EXPERIMENT MANUAL

REMOTE-CONTROL MACHINES

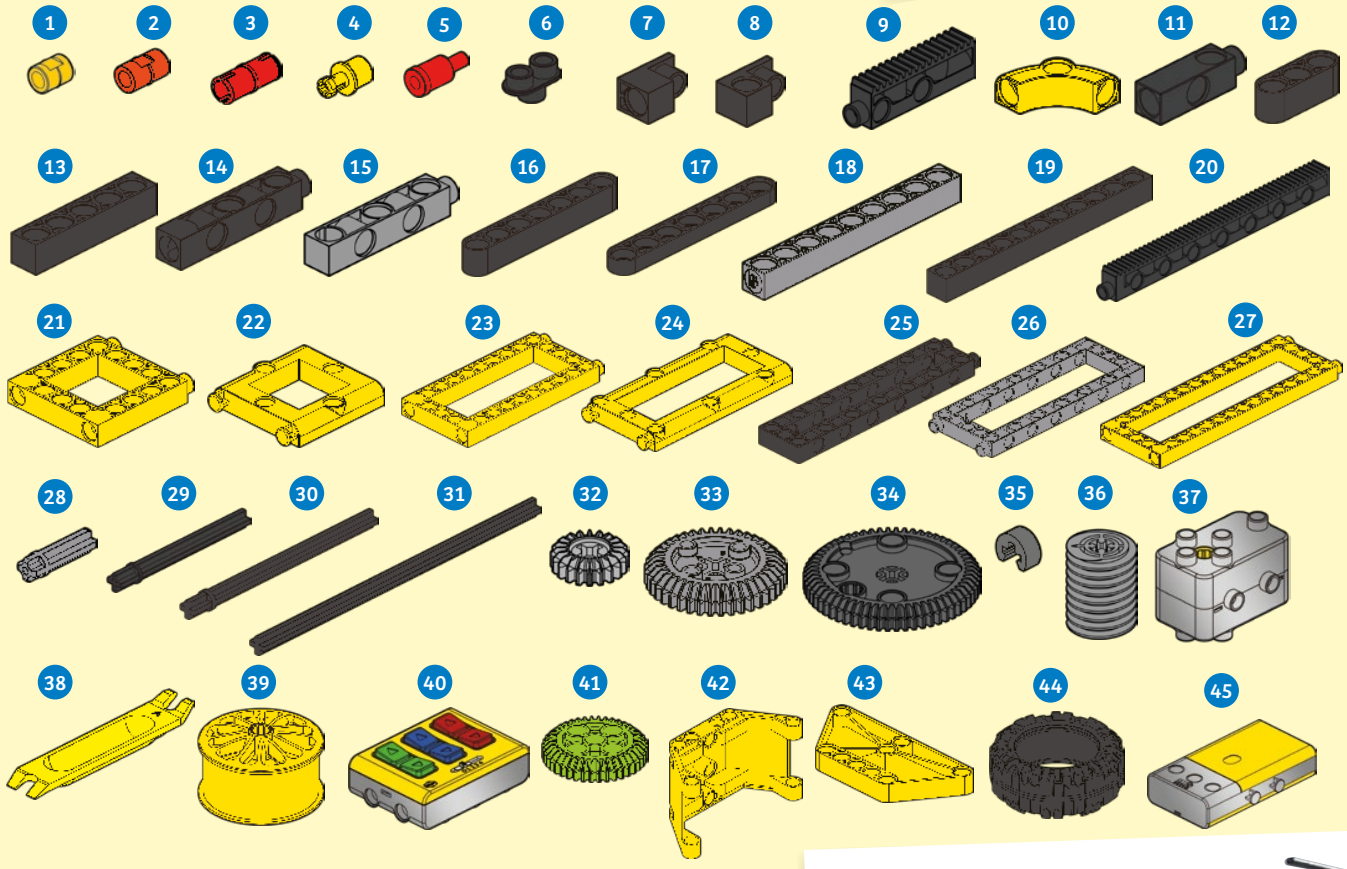
CONSTRUCTION VEHICLES

THAMES & KOSMOS

Franckh-Kosmos Verlags-GmbH & Co. KG, Pfizerstr. 5-7, 70184 Stuttgart, Germany | +49 (0) 711 2191-0 | www.kosmos.de
Thames & Kosmos, 301 Friendship St., Providence, RI, 02903, USA | 1-800-587-2872 | www.thamesandkosmos.com
Thames & Kosmos UK Ltd, Goudhurst, Kent, TN17 2QZ, United Kingdom | 01580 212000 | www.thamesandkosmos.co.uk

