

5.2 Friction

READ

Just about every move we make involves friction of some sort. This skill sheet will provide you with the opportunity to practice identifying the friction force(s) involved in real-world situations.

EXAMPLE

Marco and his dad are unloading cinder blocks from the back of their pickup truck. They need to haul the blocks across the grass to their backyard, where they are going to make a sandbox for Marco's younger sister. Marco would like to haul a bunch of blocks at once. In the garage, he finds a plastic sled and his sister's red wagon.

- Which type of friction would resist Marco's motion if he pulled the blocks in the sled?

Solution: Sliding friction.

PRACTICE

1. Answer these additional questions about Marco's sandbox building project.
 - a. Which type of friction would resist Marco's motion if he pulled the blocks in the wagon?
 - b. Do you think it would take more force to transport five blocks in the sled or in the wagon? Why?
 - c. Would the friction force increase, decrease, or stay the same if Marco added two more blocks to the sled or wagon? Explain your answer.
 - d. Marco tries piling twelve cinder blocks into the wagon. He pulls and pulls but the wagon doesn't move. What type of force is resisting motion now?
2. Brianna is rowing a small boat across a pond. The air is calm; there is no wind blowing.
 - a. What type of friction is resisting her motion?
 - b. If two friends join her in the boat, will the friction force change? Why or why not?
3. A freight train speeds along the railroad tracks at 150 km/hr.
 - a. Name two types of friction resisting this motion.
 - b. If this train were replaced with a mag-lev train, which type of friction would be eliminated?
4. **Research:** Some sports cars are designed with rear spoiler to make the car more stable when turning, accelerating, and braking.
 - a. Use the Internet or your local library to find an illustration of a spoiler to share with your class.
 - b. Does the spoiler increase or decrease friction between the rear tires and the road?
 - c. Some small hybrid cars and sport utility vehicles also have spoilers. What is their purpose? Is it the same or different from the spoiler on a sports car?

Skill Sheet 5.2: Friction

1. Answers are:
 - a. rolling friction
 - b. Sliding friction is generally greater than rolling friction, so it would probably take more force to transport the blocks in the sled.
 - c. The friction force would increase, because more blocks would mean more weight force squeezing the two surfaces together.
 - d. static friction
2. Answers are:
 - a. viscous friction
 - b. The friction force would increase because the boat would sit lower in the water.
3. Answers are:
 - a. rolling friction and air friction
 - b. rolling friction
4. Answers are:
 - a. Student responses will vary. Encourage students to look for a sports car rather than a professional racing car. Racing car spoilers may serve a different purpose.
 - b. Sports car spoilers are generally designed to increase downforce on the rear of the car, causing greater friction between the rear tires and the road.
 - c. Spoilers on hybrid cars and sport utility vehicles are usually designed to create a smoother, less turbulent airflow over the rear of the vehicle. This reduces drag (air friction). Sports car spoilers are most often designed to increase rolling friction, not to decrease air friction. Spoilers on different types of cars serve different purposes.