Energy Test Review

What is the formula for momentum?

$$\rho = m * v$$

What is the momentum of a 30 kg monkey climbing at 2 m/s?

$$\rho = m * v$$

$$\rho = 30 * 2$$

$$\rho = 60 \text{ kgm/s}$$

If two identical objects are moving, one at 50 m/s and one at 100 m/s, how do their momentums compare?

Scenario 1	Scenario 2
$\rho = m * v$	$\rho = m * v$
$\rho = 10 * 50$	$\rho = 10 * 100$
$\rho = 500$ kgm/s	$\rho = 1000$ kgm/s

The momentum of the faster object is twice as much as the slower object.

What is the formula for work?

$$w = F * d$$

What amount of work does a man do if he pushes a box for 3 meters with 100 Newtons?

$$w = F * d$$

$$w = 100 * 3$$

$$w = 300 \text{ Joules}$$

or

$$w = 300 \text{ Newton-meters}$$

What is the formula for power?

$p = w / t$

What amount of power is produced from 50 Joules of work being completed in 5 seconds?

$p = w / t$

$p = 50 / 5$

$p = 10$ Watts

What is the Potential Energy of a 15 N object at a height of 4 m?

$$PE = Wh$$

$$PE = (15)(4)$$

$$PE = 60 \text{ Joules}$$

What is the Potential Energy of a 7 kilogram object at a height of 3 meters?

$$PE = mgh$$

$$PE = (7)(10)(3)$$

$$PE = 210 \text{ Joules}$$

What is kinetic energy?

Energy of motion

What is the kinetic energy of a 25 kg object moving at 10 m/s?

$$KE = \frac{1}{2} mv^2$$

$$KE = \frac{1}{2}(25)(10^2)$$

$$KE = \frac{1}{2}(25)(100)$$

$$KE = \frac{1}{2}(2500)$$

$$KE = 1250 \text{ Joules}$$

What is the formula for Impulse?

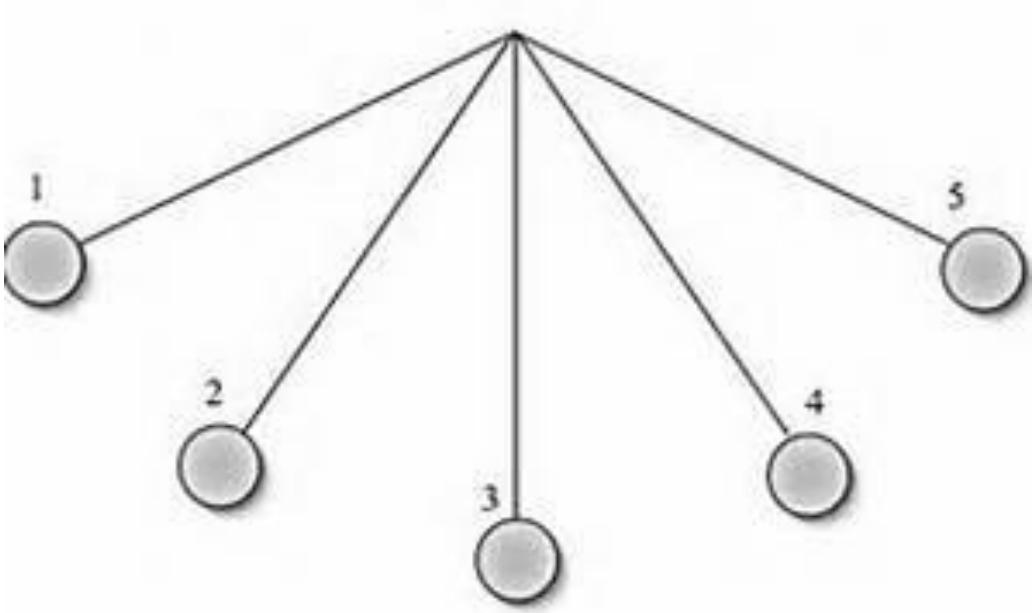
$$I = F * t$$

A truck runs a red light and hits a small car moving through the intersection.

What type of collision has occurred?

Inelastic

Where is potential energy transforming into kinetic energy?



Point 1 to Point 2

What is the formula for the Conservation of Momentum?

$$V_2 = M_1V_1 / M_2$$

If it takes you twice as long to do work, what happens to your power output?

