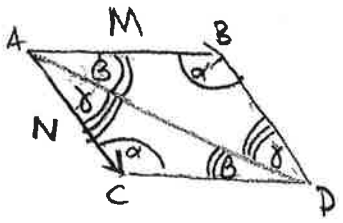
EX 22.1

(Force addition and Newton's 2nd law)

M = 5N

N = 3N

$\angle BAC = \theta = 60°$



1) What is the net force? Can just use the law of cosines.

$$\overline{AD}^2 = \overline{AB}^2 + \overline{BD}^2 - 2\overline{AB}\ \overline{BD}\cos\alpha$$

Since $\gamma + \beta$ and α are supplementary angles, $\alpha = 120°$

Solving for $\overline{AD}$ gives, $\overline{AD} =$ **7 N**

Using the law of sines, $\frac{\sin 120}{7} = \frac{\sin\beta}{3} = \frac{\sin\gamma}{5}$

We find that **$\beta = 22$ degrees** (below horizontal)

2) A 7 N force causes an acceleration of 7 m/s^2 on a 1 kg mass. After 2 seconds, it will have a velocity of **14 m/s** at an angle $\beta = 22$ deg. It will have traveled **14 meters** by the end of 2 sec.

3) If it was initially moving left @ 5 m/s, then its final speed would be less. To find this we should consider the horizontal & vertical velocities separately.

$$v_{Horizontal} = -v_{oH} + a_H t$$

$$= -5\,m/s + 7\left(\frac{m}{s^2}\right)\cos(22^\circ)\,(2\,sec)$$

$$= 8\,m/s$$

$$v_{Vert} = v_{oV} + a_V t$$

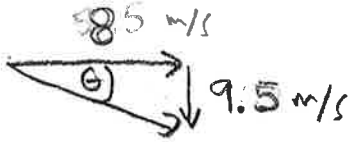
$$= 0 - \left(7\,\frac{m}{s^2}\right)(\sin 22^\circ)(2\,sec)$$

$$= -5.2\,m/s$$

$$v_{TOTAL} = \sqrt{v_H^2 + v_V^2}$$

$$\boxed{v_{TOTAL} = 9.5\,m/s}$$

- Its direction of motion would be given by



$$\theta = \arctan\left(\frac{9.5}{8}\right) =$$

$$\boxed{\theta = 50 \text{ deg below hor'z}}$$

- Its position will be $x = 3$ m, $y = -5.2$ m } $d = 5.6$ m from starting point.