Math Diversion Problem 886

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> Wherever groups disclose themselves, or
> would be introduced, simplicity
> crystallizes out of chaos.
> — Eric Temple Bell

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Source: https://www.youtube.com/watch?v=y3PJxw30MIs
Title: A Simple Problem For Competitive Exams
 Presenter:  J Educational Tutorials
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1 Problem

Given the following relations

$$a^2 - b^2 = 27\,, \tag{1a}$$
$$ab = 18\,, \tag{1b}$$

find the real values of (a, b are real)

$$\phi = a + b\,. \tag{2}$$

2 Solution

Let

$$x = a + bi\,. \tag{3}$$

Then

$$x^2 = a^2 - b^2 + 2abi = 27 + 36i\,, \tag{4}$$

where we used (1a) and (1b). On taking the square root of (4), we have that

$$x = \pm(6 + 3i)\,. \tag{5}$$

When we compare this to (3), we get

$$a = \pm 6 \quad \text{and} \quad b = \pm 3\,. \tag{6}$$

Hence

$$\phi = \pm 9\,. \tag{7}$$