

# Fun with Functions

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In each case, explain which is the **independent variable** and which is the **dependent variable**, assign a **mathematical symbol** for each, explain what **units** they are measured in, and propose a **mathematical function** describing exactly how the dependent variable *depends* on the independent variable.

For instance, a car travelling at a constant velocity  $v$  (in kph) goes a distance  $x$  (in km) in a time  $t$  (in hours):  $x = vt$ .

1. Neglecting air friction, the downward velocity of a ball dropped from the Leaning Tower of Pisa will speed up by  $g = 9.81$  m/s every second.
2. The vertical distance travelled by the ball in the previous problem will increase as  $g/2$  times the square of the elapsed time.
3. The value of a share in a certain airline stock was \$100 on March 1, 2020, and has dropped at a constant rate since then. It is now worth half what it was on that day.
4. If inflation is constant at 5% per year, how does the buying power of \$1 vary with time?
5. Helium slowly leaks right through the rubber membrane of a spherical helium balloon, causing its *volume* to decrease by a factor of two every day. What function describes the balloon's *radius* as a function of the number  $t$  of days since it was filled if its initial diameter was 0.4 m?