Name: Reardon Block: ____ Date: _____

Unit 1: Motion
Test Review

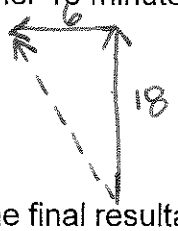
1. Which of the following quantities are vectors? Circle all that apply.

a. Speed	h. Temperature
(b.) Displacement	i. Mass
c. Distance	j. 477 ft
(d.) Force	(k.) 35 m north
e. Time	l. 22 mph
(f.) Velocity	m. 23 km/min
(g.) Acceleration	(n.) 3 cm/s left

What do all vectors have in common?

They all have direction.

2. A runner jogs 18 blocks north then 6 blocks west. It takes her 16 minutes to do this.
   a. What distance did the runner jog?
   b. What is the runner's final displacement?
   c. What is the runner's average speed?
   d. What is the runner's average velocity?
   e. Draw the vectors that represent her run as well as the final resultant vector.



a) $18 + 6 = 24$ blocks

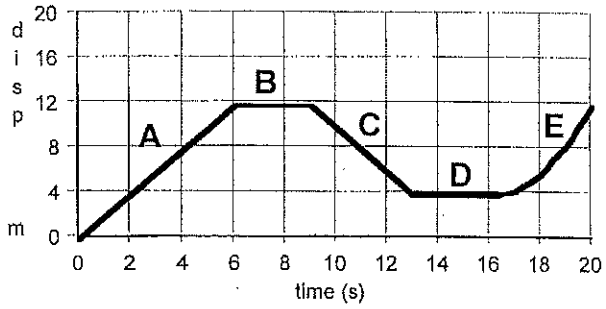
b) $18^2 + 6^2 = c^2$

$c = 19$ blocks NW

c) $\bar{s} = \frac{d}{\Delta t} = \frac{24 \text{ blocks}}{16 \text{ min}} = 1.5 \frac{\text{blocks}}{\text{min}}$

d) $\bar{v} = \frac{\Delta x}{\Delta t} = \frac{19 \text{ blocks NW}}{16 \text{ min}} = 1.2 \frac{\text{blocks NW}}{\text{min}}$

3. The questions below refer to the position graph of a car on the right:
   a. When is the car at rest?
   b. When is the car heading back to its starting position?
   c. What is the average velocity of the car during segment A?
   d. What is the final displacement of the car?
   e. What is the total distance traveled by the car?



a) B, D (horizontal lines)

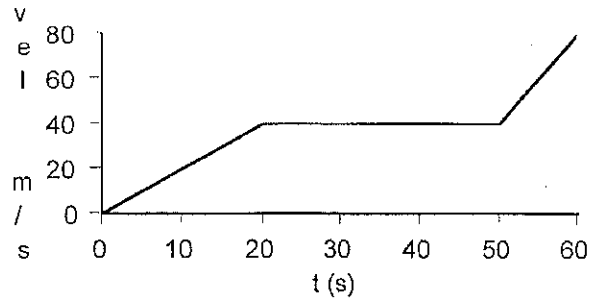
b) C (slope is negative)

c) $\bar{v} = \frac{\Delta x}{\Delta t} = \frac{12}{6} = 2$ m/s

d) 12 m

e) $12 + 0 + 8 + 0 + 8 = 28$ m

4. The questions below refer to the velocity graph of a skier on the right:
   a. At what time does the skier have its greatest velocity?
   b. When is the skier stationary?
   c. What is the average acceleration of the skier from 0 to 20 seconds?
   d. How far does the skier travel from 20 to 30 seconds?
   e. How far does the skier travel from 0 to 20 seconds?



a) 60 s

b) only at 0 s (not from 20-50 s!)

c) $\bar{a} = \frac{\Delta v}{\Delta t} = \frac{40-0}{20-0} = 2\ m/s^2$

d) $40\frac{m}{s}(10\ s) = 400\ m$

e) $(\bar{v} = 20\ m/s)(20\ s) = 400\ m$

5. A plane uniformly increases its velocity from 180 m/s to 220 m/s in 20 seconds.
   a. What is the average velocity of the plane during this time?
   b. What is the acceleration of the plane?
   c. How far does the plane travel during the 20-second period?

a) $\bar{v} = \frac{v_i + v_2}{2}$

$\bar{v} = \frac{180+220}{2} = 200\ m/s$

b) $\bar{a} = \frac{\Delta v}{\Delta t} = \frac{220-180}{20} = 2\ m/s^2$

c) $d = \bar{v}(\Delta t) = 200(20)$

$= 4000\ m$

6. A runner starts from rest and accelerates uniformly. He covers 25 m in the first 10 seconds.
   a. What is his acceleration?
   b. What is his final velocity?

Given

$v_i = 0$

$\Delta x = 25\ m$

$t = 10\ s$

a) $\Delta x = v_i \Delta t + \frac{1}{2} a \Delta t^2$

$25 = 0 + \frac{1}{2} a (10)^2$

$25 = 50a$

$a = .5\ m/s^2$

b) $v_f = v_i + at$

$v_f = 0 + .5(10)$

$v_f = 5\ m/s$

7. Sketch a position graph, velocity graph, and acceleration graph for the two motions described below. All three graphs should have time as the independent variable.
   a. An object walks in the positive direction at a constant speed.
   b. A marble starts from rest and rolls down a ramp. The marble gains speed at a constant rate.