

Section 2

Understanding Structures and Mechanisms

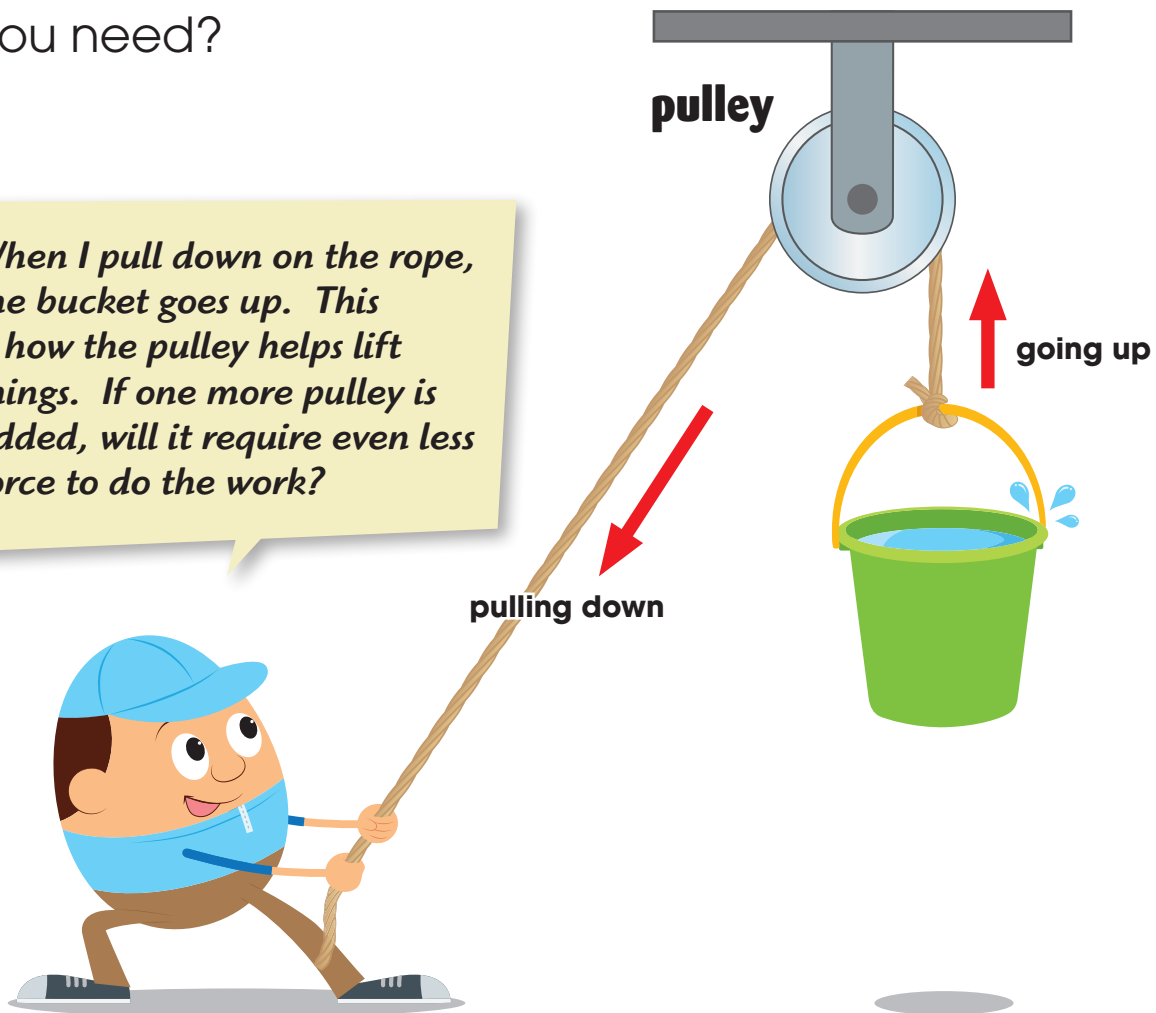
EXPLORATION 1

Lift with pulleys!

Investigate how lifting can be made easier with pulleys.

As you have learned, pulleys are one of the simple machines that can make our work easier. We can find many uses of pulleys in our daily lives. From our window blinds at home to cranes on construction sites, pulleys are often used to make lifting easier. If there is more than one pulley in a machine, does it mean that less force is needed to lift a load than with a single pulley? Is it true that the more pulleys you use, the less force you need?

When I pull down on the rope, the bucket goes up. This is how the pulley helps lift things. If one more pulley is added, will it require even less force to do the work?



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EXPLORATION 1

Lift with pulleys!

Try this experiment to see if multiple pulleys can reduce the amount of force needed.

Materials:

- string
- a jug filled with 1 L of water
- a broom

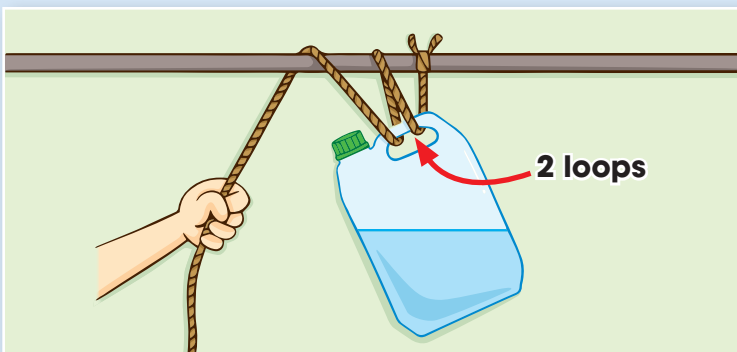
Trial 1: looping the jug once with the string



Set the broom between two chairs. Place the jug between the chairs.

