Cat II 8/30/2007

Chapter 9 - Vectors and oblique triangles

9.1 Introduction to Vectors

Scalar - only the magnitude is known

Vector - the magnitude and the direction are known

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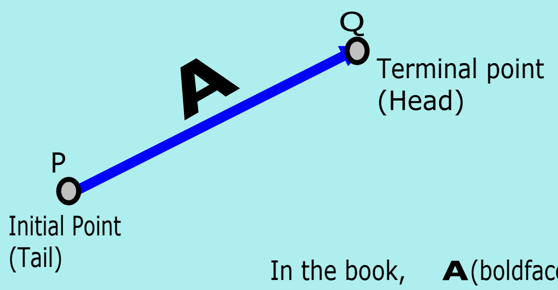
Representation of Vectors



In the book, **A** (boldface A) refers to vector A...

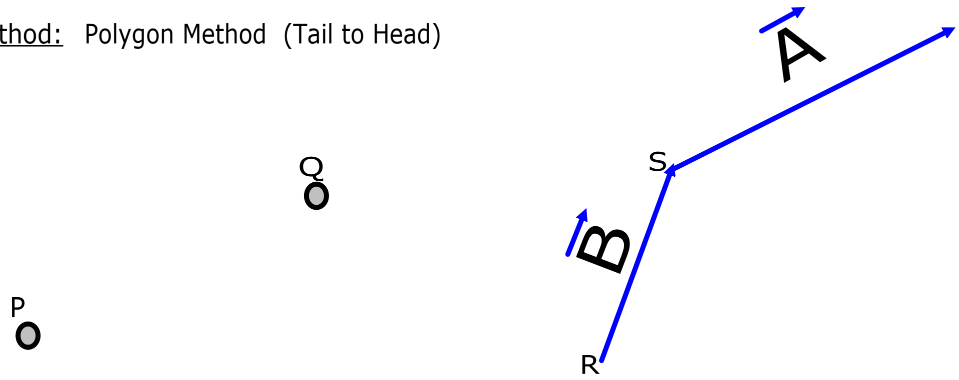
For writing purposes in class,

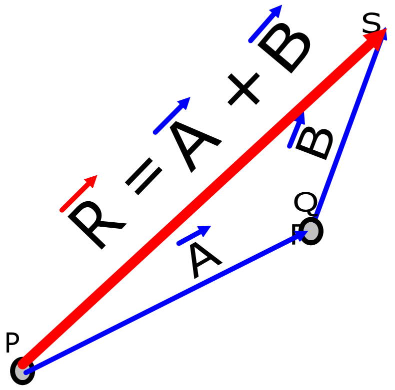
Notations :
- $\vec{A}$ refers to Vector A
- A refers to the magnitude of Vector A

9.1

Addition of Vectors (Graphically)

1st Method: Polygon Method (Tail to Head)



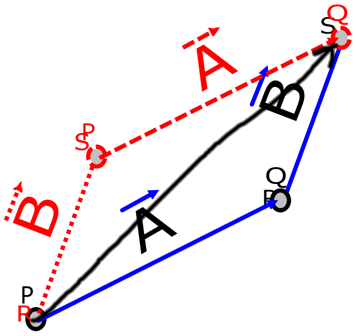


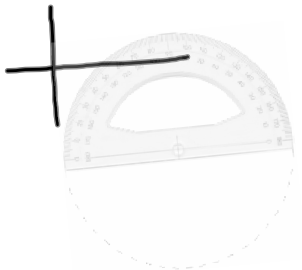
Connect Tail of one vector to the Head of the other ... connect the Tail of vector A to the Head of vector B.

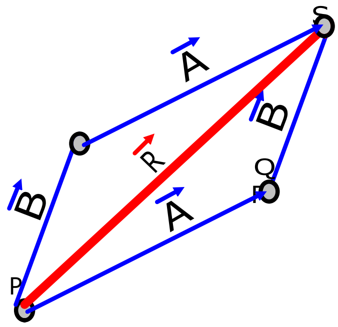
The resulting vector will be the addition of vectors A and B, which we will refer to as the *resultant vector R*

Addition of Vectors (Graphically)

2nd Method: Parallelogram Method (Tail to Tail)





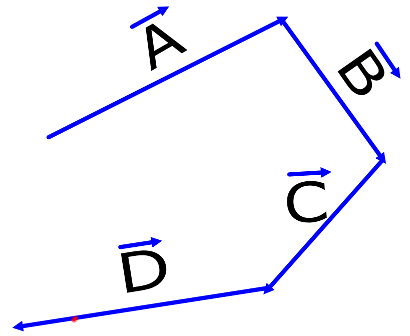


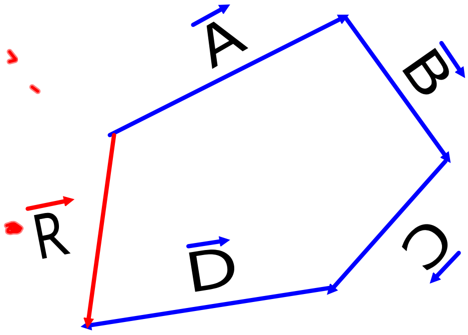
Connect Tail of one vector to the Tail of the other...connect the Tail of vector A to the Tail of vector B.

