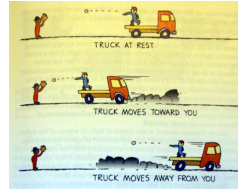


## Relativity

Motion is relative (it depends upon your point of view)

<http://www.ionaphysics.org/ntnujava/relativeVelocity/relativeVelocity.html>



Dec 29-7:25 PM

Jan 21-8:55 AM

Adding velocities:



Observer on ground sees Police car is parked.  
Truck is moving at 60 mi/hr.  
Gun has muzzle vel of 680 mi/hr.  
(No air Friction).  
Police dog sees truck moving at what speed?  
Police dog sees bullet moving at what speed?  
Other dogs see Police car moving at what speed?  
Other dogs see bullet moving at what speed?

Adding velocities:



Observer on ground sees Police car is moving at 50 mi/hr.  
Truck is moving at 60 mi/hr.  
Gun has muzzle vel of 680 mi/hr.  
(No air Friction).  
Police dog sees truck moving at what speed?  
Police dog sees bullet moving at what speed?  
Other dogs see Police car moving at what speed?  
Other dogs see bullet moving at what speed?

Jan 21-8:16 AM

Jan 21-8:16 AM

Adding velocities:



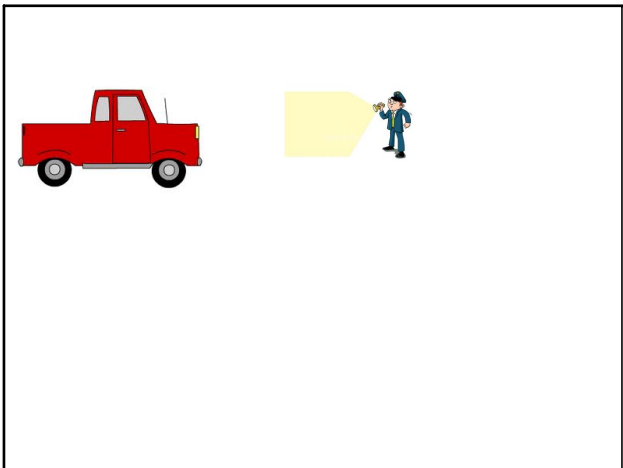
Observer on ground sees Police car is moving at 70 mi/hr.  
Truck is moving at 60 mi/hr.  
Gun has muzzle vel of 680 mi/hr.  
(No air Friction).  
Police dog sees truck moving at what speed?  
Police dog sees bullet moving at what speed?  
Other dogs see Police car moving at what speed?  
Other dogs see bullet moving at what speed?

## How about the speed of light



Jan 21-8:16 AM

Jan 21-8:47 AM



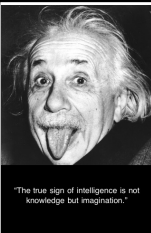
Jan 21-8:48 AM

### Theory of Relativity

Postulates:

1. All the laws of physics are the same in all inertial (uniformly moving) reference frames.
2. The speed of light in empty space will always have the same value regardless of motion of the source or the observer.

Jan 21-9:09 AM

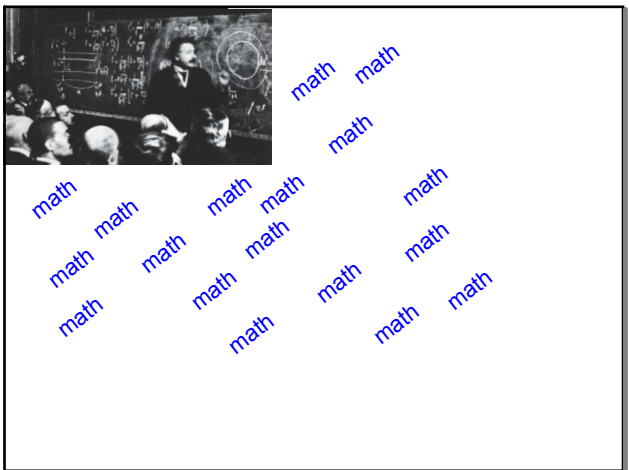


speed = distance/time  
If distance and time are fixed, then speed must be derived!

But experiment has shown that the speed of light is constant (defined) so distance and/or time MUST be variable!

"The true sign of intelligence is not knowledge but imagination."

Jan 21-9:06 AM



Jan 21-9:31 AM

Time Dilation:  
 $t = t_0 / \sqrt{1 - (v^2/c^2)}$   
 Moving clocks run slow

Length Contraction  
 $L = L_0 \sqrt{1 - (v^2/c^2)}$   
 Moving objects contract in the direction of motion.

**Why does this seem crazy?**

Jan 21-9:12 AM

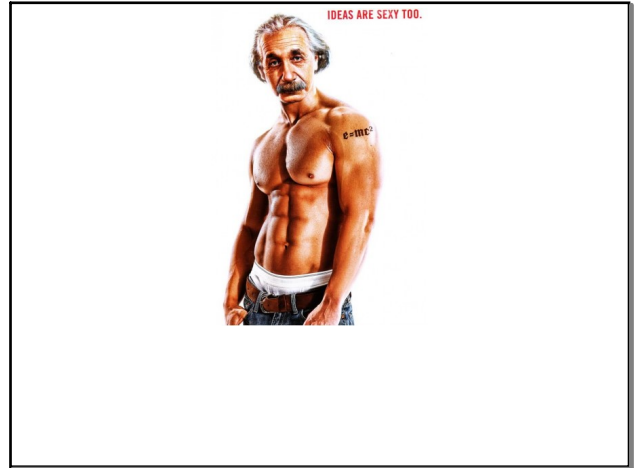
Fastest Jet plane is capable of mach 3.3

The Fastest object ever created in the world is a US satellite capable of going 14 Mps (Miles Per second), 50,400 Mph (Miles per hour). If this were a Jet air plane of some kind, it would go Mach 66.2

Jan 24-9:38 PM

		$c =$	300000000
	V(m/s)	$t (to=1)$	L (Lo - 1)
100 mi/hr	44.7	1	0.9999999
Sound	330	1	0.9999989
.1 c	30000000	1.005038	0.9
.5 c	150000000	1.154701	0.5
.9 c	270000000	2.294157	0.1
.99 c	297000000	7.088812	0.01
.999 c	299700000	22.36627	0.001

Jan 21-9:38 AM



Jan 21-9:27 AM