Scenario 1

$p = w / t$

$p = 100 / 1$

$p = 100$ Watts

Scenario 2

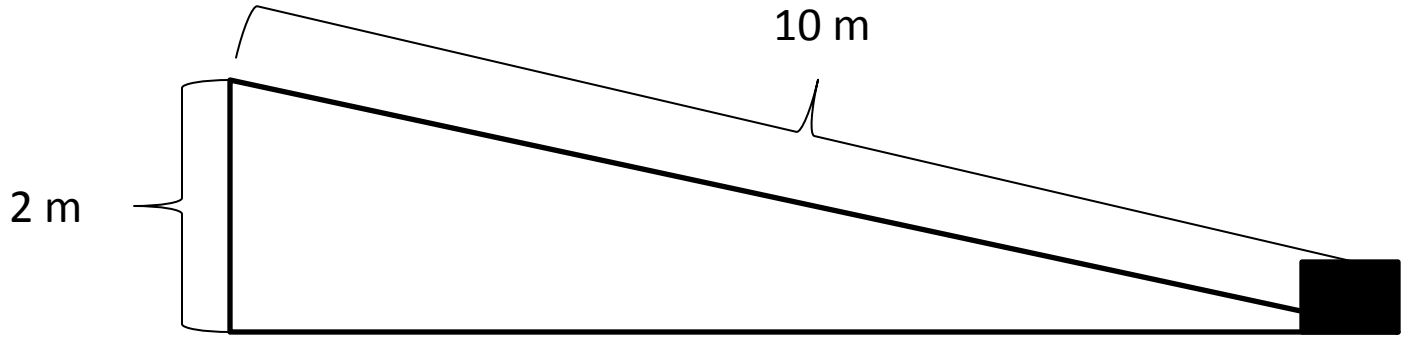
$p = w / t$

$p = 100 / 2$

$p = 50$ Watts

Your power output is cut in half.

Why is the potential energy of the box at the top of the ramp 35 Joules?



KE = 35 Joules

Law of Conservation of Energy.

PE at the bottom of the ramp, (where there is no height), is 0 Joules.

Total Energy is KE +PE, so 35 + 0 = 35 Joules.

Since Energy is conserved, PE at the top is 35 Joules (KE would be 0….it's not moving at this point!)

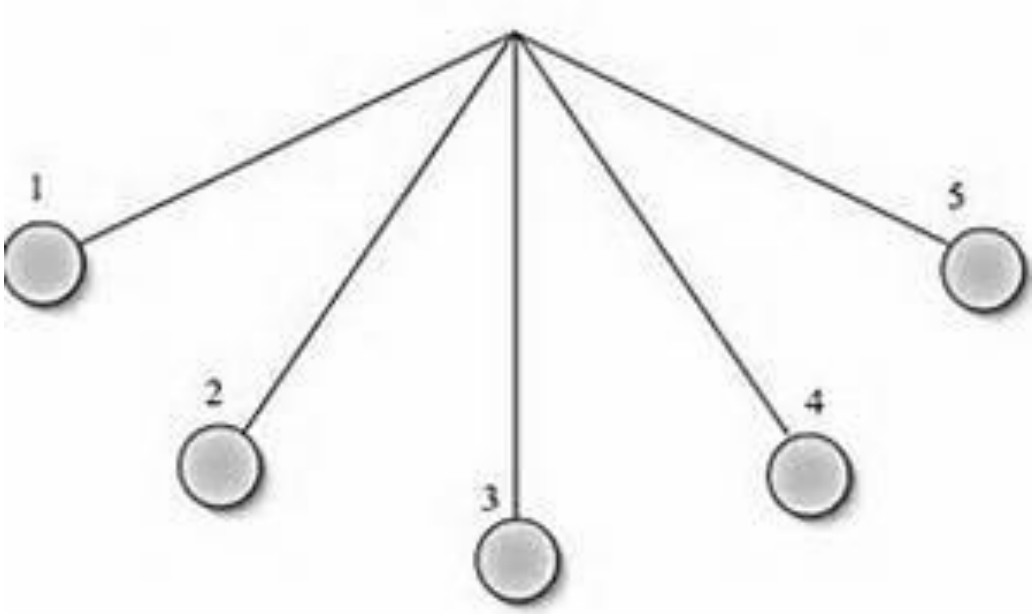
If a bouncy ball is dropped from a certain height and bounces back to that height, assuming no energy is lost, what type of collision has occurred?

