

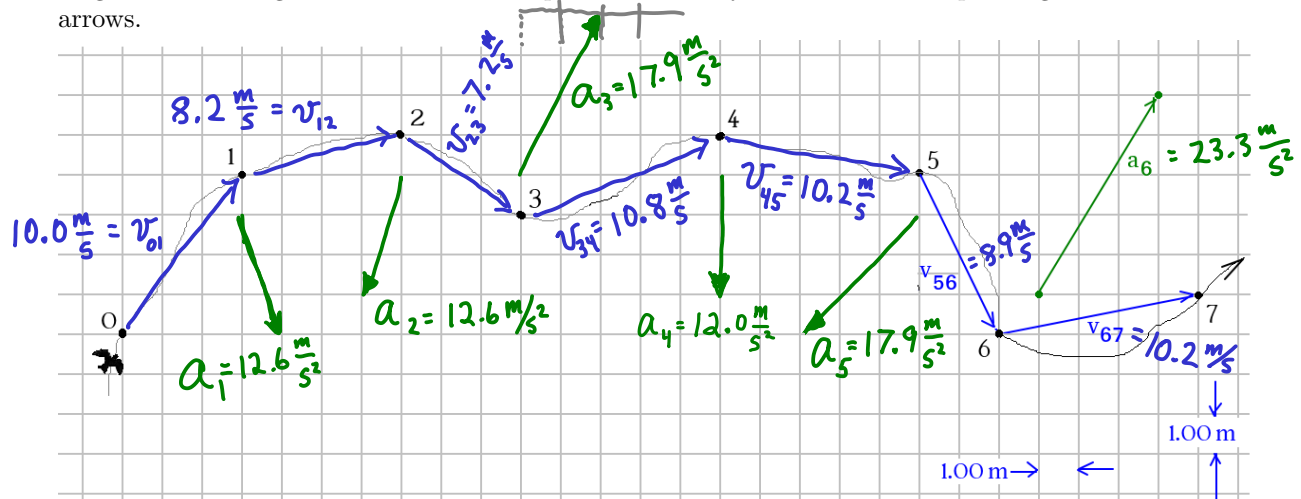
Group Number:

Names:

Date:

Show all work. If you don't have enough room on this document, you can add pages.

- (1) [15 total] An eagle is flying in the air and viewed from the side as shown below. Its location is marked and numbered at equal-time positions. The time between dots is one-half of a second ($\Delta t = 0.500$ s) and the grid shows one-meter squares $1.00 \text{ m} \times 1.00 \text{ m}$. Our goal is to construct a quantitative motion diagram for the eagle which includes a sequence of velocity arrows and corresponding acceleration arrows.



