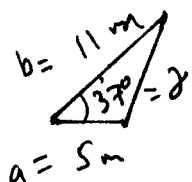


5.3 Area of a Triangle

ex. [SAS] Given $a = 5$ meters, $b = 11$ meters, $\gamma = 37^\circ$

Area of the triangle?



$$\begin{aligned} \text{Area} &= \frac{1}{2} ab \sin \gamma = \frac{1}{2} (5\text{m})(11\text{m}) \sin 37^\circ \\ &= 16.54 \text{ m}^2 \end{aligned}$$

ex [SSS] Given a triangle has sides 7 ft, 5 ft and 8 ft.
What is the area? Use Heron's formula

$$\text{Area} = \sqrt{S(S-a)(S-b)(S-c)}$$

$$\text{where } S = \text{semiperimeter} = \frac{a+b+c}{2}$$

$$\text{perimeter} = 7 + 5 + 8 = 20 \text{ ft}$$

$$S = 10 \text{ ft}$$

$$S-a = 10 - 7 = 3 \text{ ft}$$

$$S-b = 10 - 5 = 5 \text{ ft}$$

$$S-c = 10 - 8 = 2 \text{ ft}$$

$$\text{Area} = \sqrt{(10 \text{ ft})(3 \text{ ft})(5 \text{ ft})(2 \text{ ft})}$$

$$= \sqrt{300 \text{ ft}^4} = 10\sqrt{3} \text{ ft}^2 \approx 17.3 \text{ ft}^2$$

Remark: (1) Notice the units: $\sqrt{\text{ft}^4} = \text{ft}^2$

$$\begin{aligned} (2) \quad S-a &= \frac{1}{2}(a+b+c) - a = \frac{1}{2}a + \frac{1}{2}b + \frac{1}{2}c - a \\ &= \frac{1}{2}b + \frac{1}{2}c - \frac{1}{2}a = \frac{1}{2}(b+c-a) \end{aligned}$$

"Degenerate"
triangle:
(zero area)

A diagram showing a horizontal line segment of length 'a'. Above it, two smaller segments of length 'b' and 'c' are shown, with 'b' starting from the left and 'c' starting from the right. The segments 'b' and 'c' meet at a point on the line 'a', illustrating that b+c=a.

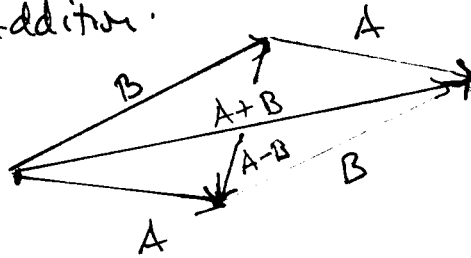
$$b+c=a$$

5.4 Vectors...

are represented as directed line segments in the plane. They have a direction (angle = θ), and a length $|\vec{v}|$.

Operations:

① Addition.

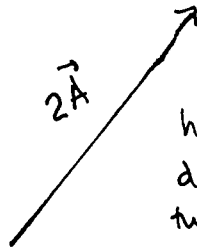


Observe:

- ① $\vec{A} + \vec{B} = \vec{B} + \vec{A}$
- ② $\vec{0}$ = zero vector
= vector of zero length
has the property that
 $\vec{0} + \vec{B} = \vec{B}$

② Scalar multiplication

["scalar" means a real number in the context of vectors]



has same direction, twice the length.

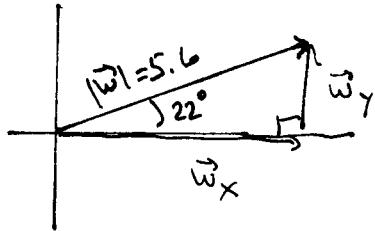


has opposite direction, half the length.

Remark: $\vec{A} - \vec{B} = \vec{A} + (-\vec{B})$ is the other diagonal of the parallelogram.

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

ex. A vector \vec{w} has magnitude 5.6 Newtons and a direction angle $\theta = 22^\circ$. Find $|\vec{w}_x|$ and $|\vec{w}_y|$.



$$\cos 22^\circ = \frac{\text{adj}}{\text{hyp}} = \frac{|\vec{w}_x|}{|\vec{w}|}$$

$$\text{So } |\vec{w}_x| = |\vec{w}| \cos 22^\circ \\ = 5.6 \cos 22^\circ = 5.2 \text{ newtons}$$

$$\text{And } |\vec{w}_y| = |\vec{w}| \sin \theta \\ = 5.6 \sin 22^\circ = 2.1 \text{ newtons}$$

What we did : Given $r, \theta \rightarrow$ we Got x, y .

Next : Given $x, y \rightarrow$ find r, θ .

Look for a QUIZ on line Friday.