GOOD TO KNOW! If you are missing any parts, please contact Thames & Kosmos customer service.
US: techsupport@thamesandkosmos.com
UK: techsupport@thamesandkosmos.co.uk

What's inside your experiment kit:



You will also need:
2 x AAA batteries (1.5-volt, type AAA/LR03) and
3 x AA batteries (1.5-volt, type AA/LR6)

Checklist: Find – Inspect – Check off

✔	No.	Description	Qty.	Item No.
❍	1	Short anchor pin (yellow)	34	7344-W10-C2Y
❍	2	Anchor pin (orange)	18	7061-W10-C1O
❍	3	Joint pin	16	1156-W10-A1R
❍	4	Shaft plug	2	7026-W10-H1Y
❍	5	Shaft pin	5	7026-W10-J3R
❍	6	Two-to-one converter	12	7061-W10-G1D
❍	7	90-degree converter Y, black	4	7061-W10-J2D
❍	8	90-degree converter X, black	4	7061-W10-J1D
❍	9	Short rack gear	1	7061-W10-T1D
❍	10	Rounded curved rod	4	3941-W10-C1Y
❍	11	3-hole dual rod, black	8	7061-W10-R1D
❍	12	3-hole wide rounded rod, black	8	7404-W10-C1D
❍	13	5-hole rod, black	5	7413-W10-K2D
❍	14	5-hole dual rod C, black	4	7026-W10-S3D
❍	15	5-hole dual rod B, gray	4	7026-W10-S2S1
❍	16	7-hole wide rounded rod, black	8	7404-W10-C2D
❍	17	7-hole flat rounded rod, black	8	7404-W10-C3D
❍	18	9-hole rod	4	7407-W10-C1S
❍	19	11-hole rod	6	7413-W10-P1D
❍	20	Long rack gear	1	7061-W10-T2D
❍	21	Square frame	6	7413-W10-Q1Y
❍	22	Rounded square frame	2	3941-W10-B1Y

✔	No.	Description	Qty.	Item No.
❍	23	Short frame	2	7413-W10-I1Y
❍	24	Rounded short frame	2	3941-W10-A1Y
❍	25	3x13 dual frame	2	7406-W10-A1D
❍	26	5x13 dual frame	3	7061-W10-U1S1
❍	27	5x15 frame	2	7413-W10-J1Y
❍	28	Motor shaft (27-mm axle)	3	7026-W10-L1S1
❍	29	70-mm axle	7	7061-W10-Q1D
❍	30	100-mm axle	1	7413-W10-L2D
❍	31	150-mm axle	1	7026-W10-P1D
❍	32	Small gear, gray	8	7026-W10-D2S
❍	33	Medium gear, gray	6	7346-W10-C1S
❍	34	Large gear, gray	1	7026-W10-W5S
❍	35	Axle lock	1	3620-W10-A1D
❍	36	Worm gear	2	7344-W10-A1S1
❍	37	Motor (40x motor)	3	7400-W85-A
❍	38	Anchor pin lever	1	7061-W10-B1Y
❍	39	Wheel	4	7407-W10-B1Y
❍	40	4-channel IR remote control unit	1	7337-W85-A2-US
❍	41	Medium gear, green	1	7408-W10-D1G
❍	42	Trapezoidal cover	5	7408-W10-B1Y
❍	43	Trapezoidal plate	2	7408-W10-A1Y
❍	44	Tire	4	7408-W10-C1D
❍	45	4-channel IR battery box	1	7408-W85-A-US

››› TABLE OF CONTENTS

TIP!
You will find additional information in the "Check it out" sections on pages 14, 32, 38, 47.

