In this Geometric Functions activity you will investigate relationships between variables, decide how to distinguish functions from non-functions, and define the term *function.*

Vary the Variables

Begin by varying independent variables and observing how several functions behave.

1. Go to [geometricfunctions.org/links/identify-functions](http://geometricfunctions.org/links/identify-functions/).

2. Read the Learning Goal. Then go to page 2.

2. Try to drag each variable point on page 2. You can drag some points but not others.

The ones you can drag are *independent variables*. The ones that move only when you drag another variable are *dependent variables*.

**Q1** Drag variables to determine which ones are related. Then list the independent and dependent variables, and describe the relation: what’s the relative speed and direction of the variables? At what locations do they come together with each other? (These locations are called *fixed points*.)

(Some independent points may control more than one dependent point, while some may not control any dependent point at all.)

|  |  |  |
| --- | --- | --- |
| **Independent Variable** | **Dependent Variable(s)** | **Description of Relation** |
| **→** | |  |
| **→** | |  |
| **→** | |  |
| **→** | |  |
| **→** | |  |

**Q2** On page 3, drag the independent variables. How is the behavior of the function (*x* →*x*') different from that of the non-function (*y* →*y*')?

**Q3** On page 4, drag the independent variables. How is the behavior of the function (*b* →*b*') different from that of the non-function (*a* →*a*')?

**Q4** Each page from 5 through 12 shows two relations. One is a function and one is a non-function. For each page, write your observations and questions.

On these pages, you will see only the variables. The arrows on earlier pages may help you make connections, but remember that the important thing is the behavior of the variables.

|  |  |  |  |
| --- | --- | --- | --- |
| **Page** | **Function** | **Non-function** | **Observations and Questions** |
| **5** |  |  |  |
| **6** |  |  |  |
| **7** |  |  |  |
| **8** |  |  |  |
| **9** |  |  |  |
| **10** |  |  |  |
| **11** |  |  |  |
| **12** |  |  |  |

**Q5** Based on the examples and non-examples of functions on pages 3 through 12, write a definition of a function in your own words. In your definition, use the terms “independent variable” and “dependent variable” rather than “independent point” and “dependent point.” Use complete sentences for your definition.

This document is based on the corresponding Dynamic Number activity from KCP Technologies (a McGraw-Hill Education Company) available at [http://www.dynamicnumber.org/activities?topic[]=16](http://www.dynamicnumber.org/activities?topic%5B%5D=16).

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|  |  |  |
| --- | --- | --- |
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| **→** | |  |
| **→** | |  |
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| **→** | |  |

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Explore More

You can use pages 13 and 14 to make your own functions and non-functions .

3. On page 13, follow the directions to reflect both independent variables. Then, translate one of the independent variables. Next, adjust the translation to match the reflection, so that both sides look like functions until the independent variables are dragged.

4. On page 14, use other transformations to make a similar challenge for your partner. For tips on using transformations, choose **Help | Using Sketchpad | Sketchpad Tips | Transform** and then click the  icon for **Translate, Rotate, Dilate,** or **Reflect.** (Don’t click the  icon unless you have headphones.)