Vector Component Notes
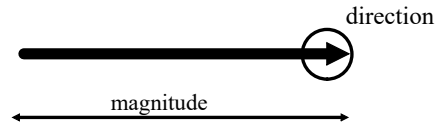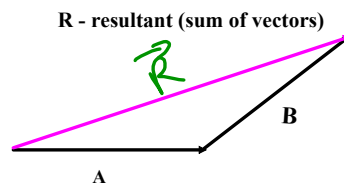
Vector quantities have both magnitude and direction. Some examples of vector quantities are velocity, force, acceleration and momentum.
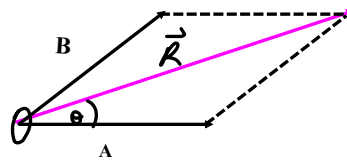
Vectors are represented by arrows.

direction

magnitude

Graphical Methods of Adding Vectors

1. Tip-to-tail Method

R - resultant (sum of vectors)

R

B

A

2. Parallelogram Method

B

$\vec{R}$

θ

A

Negative Vectors

$\vec{A}$

$-\vec{A}$

$-2\vec{A}$
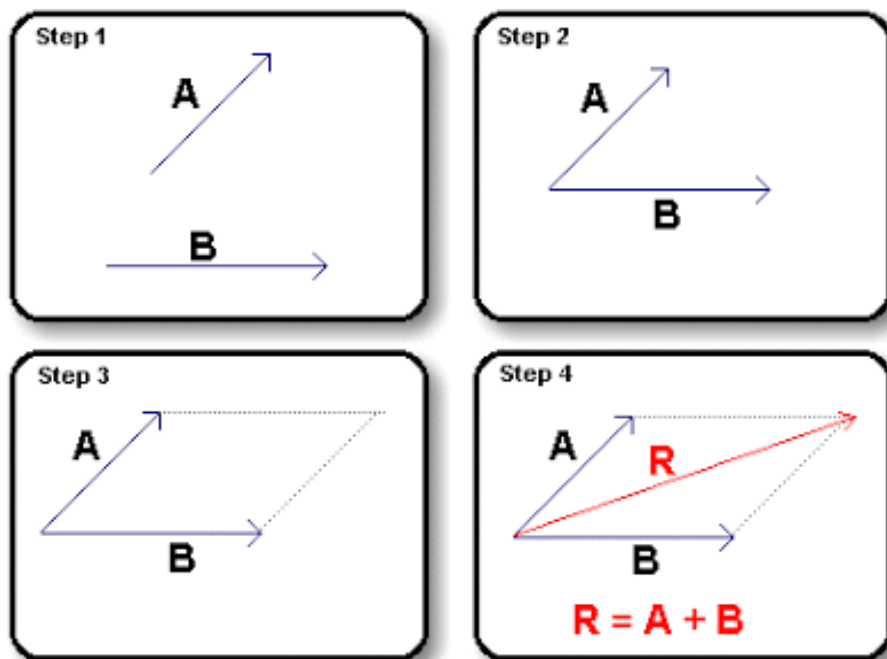
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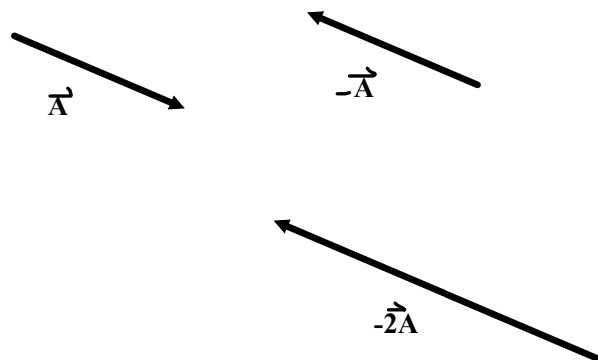
The two methods of solving vector problems

1. Parallelogram Method

The parallelogram method uses geometry and advanced trig to solve for unknowns.

Lines should be drawn (roughly) to scale to get an accurate description of the magnitude and direction of the resultant line.

Vector Component Notes

Example - Use the parallelogram method to find the resultant of 1.60 km east, and 3.40 km, 35.0° N of E. (4.8 km, 24.0⁰ N of E)
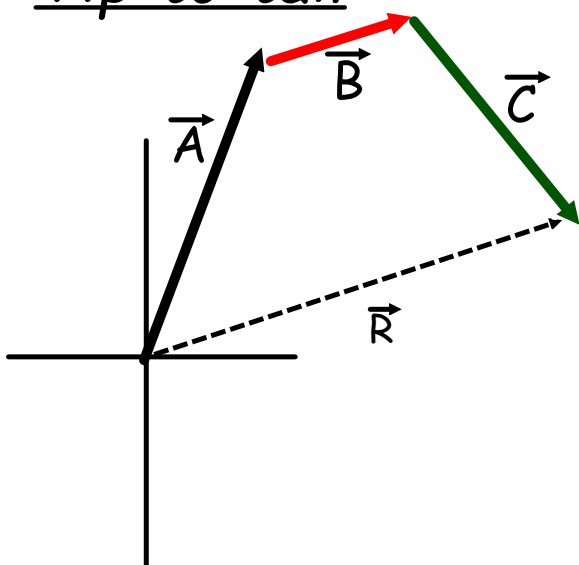
Tip to Tail Method

