



# Firrhill High School



## Summary Files P4. Grand Prix (Forces)

### WHAT SHOULD I KNOW?

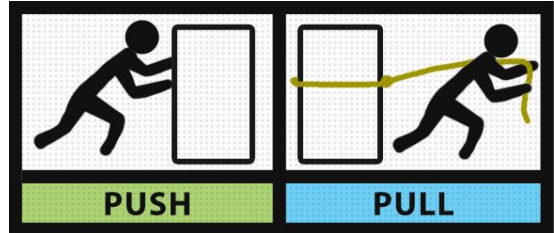
Success Criteria	Before reading	After reading	Before my test
I can state what a force is.			
I can explain what a force can do to an object.			
I can measure forces using a newton meter.			
I can explain what friction is.			
I can list examples of when friction is useful.			
I can list examples of when friction is not useful.			
I can identify when drag is acting on an object.			
I can explain what streamlining is.			
I can explain what a lubricant is.			
I can explain how a lubricant works in terms of friction.			
I can give examples of how to lubricate an object.			
I can describe how friction is related to heat.			
I can explain the difference between mass and weight.			
I can calculate the speed of an object.			
I can understand how parachutes slow objects in terms of forces.			
I can apply my learning to develop a race car.			

# FORCES

## WHAT DO FORCES DO TO OBJECTS?

All forces are **push** or **pull**.

Forces can make an object **change direction, change speed** or **change shape**.



Forces are measured using a Newton balance.

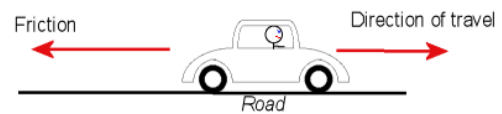
Forces are measured in Newtons.

## FRICION

Friction is a force which acts against motion. Friction can be useful or not useful.



Shoe treads make use of friction, stopping you from slipping.



Cars have to overcome friction, meaning they have to use more fuel.



The sandpaper on match boxes uses friction to light the match.



Friction has rubbed away at the socks, putting a hole in them.

When friction is caused by air or water acting against an object it is called **air resistance or drag**.

# REDUCING FRICTION

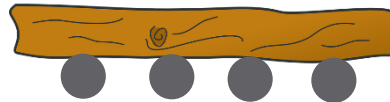
## STREAMLING

**Streamlining** is a method to reduce air resistance. This is done by trying to make the object very smooth so that air can easily pass over the object.



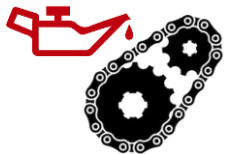
## ROLLERS

Another way of reducing friction is by using rollers, this is because less of the object has to touch the ground.



## LUBRICANT

Another way of reducing friction is by using a lubricant. This works by adding an oil surface between the object and the ground (making it slippy).



Oil is used in a bike chain to stop rust causing friction in the bike chain, this would make it harder to cycle and could break the bike!

## FRICTION AND HEAT

Friction is a force that acts against motion. When you move your hands back and forth they heat up. This is because friction causes **kinetic (moving) energy** to change into **heat energy**.



Fires can be started by rubbing sticks together. This changes the kinetic energy into heat energy and eventually creates a fire!

# MASS AND WEIGHT

MASS AND WEIGHT ARE NOT THE SAME THING!

Weight is a downwards force due to gravity. Mass is how heavy an object is.

Bigger planets have more gravity, making weight larger.

When there is no gravity objects are weightless – they will float!

My mass on earth is 60kg.  
My weight on earth is 600N.



My mass on the moon is 60kg.  
My weight on the moon is 96N.



The weight of an object is found by multiplying the mass of an object by the gravity of the planet the object is on.

$$\textit{Weight} = \textit{mass} \times \textit{gravity}$$

$$w = mg$$

A 60kg pupil standing on earth (which has a gravity of  $10 \text{ Nkg}^{-1}$ ) would have a weight of...

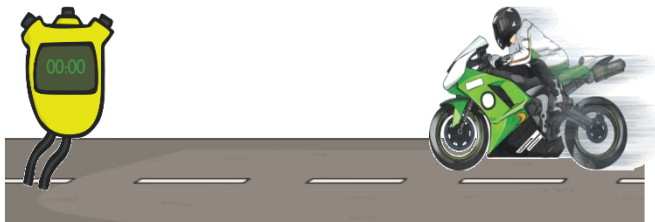
$$w = mg$$

$$w = 60 \times 10$$

$$w = 600\text{N}$$

# SPEED

We can calculate the speed of an object if we know the distance travelled by the object and the time it took for the object to travel.



$$\textit{speed} = \textit{distance} \div \textit{time}$$

This can also be written as

$$\textit{Speed} = \frac{\textit{distance}}{\textit{time}}$$

For example, if a motorbike travelled 100 meters in 5 seconds the speed of the motorbike would be...

$$\textit{Speed} = \frac{\textit{distance}}{\textit{time}}$$

$$\textit{Speed} = \frac{100}{5}$$

$$\textit{Speed} = 20 \textit{ meters per second} \quad \textit{or} \quad 20\textit{ms}^{-1}$$

We measure speed in meters per second, this is shortened to **ms<sup>-1</sup>** (this is probably a bit different to what your parents might have been taught!)

# PARACHUTES

Can we change the speed of objects?

When a person jumps out of a plane they will speed up (accelerate) because of the force due to gravity (weight).



Parachutes are used to increase air resistance.

This makes someone slow down because there is a smaller unbalanced force downwards.