The resulting vector will be the addition of vectors A and B, which we will refer to as the *resultant vector R...* in this case it is the diagonal of the parallelogram.

Adding more than two vectors... (graphically)

Given the four vectors...add using the polygon method.



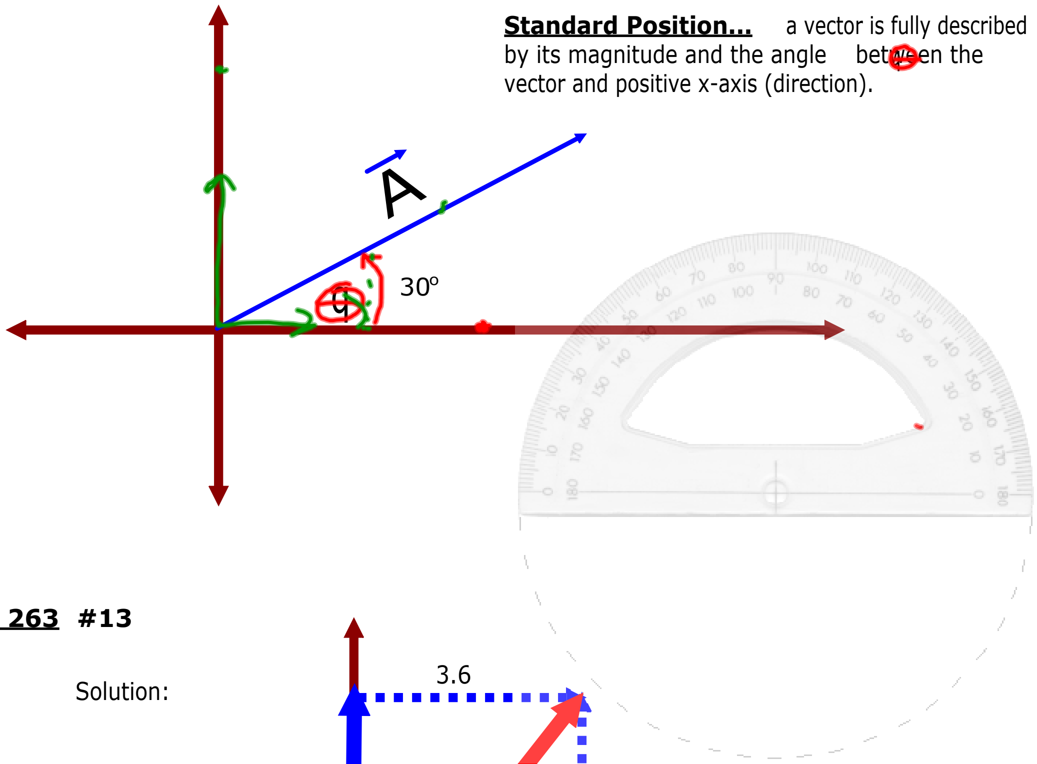


Arrange the vectors by tail to head to create a polygon. The last side that closes the polygon is the resultant $\vec{R}$

A Vector in Standard Position...

...If the tail of a vector is at the origin in a rectangular coordinate system....

Standard Position... a vector is fully described by its magnitude and the angle between the vector and positive x-axis (direction).



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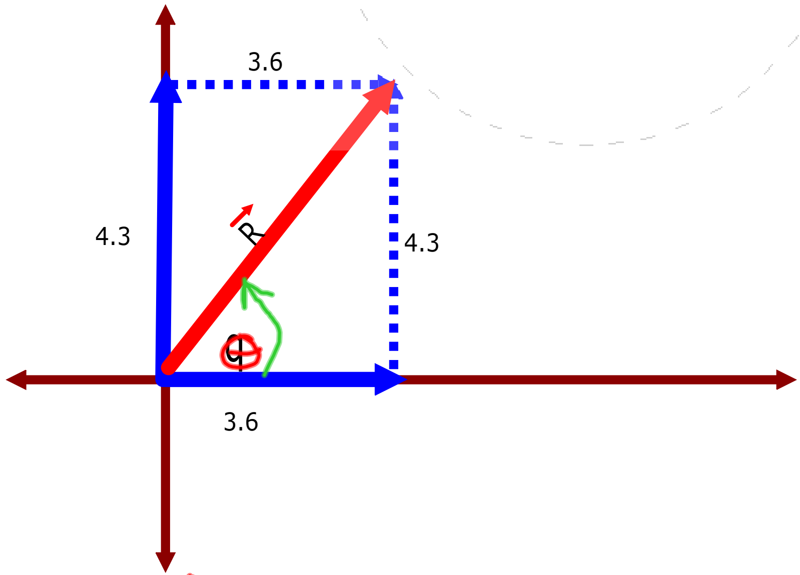
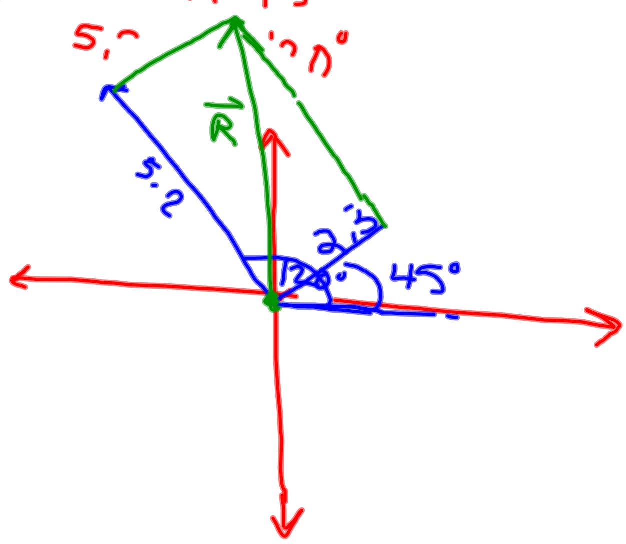
Solution:



