

The background is a stylized forest scene with dark green evergreen trees and a light blue sky with white clouds. On the left, a blue owl with large eyes sits on a branch with green leaves. On the right, there are brown pinecones. The text 'ZIP' is in large, red, blocky letters with a black outline and a small zipper pull on the 'P'. Below it, 'WORLD' is in white letters with a black outline. Below a dotted line, 'SCHOOLS' is in white letters with a black outline and a small orange zipper pull on the 'O'.

# ZIP WORLD

## SCHOOLS

**WE ARE GOING ON AN ADVENTURE!**



# THE RIDES AT ZIP WORLD WORK BECAUSE OF THE FORCES



TREETOP  
NETS



FFOREST  
COASTER



PLUMMET  
2

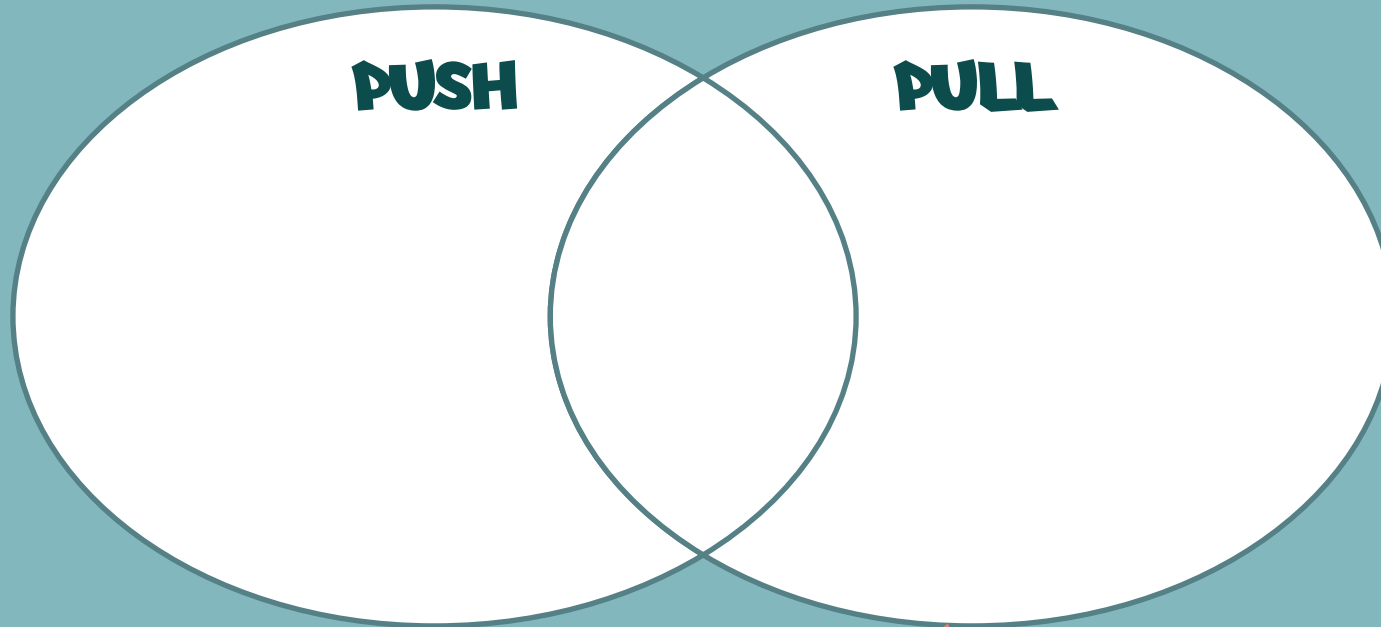
Today we are going to learn about what forces are and the effect they can have on objects.



# FORCES ARE ALL AROUND US!

They act on all objects. Forces are pushes and pulls.

Look around your classroom or playground and find examples of things that show the push or pull force when they are moved. Put them in the Venn diagram below.



You cannot see a force,  
but you can see  
the effects of the force.



**PULL**



**PUSH**





**WHAT FORCES HAVE YOU  
HEARD OF BEFORE?**







When you jump in the air, your energy pushes your body off the ground, but it is gravity that pulls you back down.

Weight is the force of gravity acting on an object. You would weigh less on the moon because the moon has less gravity.

Gravity attracts all objects towards each other.

# GRAVITY

How much gravity an object has depends on how big it is (its mass) as well as how close it is.

Gravity is a force that pulls objects towards the ground (the centre of the Earth).

