Screw

Student Worksheet

LEGO education
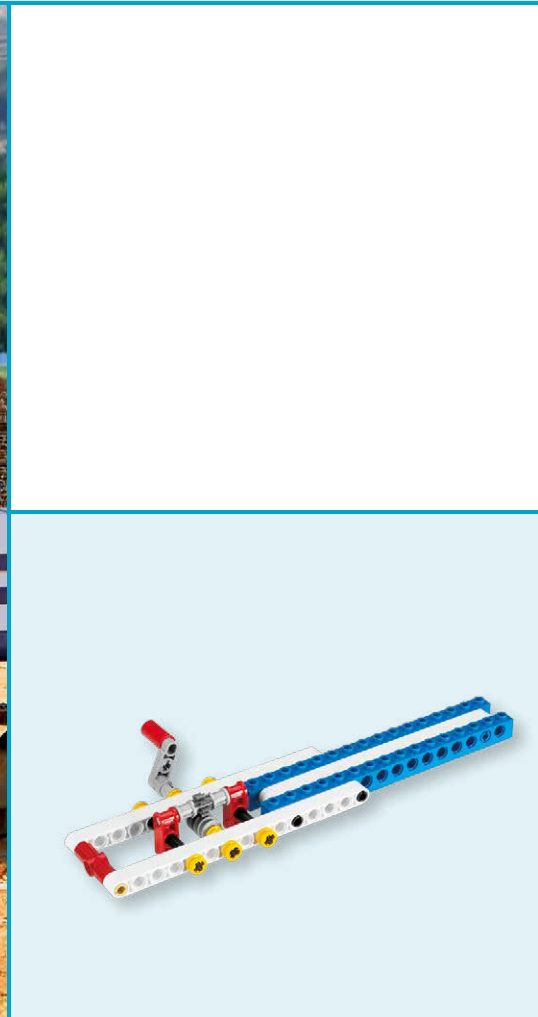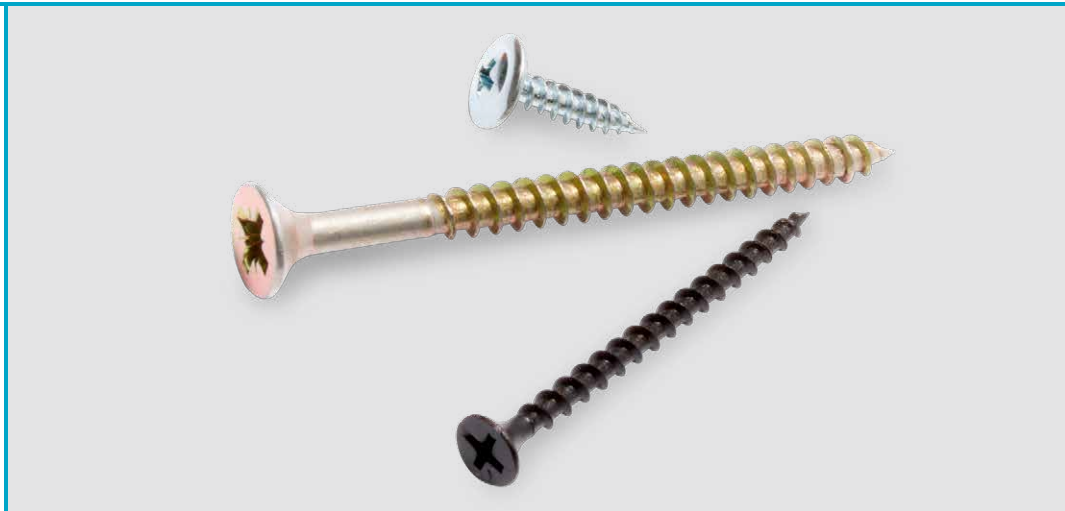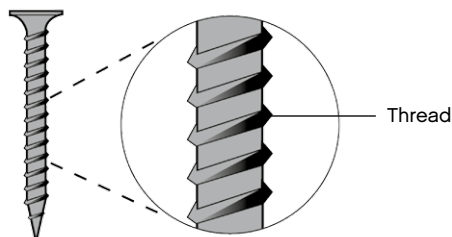
Simple Machines: Screw

A screw is a modification of an inclined plane. The threads of a screw are like an inclined plane wrapped around a cylinder. The width of the treads are like the angle of an inclined plane.

Thread

The finer the pitch of the screw, the more turns are required, but the less effort is needed to drive the screw in. The load is the friction and other forces exerted by the wood on the screw.

When a screw is screwed into a piece of wood, it is like rotating the long inclined plane through the load. The effort of a turning screwdriver is converted into a vertical effort that screws the screw into an object. How far the screw is able to move in one complete revolution is determined by the pitch of the screw.

The pitch is the number of threads per cm of screw. If a screw has 8 threads in a cm the screw has a pitch of 1/8. A screw with a pitch of 1/8 will in one complete revolution move a distance of 1/8 of a cm into an object.

Common examples of screws are cork screws and drills.

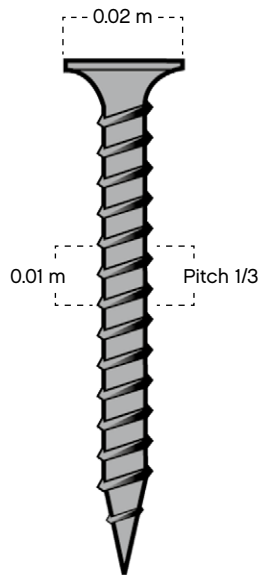# The Mechanical Advantage of a Screw

The mechanical advantage of using a screw involves the spreading of the effort over a longer distance thereby allowing heavy loads to be overcome with a smaller amount of effort.

The mechanical advantage can be calculated using the following formula:

$$\text{Mechanical advantage} = \frac{\text{Distance effort moves}}{\text{Distance load moves}} = \frac{2\pi r}{\text{Pitch}}$$

- - - 0.02 m - - -

0.01 m   Pitch 1/3

$$\text{Mechanical advantage} = \frac{2 \times \pi \times 0.02}{0.03}$$

$$\text{Mechanical advantage} = \text{approx. 4}$$

This means if you can twist your screwdriver with a force of 1N you can generate a force of 4N.

F1

Build F1 book II, pages 26 to 32

Turn the handle and explain what happens to the speed and the direction.

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