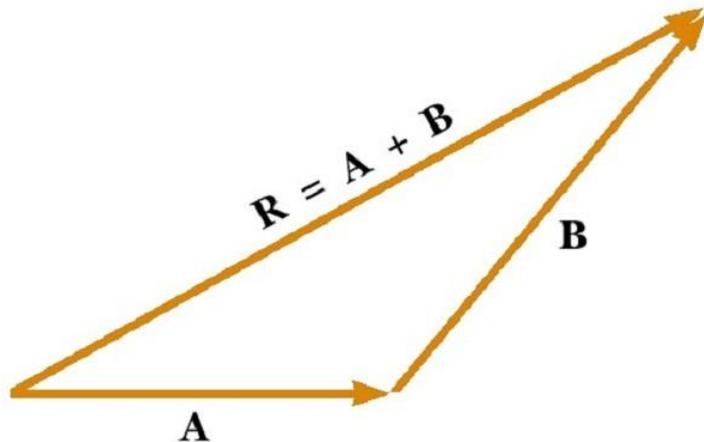


Adding Forces

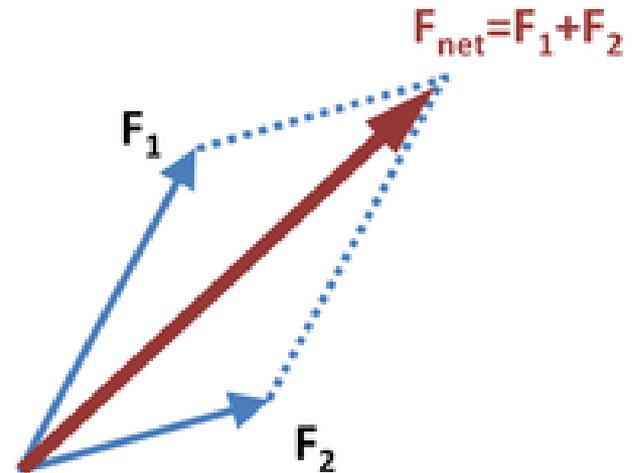
- Force is a measure of interaction. It is a vector (has direction)
- When several forces are acting on an object, they **are added as vectors**

There are two equivalent ways of adding vectors graphically:

Triangle rule
(best for displacements)



Parallelogram rule
(best for forces)



Newton's Laws (1st and 2nd)

1st Law (Same as Galileo's Law of Inertia): $\vec{F} = 0 \Rightarrow \vec{v} = \text{const}$

Modern interpretation : definition of Inertial Reference Frame.

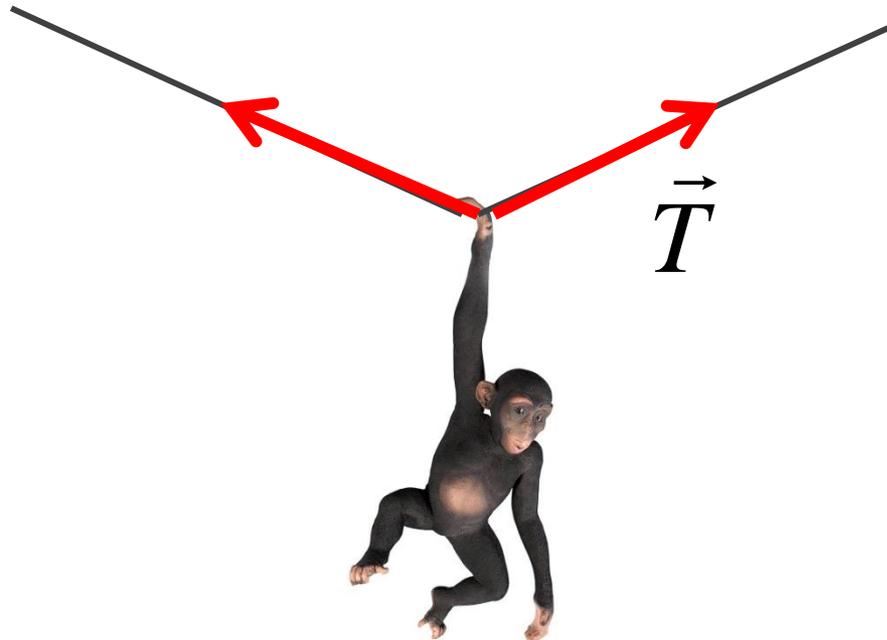
2nd Law : $\vec{F} = m\vec{a}$

3rd Law: *coming soon*

Homework

Problem 1.

A monkey is hanging on a wire as shown in the figure. Find the tension force T (shown as red arrows), by using the graphical method of force addition. The mass of monkey is $m=10\text{ kg}$. Remember that gravity acts on it with a downward force mg .



Problem 2.

A rocket shown in the figure has mass $m=10\text{ kg}$. In addition to gravity, there is a thrust force $F=200\text{ N}$ applied to it, directed forward.

- Sketch both forces (gravity and thrust) as vectors, up to scale to each other.
- By adding forces graphically, find the total force acting on the rocket, and its acceleration.