Gravity always pulls, it never pushes.





Air resistance is a friction between air and an object. When objects move, they have to push air out of the way.

Friction is a push against a moving object. It slows it down. It happens when there is contact between two objects.

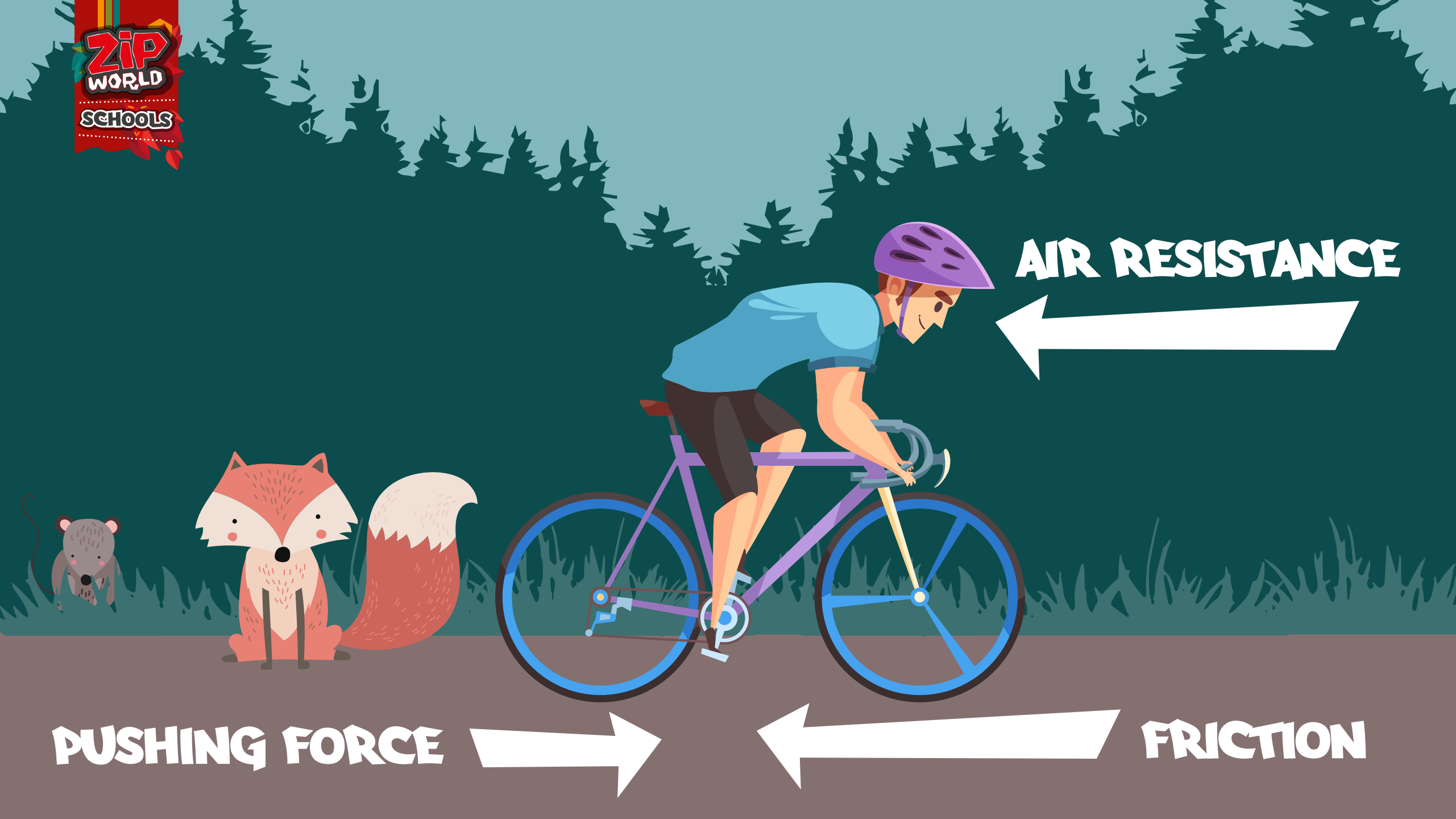
# FRICTION



Can you think of a time when we might want lots of friction?  
And an example of when we want to have the least possible friction?



The smoother the surface, the less friction is produced.



**AIR RESISTANCE**

**PUSHING FORCE**

**FRICTION**



The cyclist with high handle bars experiences more air resistance. This will slow them down and make it harder to pedal.



