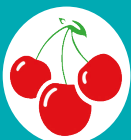


Teaching Pack



The Super-Sonic Submarine



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What is this activity book for? We're glad you asked! Danny Dingle is all about **INVENTIONS!** We want your pupils to engage with the book's laugh-out-loud story and hilarious illustrations by joining in with the adventures of Danny, Percy and Superdog! This activity pack will give your pupils the opportunity to get creative and become tip-top inventors!

This activity pack will engage with your pupils' curious minds and help them explore the world of science. The activities in this pack have all been made in line with the school curriculum with the aim of teaching essential aspects of the knowledge, methods, processes and uses of science.

This pack introduces forces and engages with their ability to identify the effects of air resistance and friction, and the role of gravity and up-thrust that act between moving surfaces.

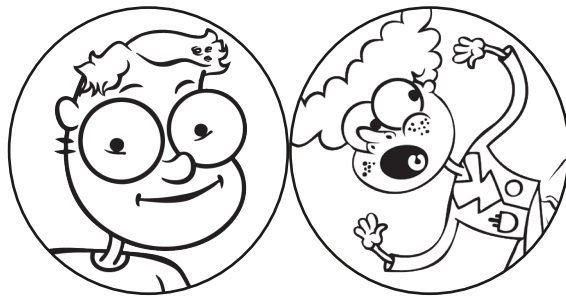
Follow the activities and experiments in this activity pack and join the world of Danny Dingle. You can use some or all of the activities in this pack and plan your lessons around them. We would love to see what you come up with; why don't you send us a tweet or an email with pictures of your wacky inventions and your class completing the activities?

Have fun exploring the fart-tastic, experimental and totally nauseous world of Danny Dingle.



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Keywords

Gravity is a force that pulls objects towards each other. Anything that has mass has a gravitational pull. The larger the object, the stronger its gravitational pull.

Gravity

friction

Friction is a force between two surfaces that are sliding, or trying to slide, across each other. Friction always slows a moving object down.

Water Resistance

Water resistance is a force that tries to slow things down that are moving through water. It is a type of friction and sometimes called drag.

Up-thrust

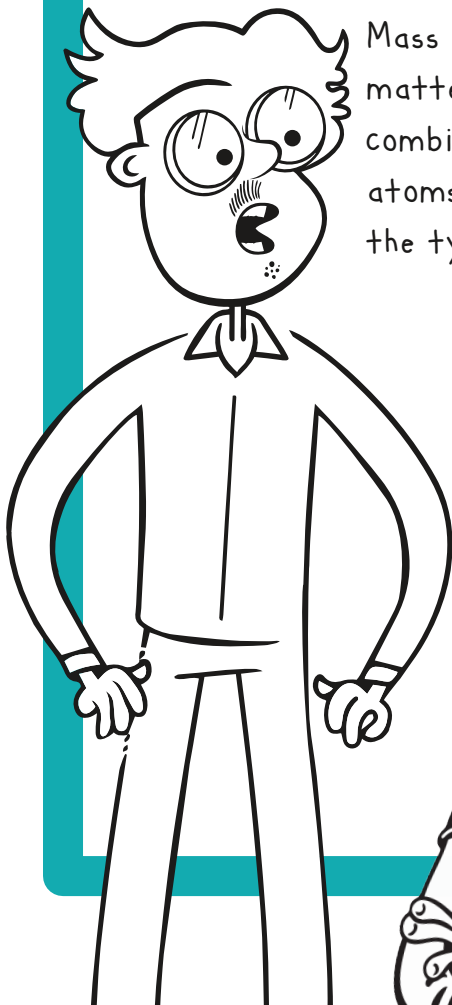
Up-thrust is a friction force that pushes things up. Things float in water because of up-thrust. Gravity pulls you down. The upwards force from the ground stops you from sinking into the Earth - this upwards force is called up-thrust.

Mass is a measurement of how much matter is in an object. Mass is a combination of the total number of atoms, the density of the atoms, and the type of atoms in an object.

Mass

Buoyancy

Buoyancy is the ability to float. It is an upward force on an object immersed in a liquid. If the buoyancy exceeds the weight, then the object floats; if the weight exceeds the buoyancy, the object sinks.



Experiment 1: Water Resistance

Water resistance is a friction force working in reaction to a moving object in a liquid. It is a result of the effects of up-thrust and gravity. As an object pushes the liquid around it out of the way, the fluid pushes back on the object creating a drag. This drag slows down the moving object.



