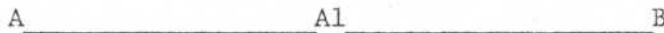


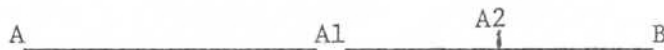
Philosophy and science began with the Greeks, and like others later they found much in the world that was difficult or impossible to explain. One phenomenon especially caused problems for the early thinkers, namely that of motion or change. The world seems to be full of all sorts of motions and changes. The sun rises and sets, seasons alternate, people are born and grow older and die. One thinker indeed was so impressed by this phenomenon that he insisted on change as the primary aspect of things: the universe is wholly in a state of flux. This belief of Heraclitus is summed up by his phrase "Everything flows, nothing remains the same." The same idea is expressed at greater length in his other phrase to the effect that one can never step twice into the same river. His point was that a river flows along constantly, and so is not exactly what it used to be on one's second step. In addition, the person doing the stepping is not quite the same, for he is at least an instant older. In this view, then, nothing is constant, nothing is free from this all-pervasive change.

Other thinkers found this view disturbing: How, they asked, could one be sure of anything if nothing remains the same from one moment to the next? The most powerful voice of such thinkers was that of Parmenides, who advocated a position the exact opposite to that of Heraclitus, and insisted that motion and change were mere illusions, and that in fact everything that exists does so forever in the same state. To illustrate the truth of Parmenides' belief, Zeno, one of his followers, proposed a series of paradoxes, one of which will be described. It may seem ridiculous, but no one in antiquity was able to refute it, and in fact it could not be refuted before the development of calculus.

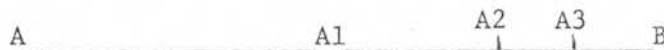
The statement is that it is quite impossible in this world for a person to move from one point to another. If you wish to move from point A to point B, you must first go halfway, to point A1:



Then to reach B, you must go half of the remaining distance, to point A2:



To continue on towards your goal (B), you must go half the remaining distance, to point A3:



You can continue this process indefinitely, but, however close to point B you get, there is still some distance, even though a small one, yet to go. Any distance, however small, is capable of infinite division, so an infinite number of steps remain. It is obvious that you cannot take an infinite number of steps, small though they may be, in any finite time. The inevitable conclusion, then, is that you cannot go from point A to point B in a finite time: motion, in our world, is impossible, and any motion you think that you observe is an illusion.

Can you refute this conclusion?