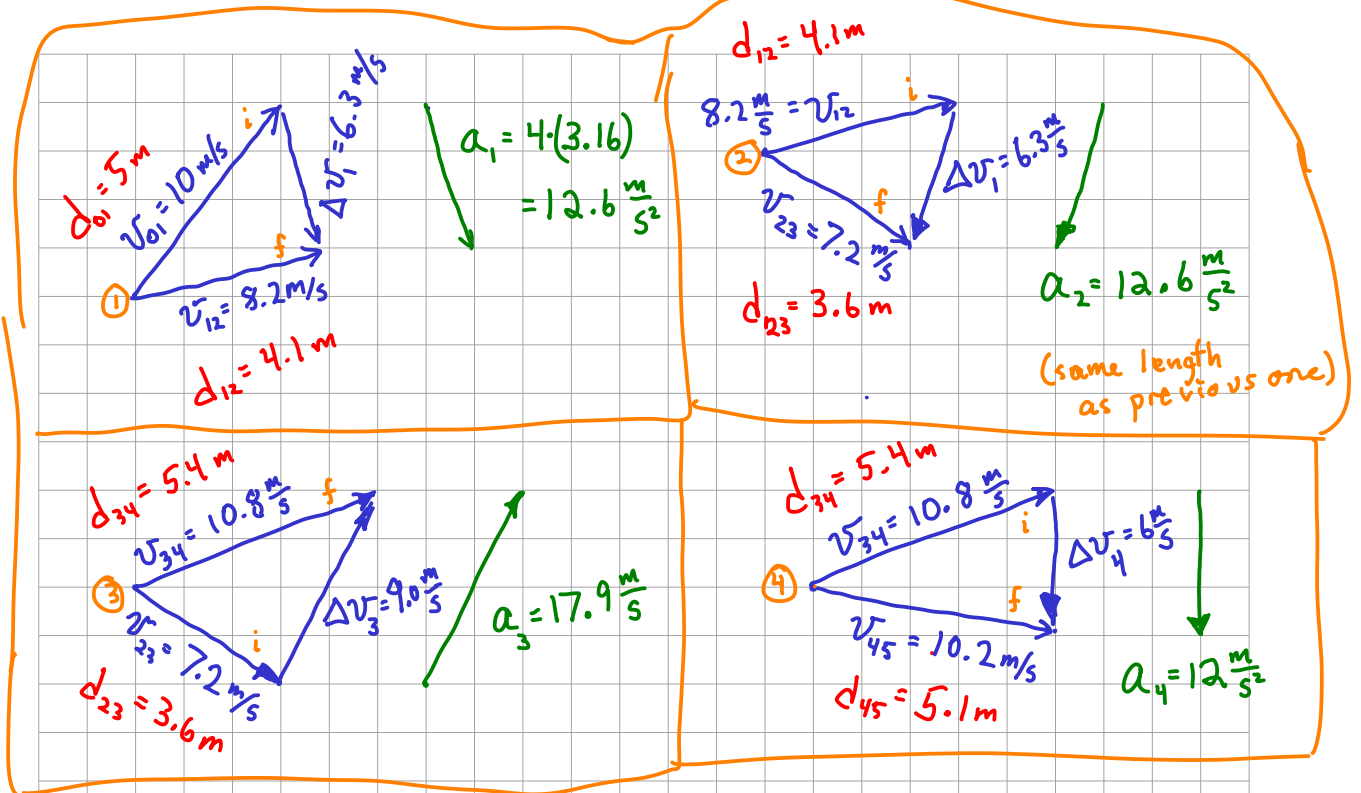
Each group is asked to complete two sets of computations:

Group	Assigned interval
1	$0 \rightarrow 1 \rightarrow 2$ $1 \rightarrow 2 \rightarrow 3$
2	$1 \rightarrow 2 \rightarrow 3$ $2 \rightarrow 3 \rightarrow 4$
3	$2 \rightarrow 3 \rightarrow 4$ $3 \rightarrow 4 \rightarrow 5$
4	$3 \rightarrow 4 \rightarrow 5$ $4 \rightarrow 5 \rightarrow 6$

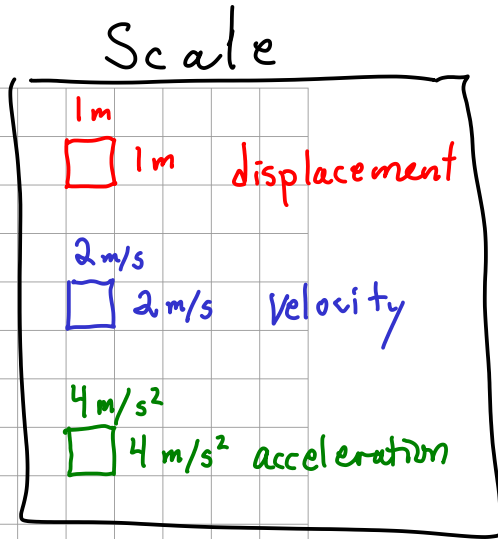
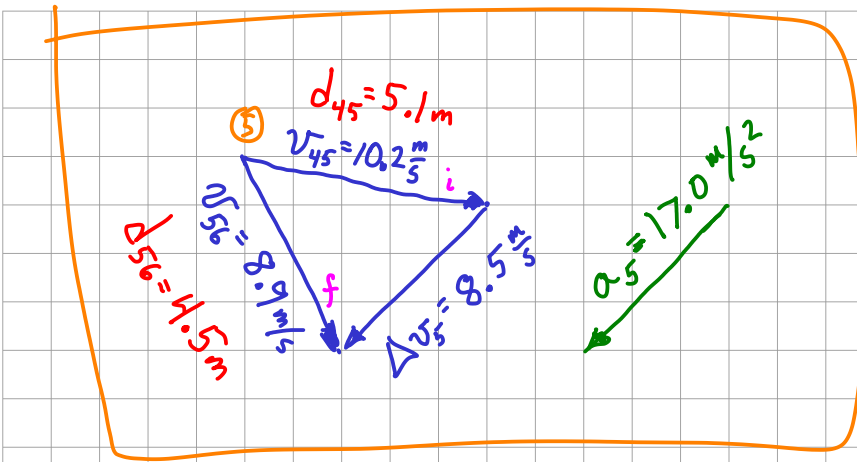
Several sheets of graph paper are included in this file. For each result you must clearly represent the magnitude and direction of the desired quantities. A graphic representation of the directions is acceptable. A model solution for $5 \rightarrow 6 \rightarrow 7$ is provided on the last page. Use a similar notation. Notice the scales for displacement, velocity, and acceleration; and the use of color.