Challenge: How does water affect how objects pass through it?

Aim: To understand how water resistance affects objects.

In groups of two, get the pupils to weigh two pieces of plasticine so that they have the same mass (measured in kg) and roll each into a ball. Grab two beakers and fill one beaker with water. Tell the children that they are going to drop both balls from the same height at the same time into each of the beakers.

Equipment:

Beaker x2
Jug of water
Plasticine
stopwatch
scales

To ensure that this is a fair test, ask the children what will be measured? They should say the time it takes the plasticine ball to reach the bottom of the beaker, the weight of the plasticine balls and the height from which they are dropped.

Once the experiment has been completed, ask the children what they found.

They should notice that the ball in the water falls slower than the one falling through the air. What is the explanation for this?

Ask the pupils to write down their findings with an explanation of their results. Why did the ball travelling through the water travel at a slower rate? Discuss this as a class.

Their results should reveal that because the mass of the plasticine exceeds the **mass** of the water it pushes away, it causes the ball to sink. The **gravitational** pull reacts against the **up-thrust force** slowing the the object as it passes through the liquid.

Experiment 2: Challenging Water Resistance

Challenge: How can we make the ball travel **faster** or **slower** in the beaker of water?

Aim: To understand that surface area and water resistance can affect how quickly objects travel through water and how changing an objects shape change how forces react with the object.

Experiment:

The students will be given pieces of plasticine that have the same mass. The challenge is to get the plasticine ball to travel through the beakers of water at different speeds by changing the shape. Encourage the pupils to keep refining the shapes of their plasticine to speed up or slow down the rate in which their plasticine ball falls. The pupils are to remember that this has to be a fair test and should be using a stopwatch to measure the time, rulers to measure the height from which the plasticine balls are dropped and ensuring the mass of the plasticine balls is always equal. The pupils should record their measurements in a table.

Results:

The students should discover that each of the shapes has the same mass but a different surface area, due to the change in shape. The larger the surface area, the more water resistance and the slower the ball will travel. Objects with smaller surface areas fall faster. As a class, discuss their findings, the fastest and slowest-sinking plasticine balls should be invited to the front of the class to demonstrate their results and discuss their designs.

Relate surface area to why some objects float and sink; the larger the surface area, the more resistance it meets from the water. When an object's density is less than that of the water it will float due to a force called up-thrust. Whilst gravity forces objects down, up-thrust works against gravity.

Activity 3: Create and Design your very own Super-Sonic Submarine

Challenge:

Aim:

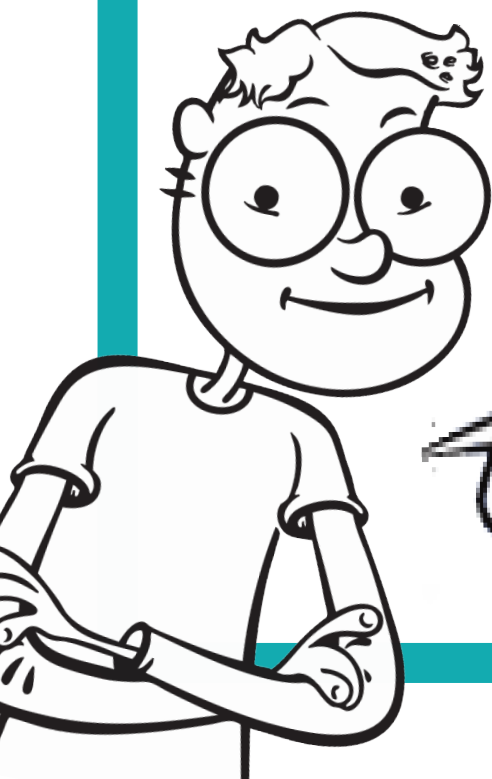
Experiment:

Provide each of the students with an A4 peice of paper and sticky tape and ask them to create their Super-Sonic Submarine. As this will be a fair test, each boat needs to be made using exactly the same material, ensuring the mass is the same. How many paper clips can your Super-Sonic Submarine hold?

Launch the boats into a large pool of water and get the students to slowly add paper clips to their boats. See if they can discover the main variables that determine which boats will float. Pupils should record their progress with diagrams of their boats with notes of how many paper clips their Super-Sonic Submarines could hold.

