

1: Motion

Name _____

Worksheet D: 1-Dimensional Motion Problems

Inquiry Physics

1. The head of a rattlesnake can accelerate 50.0 m/s^2 in striking a victim. If a car could do as well, how long would it take for it to reach a speed 24.6 m/s (which is about 55 mi/h) from rest?
0.492 s

2. A few years ago, the legal speed limit on the Turner Turnpike was changed from 55.0 mi/h to 75.0 mi/h . How much time (in hours) was saved on the 86.0 mile trip from the Tulsa entrance to the Oklahoma City exit for someone traveling at the legal speed limit?
0.417 h

3. In an emergency, a driver brings a car to a full stop in 5.00 seconds. The car is traveling along a highway at a rate of 24.6 m/s when braking begins.
 - a. At what rate is the car accelerated? *-4.92 m/s^2*
 - b. How far does it travel before stopping?

4. A supersonic jet flying at $200. \text{ m/s}$ is accelerated uniformly at the rate of 23.1 m/s^2 for 20.0 seconds.
 - a. What is its final speed?
 - b. Physicist Ernst Mach studied the effects of motion faster than sound, and the ratio of a speed to that of sound is called its "Mach number". The speed of sound itself is 331 m/s (approx. 740 mi/h) at supersonic airplane altitudes. "Mach 1.00" is the ratio $331/331$, or the speed of sound. One of the fastest planes was the SR-71 Blackbird. It flew at 1059 m/s , so $1059/331 = 3.20$; we say it flew at "Mach 3.20." What is the Mach speed of our jet?

5. If a bullet leaves the muzzle of a rifle with a speed of $600. \text{ m/s}$, and the barrel of the rifle is 0.800 m long, at what rate is the bullet accelerated while in the barrel?
 $225,000 \text{ m/s}^2$

6. What is the acceleration of a racing car if its speed is increased uniformly from 44.0 m/s to 66.0 m/s over an 11.0 s period?
7. An engineer is to design a runway to accommodate airplanes that must gain a ground speed of 360. km/h (approx. 225 mi/h) before they can take off. These planes are capable of being accelerated uniformly at the rate of $3.60 \times 10^4 \text{ km/h}^2$.
- How many kilometers long must the runway be?
 - How many seconds will a plane need to accelerate to take-off speed?
8. A plane flying at the speed of 150. m/s is accelerated uniformly at a rate of 5.00 m/s^2 .
- What is the plane's speed at the end of 10.0 seconds?
 - What distance has it traveled?
9. A Tokyo express train is accelerated from rest at a constant rate of 1.00 m/s^2 for 1.00 **minute**. How far does it travel during this time?
10. In a vacuum tube, an electron is accelerated uniformly from rest to a speed of $2.60 \times 10^5 \text{ m/s}$ during a time period of 6.50×10^{-2} seconds. Calculate the acceleration of the electron.

$$4.00 \times 10^6 \text{ m/s}^2$$