

Worksheet: Newton's Second Law

CONCEPTUAL PHYSICS: UNIT 3

Directions: Answer the following questions based your notes and textbook for chapter 6. Use the equations below and **draw a diagram** to help you answer the questions. **SHOW YOUR WORK TO RECEIVE CREDIT**

$$F = ma \quad a = \frac{F}{m} \quad P = \frac{F}{A} \quad F_g = mg$$

1. If the force acting on a cart doubles, what happens to the cart's acceleration?
2. What happens to the acceleration if the force remains constant, but the mass of the object doubles?
3. You pull horizontally on a **50-kg** crate with a force of **400 N** and the **friction force** on the crate is **150 N**. The acceleration of the crate is?
4. You pull horizontally on a 80-kg crate with a force of 200 N and the friction force on the crate is 150 N. The acceleration of the crate is?
5. A push on a **2-kilogram** brick accelerates the brick. Neglecting friction, to equally accelerate a **8-kilogram** brick, one would have to push?
6. A push on a 8-kilogram brick accelerates the brick. Neglecting friction, to equally accelerate a 4-kilogram brick, one would have to push?

7. A jet has a mass of **40,000 kg**. The thrust for each of four engines is **20,000 N**. What is the jet's **acceleration** when taking off?

8. A jet has a mass of 60,000 kg. The thrust for each of four engines is 10,000 N. What is the jet's acceleration when taking off?

9. A **20-N** falling object encounters **20 N of air resistance**. The magnitude of the **net force** on the object is?

10. A 45-N falling object encounters 15 N of air resistance. The magnitude of the net force on the object is?

11. A car has a mass of **2000 kg** and accelerates at **3.0 meters per second squared**. What is the magnitude of the **force** acting on the car?

11. A car has a mass of 1500 kg and accelerates at 2.0 meters per second squared. What is the magnitude of the force acting on the car?

13. A tow truck exerts a force of **2500 N** on a car, accelerating it at **5 m/s/s**. What is the **mass** of the car?

14. A tow truck exerts a force of 5000 N on a car, accelerating it at 2 m/s/s. What is the mass of the car?

15. A girl pulls on a **4-kg** wagon with a constant force of **5 N**. What is the wagon's **acceleration**?

16. A girl pulls on a 2.5-kg wagon with a constant force of 7.5 N. What is the wagon's acceleration?

17. A sportscar has a mass of **1200 kg** and accelerates at **3 meters per second squared**. What is the magnitude of the **force** acting on the sportscar?

18. A sportscar has a mass of 1500 kg and accelerates at 2 meters per second squared. What is the magnitude of the force acting on the sportscar?

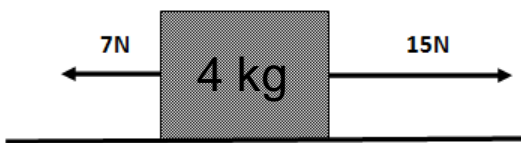
19. You are standing on a skateboard and your friend pushes you with a force of **120 N**. If your mass is **40 kg**, what will your **acceleration** be?

20. You are standing on a skateboard and your friend pushes you with a force of 75 N. If your mass is 75 kg, what will your acceleration be?

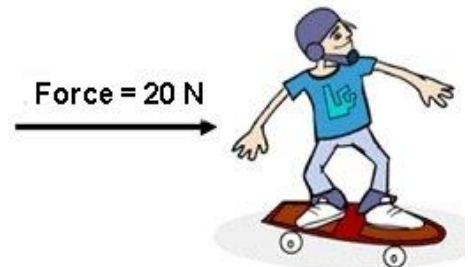
21. What is the **acceleration** on the block being pulled below?



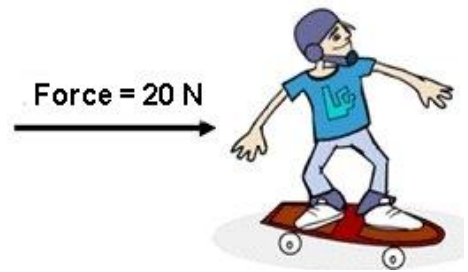
22. What is the acceleration on the box being pulled below?



23. A friend pushes you with a **20 N** force. If your mass is **80 kg**, what will your **acceleration** be?



24. A friend pushes you with a 20 N force. If your mass is 80 kg, what will your acceleration be?



25. The **500 kg mass** below was **accelerated** at **1 meter per second squared**. If the **applied force** was **400 N**, what is the **frictional force** present?



26. The 500 kg mass below was accelerated at 1 meter per second squared. If the applied force was 400 N, what is the frictional force present?



27. What is the **force** the dung beetle would have to apply to **accelerate** this **0.001 kg** dung ball at **0.1 m/s²**?



28. What is the force the dung beetle would have to apply to accelerate this 0.001 kg dung ball at 0.05 m/s²?



29. What are the units we use most commonly in physics for:

- a. Velocity-
- b. Acceleration-
- c. distance-
- d. Mass-
- e. Time-
- f. Force-
- g. Force of Gravity-
- h. weight-

30. When an object reaches terminal velocity its acceleration is _____.

31. When an object reaches terminal velocity its velocity is _____.

32. Accelerations are produced by _____.

33. A heavy person and a light person parachute together and wear the same size parachutes. Assuming they open their parachutes at the same time, which person reaches the ground first? Draw a diagram and label the forces to explain.

34. Forces always occur in _____.

35. A book weighs 3 N. When held at rest in your hand what is the support (normal) force on the book? Draw a diagram to explain and label forces involved.