

# PHYSICS DISCOVERY

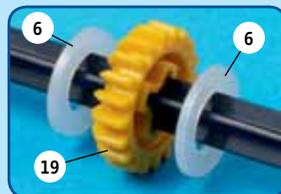


**WARNING** — Science Education Set. This set contains chemicals and/or parts that may be harmful if misused. Read cautions on individual containers and in manual carefully. Not to be used by children except under adult supervision.

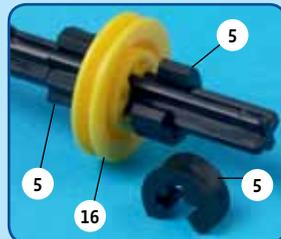
## Checklist: Find – Inspect – Check off

✓	No.	Name	Qty.	Item No.
<input type="checkbox"/>	1	Anchor pin	15	702527
<input type="checkbox"/>	2	Joint pin	3	702524
<input type="checkbox"/>	3	Shaft plug	10	702525
<input type="checkbox"/>	4	Shaft pin	1	702526
<input type="checkbox"/>	5	Axle lock	5	702813
<input type="checkbox"/>	6	Washer	6	703242
<input type="checkbox"/>	7	Large frame	2	703239
<input type="checkbox"/>	8	Small frame	2	703232
<input type="checkbox"/>	9	Long rod	4	703235
<input type="checkbox"/>	10	Short rod	2	703233
<input type="checkbox"/>	11	Long axle	2	703234
<input type="checkbox"/>	12	Medium axle	6	703238
<input type="checkbox"/>	13	Short axle	3	703236
<input type="checkbox"/>	14	Large pulley wheel	2	702516
<input type="checkbox"/>	15	Medium pulley wheel	2	702518
<input type="checkbox"/>	16	Small pulley wheel	5	702519
<input type="checkbox"/>	17	Large gear wheel	3	702506
<input type="checkbox"/>	18	Medium gear wheel	2	702505
<input type="checkbox"/>	19	Small gear wheel	4	702504
<input type="checkbox"/>	20	Base plate	1	703237
<input type="checkbox"/>	21	Crankpin	1	702599
<input type="checkbox"/>	22	Connection bridge	2	703231
<input type="checkbox"/>	23	Shovel blade	8	703240
<input type="checkbox"/>	24	Rubber band (long)	1	703241
<input type="checkbox"/>	25	Wooden ball	8	703243
<input type="checkbox"/>	26	Cord (white)	1	703244
<input type="checkbox"/>	27	Elastic cord	1	703245
<input type="checkbox"/>	28	Wheels with tires	2	703230
<input type="checkbox"/>	29	Tire rings for medium pulley wheel	2	703251
<input type="checkbox"/>	30	Tire rings for small pulley wheel	2	703250
<input type="checkbox"/>	31	Anchor pin lever	1	702590
<input type="checkbox"/>	32	Die-cut cardboard sheet	1	703365
<input type="checkbox"/>	33	“Sail” cutout sheet	1	710983

If you are missing any parts, please contact Thames & Kosmos customer service.



Washers (6) and gear wheel (19)



Axle lock (5) and small pulley wheel (16)



### Additional things you will need:

*Tape, glue, scissors, ruler, paper clips, measuring tape, pen, paper, letter, hole punch, heavy book, empty plastic bottle (16-ounce, or half-liter), pitcher, water, hair dryer*

Any materials not contained in the kit are marked in *italic script* in the “You will need” boxes.

## Gravitational Force and Gravity

Pages 5 to 11

Why you stay on the ground



## Gears and Rotational Forces

Pages 30 to 40

How pedals get your bicycle going



## Kinetic Energy

Pages 41 to 48

Racing your turbo-dragster



## Force Measurements & Work

Pages 12 to 29

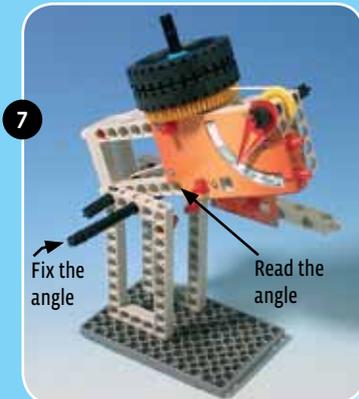
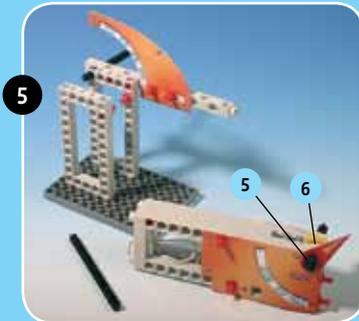
How to lift loads without effort



## CHECK IT OUT

You will find supplemental information on pages 11, 27 to 29, 38 to 40, and 48.

## Measuring force on an inclined plane



### HERE'S HOW IT CONTINUES

7. First, set the plane in a horizontal position. Now you'll be adding the load: the large gear plus two wheels with tires. Clamp the cord between the wheels and the gear. Pull it far enough through that the load is positioned directly in front of the pulley.

Set the pointer to "0."

Raise up the plane and fix it in this position with the axle.

*What does the pointer indicate now?*

You can read the angle setting by looking through the hole in the frame.

*What do you notice when you adjust the angle to a steeper or flatter position?*

*What happens when you push the weights suspended from the cord further toward the back?*

**→ WHAT'S HAPPENING?**

The downhill force increases as the angle increases.



## TRANSMISSION OF FORCE

A force can be transferred between different components inside a machine. Mechanical parts such as pulleys and wheels are used for that.

The transfer of forces and movements during rotation is called “transmission,” and it involves one drive wheel that is larger than the one being driven, or powered. That is the way it works in a bicycle: a large gear drives the smaller one at the rear wheel when you push on the pedal.

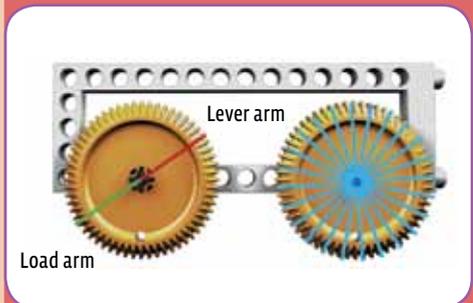
In this case, the route through which the force is transmitted is a circle, and the outer edges of the interconnected gears cover the same amount of distance. To cover that distance, the smaller one has to complete more rotations than the larger one.



## Transmissions and gears

The wheel has been in existence for about 6,000 years. Its discovery was a technological breakthrough, and even today it can be found in half of all modern machines. Of course, a mere wheel disk is no machine by itself. It only becomes one when there is an axle to serve as a point of rotation in its center, such as in the wheel of a cart.

A wheel consists of an infinite number of single-armed levers “taking turns” one after another as the wheel rotates.



A wheel is just a lot of levers that are all turning around the same axis.