



The circus includes many amazing and awe-inspiring performers: aerial silks, acrobats, clowns, horseback riders, gymnasts, trapeze artists, and human cannonballs, just to name a few! One of the most daring acts performed at the circus is the high wire.

During a high wire act, a performer walks, runs, bicycles, or otherwise crosses a thin wire rope suspended high above the ground. Also known as the tightrope, this dangerous act shocked and amazed onlookers as performers attempted cartwheels, pyramids, and even complex flips! It was extremely important for high wire walkers to have good balance, a lot of confidence, and be mindful of the forces of physics.

Illinois Lithograph (American), *Sparks Circus: Daring High Wire Exploits*, 1930. Ink on paper, 40 3/4 x 28 in. Tibbals Circus Collection. ht2000971

NEWTON'S LAWS OF MOTION

High wire performers need to know the forces of physics in order to maintain safety. How do Newton's three laws come into play for high wire performers?

▪ 1ST LAW OF MOTION (*Inertia*)

An object at rest will stay at rest and an object at motion will stay in motion at the same speed unless acted upon by an unbalanced force.

▪ 2ND LAW OF MOTION (*Force and Acceleration*)

The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force and inversely proportional to the mass of the object.

▪ 3RD LAW OF MOTION (*Action and Reaction*)

For every action there is an equal and opposite reaction.

STANDARDS:

SC.5.P.13.1

Physics of the High Wire

High wire performers need a lot of things: bravery, balance bars, and a basic understanding of physics. Some basic forces are listed below.

GRAVITY Constant downward force

APPLIED FORCE Direct application of force to an object

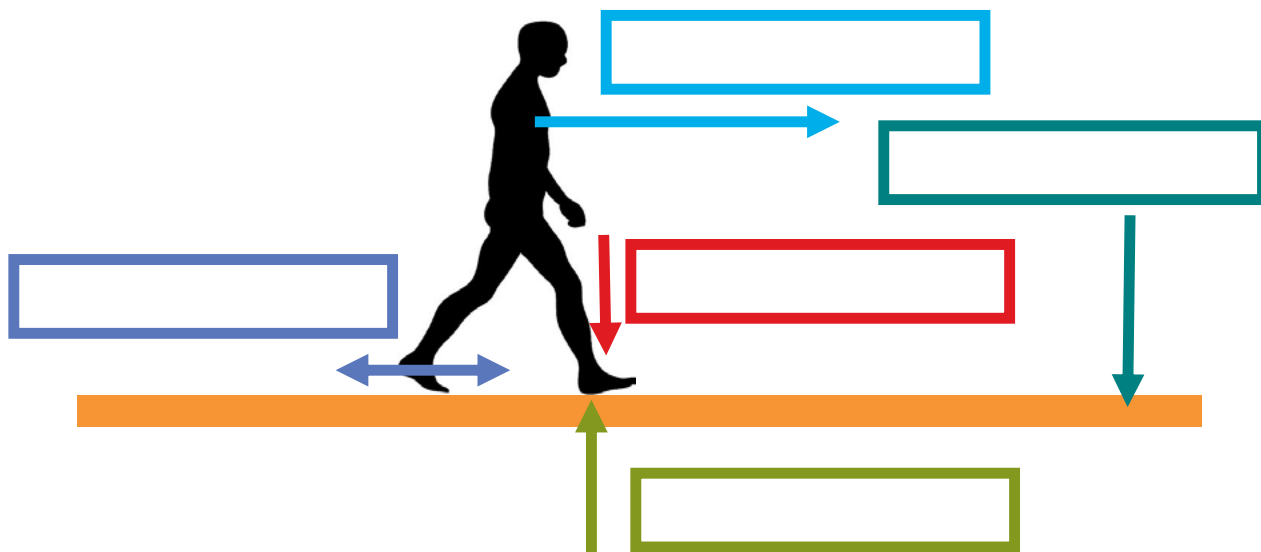
NORMAL FORCE Support force that is exerted on an object

FRICTION Force exerted by the surfaces of two objects as they move across one another

VELOCITY The rate of motion in a specific object

LABEL FORCES

Using the vocabulary listed above, label the different forces at work during a high wire performance:



CALCULATE MASS

You can calculate the mass of an object by multiplying the weight of the object by the force of gravity ($g=9.8 \text{ m/s}^2$). This is represented as $m=w/g$

What is the mass of the high wire performer if she weighs 59 kg? _____