TIP!
Above each set of assembly instructions, you will find a red bar:

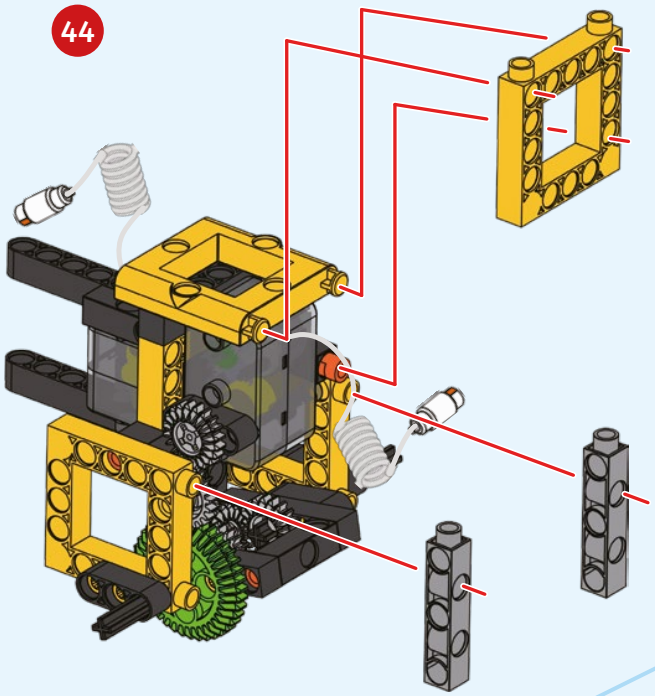
››› It shows you the difficulty level for the model's assembly:

Two Bonus Models!

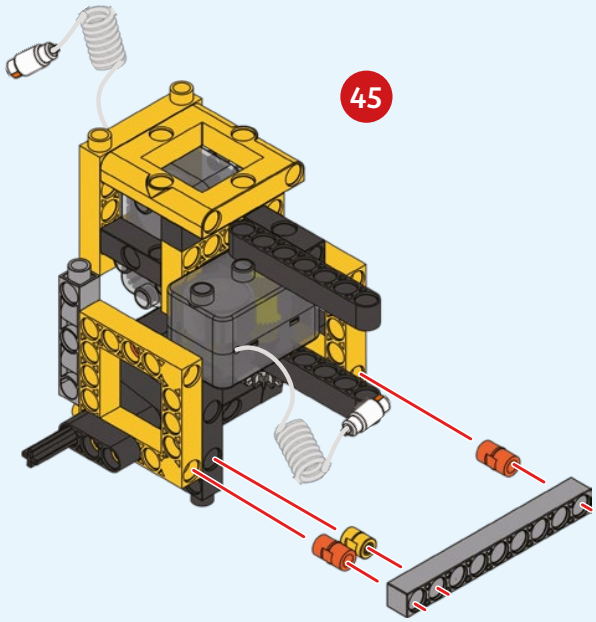
Download the assembly steps for two additional models, a reach forklift and a wheel tractor-scraper, at:

