

Forces & Machines

Gravity, resistance & simple mechanisms



1. What is gravity, and why do things fall down?

Gravity is a force that pulls every object towards the Earth's centre.

- Without air resistance, heavier and lighter objects fall at the same rate.
- Gravity is why objects fall down instead of floating away into space.

GRAVITY

Gravity is a force that pulls all objects toward the center of the Earth.

↓ Direction of Gravity



EARTH

Gravity pulls everything toward the center.

3. What is water resistance, and how does streamlining help?

Water resistance slows objects moving through water — a **streamlined** shape reduces it.

- Narrow, smooth shapes cut through water more easily than flat, wide ones.
- Boats, fish and submarines are shaped to move efficiently through water.

2. What is air resistance, and how does shape affect falling?

Air resistance pushes back against objects moving through air, slowing them down.

- More surface area means more air resistance and slower falling.
- A parachute falls far more slowly than a scrunched-up ball of paper.

Parachute Drop Test

We are investigating which parachute design will slow a falling object down the most.

Our Question
Which parachute design will take the longest time to reach the ground?

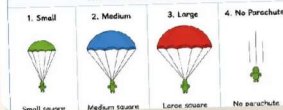
What we kept the same:

- We used the same plastic toy.
- We dropped from the same height (2 metres).
- We tested each parachute 3 times.

Our Results

Parachute Design	Time to Reach the Ground (seconds)			Average Time (seconds)
	Test 1	Test 2	Test 3	
1. Small	1.6	1.5	1.7	1.6
2. Medium	2.4	2.6	2.5	2.5
3. Large	3.7	3.6	3.8	3.7

The Parachutes We Tested



5. How do levers, pulleys and gears make tasks easier?

Levers, pulleys and gears are simple machines that change the size or direction of a force.

- A lever can help lift a heavy object using less effort.
- A pulley changes the direction of a pulling force, e.g. to raise a flag.

LEVERS, PULLEYS, AND GEARS

LEVERS

A lever is a rigid bar that moves around a fixed point called a fulcrum.



EXAMPLES:



PULLEYS

A pulley is a wheel with a grooved rim and a rope or cable that helps lift loads.



EXAMPLES:



GEARS

Gears are wheels with teeth that fit together to change speed, direction, or force.



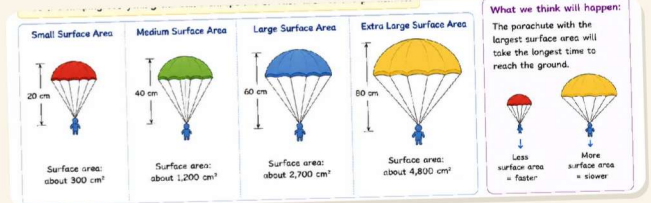
EXAMPLES:



6. Greater Depth: how does a streamlined shape reduce resistance?

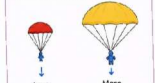
Shape changes how easily air or water flows around an object.

- Smooth, narrow, pointed shapes let air/water flow around them with less drag.
- Flat, wide or rough shapes create more turbulence and slow things down.



What we think will happen:

The parachute with the largest surface area will take the longest time to reach the ground.



7. TAPS: How do we write up our parachute test?

FAIR TEST

Our TAPS test: **how does the surface area of a parachute affect its fall time?** It's a **fair test** — we change only the parachute's surface area and keep the weight, drop height and material the same.

- Question → **prediction** → variables (independent / control / dependent).
- Materials → **method** → carry out the test → **results** → **conclusion**.

Parachute Fall Time Results

Parachute Design	Description	Fall Time (seconds)			Average Fall Time (seconds)	Rank (1 = Slowest)
		Trial 1	Trial 2	Trial 3		
A	Small (20 cm) Circle	1.21	1.19	1.24	1.21	4

All tests dropped from the same height.



KEY VOCABULARY

force gravity air resistance water resistance friction streamlined lever pulley gear mechanism predict conclusion

SKILLS I'LL USE

- Plan & carry out fair tests
- Take accurate measurements
- Record data in tables
- Use simple machines
- GD: explain results using force vocabulary