

## Equality

The idea of equality has been around for centuries, but it is a very tricky concept for some elementary school students. According to Leibniz's law, two entities are the same exactly when everything you can say about one, you can say about the other. However, as we shall see, not all uses of the equal sign "=" are the same (that is, not all equalities are equal). Below is a list of various equalities. Think about them carefully. How is the use of = used in each case? How are the uses of = different? How are they similar? Some of the cases look like they might not be different at all, but think about how you think about them. In other words, when you saw these cases for the first time, what did you immediately think about them?

1.  $5x + 3 = 8$

2.  $x^2 = 1$

3.  $x^2 = -1$

4.  $x^2 + y^2 = 1$

5.  $a + b = b + a$

6.  $1 + 3 = 4$

7.  $1 + 3 = 5$

8.  $E = mc^2$

9.  $F = \frac{Gm_1m_2}{r^2}$

10.  $A = \pi r^2$

11.  $y = mx + b$

12.  $y = ax^2 + bx + c$

13.  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

14.  $e^{i\pi} + 1 = 0$