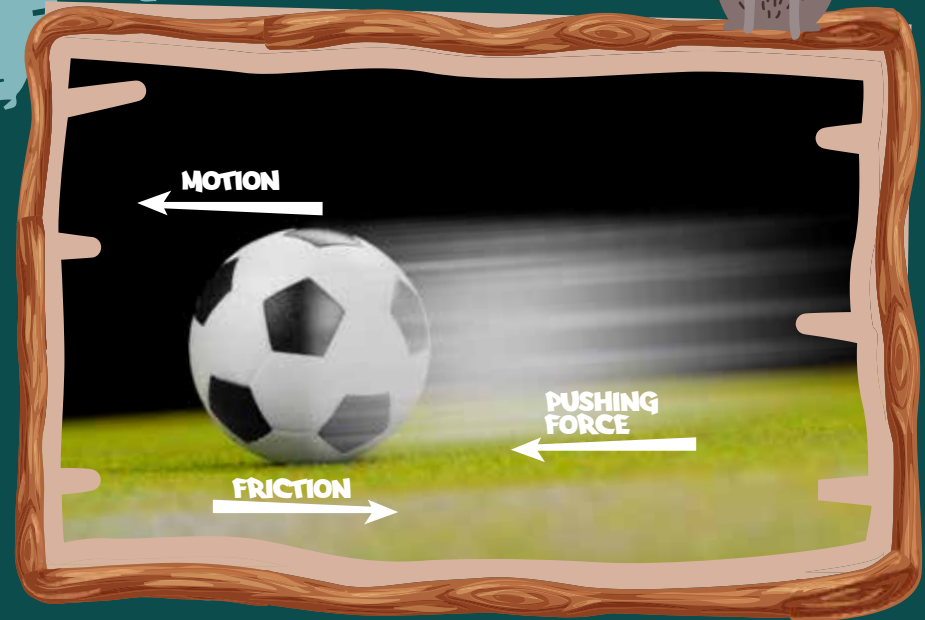
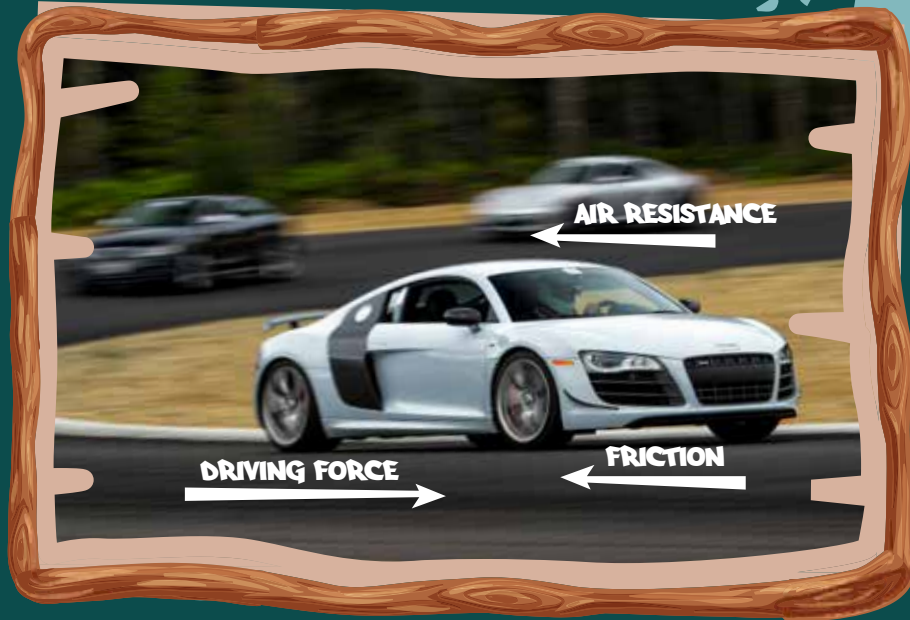




The ice is so smooth,  
there was not much  
friction between that and  
the polar bear's feet!



The trampoline applies  
an upward force on the  
boy. Gravity acts on him in  
the opposite direction.



All of these objects are moving. They have a pushing force pushing them forwards. Friction from the ground and air resistance are pushing against them.







Rubbing one hand against the other causes friction. Friction produces heat, which is why people do this when they are cold.



Even stationary objects have forces acting on them. Here, gravitational force is pulling the boy down. And the chair is reacting by pushing back up. The forces are the same size; they are balanced. He is not moving.



