



84 pieces • Ages 8+

MOVING CREATIONS

9 Different Builds 18 STEM Experiments

with **k'nex**

ENGINEERING
THROUGH
PLAY

POWERED
WITH AIR
& WATER

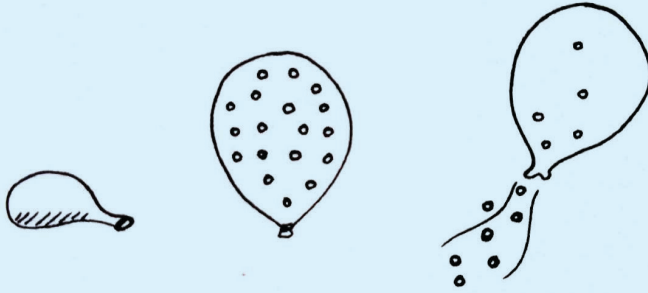
⚠ **WARNING:**
CHOKING HAZARD - Small parts.
Not for children under 3 years.

⚠ **WARNING:**
Do not aim objects at eyes or face.
Do not use objects other than those
supplied by or suggested by manufacturer.

WHAT IS PNEUMATICS?

When pressure is put upon air, big things will happen! Jackhammers can bust up pavement. Bicycle tires get filled. Rockets get shot into space. The science of **pneumatics** explains how air and other gases provide power.

Gases are compressible. You can squish them. Take a regular balloon. Let's say you inflate it all the way and then just let go of it. What is it going to do? Fly across the room!



As you blow up a balloon, you are adding more and more air molecules. These air molecules are constantly flying around and bouncing off each other. This causes pressure to build up in the balloon. When you let go of the balloon, all of the air molecules fly out. This releases the pressure in the balloon and propels it across the room.

Jet engines are propelled just like balloons! Air pressure gets released from the engine and this pushes the jet forward.

Bigger and faster pneumatic machines, like jackhammers, have motorized compressors inside them. A compressor is the device that squeezes air into smaller spaces — like a tank. With simpler machines like bicycle pumps, a person's hand compresses the air inside its tubes. Once filled with compressed air, our everyday machines are ready to go!



Jackhammer



Tank

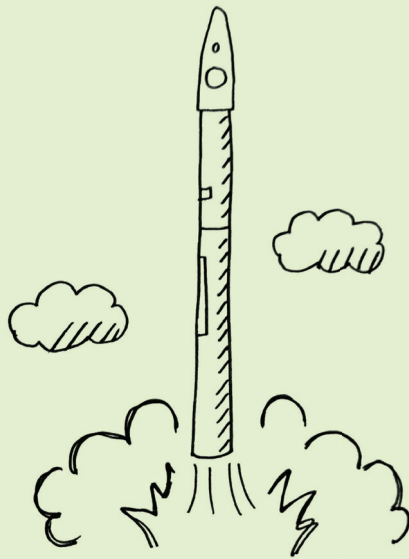


Bicycle Pump

IMAGINE!

YOU ARE ON A MISSION TO MARS...

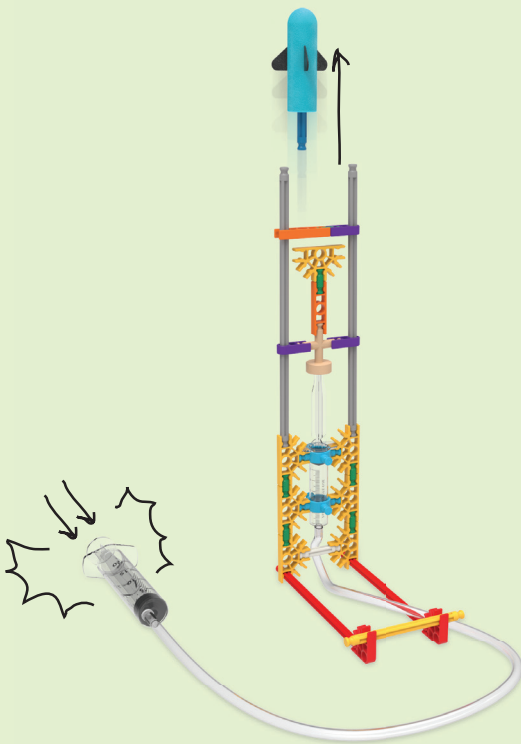
You're a top scientist inside NASA Mission Control. Humankind is about to make history. Your astronaut crew is boarding the spacecraft. The launch pad is ready. You've got seconds to lift-off. 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 ... Let's go!



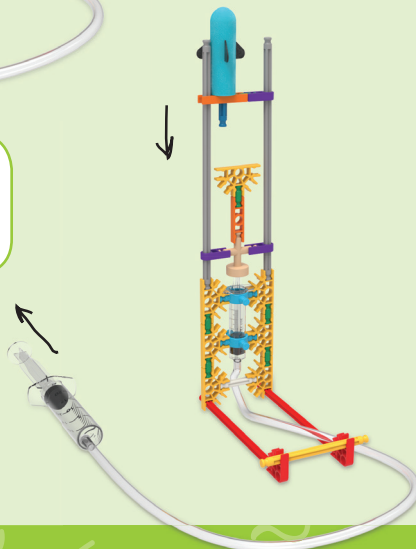
BLAST OFF!

Smack the end of the 20mL pump hard. If your rocket doesn't go far, hit the pump even harder. Watch the rocket fly!

To launch your rocket again, lower the launch pad and put the rocket back in place. Then, pull out the 20mL pump to build air pressure in the tube. On your mark, get set, launch!




Do not aim rocket at eyes or face.



THINK BIGGER!

