



Material

Item-no.	Qty.	Description
DS090-3K	1	Claw base "Sepp", 260 x 220 mm
DS093-04	1	Sliding saddle "Sepp", H=40 mm
DS095-3K	1	Bosshead cross-pattern, demo 03
DS201-00	1	Support rod, round, L=1000 mm, D=12 mm
DS204-2L	1	Bearing pin with clamp insert
DM215-1W	1	Wheel and axle, demo, dismountable
DG200-1S	1	Cord, D=1.7 mm, L=5 m
DM121-6A	4	Weight on hook 500 g, profi
DS093-04	1	Reiter "Sepp", H = 40 mm
DM725-ND	1	Newtonmeter "inno" 20 N / 2000 g
P3120-5B	1	S-shaped assembly platform

Purpose

To demonstrate the equilibrium condition on the wheel and axle.
(clockwise = counterclockwise torque)

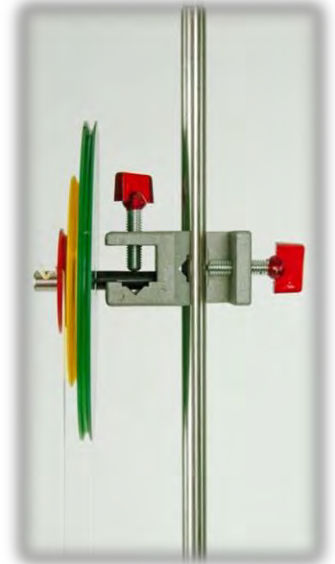
Preparation – Setup 1

Insert the 1000 mm support rod into the sliding saddle of the claw base; afterwards mount the bosshead at a height of 90 cm on the support rod and insert the bearing pin with clamp insert in this bosshead.



Cut off two 30-40 cm pieces of the cord and make loops at one end of the cords.

The other ends are arranged according to the image; make knots at the end so that the cord is fixed on the wheel and axle.



Experiment 1

Determine the radii of the inner and outer wheel and axle with a ruler or tape measure.

The ratio of the radii is: :

Try to achieve equilibrium by hanging weights to the cord.

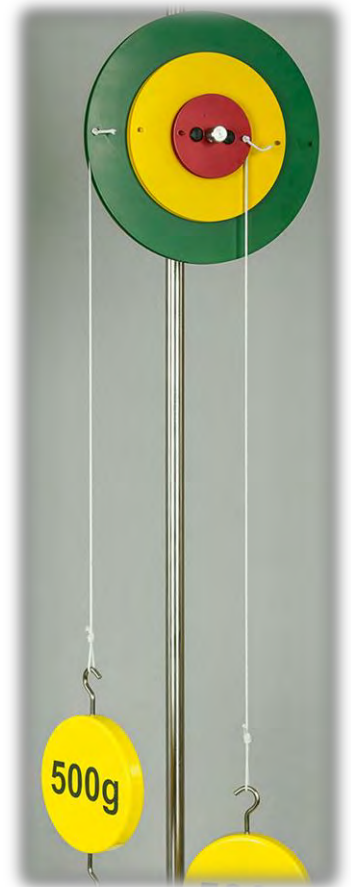
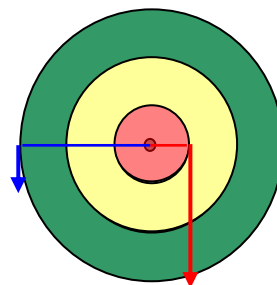
The ratio of the weights on the cords is: :

Compare the radii (paths) with the weight ratio now.

Result

$$F_1 \times r_1 = F_2 \times r_2$$

$$F_2 = F_1 \times \frac{r_1}{r_2}$$



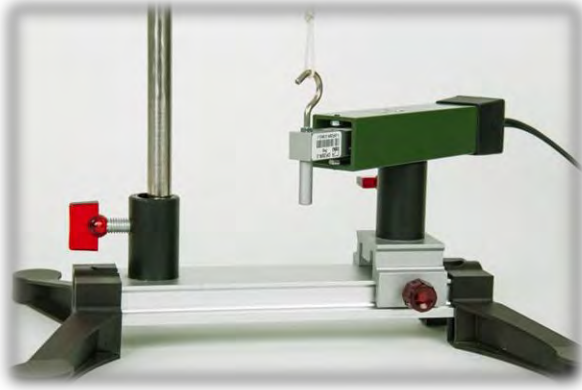
Note

If the masses of the hook weights are not in the same ratio (1: 2 or 1: 3) as the radii, then the appropriate ratio is obtained by turning them as the ratio of the distances of the lines of action from the pivot point.

Preparation – Setup 2

Remove the weights.

Mount the sliding saddle "Sepp" on the end of the claw base; the weighing bar of the Newtonmeter is mounted in this sliding saddle.



Mount a 80 cm piece of cord of 80 cm on the big wheel and a 20 cm of cord on the mid-sized wheel; afterwards hang the long piece of cord to the hook of the weighing bar.

Place the Newtonmeter on the S-shaped assembly platform for better visibility, set the measuring range of the Newtonmeter to „N“ (Newton), turn it on afterwards and tare if required (set to 0).



Experiment 2

Hang several weights to the cord that is mounted on the mid-sized wheel.

Loosen the screw on the bosshead and adjust the height of the wheel and axle including the bosshead so that the points of application of the cords on the wheel and axle are as horizontal as possible.

Fix the bosshead in this position.

Result

Compare the measuring result with the formula from the 1st experiment

$$F_2 = F_1 \times \frac{r_1}{r_2}$$

Note

In practice for example a crank is attached to the larger radius and a rope is rolled up for the smaller one (earlier well winches).