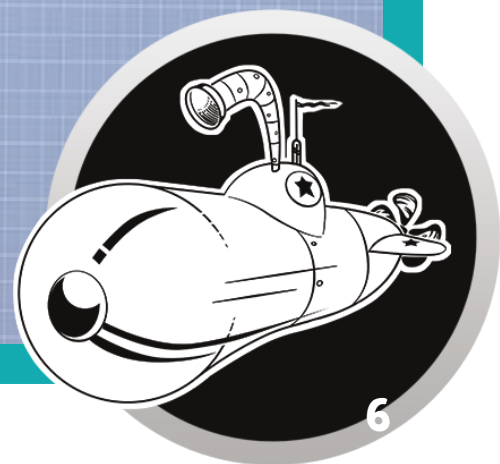
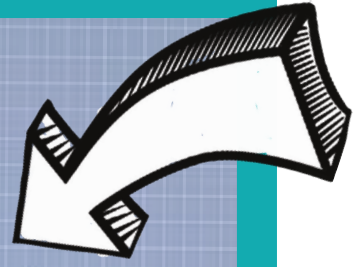
Results:

Pupils will discover that the best boats are large and nearly flat. This is because contact between the boat and the water is greater, resulting in high water resistance due to a larger surface area. Provide the students with a large sheet of paper and ask them to present their boats, results and conclusions in their own way, making sure they use the keywords.



Can you help me?! Can you design a Super-Sonic Submarine for me - help me beat that nasty, no-good, Trumpshaw? He's such a cheater!!!

Think about the shape of the boat, its mass, how it will react to gravity and up-thrust and its buoyancy.



Danny Dingle's Fantastic Finds: Tell us what you thought

1. Who was your favourite character and why?

2. If you made a fart-tastic jelly what ingredients would you include?

3. What was your favourite and least favourite part of the book and why?

4. How would you create your very own Super-Sonic Submarine and impress Metal Face?

5. Danny and Percy are master inventors, if you could invent anything in the world what would it be?

Let us know what you thought of the book! Why not write a letter to Angie Lake letting her know what you thought and remember never fart in an elevator.

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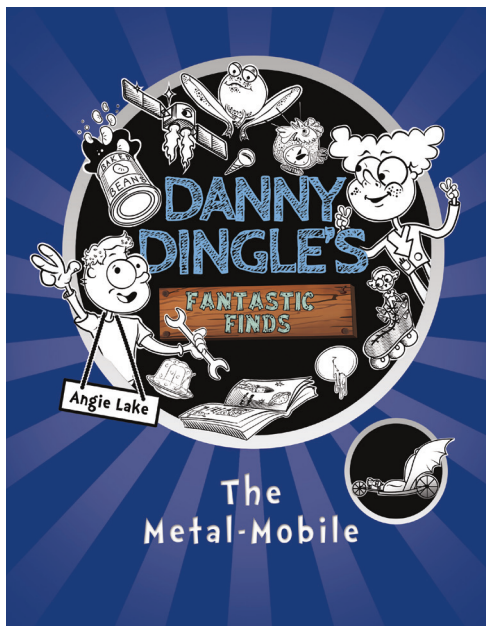
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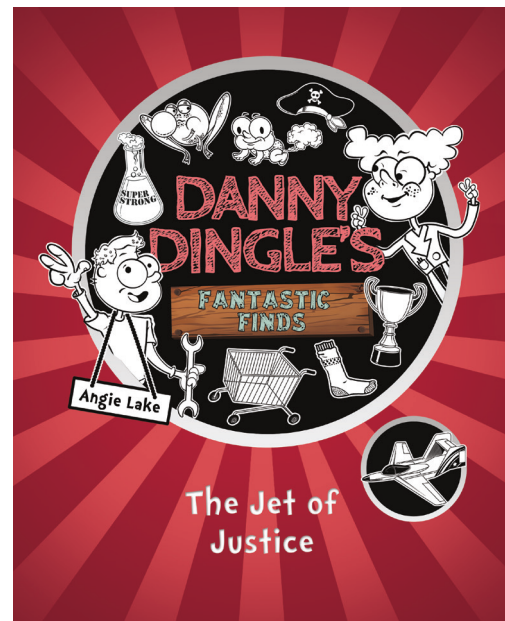
Danny Dingle Teaching Pack

extra activities

This is the fun part! We have suggested some activities for your class, but you are more than welcome to create your own! We would love to see what else your class gets up to! Send us an email or contact us via social media.



BOOK 1
Danny Dingle's Fantastic Finds: The Metal-Mobile
ISBN: 9781782262084



BOOK 3
Danny Dingle's Fantastic Finds: The Jet of Justice
ISBN: 9781782262619



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