Kinematics Worksheet 1

1. A car in front of the school goes 30.0 m in 2.35 seconds. What is its speed?

2. What speed must you average to go 280 km in 3.0 hours?

3. A car accelerates from rest to 27 m/s in 3.0 seconds. What is its acceleration?

4. A rocket accelerates at a rate of 190 m/s^2 for 2.4 seconds from rest. What is its final speed?

5. A car has a velocity of 15 m/s. It then accelerates at a rate of 3.5 m/s^2 for the next 5.0 seconds. What is its final velocity?

6. What distance will a train stop in if its initial velocity is 23 m/s and its acceleration is -0.25 m/s^2?

7. What distance will a car cover accelerating from 12 m/s to 26 m/s in 14 seconds?

8. A person starts at rest and accelerates at 3.2 m/s^2 for 3.0 seconds.
   (a) What is their final velocity?
   (b) What is their average velocity?
   (c) What distance do they cover in that time?

9. A train traveling 12 m/s stops in a distance of 541 m. What was its acceleration?

10. A car skids to a halt at a rate of -9.4 m/s^2. The skid marks measure 34 m. What speed was the car going when it slammed on the brakes?

11. A train can accelerate at a rate of 0.15 m/s^2. In what distance will it obtain a speed of 25 m/s if it starts from rest?

12. A drag racer can reach a speed of 53 m/s over a distance of 120 m.
   (a) What is the acceleration of the race car?
   (b) Over what distance can it reach a speed of 85 m/s?

13. Light from the sun reaches Earth in 8.3 minutes. The velocity of light is 3.0×10^8 m/s. How far is the Earth from the sun?

14. A car is moving down a street at 55 km/h. A child suddenly runs into the street. If it takes the driver 0.75 seconds to react and apply the brakes, how many meters will the car have moved before it begins to slow down?

15. Highway safety engineers build soft barriers so that cars hitting them will slow down at a safe rate. A person wearing a seatbelt can withstand an acceleration of -3.0×10^2 m/s^2. How thick should the safety barriers be to safely stop a car that hits a barrier at 110 km/h?

16. A car accelerates at a constant rate from 15 m/s to 25 m/s while it travels 125 m. How long does it take to achieve this speed?

17. A golf ball rolls up a hill toward a miniature-golf hole. The direction toward the hole is positive.
    (a) If the ball starts with a speed of 2.0 m/s and slows at a constant rate of 0.50 m/s^2, what is its velocity after 2.0 s?
    (b) If the constant acceleration continues for 6.0 s, what will be its velocity then?

18. A plane travels $5.0x10^2$ m while being accelerated uniformly from rest at the rate of 5.0 m/s^2. What final velocity does it attain?

19. You are dashing towards home plate with a speed of 6.0 m/s, when you have to hit the dirt. You slide for 1.2 s, just reaching the plate as you stop (safe, of course).
    (a) What is the distance that you slide?
    (b) What is your acceleration (magnitude and direction)?

20. An engineer designs a standard runway (1820 m) to accommodate airplanes that must reach a ground-velocity of 61 m/s before they can take off. These planes are capable of being accelerated uniformly at the rate of 2.5 m/s^2. Calculate the maximum amount of time the airplane will be on the runway.

21. A car slows from 22 m/s to 3.0 m/s at a constant rate of 2.1 m/s^2. How many seconds are required before the car is traveling at 3.0 m/s?

22. An airplane starts from rest and accelerates at a constant 3.00 m/s^2 for 30.0 s before leaving the ground.
    (a) How far did it move?
    (b) How fast was it going when it took off?

23. A park ranger driving on a back country road suddenly sees a deer "frozen" in her headlights. The ranger, who is driving at 11.4 m/s, immediately applies the brakes and slows with an acceleration of 3.80 m/s^2.
    (a) If the deer is 20.0 m from the ranger's vehicle when the brakes are applied, how close does the ranger come to hitting the deer?
    (b) How much time is needed for the ranger's vehicle to stop?

24. A bicyclist is finishing her repair of a flat tire when a friend rides by at a constant velocity of 3.5 m/s. Two seconds later, the bicyclist hops on her bike and accelerates at 2.4 m/s^2 until she catches her friend.
    (a) How much time does it take until she catches her friend?
    (b) How far has she traveled in this time?
    (c) What is her speed when she catches up?