Rocket Challenge
Newton’s second law of motion

Video transcript
Hi again! It’s me, Athul and today we’re going to look at Newton’s second law of motion.
Title card: Law 2: F = ma
So here it is: Force is equal to mass, multiplied by acceleration. F = ma.
But what does he mean exactly? Well, he’s just talking about how fast an object can move, depending on the amount of force you apply.
So, the harder you kick a ball, the farther it’ll go. The harder you push a swing, the higher it’ll go. The faster you eat a cheeseburger...oh wait that has nothing to do with Newton’s second law, I’m just hungry.
But heavier objects require more force to move the same distance as lighter objects.
If you use the same force to push a swing and push a car, the swing will have more acceleration because it has less mass than the car. It seems pretty obvious, but engineers use the same equation to figure out aircraft weight and thrust.
So, how does this law apply to rockets? Like all objects, rockets follow Newton's laws of motion. Remember, the first law describes how an object acts when no force is acting upon it. So, rockets stay still until a force is applied to move them. And once they’re in motion, they won’t stop until something stops them – like a crash landing!

Newton's second law tells us that the more mass an object has, the more force is needed to move it. A larger and heavier rocket will need stronger forces to move it, like more fuel to help it accelerate.

Let’s use paper planes as an example to see what forces are needed to make an object fly. If you try dropping a piece of paper from a height, the weight of the paper will cause it to crash to the ground. To fix this we need to add wings for lift!

Now try throwing a paper plane with wings into the air. Your throwing action is giving the plane its thrust. 3...2...1… blast off!

The forces of thrust (that’s you!) weight, lift and drag are now in balance, allowing our plane to fly. But uh oh, not for long! What happened? Although thrust initially overcame drag, when the fuel runs out the forces of drag and weight will slow the plane down until it lands on the ground again.

Got it? Good. Now it’s your turn to have a go with a paper plane to see who can get theirs the farthest! The better the aerodynamic design of your paper plane, the farther and straighter it will fly.