Zone 3:

On page 1.4 of the TI-Nspire document, draw and label circles to represent the three zones. Check your map by moving the *x* to a point in each zone and observing the sound intensity.