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.
Input forces exerted on and output forces exerted by machines are identified
and input work and output work are discussed.

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
Summary: As input force decreases, the input distance increases.		

Machines Do Work (pages 417–418)

1. Describe what a machine is able to do. A machine makes work easier to do by changing a force.

2. 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

3. Consider the equation Work = Force × Distance. If a machine
   increases the distance over which a force is exerted, the force
   required to do a given amount of work decreases.

4. Give an example of a machine that changes the direction of
   an applied force. Sample answers may include oars used in rowing.

5. When you make several trips to unload a few heavy items from a
   car instead of moving them all at once, the total distance over which
   you exert yourself increases.

Work Input and Work Output (pages 419–420)

6. The work done by a machine is always less than the work done on a
   machine because of friction.

Chapter 14   Work, Power, and Machines

7. Circle the letter of the definition for input force.

    a. the amount of force exerted by a machine

    b. the amount of friction slowing the speed of a machine

    c. the amount of work done by a machine

    (d.) the amount of force exerted on a machine

8. Write a word equation that describes work input.

    Work input equals the input force multiplied by the input distance.

9. Is the following sentence true or false? Every machine uses some of its work input to overcome friction. _____true_____

10. The force exerted by a machine is called the _____output_____ force.

11. Circle the letter of the expression that equals the work output of a machine.

    a. $\dfrac{\text{Input distance}}{\text{Output distance}}$
    b. Output distance × Input distance

    c. $\dfrac{\text{Output distance}}{\text{friction}}$
    (d.) Output distance × Output force

12. Is the following sentence true or false? Output work always is less than input work. _____true_____

For questions 13 through 15, refer to the figure below.

Boat moves in this direction.

Input force

Input distance

Output force
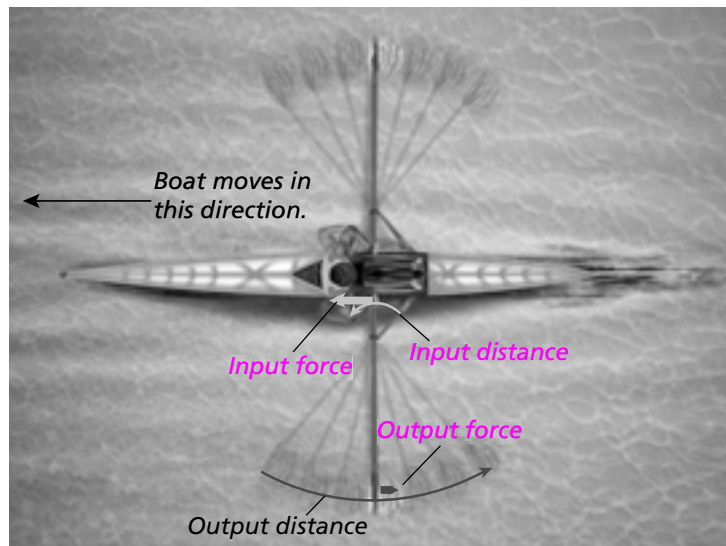
Output distance

13. Which arrow represents the input force? Label it on the figure.

14. Which arrow represents the input distance? Label it on the figure.

15. Which arrow represents the output force? Label it on the figure.

16. How can you increase a machine's work output? The only way to increase work output is to increase the amount of work put into a machine.