Elastic

A moving train car collides with a another train car at rest. The two cars stick together and continue to move. After the collision, what happens to the combined velocity of the cars?

Mass has increased, therefore velocity decreases.

At what point does the pendulum have the greatest Kinetic Energy?



KE is greatest at Point 3. At the lowest point, the pendulum is moving the fastest. The Pendulum is at its lowest point so PE is small, meaning KE is large. Remember energy is conserved.

A 2.0-kg cart (#1) is pulled with a 1.0-N force for 1 second; another 2.0 kg cart (#2) is pulled with a 2.0 N-force for 1 second.

Which cart has the greatest Impulse?

<u>Cart 1</u>

$I = Ft$

$I = (1.0)(1.0)$

$I = 1$ Newton-second

<u>Cart 2</u>

$I = Ft$

$I = (2.0)(1.0)$

$I = 2$ Newton-second

Cart 2

A 2.0-kg cart (#1) is pulled with a 1.0-N force for 1 second; another 2.0 kg cart (#2) is pulled with a 2.0 N-force for 1 second.

Which cart has the greatest change of momentum?

<u>Cart 1</u>

I = 1 Newton-second

$I = \Delta p$

$\Delta p = 1$

<u>Cart 2</u>

I = 2 Newton-second

$I = \Delta p$

$\Delta p = 2$

Cart 2 – Impulse = change in momentum, since Cart 2 had the greater Impulse, it also has the greater change in momentum.

If a 10 kg man on ice skates pushes off of his 5 kg partner who is moving at 2.0 m/s, what is the man's velocity as he moves away?

$$V_2 = M_1V_1 / M_2$$

$$V_2 = (5 * 2.0) / 10$$

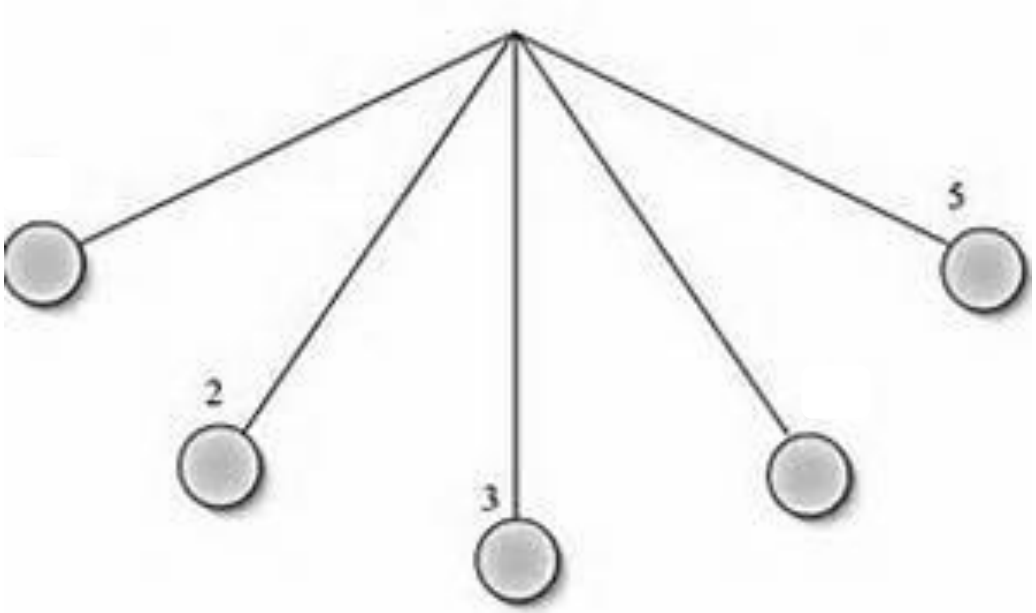
$$V_2 = 10 / 10$$

$$V_2 = 1.0 \text{ m/s}$$

A moving train car collides with a another train car at rest. The two cars stick together and continue to move. After the collision, what happens to the combined momentum of the cars?

It remains the same: Law of Conservation of Momentum

At what point does the pendulum have the greatest Potential Energy?



