

## 2.1 Forces Lessons Notes

A Force is a push or a pull.

Try pushing gently your book or pencil case across the desk. Now try pulling it.

Q. What does it do?

Q. What is easier pushing or pulling?

A. Usually pushing is easy because you don't need to hold on.

Q. If you want to move a trolley at home would you push or pull it?

Q. If you used a rope would you push it or pull it?

Q. If you throw a ball is it a push or pull?

Q. If you jump is it a push or pull?

### Lesson 1 Forces causes motion.

Most things don't move by themselves.

Q. Can you think of anything that does?

A. Animals and motor cars can move by themselves because they have motors and muscles that use food or fuel.

For those things that don't have food or fuel, they need animals or motors to push them.

Q. Can you think of something that needs a person, animal or motor to push or pull it?

(Answers: horses can pull or carry things, a motor car can pull a caravan, a person uses a cricket bat to make a ball move.)



### Do 2.2 Investigation Pushing and Pulling

### Lesson 2 Forces stop things

Q. If most things don't move by themselves, do they stop by themselves?



This is a bit harder to understand but things won't stop unless a push or pull stops them.

In this world we have a very important force called friction. Friction is the rubbing force between two objects. If one of the objects is moving over the top of the other, they try to stick and stop each other moving.

Try rubbing your hands together and feel the friction.

Q. How could you make the friction stronger?

A. Try rubbing your hands together harder or change the surface you rub. Try rubbing your desk and compare to rubbing the carpet or floor.

So if you want to stop something quickly you need a greater stopping force or friction.

Q. Why do cars have rubber tyres with grooves called tread to



make the tyres rough?

Because when cars brake the tyres have to stop quickly on the road and the rubber tyre with tread will have more friction.

Of course heavy objects take more friction to stop than light objects so they need bigger tyres with more tread.

Because heavy things that are moving are hard to stop you must be very careful not to stop them by jumping in front!

### **Do 2.3 Investigation Friction.**

## **Lesson 3 Forces can change the shape of objects**

Sometimes you can force something but it doesn't move at all!

Q. Can you give examples when this happens?

A. You could push a wall or very heavy object that won't move or two people can push or pull each other and no one moves (like tug of war)

Other times you can force something and instead of moving much it changes shape?

Q. Can you give examples when this happens?

A. Stretching, twisting, pulling, pushing, squashing, grabbing, pinching, punching

You are able to force many things with the muscles in your body.

### **Try the following challenges:**

1. How tight can you scrunch up a piece of paper?
2. How many folds of a piece of paper can you make? Try a larger piece does it make any difference?
3. How far can you stretch a rubber band? (Careful, use safety glasses)
4. How long can you make a piece of plasticine without it breaking?
5. How big can you blow up a balloon with one breath? (Careful, use safety glasses)
6. How hard can you punch a piece of paper? (Careful: Hold the paper in the air with one hand and punch it with the other. Make sure there is no one behind it! Why is it hard to punch?)
7. Push against a wall with your back and try to stand up without losing your balance.
8. Can you push against your partner using back to back and both stand up together.

As you will have noticed, different materials act differently when they are forced.

Material properties like stretchy, soft, hard, brittle, elastic, sticky all refer to how they change their shape when they are forced.

Some objects want to change shape to be helpful others definitely not.

Hard objects resist changing shape and can hurt if you try.

Soft or elastic objects however are easy to change shape and often are meant for that.

Q What property make these objects helpful when you use them?

- Cushions **A. soft to change shape when you sit**
- Rubber bands **A. elastic or stretchy to go around things and hold them.**
- Balls **A. elastic so they bounce**
- Lollies **A. brittle or soft so you can chew them.**
- Hammer heads **A. hard so that they wont dint or break when they hit a nail.**

Q Name some soft and hard objects in the class. What would they be like if they are the opposite?

## Lesson 4 Why do things break?

Some materials are **brittle or weak**. Others are very **strong**

Brittle means that they don't stay the same shape and break into pieces, when you push or pull on them. Strong Objects are very hard to bend or break.

Name some weak materials.

*Possible Answers: Paper, candy, glass, china, some plastics*

Name some strong objects.

*Possible Answers: metal, wood, cardboard, some plastics.*

Some materials are **elastic**.

This means they can stretch but return to their original shape.

Name some:

*Possible Answers: rubber bands, metal springs, balloons, bungy cords, some foam and plastic.*



Some are **plastic**.

This means they can be changed to any shape you want. Name some:

*Possible Answers: some plastic when hot, putty, plasticine, modelling clay, chewing gum, clay, hot metal.*

## Making things stronger

Obviously all things eventually break as the force on them gets bigger. Some things need to break to work properly, can you think of any?

*Possible answers*

*Tissues and toilet paper, piñata for parties, Glow in the dark lights, ice packs.*

Most things however need to be strong, especially if they have to resist large forces acting on them.

What's the strongest material? *Metals, concrete*

Give some examples of where metals are used because they're so strong. *Buildings, cars, axes, knives*

Metal though is not always the best material to use. Why?

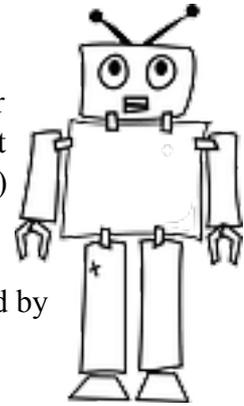
*Possible answers*

*rusts, sharp, heavy, expensive, hard to cut or shape.*

For building model cars what materials are best? *Light metals or plastic*

Metal can be used for robots and model cars (e.g. MECCANO) and is better these days because the types of metal are lighter and don't rust, but the most common building material for models is plastic (e.g. LEGO, Fischertechnik)

There are so many different types of plastic but the type used in LEGO is very strong and can be made into lots of shapes. Each piece has been shaped by melting and moulding.



## **Do 2.4 Investigation :Lego Construction.**

### **Lesson 5 What did you learn about your force?**

Q1. What is three different things force can do?

*A. Move, stop or change shape of things*

Q2. What does the force of friction do to moving things?

*A. Stops them.*

Q3. How can you make friction stronger?

*A. Use a rougher surface or push down harder.*

Q3. Are materials different in the way they change shape with force?

*A. Some are hard e.g. metals, some are soft e.g modelling clay, some stretch and go back to shape e.g. rubber band*

Q4. Does force always make things move or change the shape? *No e.g. pushing on a wall.*

### **Start your Project: Do 2.5P Water Tower Project.**