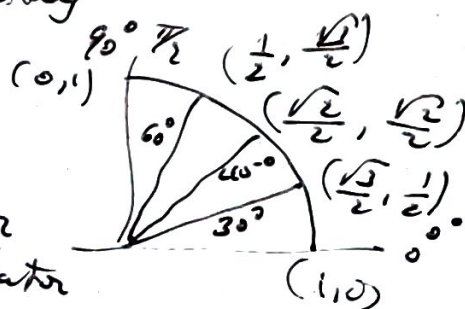


Assignment due Thursday  
# 1 unit circle

$$\frac{y}{x} = \text{tangent}$$

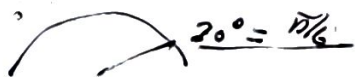
sine  
numerator  
cos numerator



# 2 → (new page)

# 3 → (new page)

$$30^\circ = 30^\circ \frac{\pi}{180^\circ} = \frac{\pi}{6}$$



$$\cos^2 \theta + \sin^2 \theta = 1$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$\begin{matrix} \text{Cosine} & \cos(\text{angle}) \\ \text{sine} & \sin(\text{angle}) \end{matrix} = [-1, 1]$$

~~cos = 1~~

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\text{Area} = \frac{1}{2} ab \sin C$$

## Law of Cosine

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

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

Ex  $A = 60^\circ$   $b = 20$   $c = 30$  in

$$\begin{aligned} a &= \sqrt{b^2 + c^2 - 2bc \cos A} \\ &= \sqrt{400 + 900 - 2(20)(30) \cos 60^\circ} \\ &= \sqrt{1300 - 1200\left(\frac{1}{2}\right)} \\ &= \sqrt{1300 - 600} \\ &= \sqrt{700} \\ &= 10\sqrt{7} \text{ in} \end{aligned}$$

$$\frac{\sin B}{b} \Rightarrow \frac{\sin A}{a}$$

$$\sin B = \frac{20 \sin 60^\circ}{10\sqrt{7}}$$

$$= \frac{2}{\sqrt{7}} \cdot \frac{\sqrt{3}}{2}$$

$$B = \sin^{-1}\left(\sqrt{\frac{3}{7}}\right)$$

$$C = \sin^{-1}\left(\frac{20 \cdot \sin 60^\circ}{10\sqrt{7}}\right)$$

$$= \sin^{-1}\left(\frac{2}{\sqrt{7}} \cdot \frac{\sqrt{3}}{2}\right)$$

$$= \sin^{-1}\left(\frac{3}{2} \sqrt{\frac{3}{7}}\right)$$

$$\begin{array}{r} \sqrt{100000} \\ 100 \sqrt{x} \\ \sqrt{10000} \\ 10 \sqrt{10} \end{array}$$

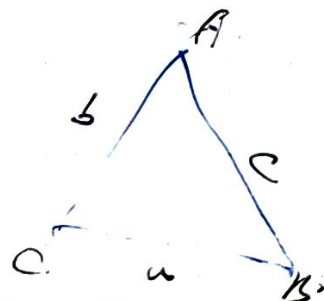
$$\frac{\sqrt{3}}{\sqrt{7}}$$

EX

$$AC = 259 = b$$

$$BC = 423 = a$$

$$\angle C = 132^\circ 40' = C$$



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

$$= \sqrt{(423)^2 + (259)^2 - 2(423)(259) \cos(132^\circ + 40' \frac{1''}{60'})}$$

$$\approx 628 \text{ m}$$

3 sides only  $a, b, c$

missing all 3 angles  $A, B, C$ .

~~$(a, b, c)$~~

$$A = \cos^{-1} \frac{b^2 + c^2 - a^2}{2bc}$$

EX

$$a = 34 \quad b = 20 \quad c = 18 \quad [\text{km}]$$

$$A = \cos^{-1} \frac{(20)^2 + (18)^2 - (34)^2}{2(20)(18)}$$

$$= \cos^{-1} \frac{400 + 324 - (34)^2}{720}$$

$$\approx 25^\circ$$

$$\frac{18}{34} \approx \frac{1}{2}$$

EX

$$a = 11, b = 6, c = 9$$

$$A = \cos^{-1} \frac{36 + 81 - 121}{2(6)(9)}$$

$$= \cos^{-1} \left( -\frac{4^2}{2(54)} \right)$$

$$= \cos^{-1} \left( -\frac{1}{27} \right)$$

$$\frac{ab}{a^2 + b^2 - c^2}$$

117

→ Sides →

Area : → Heron's Formula.

