NaSk summary

4.1

Natural forces:

* Gravitational force
* Magnetic force

Gravity produces a force that pulls objects towards each other.

=> example: a person towards the ground.

Magnetism produce a force that can either pull opposite ends of two magnets **together** or push the magnetic parts **apart**. A magnet also attracts objects made of metal.

Types of forces:

* Magnetic force = magnetic forces act between magnets or between a magnet and an iron object.
* Electrical force = the effect of electrical forces can be seen when you comb dry hair with a plastic comb. The comb attracts your hair.
* Gravitational force = the force due gravity, that pulls objects to fall downwards.

All forces that we know do not act at a distance: contact is needed with these forces. Some examples of these forces are:

* Adhesive strength = you're familiar with adhesive strength from using adhesive **tape and glue**.

=> example: flies have thin hairs under their feet which enable them to walk across walls or even across the celling. The adhesive strength of the hairs stops the fly falling downwards.

* Elastic force = for example. **A spring** that is under compression or extension exerts an opposing force which acts to restore the spring to its original form. The fore *elastic* force.
* Tension = just as a spring **a rope** extends slightly if you pull it. The rope provides an elastic force called tension that tries to restore it to its original length. The extended rope is said to be in tension.
* Frictional force = the force caused by two surfaces that come into contact with each other. Friction can be helpful as in the friction that allows a person to walk across the ground without sliding or it can be destructive such as the friction of moving parts in a motor that rub together over long periods of time.
* Air resistance = air pushing against a moving object. The air pushes on the object as the air gets out of the way to let the object through. If you've ever been on a rollercoaster, or cycled fast down hill, you might have felt this air resistance as a wind on your face.

**A force can therefore have the following effects on a objects**:

* The object changes shape and can even break.
* The object starts to move.
* The object speeds up or slows down.
* The direction of the object changes (for example, the object travels in a curve).

**Book summary**

* A force can be identified by its effect: a deformation (change of shape) or change in motion.
* Magnetic force, electrical force and gravitational force alle gy7 act a distance.
* Other forces are adhesive strength , elastic force, tension and resistance.
* These other forces act only when objects touch each other.
* In many situations forces oppose each other and cancel each other out.

**Air resistance**

Birds fly in a V-formation in order to keep each other out of the wind. This formation reduces the force from the wind as much as possible. If you move quickly it feels as through you're moving against the wind: you experience air resistance.

4.2

**Book summary**

* The unit of mass is in kilogram (kg)
* The unit of force is in newton (N)
* A force of 9,8 N is required to lift a mass of 1 kg on Earth. This is because a gravitational force of 9,8 N acts on a mass of 1 kg on Earth.
* Force can be measured using a spring with graduated divisions: a spring balance.
* Force can also be measured using scales. One kilogram corresponds to 9,8 N of force.
* The symbol for force is F .

**Kilograms and newtons**

Before 1960 force was expressed in kg. The force required to lift a mass of 1kg was called in 1kg force. This double use of kg was confusing. A kilogram is the measure of mass, so it cannot also be a measure of force. The unit of force was therefore changed to a different unit, the *newton*, with abbreviation N.

On Earth the force needed to lift **a mass of 1kg is 9,8N**. The force needed to lift a mass of 1kg must be equal to the force with which the Earth pulls this mass downwards. In order to lift a mass of 10kg you therefore need a force og 98N.

The *gravitational force* on the Moon is less than that on Earth. On the Moon you need a force of just **1,6N to lift a mass of 1kg**.

**=> Example calculation 1**

Calculate the gravitational force acting on a mass 3,4kg.

|  |  |  |
| --- | --- | --- |
| Mass | 1 kg | 3,4 kg |
| Gravitational force | 9,8 N | 33 N |

To go from the top to the bottom row of the table you multiply by a factor of 9,8.

Gravitational force= 3,4 x 9,8 = 33,32 N

*Rounded down*, the force due to gravity is 33 N

**=> Example calculation 2**

What is the mass of an object if a gravitational force of 23 N acts upon the object on earth?

|  |  |  |
| --- | --- | --- |
| Mass | 1 kg | 2,3 kg |
| Gravitational force | 9,8 N | 23 N |

To go from the top to the bottom row of the table you divide by a factor of 9,8 N

Mass= 23 : 9,8 = 2,3 kg

**Calculating gravitational force**

The gravitational force (in N) is calculated by multiplying the mass (in kg) by 9,8.

Fg = m x 9,8

Where Fg is the gravitational force in newtons and *m* is the mass in kg.