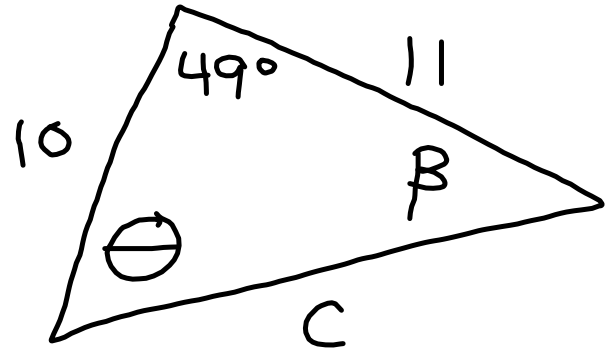
Feb. 27, 2017

Solve the triangle



$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$c^2 = 10^2 + 11^2 - 2(10)(11)\cos 49^\circ$$

$$c^2 = 76.67\ldots$$

$$\boxed{c = 8.76}$$

$$\frac{\sin\theta}{11} = \frac{\sin 49^\circ}{8.76}$$

$$\sin\theta = \frac{11 \cdot \sin 49}{8.76}$$

$$\theta = \sin^{-1}\left(\frac{11 \cdot \sin 49}{8.76}\right)$$

$$\boxed{\theta = 71.5^\circ}$$

$$\beta = 180^\circ - 71.5^\circ - 49^\circ$$

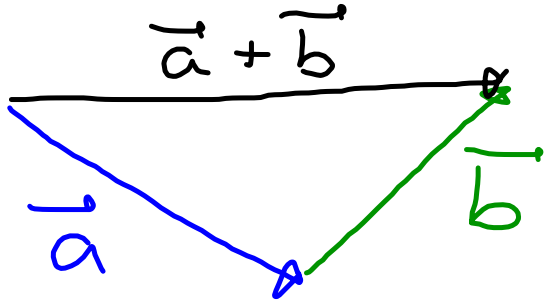
$$\boxed{\beta = 59.5^\circ}$$

Addition and Subtraction of Vectors

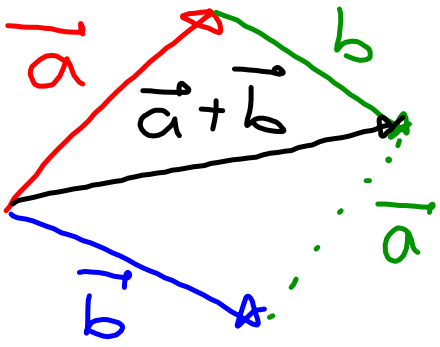
Vector Addition

Consider two vectors $\vec{a}$ and $\vec{b}$. When vectors are added they added tip to tail and the resultant is $\vec{a} + \vec{b}$

Triangle Method of Adding Vectors



Parallelogram Method



Subtracting Vectors

From Friday, the opposite vector has the same magnitude and opposite direction.

To subtract $\vec{u} - \vec{v}$, we change to $\vec{u} + (-\vec{v})$.

Change the direction of $\vec{v}$ then add the vectors.

Opposite Vectors and the Zero Vector

$3 + (-3) = 0$

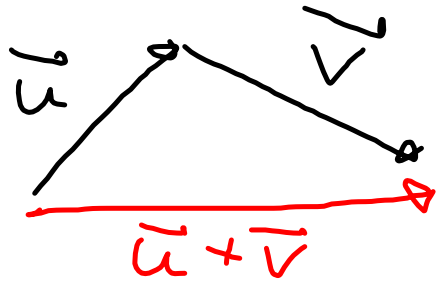
$\vec{u} + (-\vec{u}) = \vec{0}$

The zero vector $\vec{0}$ has no magnitude and no direction.

