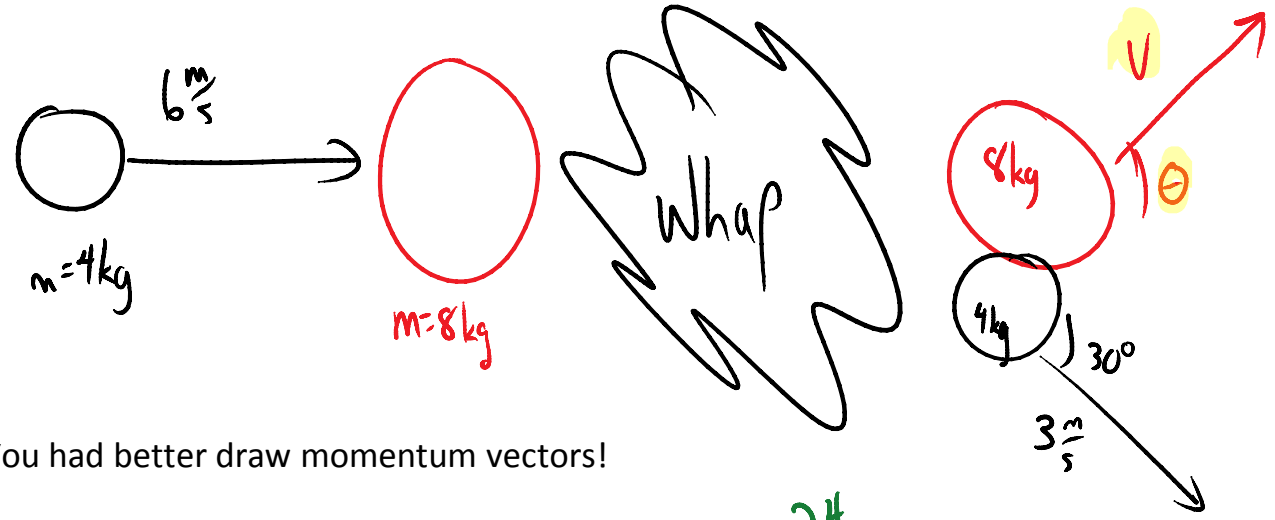
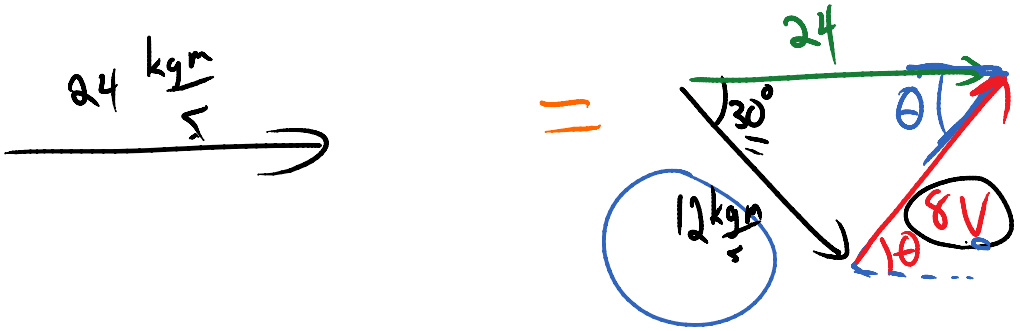
2 Dimensional conservation of momentum

Wednesday, March 27, 2013
10:22 AM

The key to your success is a good vector diagram.



You had better draw momentum vectors!