Tie one end of the string to the broom. Bring the other end of the string through the handle. Then loop it over the broom once. Pull the string to lift the jug.

Trial 2: looping the jug twice with string



Make the same setup as Trial 1, but this time loop the string through the jug's handle twice. Then pull the string to lift the jug.

Was it easier to lift the jug with two loops or with one loop?

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EXPLORATION 1

Lift with pulleys!

Explanation:

Did you notice that it was much easier to lift the jug with two loops of the string looped through the handle? This is because the loops acted as two pulleys which worked together to help you raise the jug. Since the weight of the jug was shared between the loops of the string, the jug was further supported by the extra loop. Therefore, you were required to support only half of the jug's weight, meaning that you needed to use just half of the effort to raise the jug.

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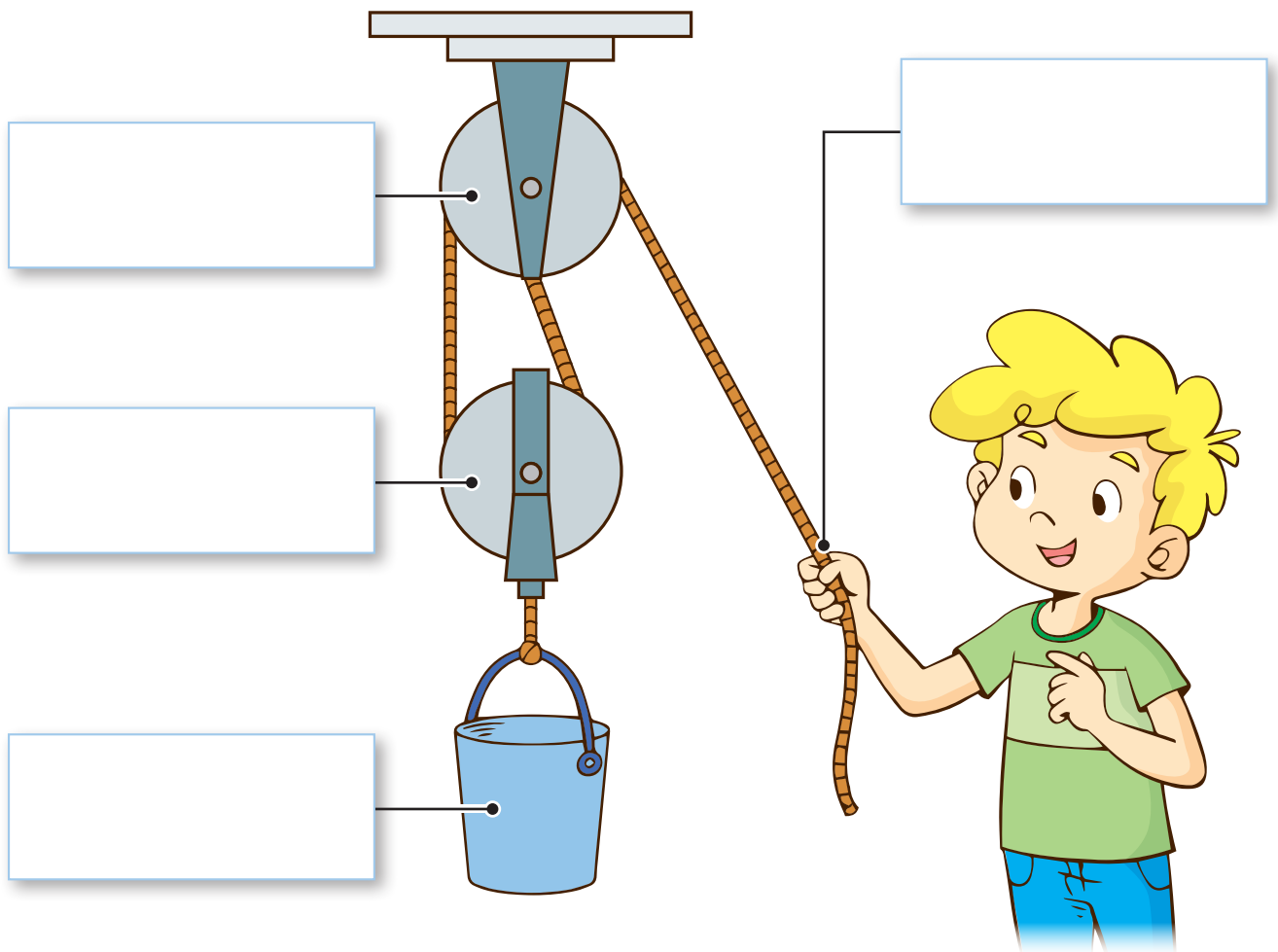
Understanding Structures and Mechanisms

EXPLORATION
1

Lift with pulleys!

Label the diagram with the given words. Then fill in the blank.

load effort movable pulley fixed pulley



When the number of pulleys increases, the effort needed

_____ .
increases/decreases