You can generalize the translation process to an n-vector $u = (u_1, \ldots, u_n)$ whose components are expressed relative to the origin of an original coordinate system. If you create a new coordinate system by translating the axes to the point $a = (a_1, \ldots, a_n)$, then the components of u relative to the origin of the new coordinate system are

$$(u_1 - a_1, \ldots, u_n - a_n) \tag{1.5}$$

Vice versa, if the components of a vector $u = (u_1, \ldots, u_n)$ are expressed relative to the origin of the new coordinate system, then the components of u relative to the origin of the original coordinate system are

$$(u_1 + a_1, \ldots, u_n + a_n)$$

Mathematical Thinking Process

Obtaining the formula in (1.5) is an example of one of the common ways in which mathematics is used to solve problems, namely, to use items — called *data* — that you know (the components of the vectors $u = (u_1, \ldots, u_n)$ and $a = (a_1, \ldots, a_n)$, in this case) to find items that you do not know but would like to know (the components of u relative to the origin of the translated coordinate system, in this case). For this problem, it is possible to derive a *closed-form solution*, which is a solution obtained from the problem data by a simple rule or formula, as in (1.5).