(14) 2.3cm 45°



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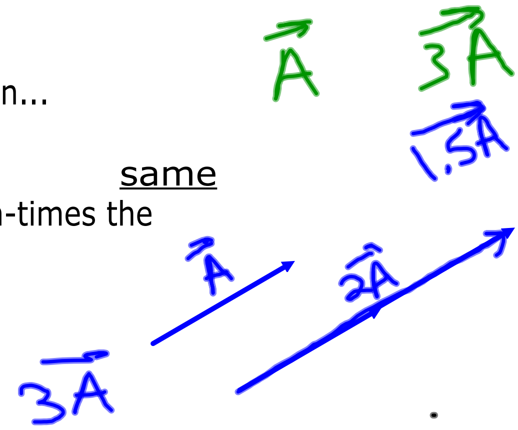
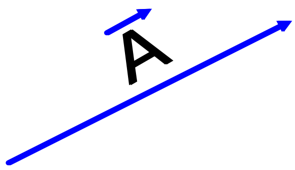
9.1 (continued) Scalar Multiple of a Vector

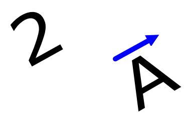


Given a vector A, and a positive real number n...

The vector n * A is the vector with the same direction as A, and the magnitude n-times the magnitude of A.

Ex:

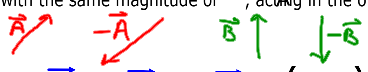




9.1 (continued) Subtracting Vectors

Opposite of a vector:

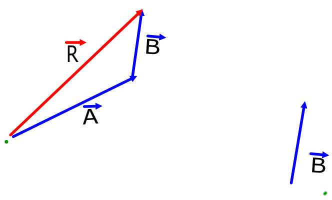
Given a vector A. The opposite of $\vec{A}$ denoted by $-\vec{A}$ is a vector with the same magnitude of $\vec{A}$, acting in the opposite direction.



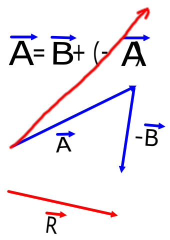
Defn: $\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$

Ex 1. $\vec{A} + \vec{B}$

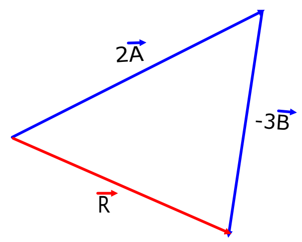
...Using the Tail-to-Head method...



Ex 2. $\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$ $\vec{A}$ $\vec{B}$



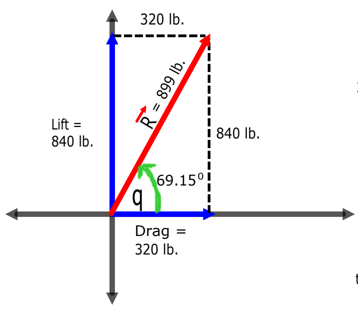
Ex 3. $2\vec{A} - 3\vec{B} = 2\vec{A} + (-3\vec{A})$ $\vec{B}$



*make drawing
*find resultant vector
*use pythag to find distance of R
*use tan to find theta of the vector to find total vector (magnitude and direction)

P. 263, #37 ...application

Two forces that act on an airplane wing are called the lift and the drag. Find the resultant of these forces scting on the airplane wing in fig 9.10



$a^2 + b^2 = c^2$

$320^2 + 840^2 = c^2$

$102400 + 705600 = c^2$

$808000 = c^2$

$898.888 = c$

$899 \approx$

$\tan \theta = \frac{840}{320}$

$\tan \theta = 2.625$

$\tan^{-1}(\tan \theta) = \tan^{-1}(2.625)$

$\theta = 69.1455^{0}$

Rationale - To find the complete resultant:
-represent graphically (Draw a Picture!!!)
-find distance of resultant (magnitude)
-find measure of θ for resultant (direction)

End of 9-1...HW assignment ... #9, 11, 17-33 every other odd (graph paper helps)