The teams are pulling  
with the same force –  
the forces are **balanced**.  
There is no movement.

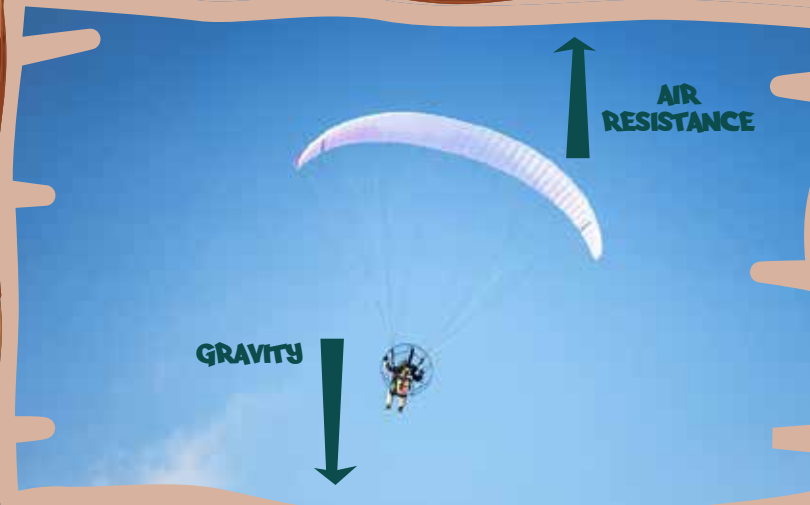


What happens when one  
team increases that  
force so that the forces  
are **unbalanced**?



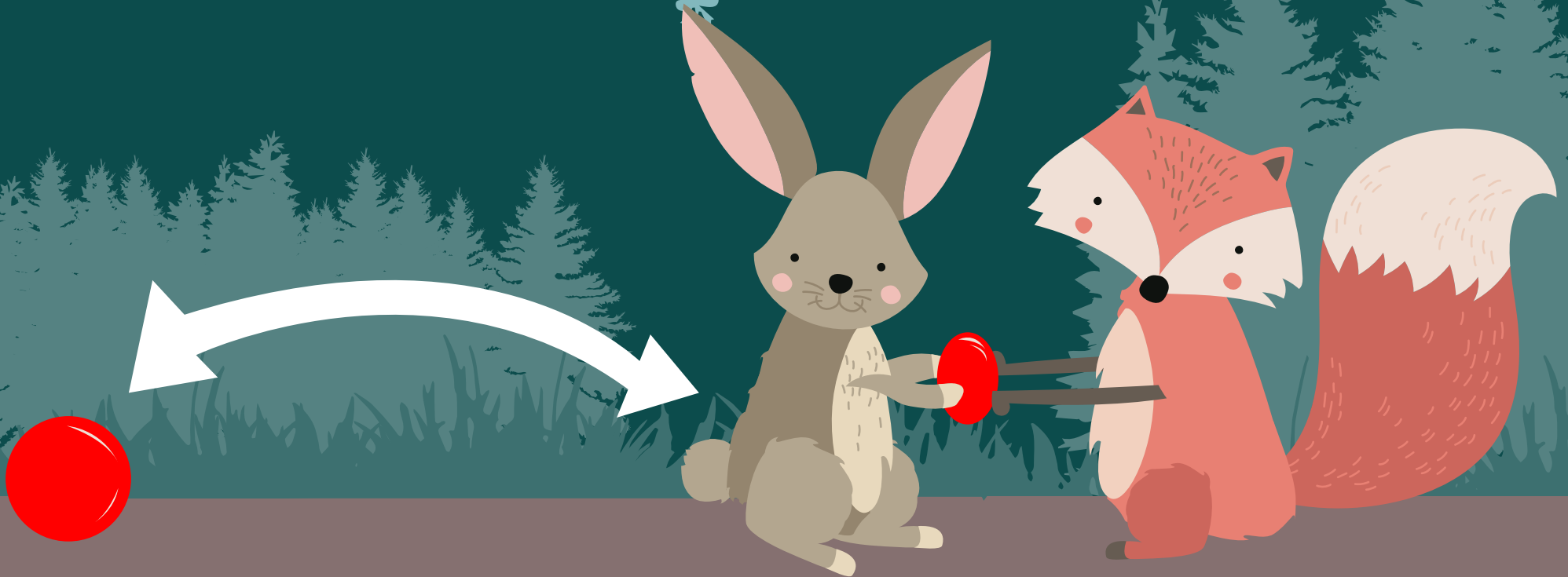


The ball changes direction  
after the batter pushes  
the ball with his bat.



