Name_____

KIN 335 - Biomechanics
PROBLEM SET 1

Instructions: Read each question carefully. On a separate sheet of paper, complete each problem and label your final answer clearly. Make sure that you show all of your work for full credit.

1. A new trail leads a hiker down a path which winds 5 km due east, 7 km north, 3 km east, and 4 km south. What was the total distance traveled? What was total displacement? Relative to the start of the trail, what was the direction of the total displacement vector?

   Distance = 19 km
   Displacement = 8.54 km, 20.56 degrees North of East

2. If the hiker in the previous problem completed the entire trail in 7 hours, what was the average speed of the hiker? What was the magnitude of the average velocity?

   Speed = 2.71 km/hr
   Velocity = 1.22 km/hr, 20.56 degrees North of East

3. A cyclist travels 40 miles in one hour. Use Figure 1 below to answer the following questions.

   a. What was the average speed during the first 20 minutes of the ride in mph?

      Speed = 60 mph

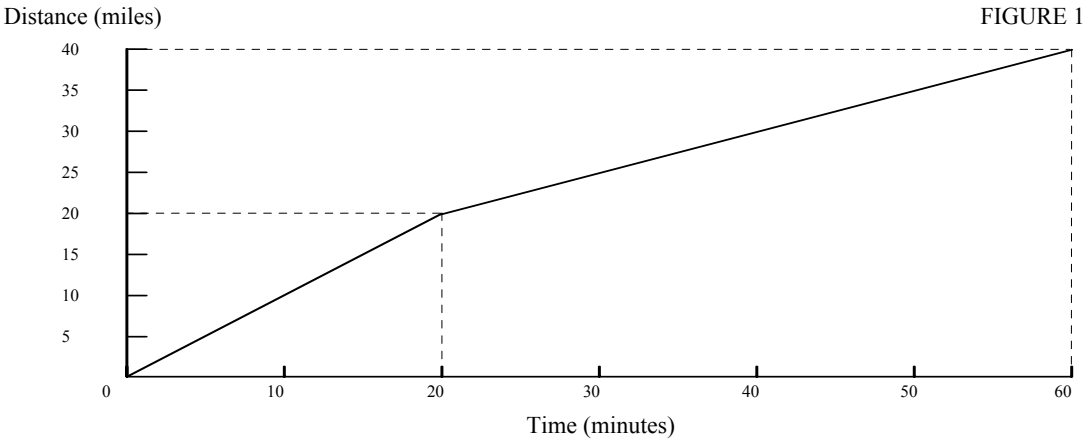
   b. What was the average speed during the last 40 minutes of the ride in mph?

      Speed = 30 mph

   c. What was the average speed during the entire ride in mph?

      Speed = 40 mph

FIGURE 1



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4. At the instant of take-off, a long jumper has a forward velocity of 32 ft/sec and a vertical velocity of 12 ft/sec. Find the angle of take-off (relative to the horizontal), and the magnitude of the resultant velocity vector.

   V_R = 34.18 ft/s
   θ = 20.56 degrees

5. A figure skater completes a double axle (2 complete rotations) in 0.5 seconds. Calculate the skater's average angular velocity in a) deg/sec, and b) rad/sec.

   Technically, the average angular velocity during the entire 0.5 s spin would be zero. But, if we think of this as instantaneous velocity, it will be more meaningful.

   ω = 1440 deg/s or 25.13 rad/s

6. In the skater in the previous problem manages to stop spinning in a time of 1.5 seconds, what was the average angular acceleration during this period (in deg/s)?

   $\alpha = -960 \text{ deg/s}^2$