

## Chapter 14 Work, Power, and Machines

**Section 14.2 Work and Machines****(pages 417–420)**

*This section describes how machines change forces to make work easier to do. It identifies input forces exerted on and output forces exerted by machines and discusses input work and output work.*

**Reading Strategy (page 417)**

**Summarizing** As you read, complete the table for each machine. After you read, write a sentence summarizing the idea that your table illustrates. For more information on this Reading Strategy, see the **Reading and Study Skills** in the **Skills and Reference Handbook** at the end of your textbook.

| Machine   | Increases or Decreases Input Force | Increases or Decreases Input Distance |
|---|------------------------------------|---------------------------------------|
| Tire jack   | Decreases                          | Increases                             |
| Lug wrench  | Decreases                          | Increases                             |
| Rowing oar  | Increases                          | Decreases                             |
| <b>Summary:</b> As input force decreases, the input distance increases. |                                    |                                       |

**Machines Do Work (pages 417–418)**

1. Is the following sentence true or false? A machine can make work easier to do by changing the size of the force needed, the direction of a force, or the distance over which a force acts. true
2. Consider the equation  $\text{Work} = \text{Force} \times \text{Distance}$ . If a machine increases the distance over which a force is exerted, the force required to do a given amount of work decreases.
3. You make several trips to unload a few heavy items from a car instead of moving them all at once. Does the total distance over which you exert yourself increase or decrease? increase

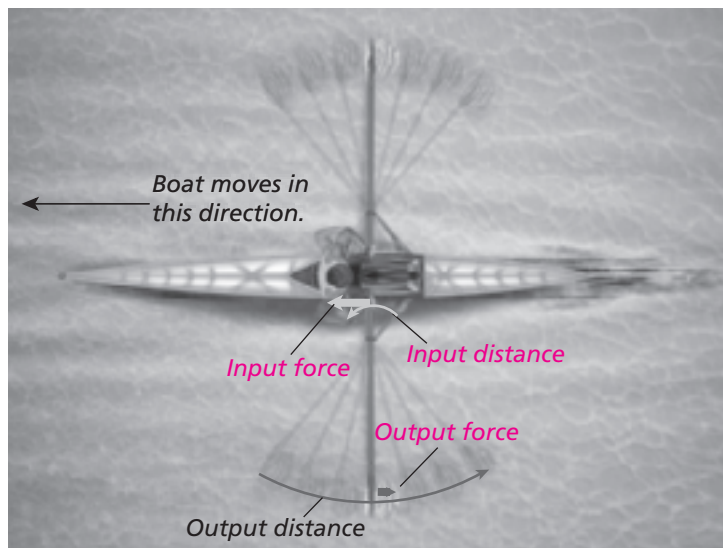
**Work Input and Work Output (pages 419–420)**

4. The work done by a machine is always less than the work done on a machine because of \_\_\_\_\_. Circle the correct answer.  
attraction      friction      gravity

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5. Circle the letter of the definition for input force.
  - a. the amount of force exerted by a machine
  - b. the amount of work done by a machine
  - c.** the amount of force exerted on a machine
  
6. Is the following sentence true or false? Every machine uses some of its work input to overcome friction.           true
  
7. Circle the letter of the expression that equals the work output of a machine.
  - a.  $\frac{\text{Input distance}}{\text{Output distance}}$
  - b.  $\text{Output distance} \times \text{Input distance}$
  - c.**  $\text{Output distance} \times \text{Output force}$
  
8. Is the following sentence true or false? Output work always is less than input work.           true

For questions 9 through 11, refer to the figure below.



9. Which arrow represents the input force? Label it on the figure.
10. Which arrow represents the input distance? Label it on the figure.
11. Which arrow represents the output force? Label it on the figure.