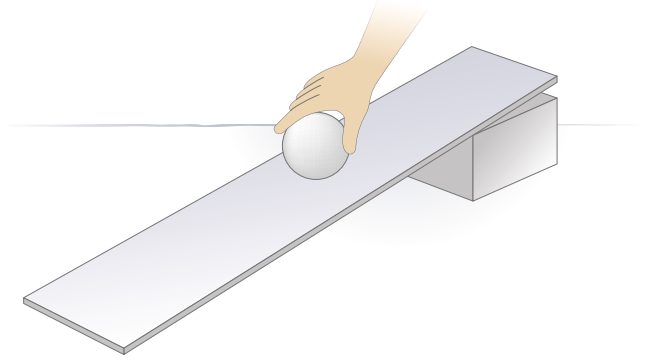
Potential and Kinetic Energy

Energy cannot be made or destroyed as stated in the Law of Conservation of Energy and it can come in a variety of forms. Each form can be categorised as either potential energy or kinetic energy.

Potential Energy
Potential energy is stored energy due to an objects relative position and mass. Should changes to the objects position occur, the potential energy of the object will increase, decrease, remain constant or be released, in which case it will be converted into other forms of energy.
Two forms of potential energy are gravitational potential energy and elastic potential energy. Gravitational potential energy is the energy stored in an object as a result of the Earth's gravitational pull. A ball half way up an inclined plane has gravitational potential energy as a result of gravity trying to pull the ball back down to its original position. How much gravitational potential energy the ball possesses depends on the mass of the ball, its vertical position or height and the gravitational acceleration of the Earth.

Did you know?
There are several other forms of potential energy, like electrical potential energy and chemical potential energy.



In other words, this means that if the ball was moved further up the inclined plane its potential energy would increase. If the ball was moved further down the inclined plane its potential energy would decrease and if the ball was let go its potential energy would be released and converted into kinetic energy as it rolls down.

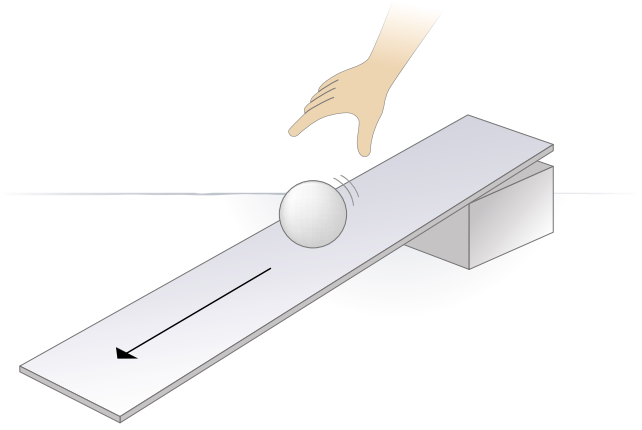
Elastic potential energy is the stored energy of an object that is being stretched, squashed or twisted. Sometimes solid materials are shaped especially so that they are good at storing elastic potential energy. This is true for springs and elastic bands. A stretched elastic band has stored elastic potential energy as a result of the elastic band trying to assume its natural shape. Exactly how much stored elastic potential energy there is, will depend on the characteristics of the band and the amount of force it is subjected to. The same applies for a spring.

In other words, this means the more you stretch it the more elastic potential energy it will contain. If you let go of the elastic band its potential energy will be released and converted to kinetic energy as the elastic band contracts and returns to its original shape.

Kinetic Energy

Kinetic energy is the energy a body has by virtue of its motion. Whenever an object is in motion, whether it is vertical, horizontal, and rotational or simply moving from one location to another, it has kinetic energy.

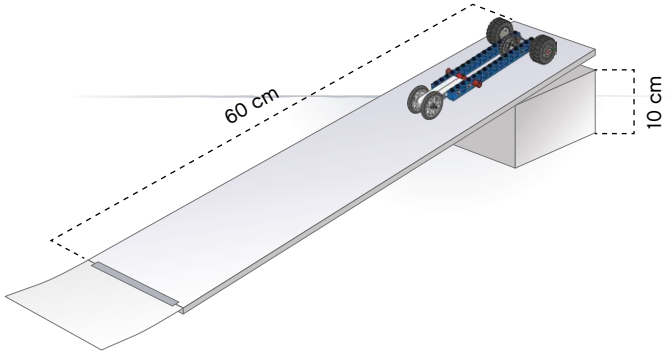
The ball that is being held half way up the inclined plane has potential energy but no kinetic energy, as it is not moving. If the ball is released and it started to roll down the inclined plane it would be gaining kinetic energy. How much it gains will depend on its mass and velocity.



