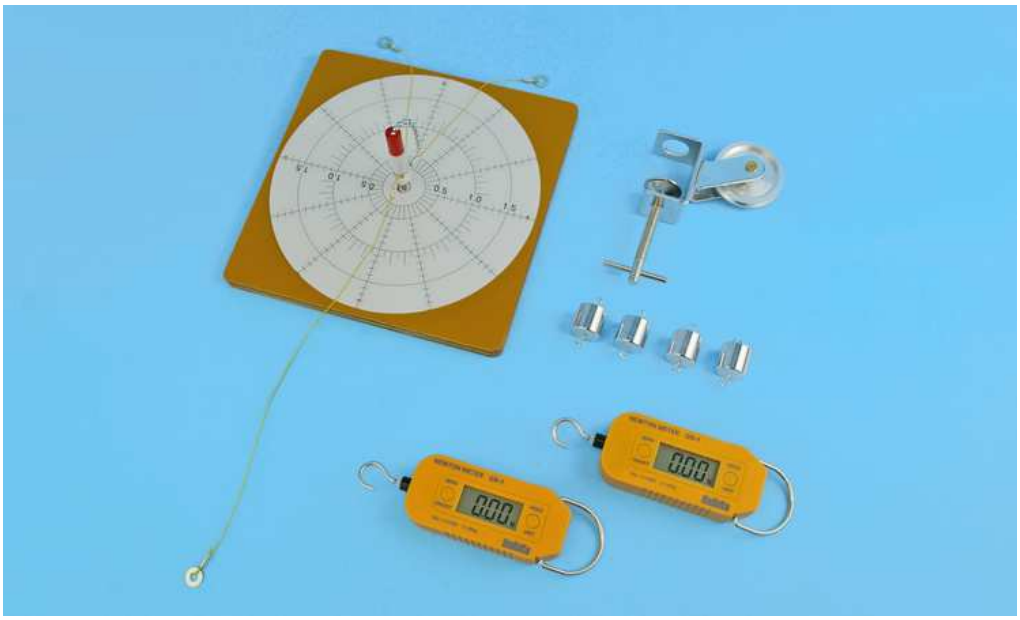
Force Board Set 52MS

Cat. No. C15-1374-W0



April.2022

Cautions

- Please read the instruction manuals of each equipment before the experiments.
- Check the condition of each item, especially, the battery condition of Newton meter, after a long time of storage.

Introduction

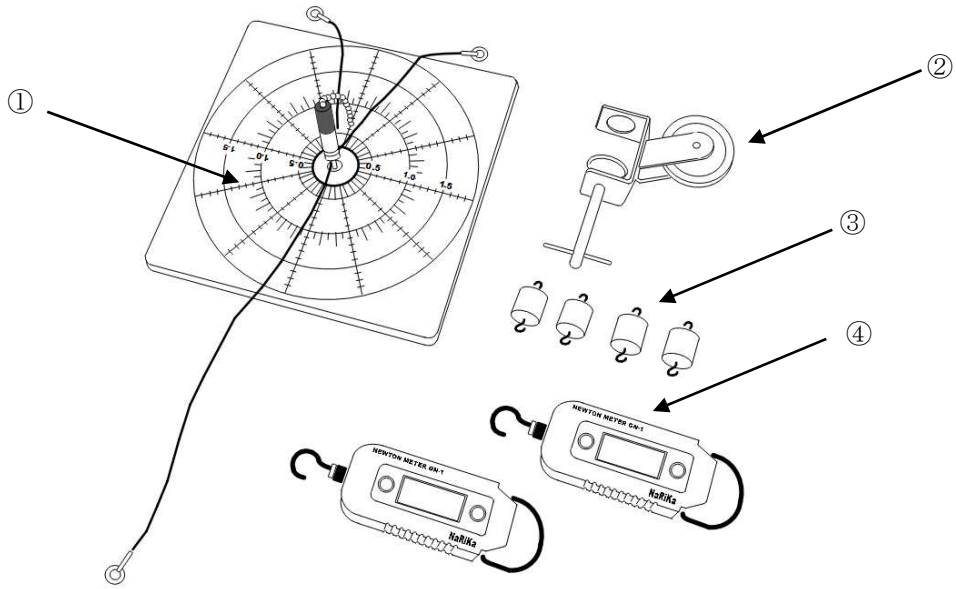
All-in-one set designed for students experiments of resultant and resolution of force. Easy set up as opposed to conventional table type demonstrator that requires complicated operation.

Easy to determine the direction of resultant force owing to the built-in indicator lock pin with a small chain on the tip developed to improve the usefulness over common product.

Achieved significant size reduction, weight saving and improvement in usability of the main body thanks to the simple design of the whole set.

Achieved direct and easier reading of the measured force value, as opposed to common newton spring scales, thanks to the hold (retain) function of the “Newton Meter (A05-4065)” included in the set as a digital force measurement equipment.

