WOW sheet

What is tension?

Here is what ‘tension’ means in physical science:

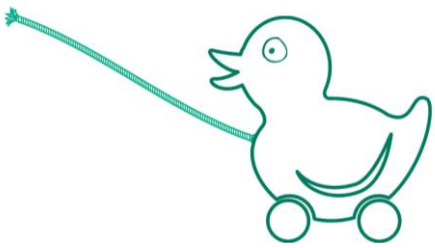
> Tension is the pulling force between two objects connected by a rope (or a rope-like thing), that is transmitted by the rope.

In other words, tension is the force a rope, string, chain, or cable exerts on whatever is attached to the rope.

Here’s an example

Have you ever seen a pull-along toy? These simple toys let little kids pull on a rope as they walk and the toy rolls along behind them.

Tension is what allows a pull-along toy to work. The child pulls one end of the rope, which makes the rope go taut. This puts the rope under tension. The tension allows the rope to transfer the force from one end of the rope to the other end. In other words, the rope transmits the force of the pull down the length of the rope until it reaches the toy at the other end. The force of the pull then makes the toy roll forward.



Tension transfers force across a distance

Tension is a **contact force.**

Contact forces are forces that act between two objects that physically touch one another. When one of those two objects is a rope, string, chain, or cable, we call that contact force tension.

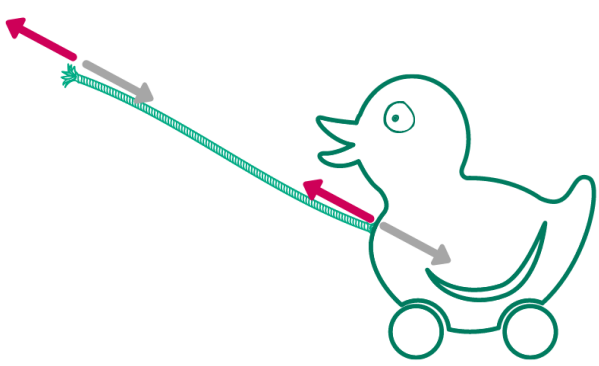
Tension is what makes ropes (and rope-like things) useful. Ropes allow us to transmit force over a distance because of tension.

Newton's third law tells us that when a contact force acts between two objects, both objects experience the same size force, but in opposite directions.

In tension, this means that the two objects attached by the rope pull on each other. This pull is transmitted between the two objects by the rope.

Here's an example

Think back to the pull-along toy. According to Newton's third law, the child and the toy are pulling against each other. The rope, which is connecting the child and the toy, transmits the equal-sized but opposite direction force between the two.



Because tension moves the force from one end of the rope to the other end, longer ropes allow you to move force over larger distances.

Tension doesn't always result in motion

Newton's second law (**F**=*m***a**) tells us that force, mass and acceleration are interconnected. This relationship determines the motion of an object.

Because tension is a force, tension can be used to accelerate (that is, to move) an object. It can also be used to keep an object from moving.

Here's an example

Have you ever seen a party balloon filled with helium? The helium makes the balloon float. If you let the balloon go, it will float away. But if you tie some string to the balloon, and then tie the other end to your wrist or a table, what happens?

Now, when you let go of the balloon, the balloon can only float a little way before the string goes taut because of tension. The pull of the balloon on one end of the string is countered by the mass at the other. The tension means that the balloon can no longer accelerate and float away!

Tension is a pulling force

Tension is a pulling, not a pushing force. This is because ropes cannot push effectively. Trying to push with a rope causes the rope to go slack. This causes the rope to lose the tension and it can no longer transfer force.

The force of tension follows the path of the rope. In other words, the direction of the tension force is the same as the path of the rope, in the direction of the pull.