
As an application of our solution (due to Bhaskarāchārya) of the famous equation $x^2 - Dy^2 = 1$, we pose a few problems which can be reduced to it and thus solved. However, the reduction needs some ingenuity.

These are originally from Bhaskarāchārya's book *bījagaṇita* (Algebra) (12-th century.)

Note that typically, answers are expected to be positive integers.

1. The square of the sum of two numbers added to the cube of their sum is equal to twice the sum of their cubes. Find the numbers.

Note: In modern notation, this asks us to find integers x, y such that

$$(x + y)^2 + (x + y)^3 = 2(x^3 + y^3).$$

2. Find a number whose square's square, multiplied by 5 and lessened by 100 times the square becomes a square.

Note: In modern notation, this asks us to find an integer x such that:

$$5x^4 - 100x^2 = y^2 \text{ for some integer } y$$

3. Find pairs of numbers, the difference of which is a square and the sum of their squares is a cube.

Note: In modern notation, this asks us to find integers x, y such that

$$x - y = z^2 \text{ and } x^2 + y^2 = w^3 \text{ for some integers } z, w.$$