$\vec{u} + \vec{0} = \vec{u}$

Commutative Property for Vector Addition

$$\vec{u} + \vec{v} = \vec{v} + \vec{u}$$



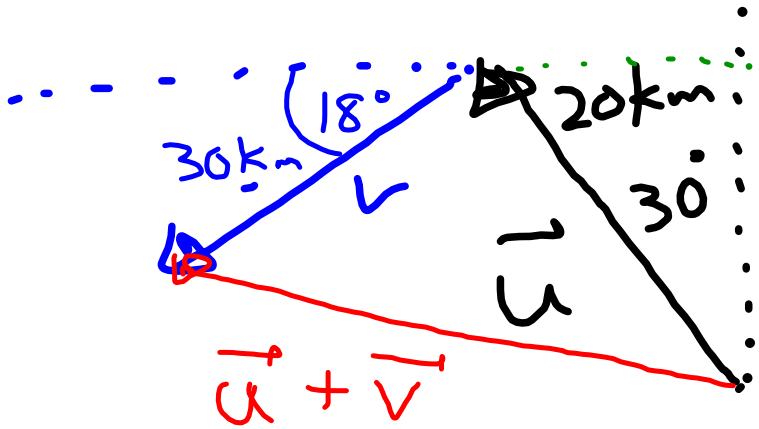
Associative Property

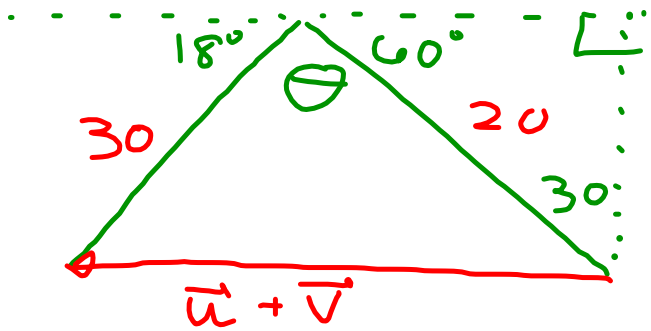
$$\vec{u} + (\vec{v} + \vec{w}) = (\vec{u} + \vec{v}) + \vec{w}$$

Vectors can be added in any order.

Ex. 1: If $\vec{u} = 20\text{km}[N30°W]$, $\vec{v} = 30\text{km}[W18°S]$, $\vec{w} = 40\text{km}[S22°E]$ sketch and find

a) $\vec{u} + \vec{v}$





$$\theta = 180^\circ - 60^\circ - 18^\circ$$

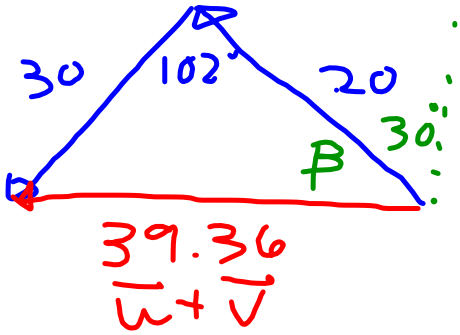
$$\boxed{\theta = 102^\circ}$$

magnitude

$$|\vec{u} + \vec{v}|^2 = 30^2 + 20^2 - 2(30)(20)\cos 102^\circ$$

$$|\vec{u} + \vec{v}|^2 = 1549.5\ldots$$

$$\boxed{|\vec{u} + \vec{v}| = 39.36 \text{ km}}$$



heading

$30° + \beta$ from [N]

$$\frac{\sin\beta}{30} = \frac{\sin 102°}{39.36}$$

$$\sin\beta = \frac{30 \cdot \sin 102°}{39.36}$$

$$\boxed{\beta = 48.1°}$$

[N 30 + 48.1° W]

[N 78.1° W]

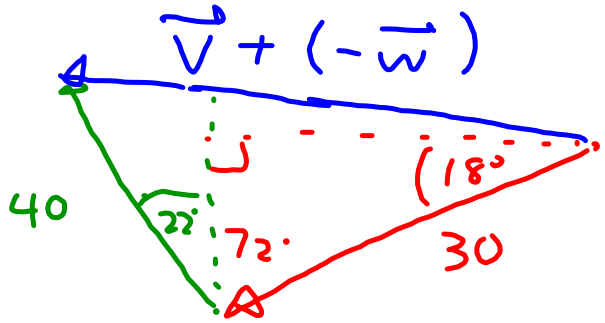
$$\vec{u} + \vec{v} = 39.36\text{km}\,[W\,11.9°\,N]$$

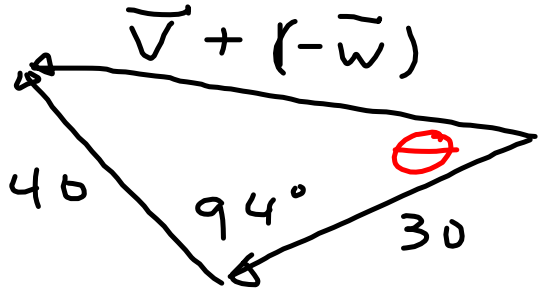
$\vec{V} - \vec{W}$

$\vec{V} = 30\text{km}\,[W\,18°S]$

$\vec{W} = 40\text{km}\,[S\,22°E]$

$-\vec{W} = 40\text{km}\,[N\,22°W]$





$$|\vec{v}+(-\vec{w})|^2 = 40^2 + 30^2 - 2(40)(30)\cos 94$$

$$|\vec{v}+(-w)|^2 = 2667.416\ldots$$

$$\boxed{|\vec{v}+(-w)| = 51.6}$$

heading [W θ - 18° N]

$$\frac{\sin\theta}{40} = \frac{\sin 94}{51.6}$$

$$\sin\theta = \frac{40 \cdot \sin 94}{51.6}$$

$$\boxed{\theta = 50.7^\circ}$$

$\therefore \vec{v} + (-\vec{w}) = 51.6\text{km}\ [\text{W}\ 32.7^\circ\text{N}]$

HW p. 325

5, 6, 7, 9, 11, 14, 15, 16