

Visualizing the Abstract

Once you've gotten in the habit of sketching your ideas, then you can move on to creating mental representations of those ideas. Eventually, as you get better, you can skip the first step entirely and focus just on creating the mental image. This will save you more time so you can create those connections and visceraitons even faster.

Let's walk through the example of doing the second step of a mental representation with the idea of derivatives. Now a derivative, if you've taken calculus, is a function. The derivative of that function is the slope of that line at each point, so if you have a function that is going up constantly at the same rate, then the derivative would be a flat line because the slope is the same at every single point. If you have a line that's curved and it's curved in quadratic fashion, then the slope of the line would go up in a constant amount.

So, this can be kind of a complicated idea—a fairly abstract idea—and fairly difficult to visualize. So the first step, if you've having difficulty visualizing it, is to again go to diagramming. Try sketching it out and seeing what it would look like. However, once you've progressed beyond that and you can kind of get an idea of what you would sketch on paper, the next part is to just do it mentally. And when you're doing it mentally, you can do things in your mind that would be very difficult or time consuming to do on paper.

So, for example, not only am I thinking of how the line goes up and changes with the curve, I can imagine a complicated line and imagine a person riding that line, seeing the slope, and seeing how that would be translated to a graph above them. That can sometimes be difficult to do on paper, but in your head you can run through the animation and see how one corresponds to the other.

Try this with your own ideas. Once you've gotten in the habit of sketching them, try doing it mentally and try adding things to the mental representation that you would have difficulty adding on paper that can help you understand the idea better.