Contents

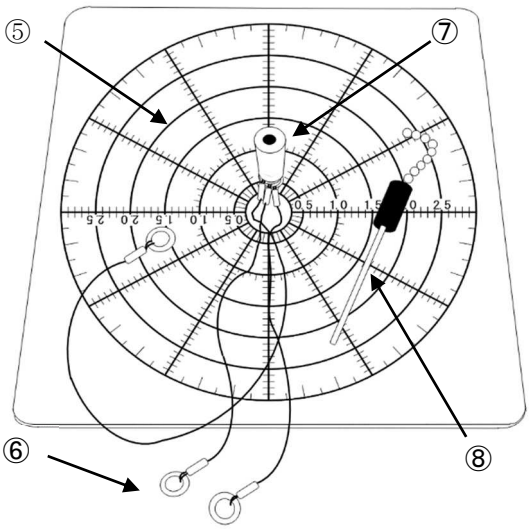


①Functional Force Board x 1 pc　②Bench Clamp Pulley x 1 pc

③Weight (50 g) x 4pcs　④Newton Meter GN-1 x 2 pcs

Description of each part

①Functional Force Board



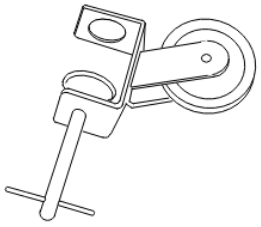
⑤Full circle (360-degree) protractor: Designed to easily/directly draw force vectors on its surface after converting certain forces measured by Newton Meters into each corresponding length, thanks to the printed guiding lines and its plastic material if using a white-board maker.

⑥String with a ring: Each of three strings is permanently connected with a built-in resilient spring bush (BRSB, see below section) at one end, while the other end has ring to hang weights or Newton Meter. Two of the strings have a length of 150 mm, while the other has a length of 300 mm. Use the shorter strings to hang the hook of Newton Meters, and use the longer one to hang weights through the pulley.

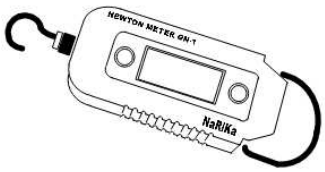
⑦Built-in resilient spring bush (BRSB): BRSB is a supporting mechanism with a resilient spring base on the board center. BRSB indicates the direction of the force acting on the string by tilting toward it. When two forces are applied to BRSB, it will indicate the direction of the resultant force generated by those two forces.

⑧Detachable indicator lock pin (with a small chain on the tip) (DILP): DILP will act as a small fixing rod when being fully inserted into the center of BRSB. When being not fully inserted to unfix the BRTA, the DILP will lean to a certain direction and indicate the direction of the force acting on the BRTA, the end of the small chain on the tip of the DILP will clearly/accurately point in a certain direction of the force acting on the BRITA on the protractor.

②Bench Clamp Pulley: Combination of a pulley and clamp easy to affix the board on lab bench up to 25 mm thickness. After securely affixing the board onto the lab bench, thread the longer string through the pulley to hang weight(s).



④Newton Meters GN-1: Digital force measurement equipment. Read the detailed instruction included in the package.



Example Experiments & Practices

1. Experiment of Equilibrium forces

1. What to prepare:

①Functional Force Board ②Bench Clamp Pulley

③Weight (50 g) x 1 pc ④Newton Meter GN-1 x 1 pc

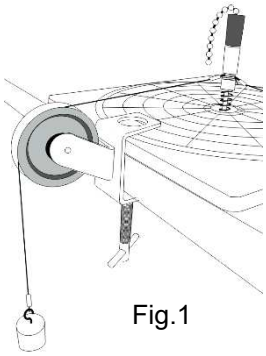


Fig.1

2. Experiment setting

1. Secure a functional force board onto the lab bench using with the bench clamp pulley and fully insert DILP into BRSB.

2. Thread the longer string through the pulley to hang a weight (50 g x 1 pc) from the ring of the string (see Fig.1).

3. Procedure

1. Pull DILP out a bit to unlock BRSB, a whole of DILP and BRSB leans in a certain direction and indicates the direction of the force acting on the BRSB. (see Fig.2).

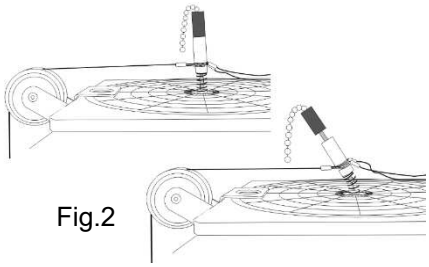


Fig.2

2. Select the “mass” measuring mode of Newton Meter and display "g" on the LCD screen. Hook the Newton Meter to the ring of one of the shorter strings (see Fig.3). Slowly pull the Newton Meter in the opposite direction to the weight until DILP is fully inserted into BRSB (see Fig.4, 5, and 6) and read the value displayed on the Newton Meter.

