

# Grade 6 · Dependent and Independent Variables · Lesson

Common Core 6.EE.C.9 · mathovore.fr

The independent variable is the quantity that changes on its own, such as time, and the dependent variable is the quantity that depends on it, such as distance. An equation like  $d = 65t$  shows the relationship. A table and a graph show the same pairs, with the independent variable on the horizontal axis.

## Grade 6 Common Core: 6.EE.C.9

### Key facts:

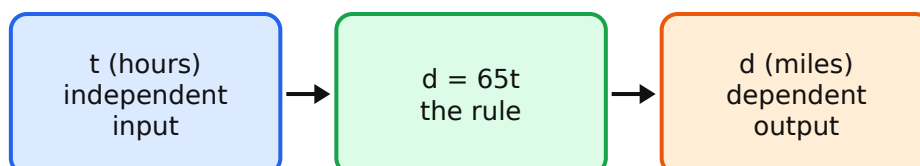
- The independent variable is the input; the dependent variable is the output that depends on it.
- In  $d = 65t$ , time  $t$  is independent and distance  $d$  is dependent.
- The independent variable goes on the horizontal axis and the dependent variable on the vertical axis.
- Each row of a table is an ordered pair:  $t = 3$  and  $d = 195$  give the point  $(3, 195)$ .

## What are independent and dependent variables?

Many real situations involve two quantities that change together. The **independent variable** is the quantity you choose or that changes on its own, such as time. The **dependent variable** is the quantity whose value depends on it, such as distance. Ask: "Which quantity is determined by the other?" That one is dependent.

### Example

A car travels at a steady 65 miles per hour. The distance  $d$  depends on the time  $t$  driven. So  $t$  (hours) is the independent variable and  $d$  (miles) is the dependent variable.



## How do you write an equation that relates two variables?

Describe the rule in words, then use letters. Distance equals rate times time, so  $d = 65t$ . Notice that the dependent variable is alone on one side of the equation. Other rules work the same way: if notebooks cost \$3 each, the cost is  $c = 3n$ ; if Maya is 5 years older than her cousin, her age is  $m = c + 5$ .

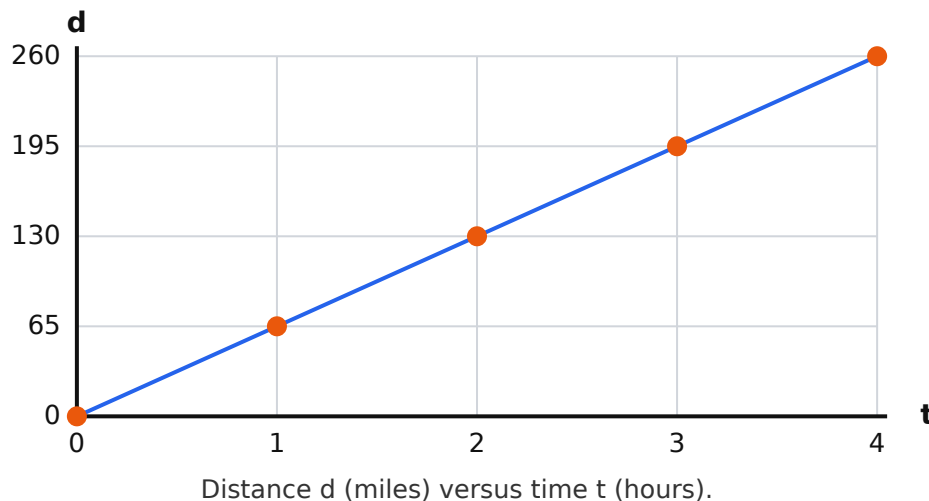
To find the output, substitute a value for the independent variable. When  $t = 3$ ,  $d = 65 \times 3 = 195$  miles.

| <b>t (hours)</b> | <b><math>d = 65t</math></b> | <b>d (miles)</b> |
|------------------|-----------------------------|------------------|
| 1                | $65 \times 1$               | 65               |
| 2                | $65 \times 2$               | 130              |
| 3                | $65 \times 3$               | 195              |
| 4                | $65 \times 4$               | 260              |

Each row is an ordered pair.

## How do you show the relationship in a table and a graph?

A table lists values of the independent variable and the matching values of the dependent variable. Each row is an ordered pair, such as  $(3, 195)$ . On a graph, the independent variable goes on the horizontal axis (x-axis) and the dependent variable goes on the vertical axis (y-axis). Plot each ordered pair as a point. For  $d = 65t$ , the points lie along a straight line that starts at the origin.

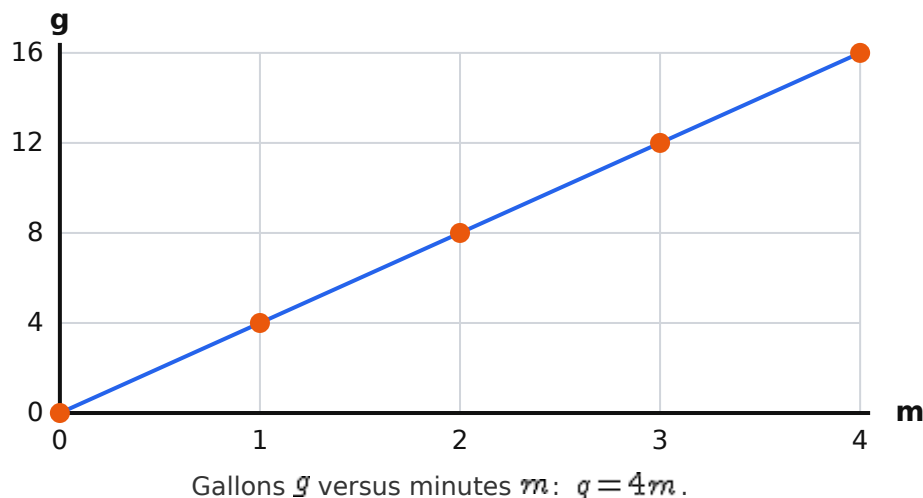


## How do you read a graph?

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1. Identify what each axis shows, including the units.
2. To find an output, start at a value on the horizontal axis, go up to the graph, then across to the vertical axis.
3. To find an input, start at a value on the vertical axis, go across to the graph, then down.

In the water tank graph below, 3 minutes of filling gives 12 gallons, so the tank fills at  $g = 4m$  gallons per minute. To find the time for 16 gallons, go across at 16 and down to 4 minutes.



## Dependent and Independent Variables: frequently asked questions

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### How can you tell which variable is independent?

The independent variable is the one you choose or that changes by itself, and the other quantity depends on it. In a plant growth study, the number of days is independent and the plant's height is dependent.

### Which axis does the independent variable go on?

The independent variable goes on the horizontal axis, the x-axis. The dependent variable goes on the vertical axis, the y-axis. Always label both axes with the quantity and its units.

### What does the equation $d = 65t$ mean?

It means the distance  $d$  in miles equals 65 times the time  $t$  in hours, so a car traveling at a steady 65 miles per hour goes 65 miles in 1 hour and 130 miles in 2 hours.

### How do you make a table from an equation?

Choose values for the independent variable, substitute each into the equation, and record the

results. For  $c = 3n$ , the values  $n = 1, 2, 3$  give  $c = 3, 6, 9$ .

### **Can the dependent variable ever be written first in an equation?**

Yes. In  $d = 65t$ , the dependent variable  $d$  is alone on the left. Writing the dependent variable alone on one side makes it easy to substitute a value of the independent variable.