PE is greatest at Point 5. PE, or energy based on position, is dependent on the height of an object. At location 5 the pendulum is at the highest point, therefore the PE is the greatest.

Why do highways have “runaway” ramps for large trucks?

The gravel increases the time to impact, which decreases the impact force when the truck hits the barrels of water at the end.

In terms of force and time, Why does a watermelon crack when dropped on concrete?

The force of impact is increased because the time of impact is decreased.

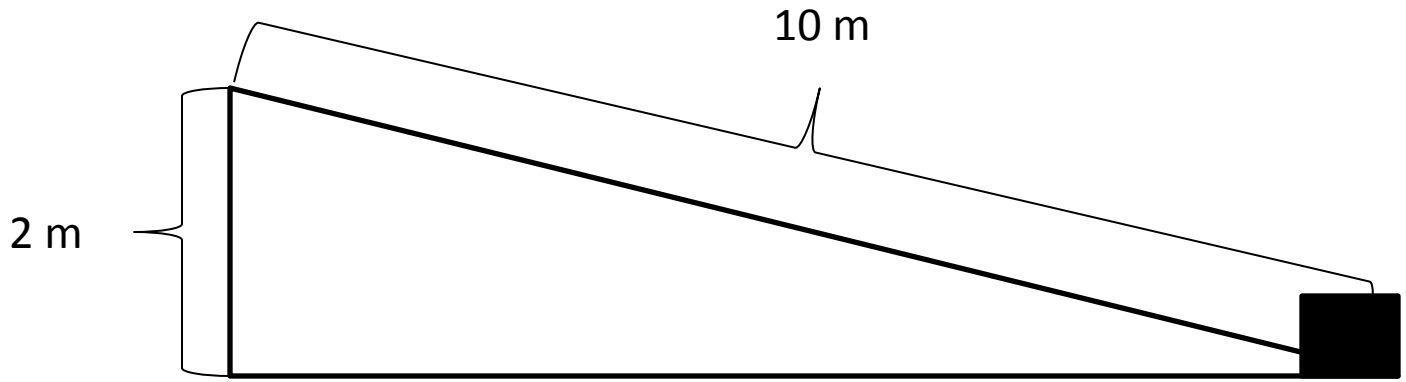
Remember: As time decreases, force increases

In order to maximize the change of momentum of a baseball, what must a batter do?

1. Hit with the greatest amount of force
2. Make contact with the ball over the longest period of time

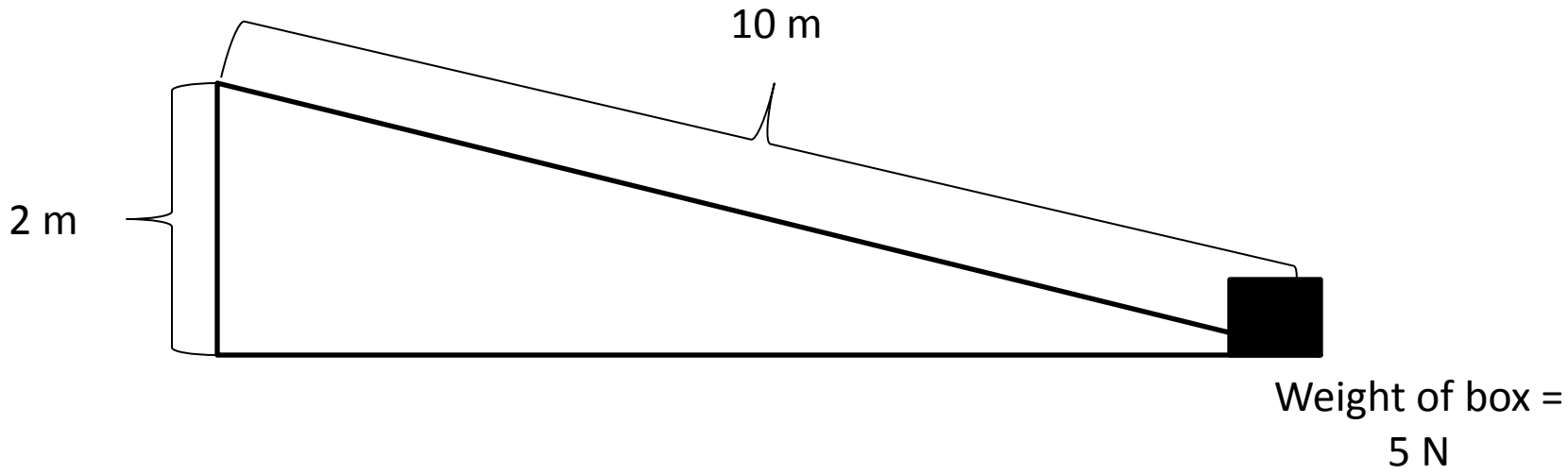
Define impulse and relate it to momentum?

