8.8

1. \( \text{MA}_{\text{total}} = (\text{MA}_{\text{plane}})(\text{MA}_{\text{pulley}}) = \left( \frac{21.0 \text{ m}}{7.00 \text{ m}} \right) (5) = 15.0 \)

2. \( F_E = \frac{F_R}{\text{MA}} = \frac{3790 \text{ N}}{15.0} = 253 \text{ N} \)

3. \( \text{MA}_{\text{plane}} = \frac{50.0}{10.0} = 5.00 \)
   \( \text{MA}_{\text{wh}} = \frac{1.00}{0.500} = 2.00 \)
   \( \text{MA}_{\text{total}} = (5.00)(2.00)(4.00) = 40.0 \)

4. \( F_R = \text{MA} F_E = (40.0)(300 \text{ lb}) = 12,000 \text{ lb} \)

5. \( F_E = \frac{F_R}{\text{MA}} = \frac{3000 \text{ lb}}{40.0} = 75.0 \text{ lb} \)

6. \( \text{MA} = \frac{\text{length}}{\text{height}} = \frac{8.00 \text{ m}}{2.00 \text{ m}} = 4.00 \); \( \text{MA}_{\text{total}} = (4.00)(5.0) = 20 \)

7. \( F_E = \frac{F_R}{\text{MA}} = \frac{2500 \text{ N}}{20.0} = 125 \text{ N} \)

8. \( \text{MA} = \frac{\text{length}}{\text{height}} = \frac{12.0 \text{ m}}{0.500 \text{ m}} = 24.0 \); \( \text{MA} = \frac{f_E}{f_R} = \frac{40.0 \text{ cm}}{12.0 \text{ cm}} = 3.33 \)
   \( \text{MA}_{\text{total}} = (24.0)(3.33)(4) = 320 \)

9. \( F_R = \text{MA} F_E = (320)(450 \text{ N}) = 1.44 \times 10^5 \text{ N} \)

10. \( F_E = \frac{F_R}{\text{MA}} = \frac{(2500 \text{ kg})(9.80 \text{ m/s}^2)}{320} = 76.6 \text{ N} \)

Chapter 8 Review Questions

1. d 2. a 3. b 4. d 5. b 6. b 7. (a) bicycles (b) auto transmission (c) high-speed drill 8. resistance force 9. effort force x effort distance = resistance force x resistance distance 10. mechanical advantage 11. efficiency 12. No 13. the fulcrum

14. \( \frac{\text{length of effort arm}}{\text{length of resistance arm}} = \text{MA of lever} \)

15. First class

16. \( F_R \times d_R = F_E \times d_E \)

17. The opposite end of the resistance force with the effort force between.

18. Resistance force x resistance radius = effort force x effort radius

19. No; it depends on the radii

20. A fixed pulley does not move. It is suspended by its center axle. A movable pulley is free to move and is suspended by the strand around the groove.

21. No

22. \( \text{MA} = \frac{\text{length of plane}}{\text{height of plane}} \)

23. The distance a screw advances into the wood in one revolution.

24. It is greater because the handle of the jackscrew can be longer than the radius of the screwdriver.

25. Total MA equals the product of the MA of each simple machine.