Re-draw in tip to tail fashion:

$c^2 = 12^2 + 24^2 - 2(12)(24)\cos 30$

$c = 14.9 \frac{kgm}{s} \leftarrow \frac{p}{m} = v = \frac{14.9}{8} = 1.86 \frac{m}{s}$

COSINE LAW saves the day

$\frac{\sin\theta}{12} = \frac{12\sin 30}{14.9}$

$\theta = 23.7°$

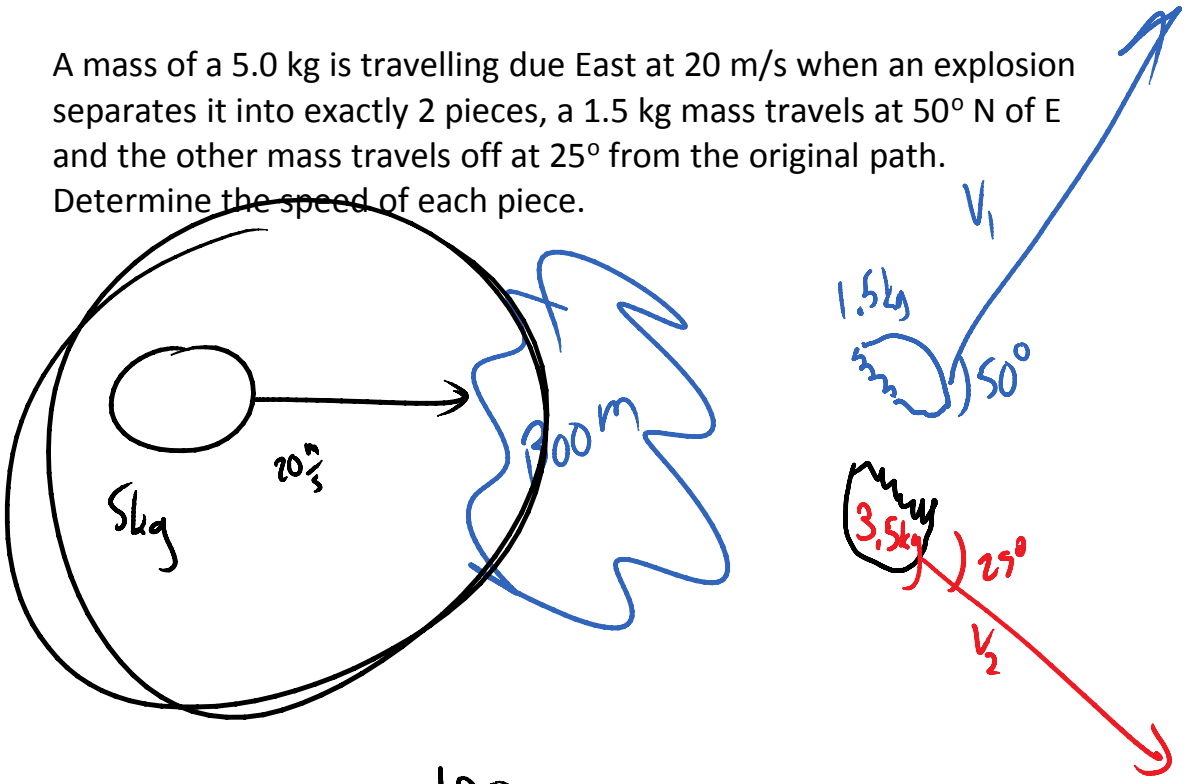
N Jome

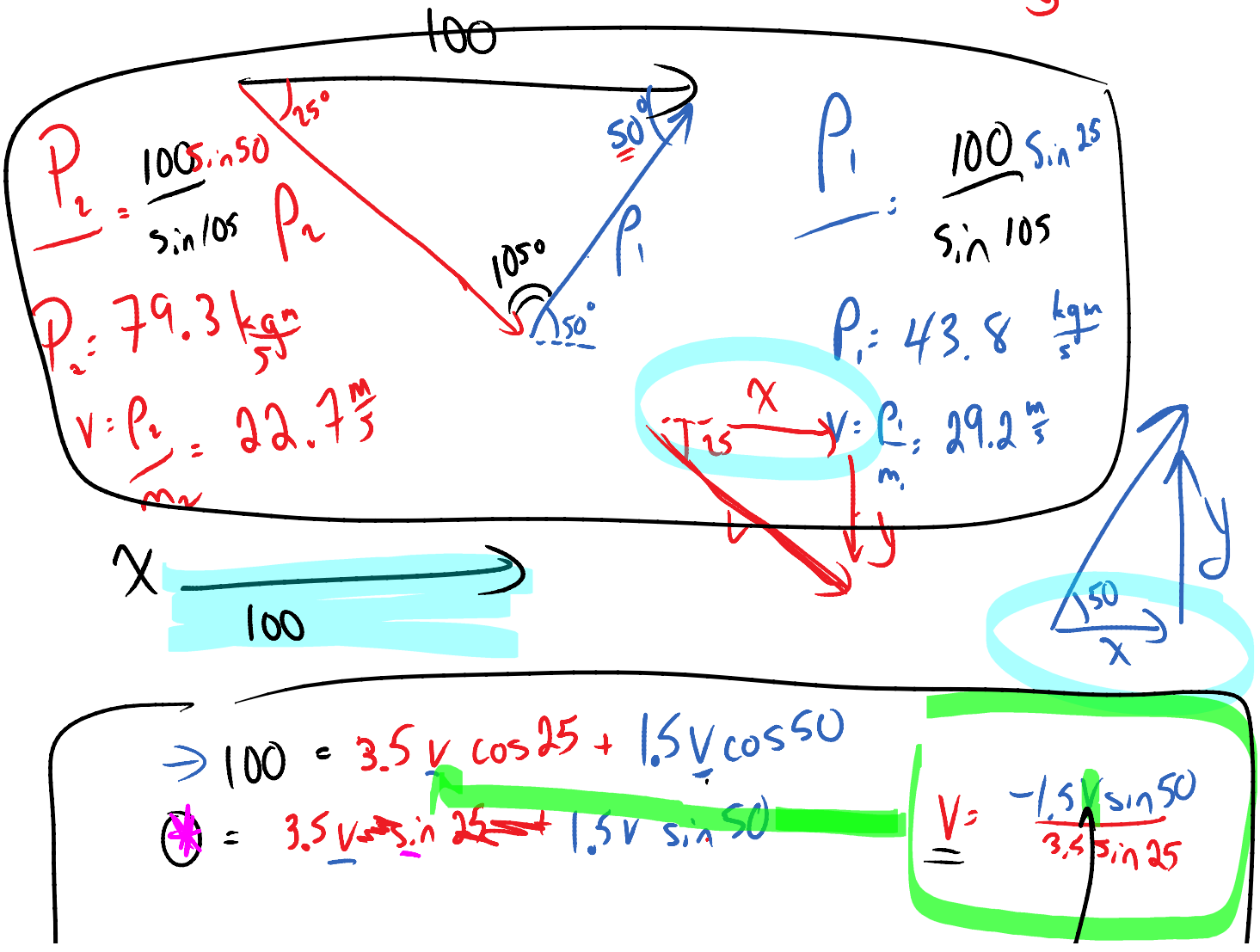
$= 2^2 + 8^2 - 2(2)(8)\cos 45$

$c = 6.7 \leftarrow p$

$\frac{p}{m} = v = \frac{6.7}{4} = 1.69 \frac{m}{s}$

A mass of a 5.0 kg is travelling due East at 20 m/s when an explosion separates it into exactly 2 pieces, a 1.5 kg mass travels at 50° N of E and the other mass travels off at 25° from the original path. Determine ~~the speed~~ of each piece.