ARE YOU FLIGHT READY?

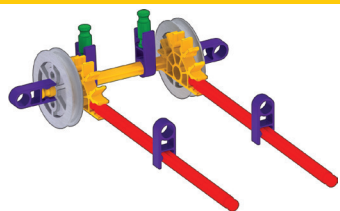
Attach more K'NEX® pieces to your rocket. How does it fly now? How does weight affect its lift? How much weight can you add and still make it fly?

Sketch of rocket	Weight of rocket	Height of launch
		

According to Newton's Second Law of Motion, it is easier to push an object with a smaller mass than a larger one. It will accelerate faster.

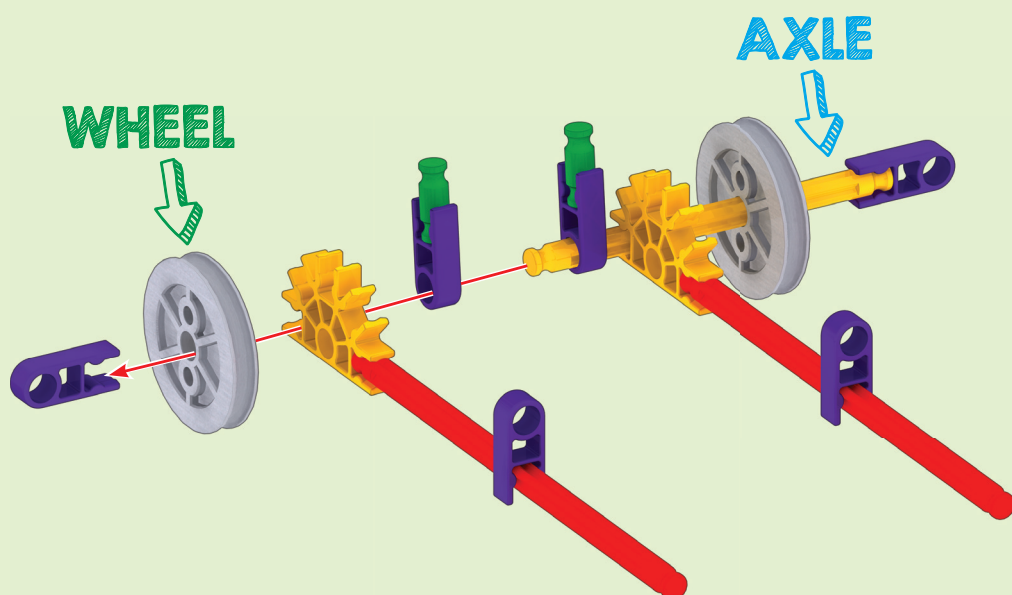
BUILD THE TRUCK

STEP 1



GATHER THESE PIECES:

- 2 6 2 2
- 2
- 1

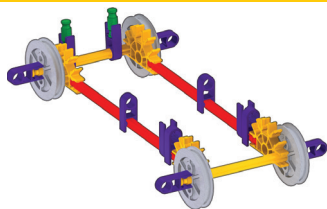


A SIMPLE MACHINE

A dump truck's wheel and axle is a kind of simple machine. Its rolling motion helps the truck move heavy loads.

STEP **1** 2 3 4 5 6

STEP 2



GATHER THESE PIECES:

6



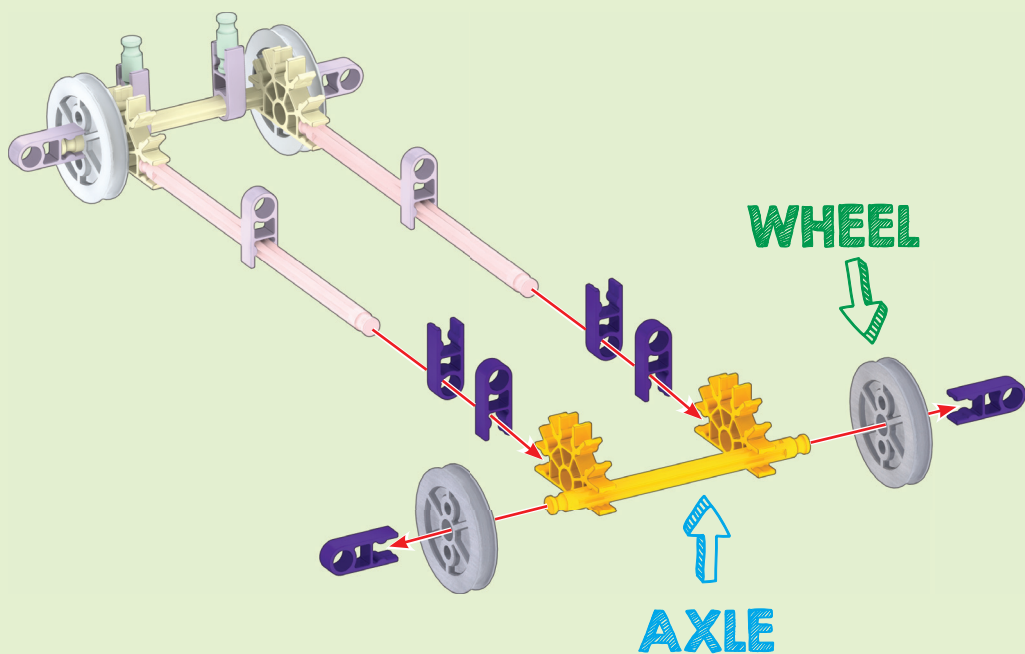
2



2



1



The world's biggest dump truck is as long as two double-decker buses. And it weighs more than an airplane!

STEP 1 2 3 4 5 6