In other words, this means that a heavier ball rolling down the inclined plane will have more kinetic energy than a lighter ball rolling from the same position. A ball rolling from the top of the inclined plane will be travelling faster by the time it reaches the bottom of the inclined plane than a ball of the same mass released from half way up the inclined plane. It will have more kinetic energy than the slower moving ball of the same mass simply because it is moving faster.

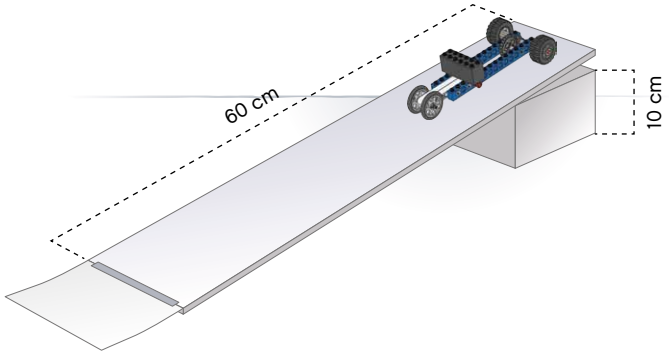
A1

Potential energy is transformed to kinetic energy as the cart rolls down the ramp. The cart has greatest potential energy at its starting point and greatest kinetic energy at the bottom of the ramp.



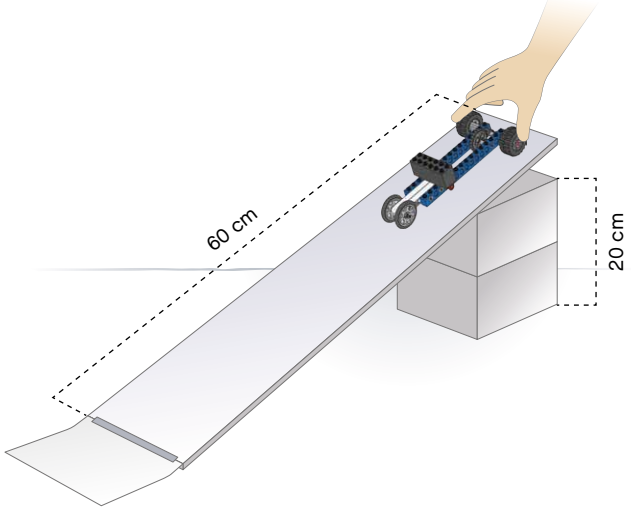
A2

Addition of mass to the cart constitutes an increase in potential energy. As the cart rolls down the ramp, potential energy is transformed to kinetic energy. The increase of potential energy and kinetic energy makes the cart travel further and faster.



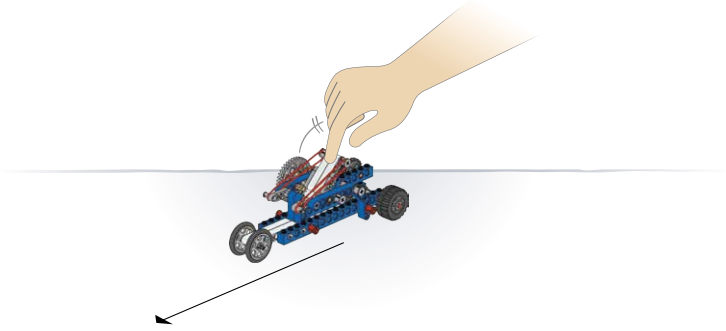
A3

Addition of height to the ramp constitutes a further increase in the potential energy of the cart still with the additional mass. As the cart rolls down the ramp, potential energy is transformed to kinetic energy. The increase of potential energy and kinetic energy makes the cart travel even further and even faster.



A4

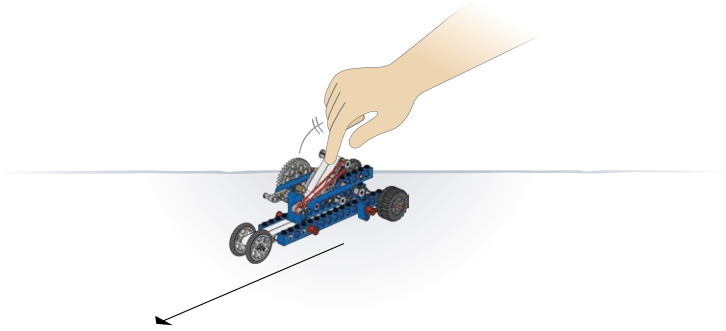
As the handle of the cart is pulled back the elastic band increases its potential energy. As the handle is let go, potential energy is transformed to kinetic energy and the cart moves.



