COMPOUND
BLOCK AND TACKLE

MED 11.04

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
DS203-1S	1	Support with hook
DG110-1G	1	Pointers for rods, pair
DM210-2D	1	Block and tackle with 4 pulleys, D=100 mm
DG200-1S	1	Cord, D=1.7 mm, L=5 m
DM121-7A	1	Weight on hook 1 kg, profi
DM121-6A	1	Weight on hook 500 g, profi
DM725-ND	1	Newtonmeter "inno" 20 N / 2000 g
P3120-5B	1	S-shaped assembly platform

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Purpose
To demonstrate the effect of a compound block and tackle consisting of four pulleys.

Preparation

Insert the 1000 mm support rod into the sliding saddle of the claw base; then 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 the bosshead at a height of 90 cm on the support rod; the support with hook is fixed to this bosshead.

Cut off a 230 cm piece of the cord and make loops at both ends of the cord; the remaining length after making the loops should be around 220 cm.

Mount one of the "block and tackle" - blocks on the hook of the support and hang one end of the cord into this hook.

Wind the cord around the pulleys as shown on the image to the right and hang the other end of the cord on 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).

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Experiment 1
Load one or more weights on the compound block and tackle.

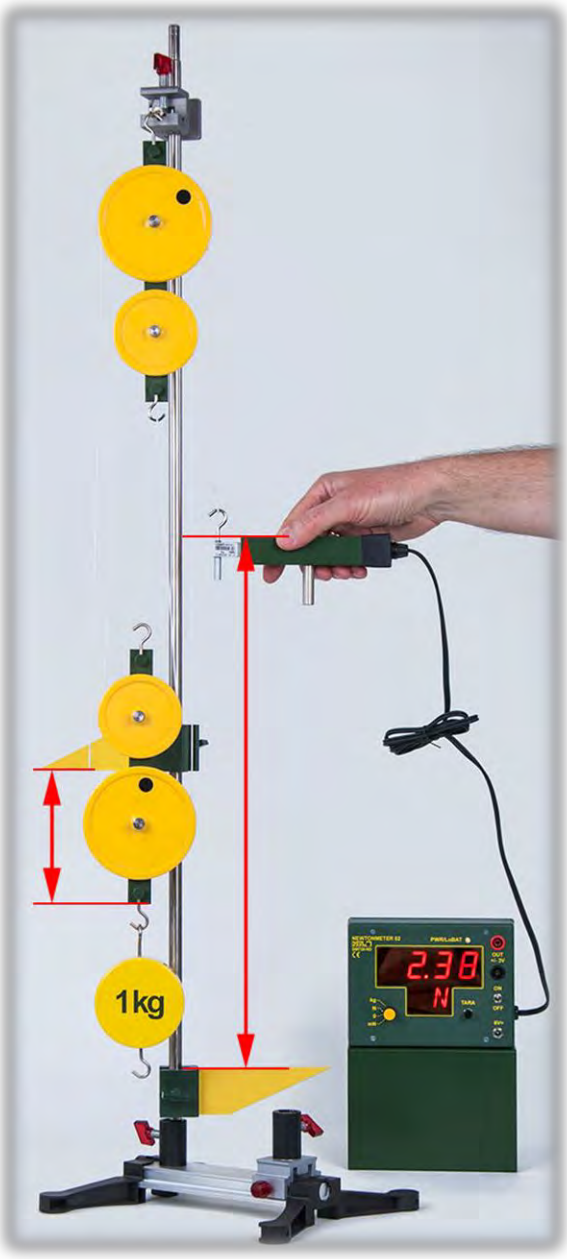
Result
Approximately only a quarter of the force of weight is required to hold the mass.

The friction of the pulleys causes a small loss of force, thus the force of weight will be a little less than a quarter of the total force of weight.

Experiment 2
Adjust the upper pointer so that it marks the bottom end of the pulley.

Remove the weighing bar from the sliding saddle and raise it by 50 cm approximately; thus the weight moves down.

Measure the two paths with a ruler or tape measure and compare them.



Result
For the compound block and tackle with 4 pulleys the following applies:

$$F \times s = \frac{F}{4} \times 4s$$

The mass is distributed on the 4 pulleys; only the corresponding fraction of the force has to be exerted by one pulley.

The change of direction of the force can also be observed.

Note
If it is not possible to tare the Newtonmeter with the mass on the hanging "block and tackle" - block this weight has to be added to the "hanging mass".

For reasons of space and stability the fixed and the loose pulleys are often placed next to each other as it can be seen in the experiment MED 11.05 Compound block and tackle (parallel).