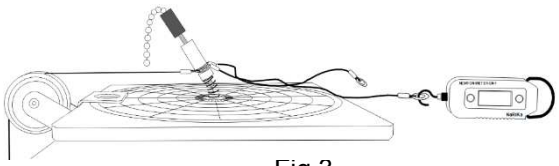


Fig.3

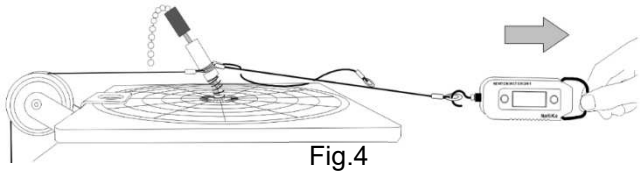


Fig.4

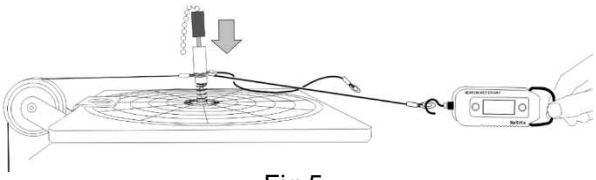


Fig.5

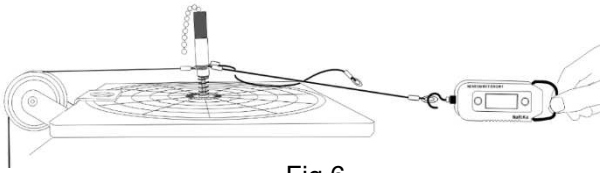


Fig.6

4. Description:

Students may intuitively and visually better understand what the balance of forces is, by a combination of measurement using Newton Meter and observation of DILP standing upright in between.

2. Experiment of resultant force

1. What to prepare:

①Functional Force Board ②Bench Clamp Pulley

③Weight(50 g) x 1 pc ④Newton Meter GN-1 x 2 pc

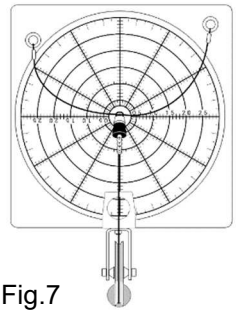


Fig.7

2. Experiment setting

1. Secure a functional force board onto the lab bench using the bench clamp pulley and fully insert DILP into BRSB.

2. Thread the longer string through the pulley to hang a weight (50 g x 1 pc) from the ring of the string (see Fig.1).

3. Procedure

1. Pull DILP out a bit to unlock BRSB (not fully pull out), a whole of DILP and BRSB leans in a certain direction and indicates the direction of the force acting on the BRSB. (see Fig.2 & 7).

2. Select the “mass” measuring mode of Newton Meter and display "g" on the LCD screen. Hook the Newton Meter to the ring of a string (see Fig.3).

3. Hook the Newton Meter to the ring of one of shorter strings (see Fig.3). Pull the Newton Meter perpendicular to the force that the weight applies to DILP and adjust your pulling power until the Newton Meter displays 50 g (see Fig.8).

4. Check where the “small chain on the tip” of DILP points on the protractor (Functional Force Board) when the Newton Meter displays 50 g. It makes an angle of roughly 45 degrees to the force the weight applies to DILP (Force A) and the one the Newton Meter (NM-1) applies to DILP (Force B), which is the resultant force of Force A and B (see Fig.8).

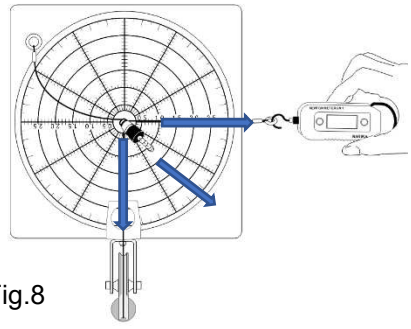


Fig.8

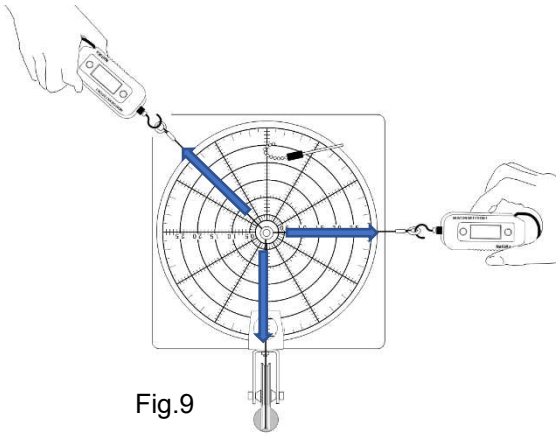


Fig.9

5. Add another Newton Meter (NM-2) and hook it to the ring of remaining string. Reset DILP not fully inserted to unfix the BRSB. Keep the NM-1 still and try to find the appropriate angle and pulling force NM-2 indicates to bring DILP upright again (Fig.9).

4. Description

You may find the value to be displayed on NM-1 be “55 g” and that on NM-2 be “75 g”. You may know that resultant force of Force A (force the 50 g weight applies to DILP) and Force B is indicated at the angle of 45 degrees to each of Force A and B with the magnitude of around “70 g”, which is close to the theoretical value.