

Newtonian Needlers (of the 2nd kind)

Name _____

Use $g = 9.80 \text{ m/s}^2$.

1.1) Suppose that the total force of air drag on your car is 250 N as you cruise down a highway. What force must the road provide to keep your car moving at a constant speed?

1.2) A 2.0 kg coconut falls from a tree on Gilligan's Island. Ignoring air drag, what is the net force on the nut as it falls? What was the net force on it while it was hanging from the branch, before it fell?

1.3) In a *Muppet Show* skit, Kermit the Frog stands on the planet Coozbane doing a news interview. Suppose that his mass is, say, 10.0 kg (he is, after all, pretty big for a frog) and he finds that on Coozbane he weighs 68 N. What is g , the acceleration due to Coozbanian gravity? What is the net force on him as he stands there?

2.1) A certain force causes a 0.75 kg box of Dunkin' Donuts to accelerate at 3.0 m/sec^2 across a smooth (that means, basically frictionless) tabletop. If that same force causes a box of Palcho's donuts to accelerate instead at 2.5 m/sec^2 , what is its mass?

2.2) In an illegal drag race, Vinnie accelerates his 1000.0 kg car from rest for 6.0 seconds with a net force of 12,000 N. How fast is he traveling after that time?

3.1) A 20.0 N rutabaga falls from a helicopter (hey, if you were in a helicopter, you wouldn't want a rutabaga in there with you, now, would you?)

a) What is the rutabaga's acceleration just after it starts falling?

b) After it falls for a few seconds, the air drag has built up to 16 N. What is its acceleration now?

3.2) A 1963 Buick weighs, let's say, 10,000.0 N.

a) What is its mass?

b) What force does the road provide to accelerate it from rest to 32 m/sec in 8.0 sec, if an average air drag force of 1000.0 N is acting?

3.3) Rex the dog is experimenting to see how many lives the family's pet Kitty really has. He drops the unwilling cat from a high place with no initial speed.

a) What is its initial acceleration?

b) After a short time, the cat has reached its terminal velocity {a really sick pun...} and Rex observes that the drag force on it is 80.0 N. How much does Kitty weigh? (Hint: What does "terminal velocity" really mean?)

c) What is Kitty's mass?