Using trig properties to connect vectors end-to-end to find the resultant and angle.
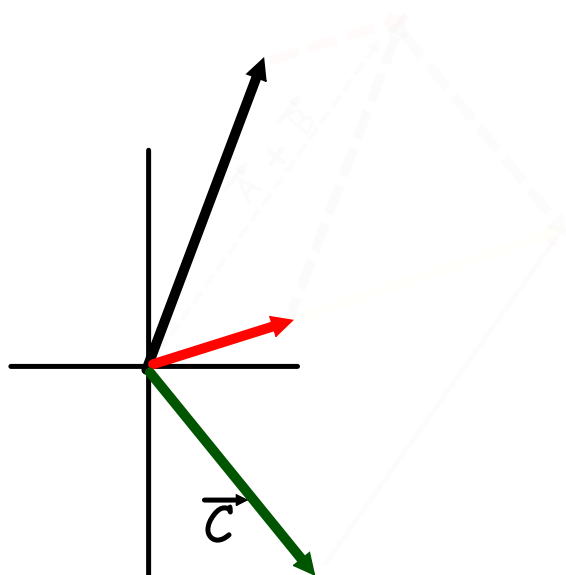
Vector Component Notes

<u>Example</u> - Use the tip-to-tail method to find the resultant of 1.60 km east, and 3.40 km, 35.0° N of E. (4.8 km, 24.0° N of E)

How could the 2 methods be used to solve 3 vectors?

Tip-to-tail

Parallelogram

Finding the Resutant Velocity Mathematically

An airplane flying due east at 90.0 km/h meets a strong wind blowing north at 50.0km/h. What is the resultant velocity of the plane? Calculate to scale first and then check your answer using trig.

Vector Problems

Pg. 113 #1.1 - 1.4
Pg. 112-116 #1-10

*1-6 should be drawn while 7-10 will be calculated.

Vector Component Notes

Components of a Vector

A vector can be expressed as the sum of two other vectors, called the components of the vector. The process of finding the components of a vector is called vector resolution. We will always be finding the perpendicular components of a vector.
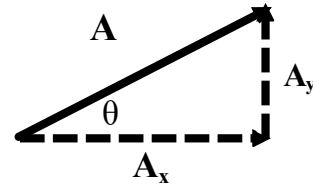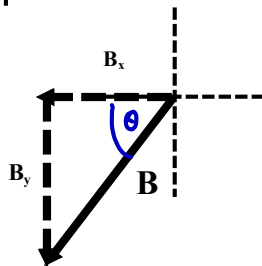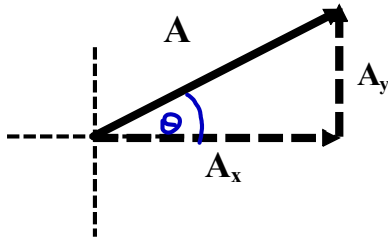
Use trigonometric ratios to determine the magnitudes of the components. The arrows of the components show their directions.

Trig Ratios – SOH CAH TOA
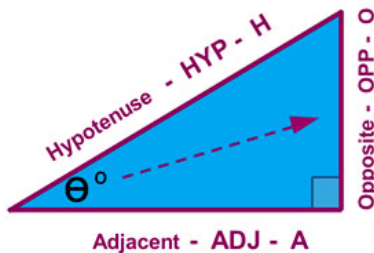
Name	Ratio	Expression
Sine	O / H	SinΘ
Cosine	A / H	CosΘ
Tangent	O / A	TanΘ

We use "SOH-CAH-TOA" to help us remember the Ratios

SOH is short for **Sine** = Opposite / Hypotenuse = O / H
CAH is short for **Cosine** = Adjacent / Hypotenuse = A / H
TOA is short for **Tangent** = Opposite / Adjacent = O / A

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Adding Vectors Using Perpendicular Components

1. <u>Resolve each vector into its perpendicular components.</u>
2. Add corresponding vector components.

$$\vec{R}_x = \vec{A}_x + \vec{B}_X$$
$$\vec{R}_y = \vec{A}_y + \vec{B}_y$$

3. Sketch $\vec{R}_x$ and $\vec{R}_y$ tip-to-tail.
4. Use the Law of Pythagoras and a trig ratio to determine the magnitude and direction of the resultant.

Vector Component Notes

Try - Three forces act simultaneously on point P. The first
force is 1.0×10^1 N east. The second force is 15 N
south. The third force is 28 N, 46° S of E. Find the
resultant force using either method. (45.5 N, 50° S of E)

Vector Component Notes

<u>Try</u> - Determine the resultant distance travelled of 243 km, 50.0° N of E and 57.0 km, 20.0° S of E using either method. (268 km, 38.5° N of E)

<u>Try</u> - Determine the resultant distance travelled of 243 km, 50.0° N of E and 57.0 km, 20.0° S of E using either method. (268 km, 38.5° N of E)

Vector Problems

Pg. 118 #11-14
Pg. 120 #15-16, 2.1-2.4