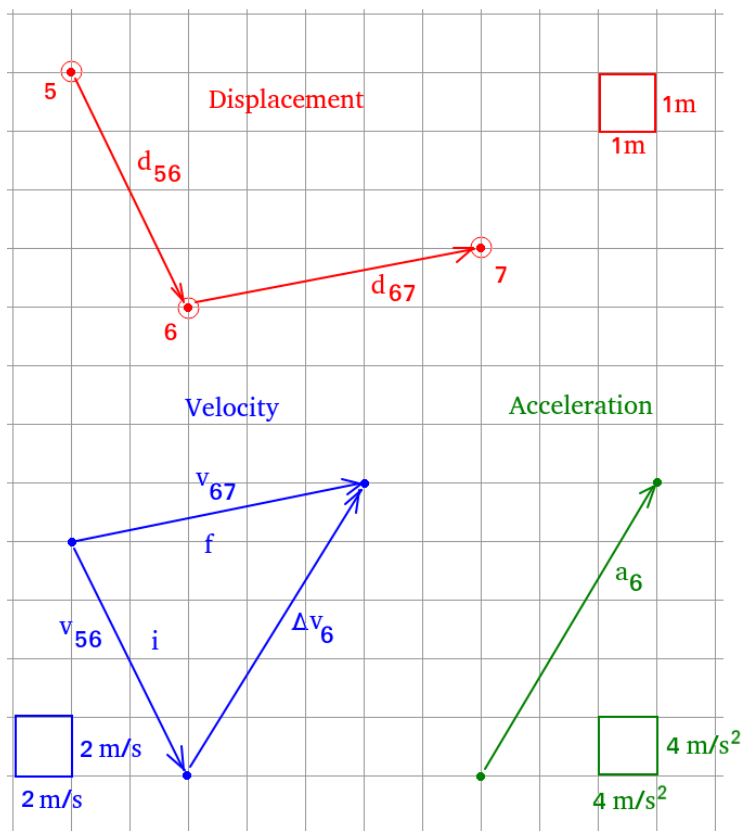
- /4 (1.a) Determine the magnitude and direction of the displacements for your sets of points.
- /6 (1.b) Determine the magnitude and direction of the velocities and changes in velocity for your sets of points.
- /3 (1.c) Determine the magnitude and direction of the accelerations for your sets of points.
- /2 (1.d) When complete, draw corresponding labeled arrows for your sets of points in the figure above. The model solution for $5 \rightarrow 6 \rightarrow 7$ is done.

(See the scale on next page.)



point 5 on next page



Model Solution for Points 5 \rightarrow 6 \rightarrow 7

Displacement:

$$d_{56} = \sqrt{(2)^2 + (4)^2} = 4.47 \text{ m}$$

$$d_{67} = \sqrt{(5)^2 + (1)^2} = 5.10 \text{ m}$$

Velocity:

$$v_{56} = \frac{d_{56}}{\Delta t} = \frac{(4.47)}{(0.500)} = 8.94 \text{ m/s}$$

$$v_{67} = \frac{d_{67}}{\Delta t} = \frac{(5.10)}{(0.500)} = 10.20 \text{ m/s}$$

$$\Delta v_6 = \sqrt{(2 \cdot 3)^2 + (2 \cdot 5)^2} = 11.66 \text{ m/s}$$

Acceleration:

$$a_6 = \frac{\Delta v_6}{\Delta t} = \frac{(11.66)}{(0.500)} = 23.3 \text{ m/s}^2$$