Appendix C

Meteoroids and Orbital Debris
Velocity and Acceleration Practice Problems

DIRECTIONS: Solve the following situation problems using equations for velocity and acceleration.

1. What is the speed of a rocket that travels 9000 meters in 12.12 seconds?
2. What is the speed of a jet plane that travels 528 meters in 4 seconds?
3. After an impact involving a non-functioning satellite, a paint chip leaves the surface
   of the satellite at a speed of 96 m/s. After 17 seconds, how far has the chip landed?
4. The space shuttle Endeavor is launched to altitude of 500 km above the surface of the earth. The shuttle travels at an average rate of 700 m/s. How long will it take for
   Endeavor to reach its orbit?
5. How long will your trip take (in hours) if you travel 350 km at an average speed of
   80 km/hr?
6. How many seconds will it take for a satellite to travel 450 km at a rate of 120 m/s?
7. What is the speed of a walking person in m/s if the person travels 1000 m in 20 minutes?
8. How far (in meters) will you travel in 3 minutes running at a rate of 6 m/s?
9. A trip to cape Canaveral, Florida takes 10 hours. The distance is 816 km. Calculate the average speed.
10. In 0.5 seconds, a projectile goes from 0 to 300 m/s. What is the acceleration of the projectile?
11. A meteoroid changed velocity from 1.0 km/s to 1.8 km/s in 0.03 seconds. What is the acceleration of the meteoroid?
12. The space shuttle releases a space telescope into orbit around the earth. The telescope goes from being stationary to traveling at a speed of 1700 m/s in 25 seconds. What is the acceleration of the satellite?
13. A dragster in a race accelerated from stop to 60 m/s by the time it reached the finish line. The dragster moved in a straight line and traveled from the starting line to
    the finish line in 8.0 sec. What was the acceleration of the dragster?

Meteoroids and Orbital Debris
Velocity and Acceleration Answer Sheet

1. d=vt (distance = velocity multiplied by time)

   d=9000 m
   t=12.12 sec.
   solving for v, v=d/t,

   v=742.57 m/sec.

2. d=vt

   d=528 m
   t=4 sec
   solving for v, v=d/t,

   v=132 m/sec.

3. d=vt

   v=96 m/sec.
   t=17 sec.

   d=1632 m

4. d=vt

   d=500,000 m
   v=700 m/sec.
   solving for t, t=d/v,

   t=714.3 sec.(11.9 min.)

5. d=vt

d=350,000 m
v=80,000 m/hr.
solving for t, t=d/v

t=4.375 hrs.

6. d=vt

d=450,000 m
v=120 m/sec
solving for t, t=d/v,

t=3750 sec.

7. d=vt

d=1000m
t=20 min.(60 sec./min) =1200 sec.
solving for v, v=d/t,

v=0.83 m/sec.

8. d=vt

v=6 m/sec
t=3 min.(60 sec./min)=180 sec.

d=1080 m

9. d=vt

d=816,000 m
t=10 hrs.(60 min./hrs)(60 sec./min) = 36,000 sec.
solving for v, v=d/t,

v=22.67 m/sec. **or**

d=816,000 m
t=10 hrs.
solving for v, v=d/t,

v=81.6 km/hr.

10. a=v/t (acceleration = velocity divided by time)

t=0.5 sec.
v=300 m/sec.

a=600 m/sec.^{2}

11. a=v/t

t=0.03 sec.
v=0.8 km/sec.

a=26.7 km/sec.^{2}

12. a=v/t

t=25 sec.
v=1700 m/sec.

a=68 m/sec.^{2}

13. a=v/t

t=8 sec.
v=60 m/sec.

a=7.5 m/sec.^{2}