Calculating Probabilites for Quantum Events

- Probability = (length of arrow associated with event)^2

  (The technical term for the probability arrow associated with an event is "probability amplitude.")

  Example: we know that the probability for light to reflect off a glass surface is 4% or 0.04. This means the probability arrow for reflection must have length $\sqrt{0.04} = 0.2$

- If there are two alternate ways for an event to happen, find the probability arrow for each way and add the arrows.

Total probability = (length of final arrow)^2

Stopwatch Model for Determining Probability Arrows

An imaginary stopwatch rotates as the photon moves. (The rate of rotation depends on the color of the light.) The stopwatch starts when the photon leaves the source; the initial length of the stopwatch hand is 1. The final length and direction of the stopwatch hand correspond to the length and direction of the probability arrow.

- Traveling through air or glass: just rotates.

- Reflection at glass surface (coming from air): rotate by 180°; multiply length by 0.20.

- Transmission from air to glass: multiply length by 0.98.

- Reflection at glass surface (coming from inside glass): multiply length by 0.20.

- Transmission from glass to air: multiply length by 0.98.