

NAME _____ DATE _____

UNIT 3 Newton's Second Law

Newton's second law expresses the relationship between the net force on an object and the object's acceleration:

$$\text{net force} = \text{mass} \times \text{acceleration}$$

$$F_{\text{net}} = ma$$

Use Newton's second law to solve the following problems.

- A 1520 kg car accelerates at a rate of 1.50 m/s^2 . What is the net force on the car?

- A $5.22 \times 10^7 \text{ kg}$ cruise ship is moving at its top speed as it comes into port. The ship then undergoes an acceleration equal to -0.357 m/s^2 until it comes to rest at its anchorage. What is the net force acting on the ship as it slows down?

- A catcher in a professional baseball game exerts a force of -65.0 N to stop the ball. If the baseball has a mass of 0.145 kg , what is the ball's acceleration as it is being caught?

- A 214 kg boat is sinking in the ocean. The force of gravity that draws the boat downward is partially offset by the buoyant force of the water, so that the net force on the boat is -1310 N . What is the acceleration of the boat?

- A freight train slows down as it approaches a train yard. If a force of $-3.8 \times 10^4 \text{ N}$ is required to provide an acceleration of -0.33 m/s^2 , what is the train's mass?

- A house is lifted from its foundations onto a truck for relocation. The net force lifting the house is 2850 N . This force causes the house to move from rest to an upward speed of 0.15 m/s in 5.0 s . What is the mass of the house?

- Because of a frictional force of 2.6 N , a force of 2.8 N must be applied to a textbook in order to slide it along the surface of a wooden table. The book accelerates at a rate of 0.11 m/s^2 .
 - What is the net force on the book?

 - What is the mass of the book?

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