

Chapter 5 Extra Credit

Name: _____

Date: _____

Directions: Show all work on a separate sheet of paper. Include formulas, substitutions, units, and clear reasoning where appropriate. Answers without work may receive reduced credit.

Part I — Pythagorean Theorem

Use:
$$a^2 + b^2 = c^2$$

1. A right triangle has legs measuring 9 cm and 12 cm. Find the length of the hypotenuse.
2. A right triangle has a hypotenuse of 13 m and one leg of 5 m. Find the missing leg.
3. A ladder leans against a wall. The base of the ladder is 8 m from the wall, and the ladder is 17 m long. How high up the wall does the ladder reach?
4. A rectangular field measures 30 m by 40 m. Find the length of the diagonal.
5. A wheelchair ramp rises 1.5 m over a horizontal distance of 6.0 m. Find the length of the ramp.

Part II — Free-Body Diagrams

6. A book rests motionless on a table. List all the forces acting on the book.
7. A sled is pulled across level ground and accelerates to the right. Identify all forces acting on the sled and indicate their directions.
8. A rock is falling freely through the air. Ignore air resistance. Draw or describe the free-body diagram
9. A skydiver is falling at **constant velocity**. What forces act on the skydiver? Explain why the speed remains constant.

10. A monkey hangs motionless from a tree branch. Draw or describe the free-body diagram.

Part III — Friction

11. A crate is pushed across a warehouse floor. What type of friction opposes its motion?
12. A car is driving along a dry road without skidding. Which type of friction allows the tires to move the car forward?
13. A hockey puck slides across the ice after being hit. What type of friction slows the puck?
14. Which generally has more friction: rubber tires on dry pavement or rubber tires on ice? Explain.
15. Explain why a wagon is usually easier to pull than dragging the same load on a sled across pavement.

Part IV — Torque

$$\tau = Fr$$

Use:

16. A 40-N force is applied 0.50 m from a pivot. Find the torque.
17. A mechanic applies 120 N·m of torque using a wrench 0.40 m long. What force does the mechanic apply?
18. A child pushes on a merry-go-round with a force of 80 N applied 1.8 m from the center. Find the torque.
19. A 250-N force acts 0.20 m from the pivot. Find the torque.
20. Two children sit on opposite sides of a seesaw. One child weighs 300 N and sits 1.5 m from the pivot. The other child weighs 450 N. How far from the pivot must the heavier child sit to balance the seesaw?