3. Figure 4

\[ W_{\text{out}} = 70 \text{ N} \times 0.01 \text{ m} = 0.7 \text{ J} \]

4. \( IMA = \frac{F_{\text{out}}}{F_{\text{in}}} = 3.5 \)

\[ W_{\text{in}} = 0.7 \text{ J} \quad 0.7 \text{ J} = 20 \text{ N} \]

\[ d_{\text{in}} = 0.035 \text{ m} \]

Section 3 (page 34)

Procedure

ISA = \( \frac{52}{34} = 1.5 \), IMA = \( \frac{34}{52} = 0.65 \)

Questions

1. Answers will vary.
2. Answers will vary.
3. Answers will vary. Students should address the usage differences between ten-speed and mountain bikes including the terrain.

Note-Taking Worksheet (page 35)

Refer to Teacher Outline; student answers are underlined.

Assessment

Chapter Review (page 39)

Part A. Vocabulary Review

1. false; simple (5/3)
2. false; mechanical advantage (5/2)
3. true (5/3)
4. false; gear (5/3)
5. false; an inclined plane (5/3)
6. true (5/3)
7. true (5/3)
8. false; wedge (5/3)
9. false; one (5/3)
10. false; a compound (5/3)
11. true (5/3)
12. true (5/1)
13. true (5/2)

Part B. Concept Review

1. inclined plane (1–8: 5/3)
2. screw
3. lever
4. wheel and axle
5. wedge
6. wheel and axle
7. pulley
8. inclined plane
9. e (9–13: 5/3)
10. c
11. a
12. b
13. d
14. \( IMA = \frac{F_{\text{out}}}{F_{\text{in}}} = 60 \text{ N}/15 \text{ N} = 4 \)
15. \( IMA = L_{\text{out}}/L_{\text{in}} = 2/1 = 2 \)
16. \( IMA = r_{\text{out}}/r_{\text{in}} = 9 \text{ cm}/0.6 \text{ cm} = 15 \)
17. Ideal mechanical advantage is determined by equation and assumes no friction. Actual mechanical advantage takes friction into account and is realistic. (5/2)

Chapter Test (page 41)

I. Testing Concepts

1. a (5/3)
2. b (5/3)
3. a (5/3)
4. c (5/1)
5. a (5/1)
6. a (5/2)
7. d (5/2)
8. d (5/3)
9. b (5/3)
10. d (5/2)
11. b (5/3)
12. a (5/3)
13. c (5/3)
14. c (5/3)
15. a (5/3)
16. b (5/3)
17. c (5/3)
18. b (5/3)
19. a (5/3)
20. b (5/3)

II. Understanding Concepts

1. \( IMA = \frac{L_{\text{in}}}{L_{\text{out}}} = 4.0 \text{ m}/1.0 \text{ m} = 4 \)
2. \( IMA = \frac{L_{\text{in}}}{L_{\text{out}}} = 2.0 \text{ m}/1.0 \text{ m} = 2 \)
3. screws (5/3)
4. wedges (5/3)
5. pulleys (5/3)
6. wheels and axles (5/3)
7. screws (7–13: 5/3)
8. wedges
9. pulleys
10. wheels and axles
11–13: fixed pulley; moveable pulley; block and tackle (order may vary)

III. Applying Concepts

1. c (5/3)
2. a (5/3)
3. d (5/3)
4. c (5/1)
5. b (5/2)
6. c (5/3)

IV. Writing Skills

1. The object has to move and the movement has to be in the direction of the force being applied (5/1)
2. The screwdriver with a 5-cm handle and a 1-cm shaft would have a greater mechanical advantage (5/2)
3. Power is a measure of the amount of work done in a given period of time. (5/1)
4. Adding oil to the moving parts of a machine would increase efficiency by decreasing friction. (5/2)