A5

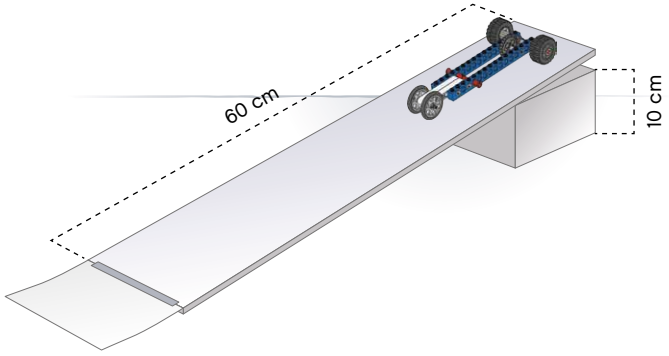
Due to the removal of an elastic band, there is a decrease in potential energy, which makes the cart move a shorter distance.

As the handle of the cart is pulled back the elastic band increases its potential energy. As the handle is let go, potential energy is transformed to kinetic energy and the cart moves.



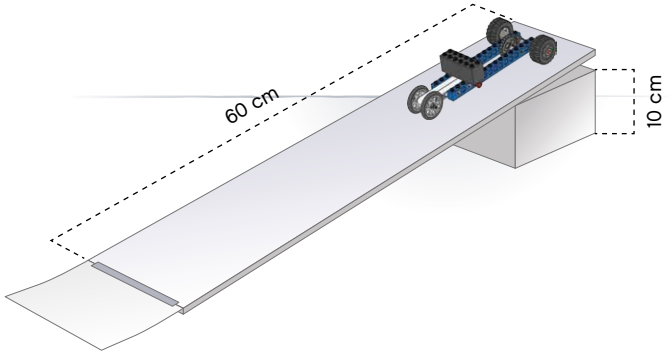
A1

(Building Instruction booklet I, page 9 step 11).
Let the cart roll down the ramp and explain what has happened in terms of potential and kinetic energy.



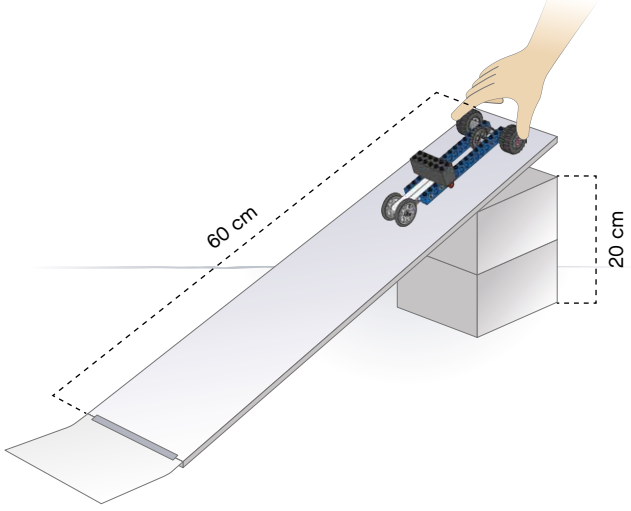
A2

(Building Instruction booklet I, page 9 step 12).
Let the cart roll down the ramp and explain what has changed and what has happened in terms of potential and kinetic energy.



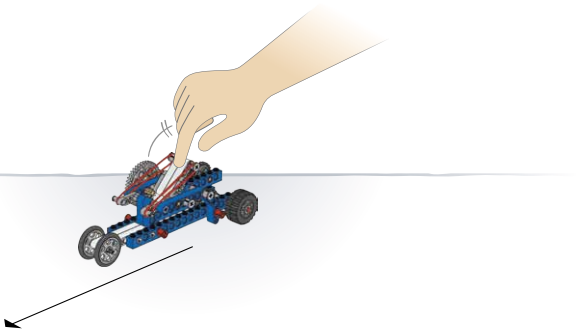
A3

Let the cart roll down the ramp and explain what has changed and what has happened in terms of potential and kinetic energy.



A4

(Building Instruction booklet I, page 18 step 27).
Pull the handle back as far as it goes. Then let go and see the cart move. Explain what has happened in terms of potential and kinetic energy.



A5

(Building Instruction booklet I, page 19 step 28).
Pull the handle back as far as it goes. Then let go and see the cart move. Explain what has changed and what has happened in terms of potential and kinetic energy.