Physics 12

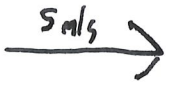
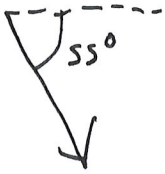
Booklet #1

- 2D Vectors
- Sine and Cosine Law
- Momentum and Impulse
- Collisions
- 2D Collisions

2D Vectors

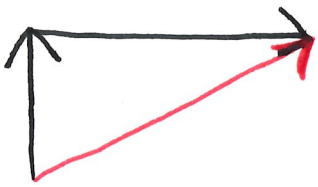
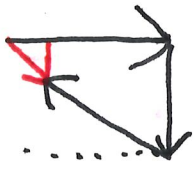
A vector has both magnitude and direction

Example: Sketch each of the following vectors, labelling angles if necessary

5 m/s East 	5 m/s South 	5 m/s ,25° North of East 
5 m/s, 25° above the horizontal 	5 m/s, 55° below the horizontal 	5 m/s 25°, East of North 

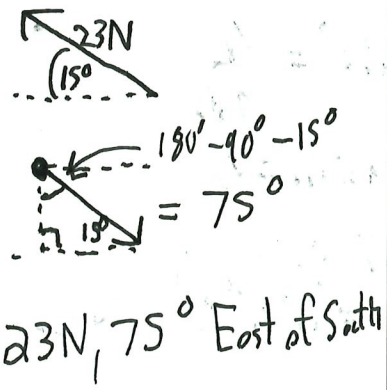
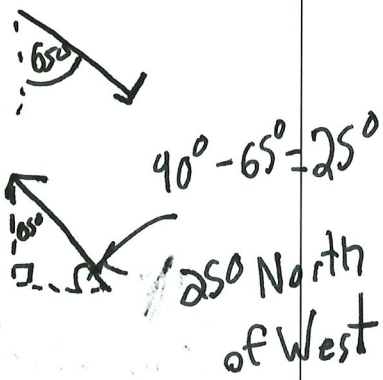
To add vectors draw them tail to tip, the sum is the result of drawing a vector from start of the first vector to the end of the last vector.

Example: Roughly sketch the following additions (do not need to calculate answer)

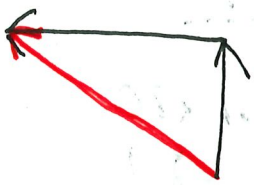
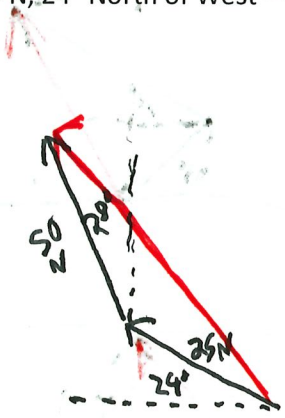
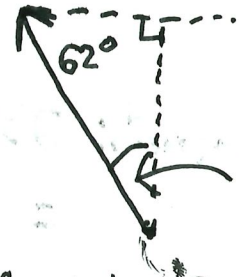
5 m/s North + 10 m/s East 	20 m/s^2 at 45° above the horizontal + 10 m/s^2 straight down 
20 N East + 20 N South + 20 N 45° North of West 	

To subtract vectors, change the subtracting into an addition by adding the opposite vector:

Sketch each of the vectors and their opposites:

15 m/s North	23 N, 15° North of West	45 m/s^2, 65° East of South
		

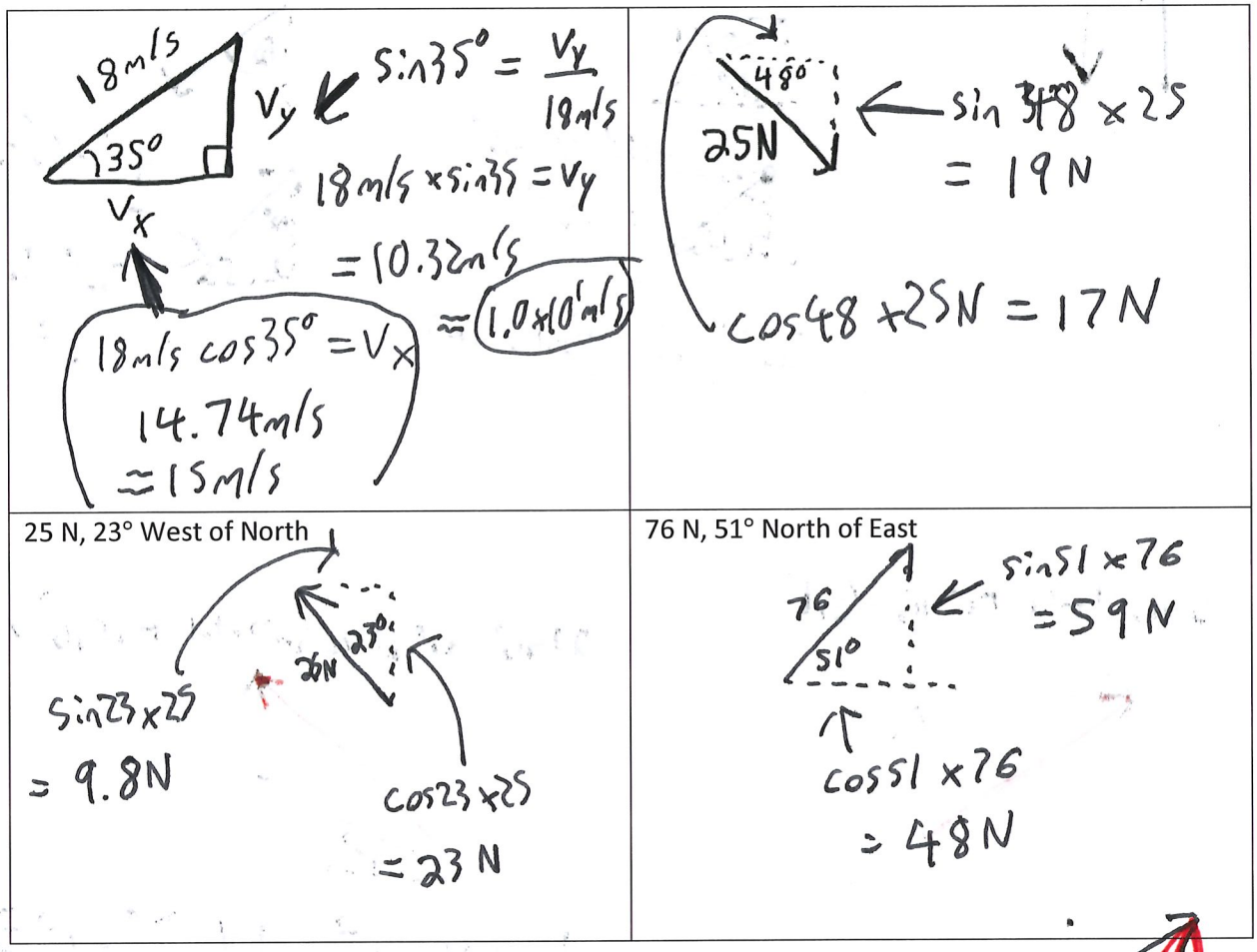
Example: Roughly sketch the following subtractions (do not need to calculate answer)

5 m/s North – 10 m/s East	20 m/s^2 at 45° above the horizontal minus 10 m/s^2 straight down
5m/s North + 10m/s West 	20m/s^2 45° above horizontal + 10m/s^2 up 
25 N, 24° North of West – 50 N, 62° South of East 	Opposite of 50N, 62° S of East 

Vector Components

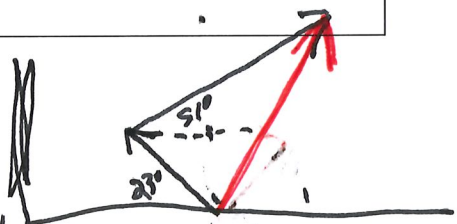
Any vector can be written as the sum of two vectors at 90 degrees to each other, normally these are the horizontal component and vertical components.

Example: Determine the horizontal and vertical components of the following vectors



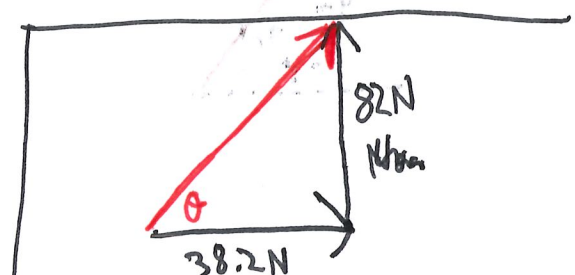
You can add (or subtract) vectors using their components.

Example: What is 25 N, 23° West of North + 76 N, 51° North of East



North/South components: 23N North + 59N North
= 82N North

East/West: 9.8N West + 48N East
= -9.8N East + 48N East
= 38.2N East



$mag = \sqrt{38.2^2 + 82^2} = 90 N$

$\tan^{-1}\left(\frac{82}{38.2}\right) = 65°$ North of East