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P3 Forces and motion

P3.02 We have lift-off

1. Forces change motion

Force: causes acceleration by pushing or pulling a mass

- **The action that causes its velocity to change**
- **newton(N)** - unit
- **Newton:** the force required to give a mass of 1kg an acceleration of 1m/s^2
- Big objects are harder to accelerate than small ones

$$\text{Force(F)} = \text{Mass(m)} \times \text{acceleration(a)}$$

Quantity	Symbol	SI unit
Force	F	N
Mass	m	kg
acceleration	a	m/s^2

2. Important forces

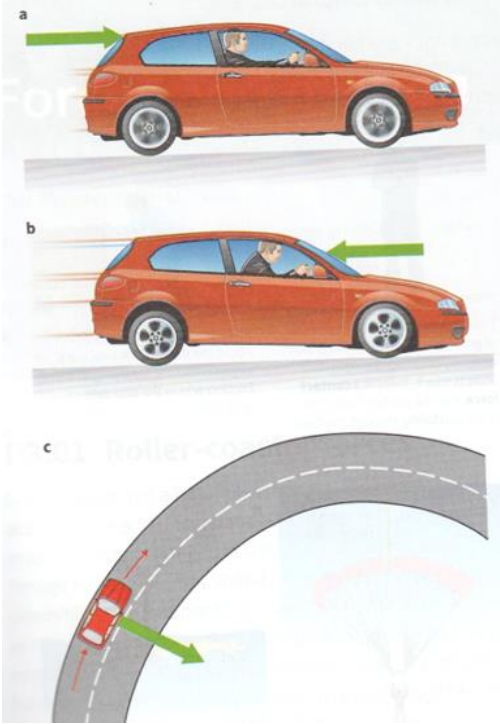
- **Weight** $\longleftrightarrow$ **contact force**
 - Weight: a pull of gravity on it
 - Contact force: stop me falling through the floor
- **Motion** $\longleftrightarrow$ **friction**
- **Weight in air** $\longleftrightarrow$ **air resistance**
 - Air resistance: Force of **friction** when an object moves through air or water
- **Weight in liquid** $\longleftrightarrow$ **upthrust**
 - Upthrust: the upward push of a liquid or gas

3. Forces produce acceleration

Features of forces

- Represented by arrows
- Make an object change speed

- Force change the direction in which an object is moving



- Forward force: cause the car to accelerate forwards
- Backward force: cause the car to accelerate backwards
- Sideways force: cause the car to change direction

4. Two or more forces

Car

- Engine force: provide a force to accelerate forwards
- Air resistance: a form of friction(drag), tends to slow down the

car

Resultant force: the single force that has the same effect as two or more forces

- If no resultant force acts on an object, it won't accelerate - constant speed

P3.03 Mass, weight and gravity

- Force of gravity = weight = newtons(N)
- Gravitational field:** any object in this field has weight because of the pull of gravity
- Pulls with the force of 10N on each kilogram
- Gravitational force per unit mass $g = 10\text{N/Kg}$**
- 5kg ball 이나 1kg ball 이나 같은시간에 도착함

1. calculating weight

Weight = mass x gravitational force per unit mass

$$W = mg$$

2. Distinguishing mass and weight

- Mass:** tells how much matter it is composed of, measured in Kg
 - Absolute value
- weight:** gravitational force that acts on it, measured in N
 - Relative value

3. Gravitational field strength

- Earth's gravitational field - extends far out into space
- Farther you go from the Earth, the weaker is its field
- Reason why moon orbits around the Earth
- $g = 10\text{N/Kg}$**

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