Reflection and Transmission of Waves

At boundaries between different media, there is generally both **reflection** and **transmission**. A "boundary" is a place where there is a change in "how hard it is" for the wave to cause a disturbance the two media. This includes the **end** of a medium.

- The **incident** wave is the one that approaches the boundary, but hasn't reached it yet.
- The **reflected** wave is the one that moves away from the boundary, but in the same medium as the incident wave.
- The **transmitted** wave is the one that moves away from the boundary, on the other side of the boundary from the incident wave.

The results depend on "how hard" it is to disturb the new medium compared to the old. More massive media are "harder to disturb." Also, media with a stronger restoring force are "harder to disturb."

The reflected and transmitted waves are described as **inverted** or **upright** and **reversed** or not.

- **Inverted** means that, compared to the incident wave, the disturbance in the medium is the opposite. Transverse waves are turned upside down, compression turns into rarefaction, etc.
- **Upright** means that the disturbance in the medium is the same as with the incident wave

(NEITHER of these means "pointing up" or "pointing down". They are relative to the incident wave.)

- **Reversed** means turned around along the direction of travel.

The following table shows the full continuum of possible cases. The first row described what the incident wave encounters as it reaches the boundary and looks at what is on the other side.
(The shaded rows apply only in the common case where the restoring force is the same on both sides of the boundary.)

The Situation:	➔ fixed end	➔ harder to disturb	both sides the same	➔ easier to disturb	➔ free end (no restoring force)
		➔ heavier	same medium	➔ lighter	
Reflected Wave:	all reflected	some reflected	none reflected	some reflected	all reflected
	reflection is inverted			reflection is upright	
	Reflection is *always* reversed.				
	Reflected wave speed is *always* the same as the incident wave speed.				
Transmitted Wave:	none transmitted	some transmitted	all transmitted	some transmitted	none transmitted
	Transmission is *always* upright.				
	Transmitted wave is *never* reversed				
		speed 1 > speed 2	speed 1 = speed 2	speed 1 < speed 2	

Note that if (transmitted speed < incident speed), then the transmitted wave is compressed along the propagation direction. In the opposite case, the transmitted wave is stretched.