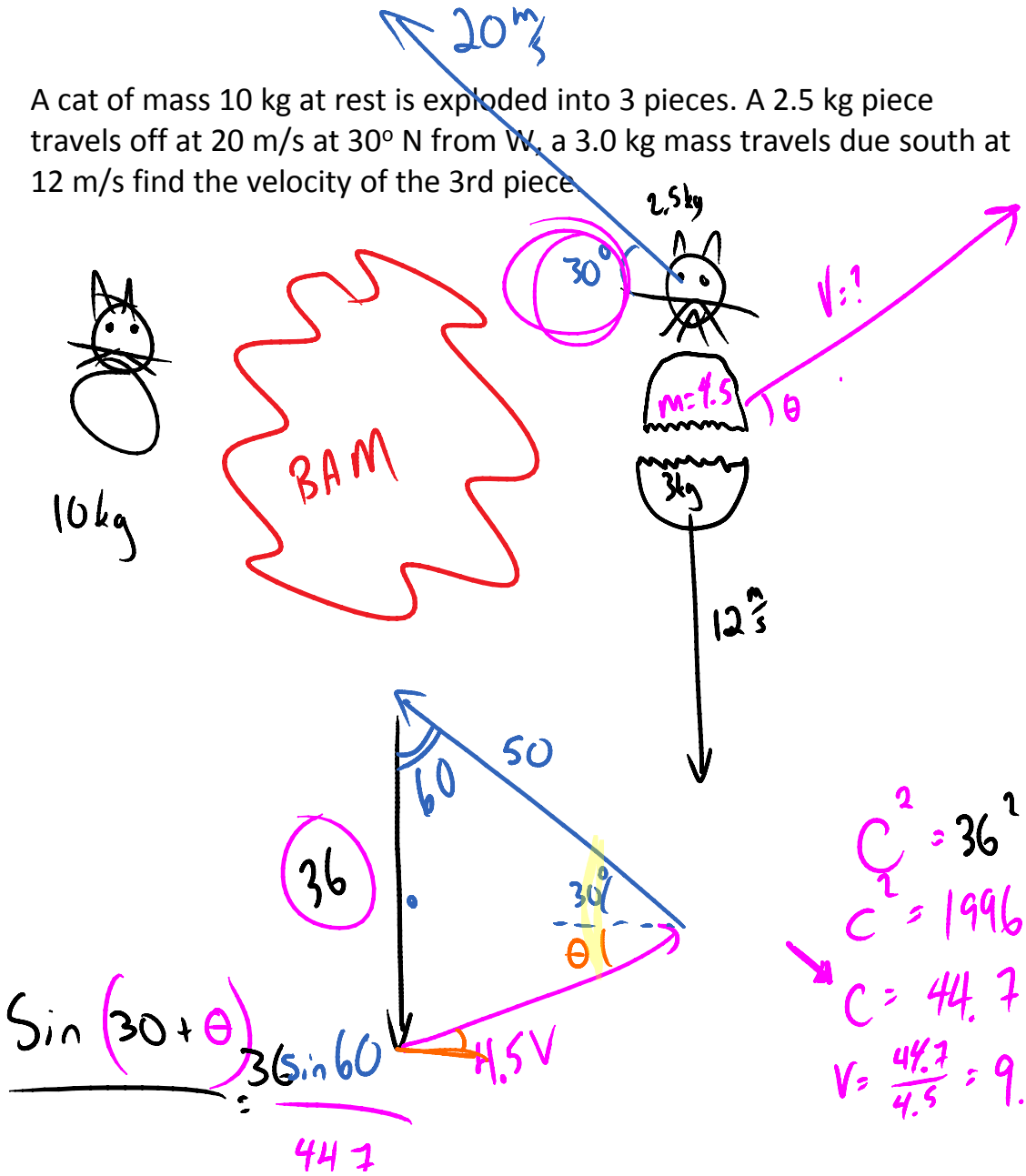
$\Rightarrow 100 = 3.5V\cos 25 + 1.5V\cos 50$

$(*) = 3.5V\sin 25 + 1.5V\sin 50$

$V = \dfrac{-1.5V\sin 50}{3.5\sin 25}$

$$100 = 3.5\left(\frac{-1.5\,V\sin 50}{3.5\sin 25}\right) + 1.5\,V\cos 50$$

A cat of mass 10 kg at rest is exploded into 3 pieces. A 2.5 kg piece travels off at 20 m/s at 30° N from W, a 3.0 kg mass travels due south at 12 m/s find the velocity of the 3rd piece



44.7

$\sin(30+\theta) = \frac{36 \sin 60}{44.7}$

$30 + \theta = 44$

$\theta = 14^\circ$ N from E