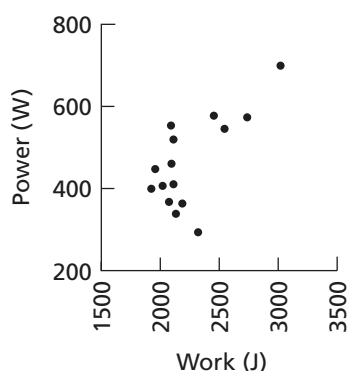
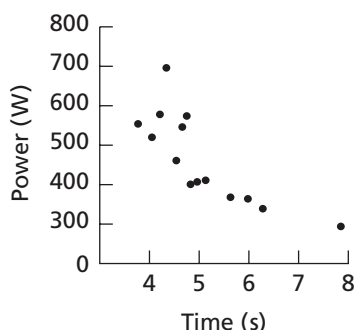


5.



6.



Conclude and Apply

1. No, each student did not have the same power rating. There is a great deal of variation in mass and in time taken to ascend the stairs.
2. Power vs. Work and Power vs. Time
3. Both show a definite relationship because Power is defined by work and time.
4. Power is the quotient found when work done is divided by the time required to complete that work.

Going Further

1. You can either increase the mass you will transport or the distance you will climb (while keeping time constant) or decrease the time it takes to ascend the stairs (while keeping mass and distance constant)
2. The fastest climbers may have had a very small mass.
3. The most massive climbers may have been very slow.
4. Answers will vary.

Real-World Physics

1. Some students may find they will be able to power a 120 W television or a 60.0 W radio.
2. Students may find they can generate 6.0 kWh, which would earn them \$0.36.
3. There would either have to be a weight sensor or climbers would have to enter their weight. The machine could also have sensors to measure the distance climbed and the time so that power could be calculated.

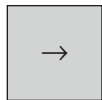
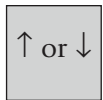
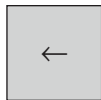
Study Guide

Vocabulary Review

1. efficiency
2. machine
3. compound machine
4. resistance force
5. watt
6. effort force
7. work-energy theorem
8. energy
9. kinetic energy
10. power
11. mechanical advantage
12. joule
13. ideal mechanical advantage
14. work

Section 10-1 Energy and Work

1. c
2. b
3. e
4. d
5. f
6. a
7. true
8. positive
9. true
10. decreases
11. is constant
12. true

13. $W > 0$  $d \rightarrow$ 14. $W = 0$  $d \rightarrow$ 15. $W < 0$  $d \rightarrow$

16. 0.50 m

17. 30.0 N

18. The area represents the work done on the crate.

19. $W = Fd = (30.0 \text{ N})(0.10 \text{ m}) = 3.0 \text{ J}$ 20. From 0.0 m to 0.40 m, the area under the graph is $A = lw = (0.40 \text{ m})(30.0 \text{ N}) = 12 \text{ J}$. Using the equation for work, $W = Fd = (30.0 \text{ N})(0.40 \text{ m}) = 12 \text{ J}$. The answers are the same.

21. First, find the area under the graph from 0.50 m to 0.70 m, consisting of a rectangle and a triangle on top of it formed by the sloped line.

$$A_{\text{rectangle2}} = (30.0 \text{ N})(0.20 \text{ m}) = 6.0 \text{ J}$$

$$A_{\text{triangle}} = \frac{1}{2} (0.20 \text{ m})(10.0 \text{ N}) = 1.0 \text{ J}$$

Add to this the area under the graph from 0.0 m to 0.50 m.

$$A_{\text{rectangle1}} = (30.0 \text{ N})(0.50 \text{ m}) = 15 \text{ J}$$

The total work is equal to the total area under the graph:

$$A_{\text{total}} = A_{\text{rectangle1}} + A_{\text{rectangle2}} + A_{\text{triangle}} = 15 \text{ J} + 6.0 \text{ J} + 1.0 \text{ J} = 22 \text{ J}$$

22. d

23. b

24. c

25. e

26. a

Section 10-2 Machines

1. simple and complex
2. either the direction or the magnitude
3. true
4. cannot
5. resistance

6. ratio

7. true

8. can

9. true

10. equal to

11. ideal machine

12. true

13. equal to

14. greater

15. c

16. d

17. d

18. b

19. b

20. b

21. b

22. d

23. d

24. a

25. c

26. a. $W_i = W_o$
 $F_i d_i = F_o d_o$
 $(218 \text{ N})d_i = (1050 \text{ N})(0.110 \text{ m})$
 $d_i = \frac{(1050 \text{ N})(0.110 \text{ m})}{218 \text{ N}} = 0.530 \text{ m}$
- b. $(0.783)W_i = W_o$
 $(0.783)F_i d_i = F_o d_o$
 $(0.783)(218 \text{ N})d_i = (1050 \text{ N})(0.110 \text{ m})$
 $d_i = \frac{(1050 \text{ N})(0.110 \text{ m})}{(218 \text{ N})(0.783)} = 0.677 \text{ m}$

10-1 Section Quiz

1. The work-energy theorem states that when work is done on an object, the result is a change in kinetic energy. It can be represented by the equation $W = \Delta KE$.
2. $W = Fd = (328 \text{ N})(3.55 \text{ m}) = 1160 \text{ J}$
3. $W = Fd \cos \theta$
 $= (485 \text{ N})(2.66 \text{ m})(\cos 15.0^\circ)$
 $= 1250 \text{ J}$