Impulse is the average force applied to the object multiplied by the time that force was applied.
(I = Ft)
The impulse-momentum theory states impulse is equal to the change in momentum



How much force is required to lift the box?

5 N

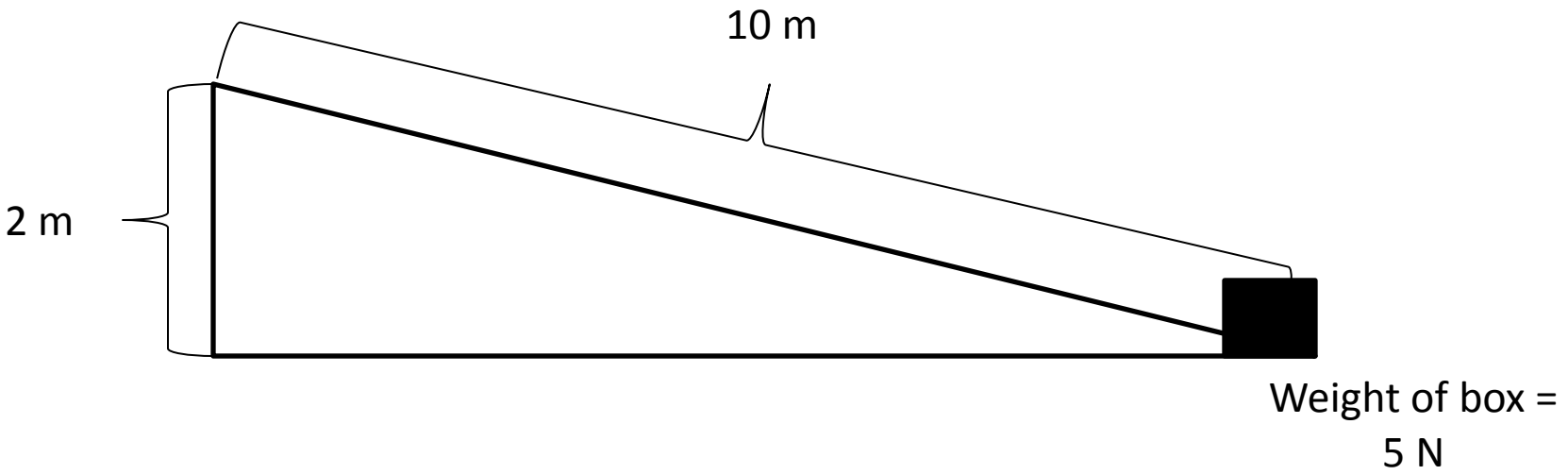


How much work is done lifting the box?