http://thamesandkosmos.com/downloads/rcmcv.pdf

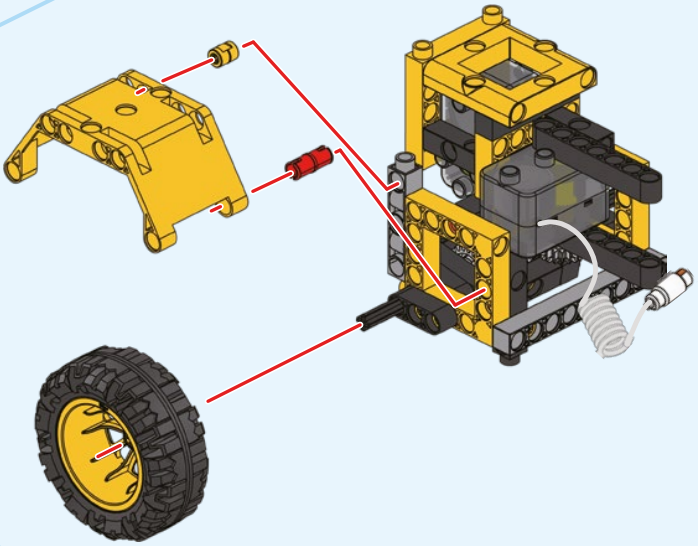
44



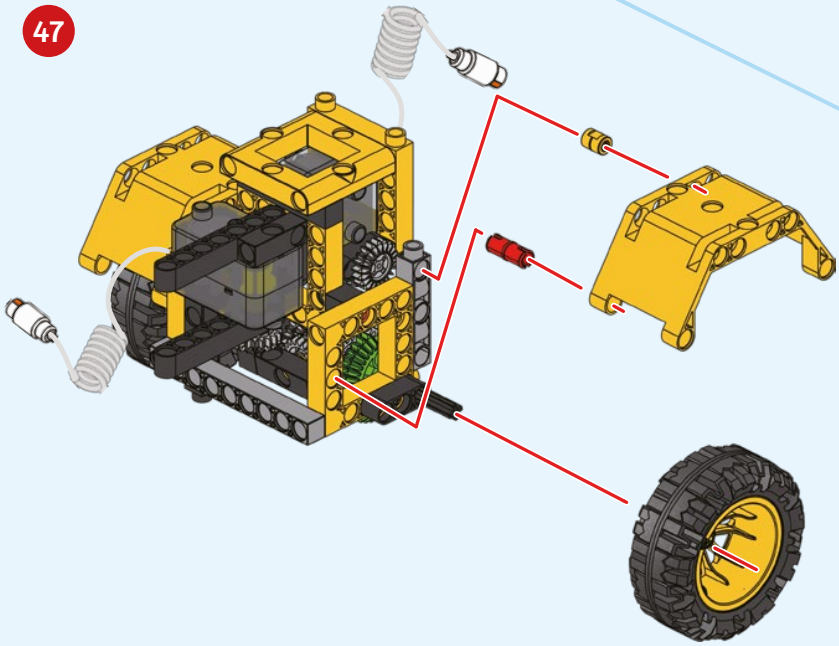
45



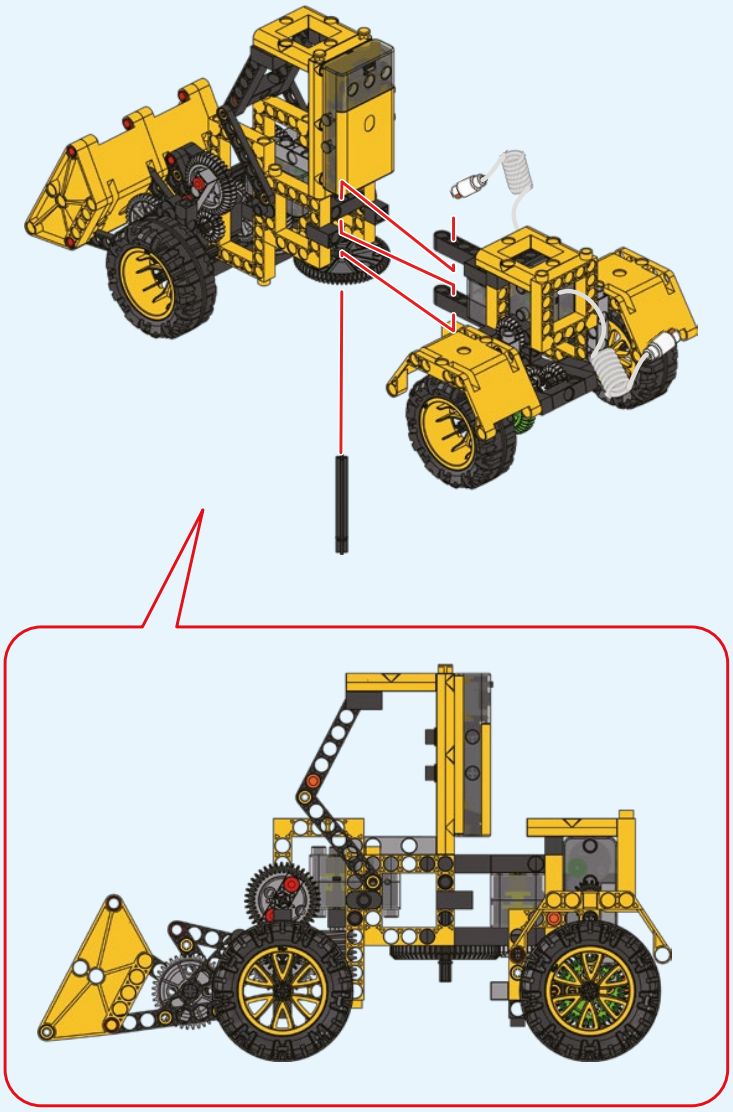
46



47



48



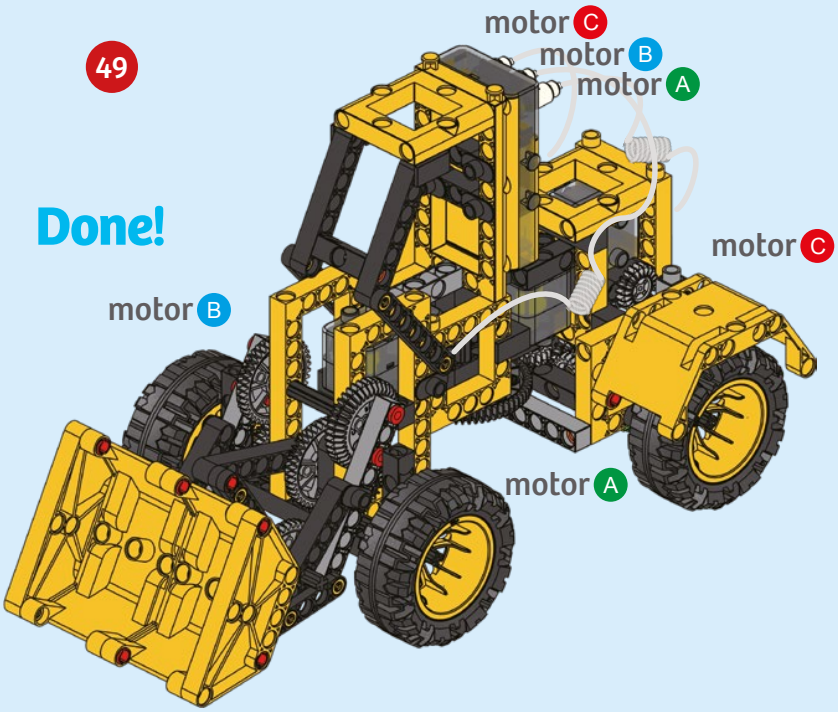
EXPERIMENT 1

Can you move it?

HERE'S HOW

Find various materials such as small toy blocks, small rocks, crumpled up pieces of paper, or foam packing peanuts. Lay the materials around a room. Then drive the bulldozer around and try to collect the materials. Can you pick up some items and not others?

49



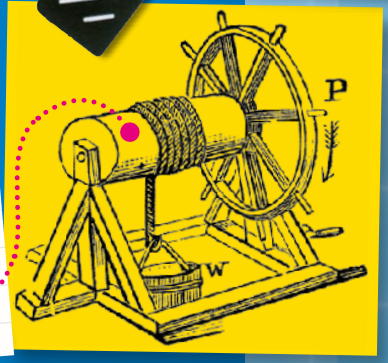
CHECK IT OUT

Simple Machines

Construction vehicles are complex machines. To analyze and better understand them, you can break them down into combinations of many **simple machines** that all work together.

WHAT IS A SIMPLE MACHINE?

A simple machine is a mechanical device that changes the direction or magnitude of a force. A **force** is simply a push or a pull. A simple machine takes one input force and produces an output force, which is used to do work. For example, when the **wheel** in the diagram is turned the **bucket** is raised. This is an example of a simple machine called a **wheel and axle.**



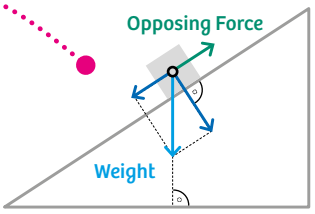
There are six classical simple machines as originally defined by Renaissance scientists: **the lever, the wheel and axle, the pulley, the inclined plane, the wedge, and the screw.** On the Check It Out pages, there are examples of simple machines that can be found in construction vehicles. Can you find more examples in the models you build?

MECHANICAL ADVANTAGE

The efficiency with which a simple machine amplifies a force is measured through its **mechanical advantage.** Mechanical advantage is the ratio of the input force to the output force. The mechanical advantage of a complex machine can be found by multiplying the mechanical advantages of the simple machines that make up the complex machine.

THE INCLINED PLANE

Another example of a simple machine is an **inclined plane** or ramp. An inclined plane is a flat surface with one end that is higher than the other. Moving an object up an inclined plane requires less force than lifting the object up vertically. However, the object has to be moved over a longer distance. In simple machines, there is often a trade-off between force and distance. Inclined planes are used at construction sites to make it easier to move materials around.



THE WEDGE: A BULLDOZER'S BLADE

A bulldozer is equipped with a large metal plate on its front, known as a **blade.** It is used to move large quantities of dirt or rocks. The blade is an example of a **wedge,** another type of simple machine that works like a portable inclined plane.

There are different types of bulldozer blades. The straight blade **("S blade")** is very shallow and is used for fine grading. A universal blade **("U blade")** is tall and very curved so that it can carry more material. There are also blades that have a combination of the properties of U and S blades **("SU blades").**