This parachutist is falling  
because gravity is pulling  
him towards the ground.  
Air resistance is  
pushing upwards, in the  
opposite direction.

**THE PUSHING FORCE ON THE BALL  
HAS CHANGED ITS SHAPE.**





**WE CAN SEE FROM  
ALL THOSE EXAMPLES  
THAT FORCES CAN  
CAUSE AN OBJECT  
TO...**

**FORCES CAN EVEN CHANGE  
AN OBJECT'S SHAPE...**

**CHANGE ITS SPEED**

**CHANGE ITS DIRECTION**

**MOVE OR STOP**





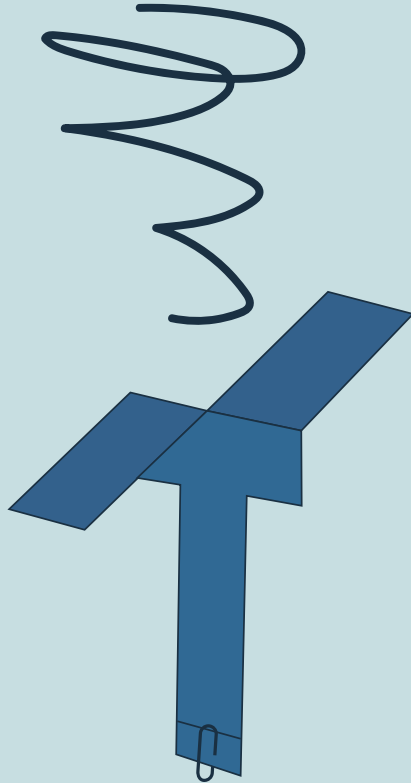
# LET'S SEE FORCES IN ACTION!

In your groups, prepare your paper helicopter, using the instructions.

Stand on a chair and drop your helicopter – what happens?

WHICH FORCE IS  
ACTING AGAINST THIS?

WHAT FORCE IS  
PULLING IT DOWN?



Who in your class can  
make their helicopter  
stay up the longest?

If you have time, explore ways to make your helicopter faster/slower/spin more...Remember – scientists only change one thing at a time. Don't forget to consider how to measure your findings.

You may want to use more paperclips, different paper, cut the blades differently, try a different sized template or even use your imagination and create a whole new template!