$$w = F * d$$

$$w = (5)(2)$$

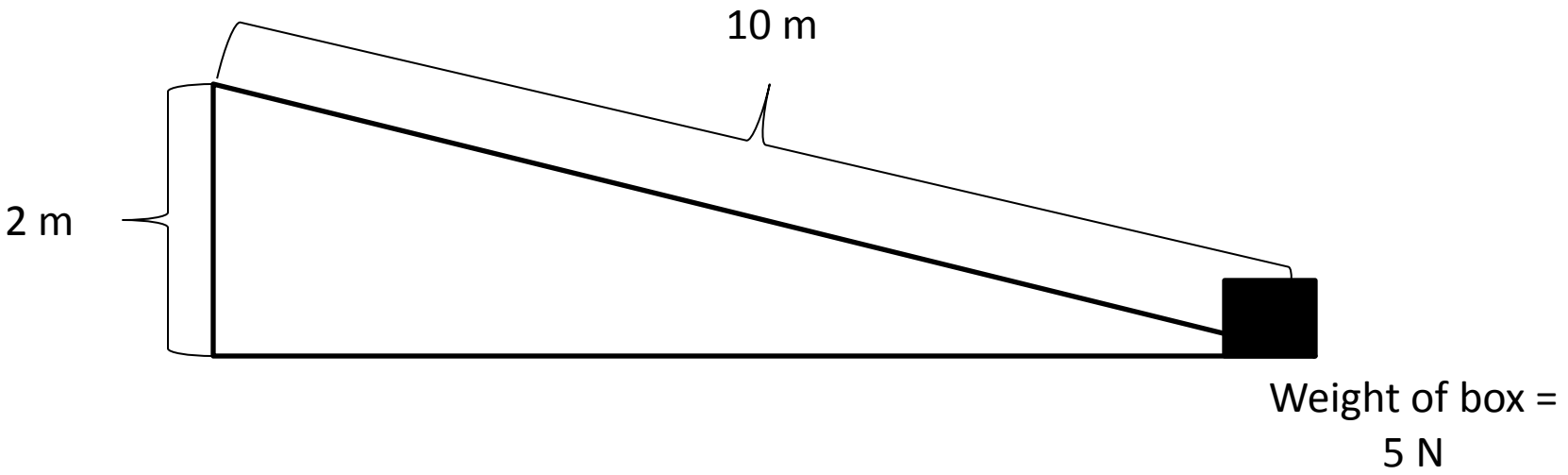
$$w = 10 \text{ Joules}$$



How much work is done sliding the box to the top of the ramp?

w = 10 Joules

Remember: the height of the box will still be at 2 m even if you slide it, therefore work doesn't change!



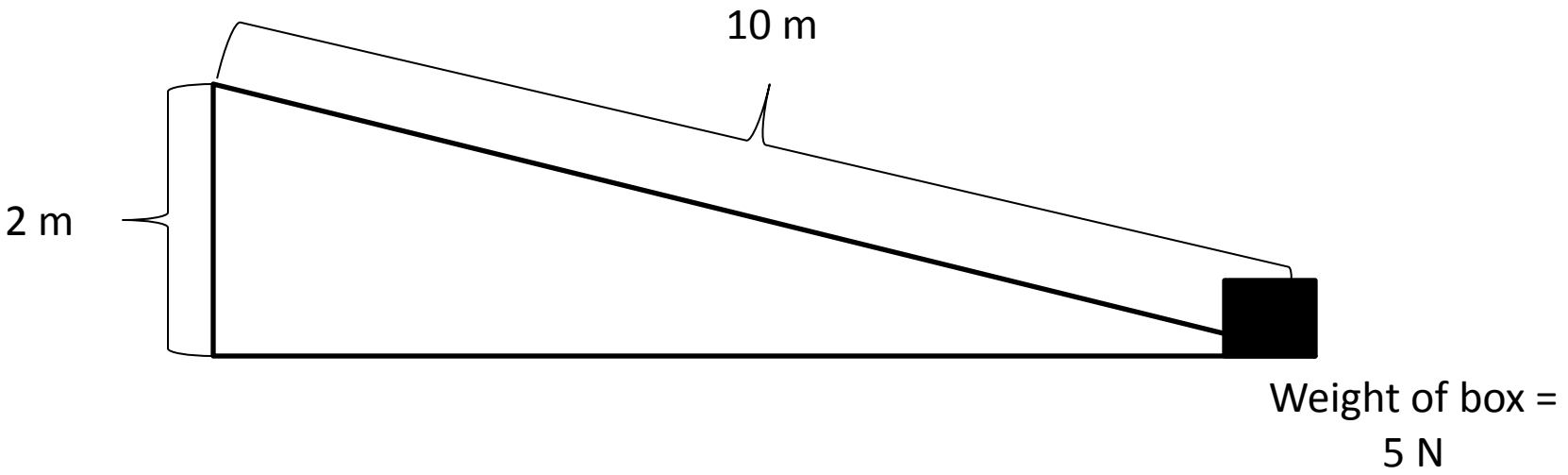
How much force is required to slide the box to the top of the ramp?

Remember Work was 10 Joules

$F = w/d$

$F = 10 / 10$

$F = 1\ N$



Where on the ramp would the box have the most potential energy?

At the top. The box would be at the highest point, therefore it would have the most PE.