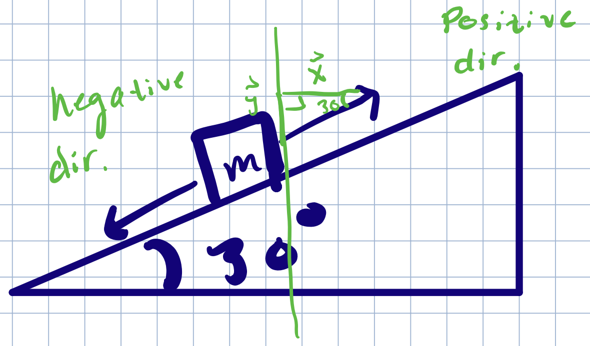
1)



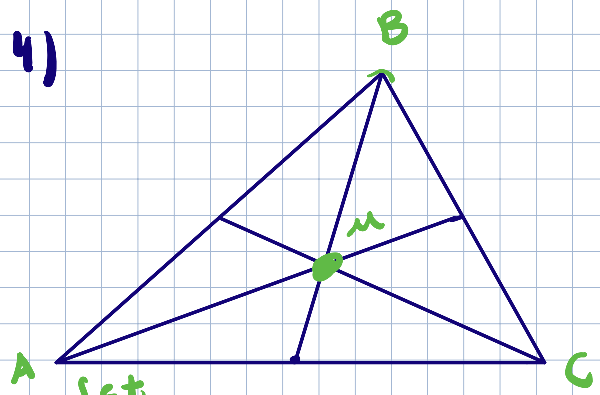
SOH CAH TOA

$$\sin(30^\circ) = \frac{|\vec{y}|}{|\vec{f}|}$$

$$|\vec{f}| = \frac{|\vec{y}|}{\sin(30^\circ)}$$

$$= \frac{10m}{\sin(30^\circ)} = 5 \cdot m \text{ N}$$

4)



$$\vec{OM} = \frac{1}{3}(\vec{OA} + \vec{OB} + \vec{OC})$$

$$\vec{AB} = \vec{OB} - \vec{OA}$$

set $O = M$

thus $\vec{MA} + \vec{MB} + \vec{MC} = \vec{0} = \vec{OA} + \vec{OB} + \vec{OC}$

If $O = M$ $\vec{OM} = \vec{0}$

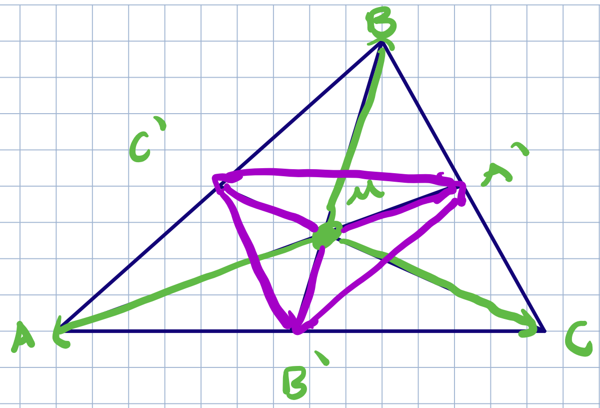
$$\left.\begin{aligned} \vec{OA} &= \vec{OM} + \vec{MA} \\ \vec{OB} &= \vec{OM} + \vec{MB} \end{aligned}\right\} = 0$$

$$\vec{OC} = \vec{OM} + \vec{MC}$$

$$\vec{OA} + \vec{OB} + \vec{OC} = 3\vec{OM}$$

$$\vec{OM} = \frac{1}{3}(\vec{OA} + \vec{OB} + \vec{OC})$$

5)



$$\vec{MB'} + \vec{B'A} = \vec{MA} = \vec{MB'} + \frac{\vec{CA}}{2}$$

$$\vec{MB} = \vec{MA} + \vec{AB} = \vec{MC'} + \frac{\vec{AB}}{2}$$

$$\vec{MC} = \vec{MB} + \vec{BC} = \vec{MA'} + \frac{BC}{2}$$

$$\vec{MB} + \vec{MC} + \vec{MA} = \vec{MB'} + \vec{MC'} + \vec{MA'}$$

$$+ \underbrace{\tfrac{1}{2}(AB + BC + CA)}_{=0}$$

$$\vec{MB} + \vec{MC} + \vec{MA} = \vec{MB'} + \vec{MC'} + \vec{MA'}$$

It is known that

$\vec{MC'} = \frac{1}{3}\vec{CC'}$

$\vec{MA'} = \frac{1}{3}\vec{AA'}$

$\vec{MB'} = \frac{1}{3}\vec{BB'}$

$\vec{MC} = 2\vec{MC'}$

$\vec{MA} = 2\vec{MA'}$

$\vec{MB} = 2\vec{MB'}$

$\Rightarrow$ $2\vec{MC'} = \vec{MC}$

$2\vec{MB'} = \vec{MB}$

$2\vec{MA'} = \vec{MA}$

thus

$2MC' + 2MB' + 2MA' =$

$MC' + MB' + MA'$

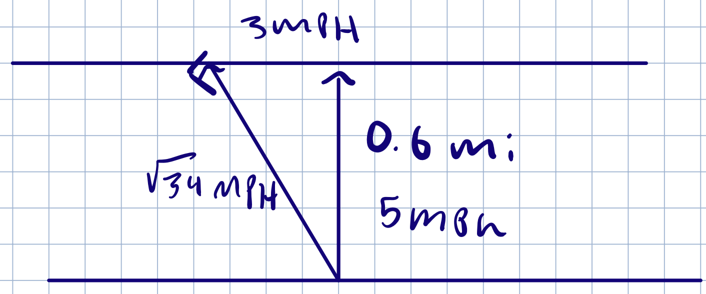
↳ this is only true if

$MC' + MB' + MA' = 0$

cont.

so, $\vec{MA} + \vec{MB} + \vec{MC} = 0$

2)



$3/5 = 0.6$

$x : 3/5$ $\qquad \frac{5x}{3} = 3/5$

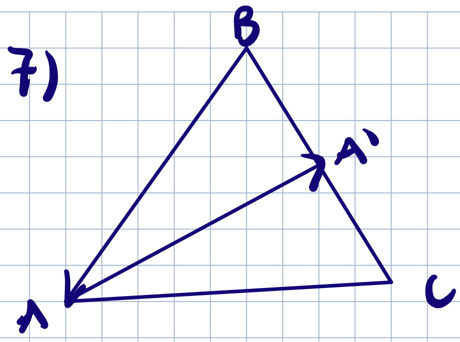
$5x = 9/5$

$x = 9/25$

$$\sqrt{(0.6)^2 + (9/25)^2} \approx 0.7 \text{ mi}$$

$$\frac{0.7 \text{ mi}}{\sqrt{34} \text{ mi/hr}} = 0.24 \text{ hr}$$

7)



$\vec{AA'} = \frac{1}{2}(\vec{AB} + \vec{AC})$

$2AA' = \vec{AB} + \vec{AC}$

$2AA' + \vec{BA} + \vec{CA} = 0$

$\vec{BA} = -(\vec{AA'} + \vec{A'B})$

$\vec{CA} = -(\vec{AA'} + \vec{A'C})$

$2AA' = 2AA' + A'B + A'C$

b/c $\vec{AA'}$ is the median,

$\vec{A'B} = -\vec{A'C}$

thus this simplifies to

$\vec{AA'} = \vec{AA'}$ which is true

$\Rightarrow \vec{AA'} = \frac{1}{2}(\vec{AB} + \vec{AC})$