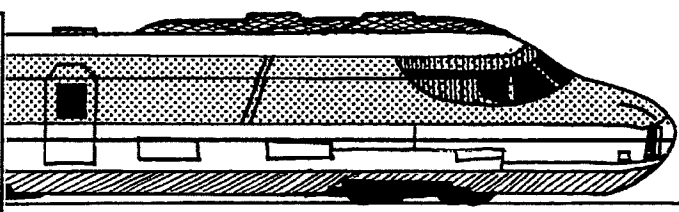


PROBLEMS WITH TRAINS

What is it about trains that makes them so popular in problems about motion? Well, probably it's the fact that it's usually speeding along or chugging along in a steady motion—going somewhere beyond wherever you are. In keeping with the tradition of train problems, practice your calculations with rate of motion by solving these questions.

REMEMBER:
Distance = rate x time
SO: Time = distance ÷ rate
AND: Rate = distance ÷ time



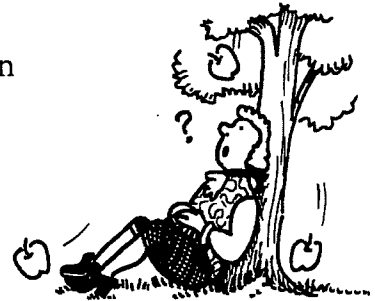
- _____ 1. The *Midnight Express* heading west from Chicago to Albuquerque travels at 100 mph for 160 miles. How much time does this take?
- _____ 2. A train that's heading west leaves a station at the same time that an east-bound train 840 miles away leaves its station. They both travel at an average speed of 120 mph. How long will it take before they meet?
- _____ 3. If the *West Coast Skyliner* is traveling north at 120 mph and the *Skyliner II* is traveling south at 120 mph, do these trains have the same speed? Do they have the same velocity?
- _____ 4. The *Black Giant* heads west for 16 hours traveling at an average speed of 120 mph. The *Speed Demon* leaves the same station and heads west on a parallel track, traveling at 95 mph for 20 hours. After these amounts of time, which train will have covered more distance?
- _____ 5. Two trains leave their stations, which are 2860 miles apart, at the same time—8:00 A.M. central time. They both travel at 110 mph toward each other on the same track. At what time (central time) will they meet?
- _____ 6. The *Rocky Mountain Cruiser* covers 3105 miles in 27 hours. What is its rate?
- _____ 7. You are on a train that is going east at 95 mph. You are walking at 5 mph toward the front of the train. In relation to the passengers seated on the train, how fast are you moving?
- _____ 8. In the same situation above, how fast are you moving in relation to the kid standing beside the railroad track, watching the train go by?
- _____ 9. The *Appalachian Express* and the *Mississippi Streamer*, starting 2184 miles apart, leave at the same time, heading toward each other. They meet in 12 hours. The *Appalachian Express* has traveled at a rate of 85 mph, and the *Mississippi Streamer* has traveled at a rate of 97 mph. How far has the *Mississippi Streamer* traveled when they meet?
- _____ 10. The *Quebec Racer* travels for 6 hours at 105 mph. The *Chicago Skyscraper* travels for 8.5 hours at 92 mph. Which train covers more distance? How much more?

Name _____

WHICH LAW?

We're told that Sir Isaac Newton discovered some things about motion when an apple dropped on his head. Whatever "force" was behind his discoveries, we have benefited from his discoveries.

Here are his three laws of motion. You should be familiar with them. Fill in the missing words in each of the three laws. Then tell which law fits each example below.



Which law? First, Second, or Third?

- _____ 1. A frog leaping upward off his lily pad is pulled downward by gravity and lands on another lily pad instead of continuing on in a straight line.
- _____ 2. As the fuel in a rocket ignites, the force of the gas expansion and explosion pushes out the back of the rocket and pushes the rocket forward.
- _____ 3. When you are standing up in a subway train, and the train suddenly stops, your body continues to go forward.
- _____ 4. After you start up your motorbike, as you give it more gas, it goes faster.
- _____ 5. A pitched baseball goes faster than one that is gently thrown.
- _____ 6. A swimmer pushes water back with her arms, but her body moves forward.
- _____ 7. As an ice skater pushes harder with his leg muscles, he begins to move faster.
- _____ 8. When Bobby, age 5, and his dad are skipping pebbles on the pond, the pebbles that Bobby's dad throws go farther and faster than his.
- _____ 9. When you paddle a canoe, the canoe goes forward.
- _____ 10. A little girl who has been pulling a sled behind her in the snow is crying because when she stopped to tie her hat on, the sled kept moving and hit her in the back of her legs.

NEWTON'S FIRST LAW OF MOTION:
An object at _____ stays at _____
or an object that is _____ at a
_____ in a straight _____ keeps
moving at that _____ unless another
_____ acts on it.

NEWTON'S SECOND LAW OF MOTION:
The amount of _____ needed to
make an object change its _____
depends on the _____ of the object
and the _____ required.

NEWTON'S THIRD LAW OF MOTION:
For every _____ (or force), there is an
_____ and _____ action (or force).

Name _____