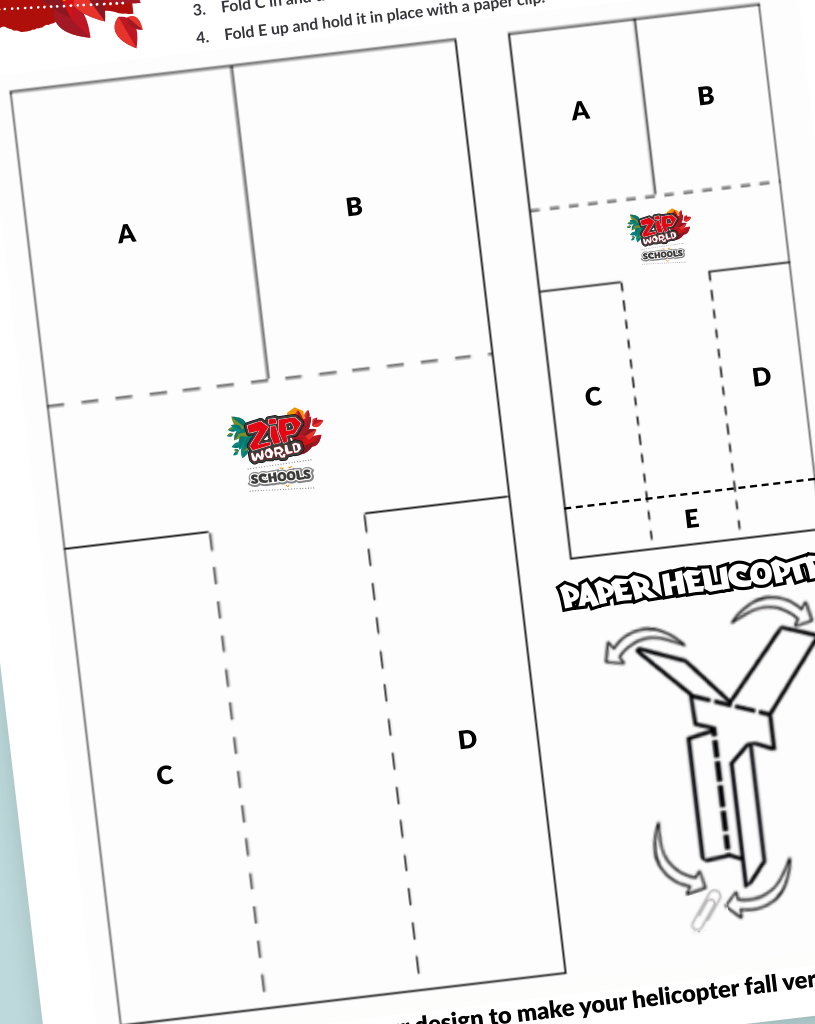




## FFOREST PRE-VISIT ACTIVITY SHEET 3

NAME: \_\_\_\_\_

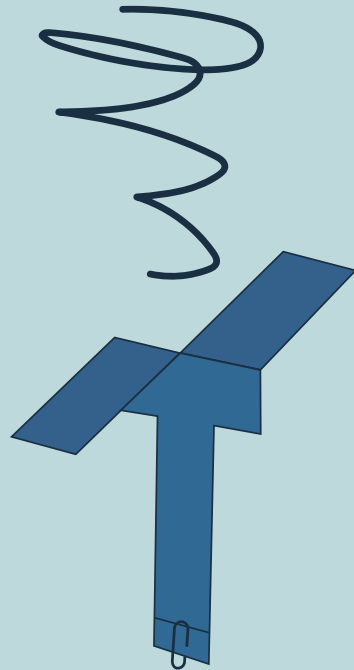
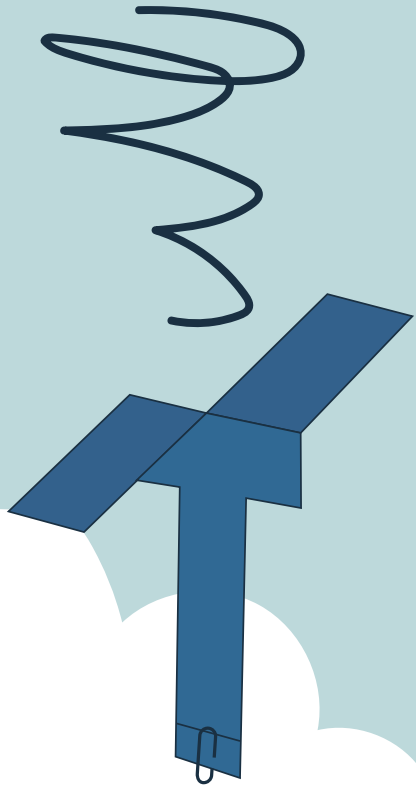
1. Cut along all the solid lines (don't cut the dotted lines!)
2. Fold A forwards and B backwards. These are the blades.
3. Fold C in and then fold D on top.
4. Fold E up and hold it in place with a paper clip.



PAPER HELICOPTER



**CHALLENGE** change your design to make your helicopter fall very slowly!



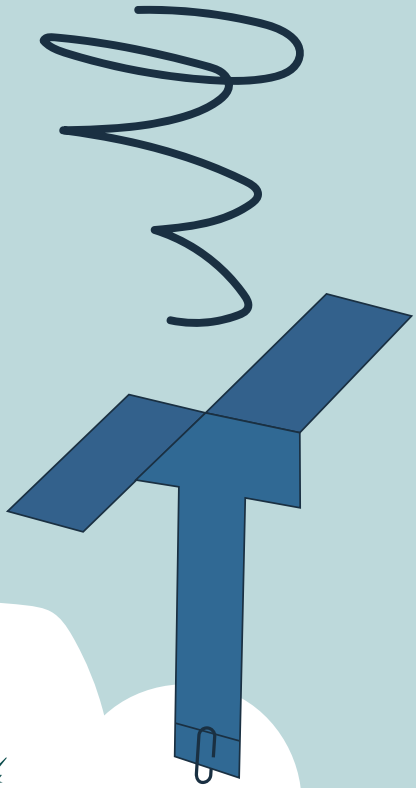


# THE SCIENCE

## BEHIND THE FUN

Gravity pulls the helicopter down.

The air resists the movement and pushes up each rotor separately, causing the helicopter to spin.





# LOOK AT THESE PICTURES FROM ZIP WORLD.

Use what you have learned today to explain the forces in action in these pictures.  
When you are there, see if you can feel the effects of the forces acting upon you!



**ENJOY!**