$$K = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s = \frac{1}{2}(a+b+c)$$

Ex. 11. 47,  $a = 4$   $b = 5$ ,  $c = 7$

$$s = \frac{1}{2}(4+5+7)$$
$$= 8$$

$$\text{Area} = \sqrt{8(8-4)(8-5)(8-7)}$$
$$= \sqrt{8(4)(3)}$$
$$= \sqrt{96} \text{ unit}^2$$

## Review

2.2 Given:  $r = 6$   $\theta = 30^\circ = \frac{\pi}{6}$   
s?

$$\begin{aligned}s &= r\theta \\ &= 6 \frac{\pi}{6} \\ &= \pi \text{ unit}\end{aligned}$$

---

Given:  $r = 5$   $\theta = 60^\circ = \frac{\pi}{3}$  Area?

$$\begin{aligned}\text{Area} &= \frac{1}{2} r^2 \theta \\ &= \frac{1}{2} (25) \frac{\pi}{3} \\ &= \frac{25}{6} \pi \text{ unit}^2\end{aligned}$$

---

6.3 #6  $(9, -12) \Rightarrow 3(3, -4) \rightarrow 5$  (c)

$$\begin{aligned}\sin \theta &= -\frac{4}{5} & \cos \theta &= \frac{3}{5} & \tan \theta &= -\frac{4}{3} \\ \csc \theta &= -\frac{5}{4} & \sec \theta &= \frac{5}{3} & \cot \theta &= -\frac{3}{4}\end{aligned}$$

---

# 32  $\cos \theta = \frac{12}{13}$   $\theta \in Q IV$   $5, 12 \rightarrow 13$

$$\begin{aligned}\sin \theta &= -\frac{5}{13} & \cos \theta &= \frac{12}{13} & \tan \theta &= -\frac{5}{12} \\ \csc \theta &= -\frac{13}{5} & \sec \theta &= \frac{13}{12} & \cot \theta &= -\frac{12}{5}\end{aligned}$$

---



6.5 # Given:  $a=3$   $b=7$   $A=60^\circ$

$$\frac{\sin B}{b} = \frac{\sin A}{a}$$

$$\begin{aligned}\sin B &= \frac{7}{3} \sin 60^\circ \\ &= \frac{7}{3} \frac{\sqrt{3}}{2} > 1\end{aligned}$$

no triangle.

$a=3$   $b=7$   $A=30^\circ$

$$\begin{aligned}\sin B &= \frac{7}{3} \sin 30^\circ \\ &= \frac{7}{6} > 1 \therefore \text{No triangle}\end{aligned}$$

#46  $a=6$ ,  $b=4$   $C=60^\circ$ .

$$\begin{aligned}\Delta_{\text{area}} &= \frac{1}{2} ab \sin C \\ &= \frac{1}{2} (6)(4) \sin 60^\circ \\ &= 12 \frac{\sqrt{3}}{2} \\ &= 6\sqrt{3} \text{ unit}^2\end{aligned}$$

$A=60^\circ$   $b=20$   $c=10$   $a=?$

$$\begin{aligned}a &= \sqrt{b^2 + c^2 - 2bc \cos A} \\ &= \sqrt{400 + 100 - 2(20)(10) \cos 60^\circ} \\ &= \sqrt{500 - 400 \left(\frac{1}{2}\right)} \\ &= \sqrt{500 - 200} \\ &= \sqrt{300} \\ &= 10\sqrt{3}\end{aligned}$$

$$A = 30^\circ \quad b = 10 \quad c = 20$$

$$\begin{aligned} a &= \sqrt{b^2 + c^2 - 2bc \cos A} \\ &= \sqrt{100 + 400 - 2(10)(20) \cos 30^\circ} \\ &= \sqrt{500 - 400\left(\frac{\sqrt{3}}{2}\right)} \\ &= \sqrt{500 - 200\sqrt{3}} \end{aligned}$$

6.4  $C = 30^\circ \quad r = 18 \quad \lambda = ?$

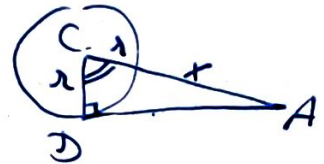
$$\cos 30^\circ = \frac{18}{x+18} = \frac{\sqrt{3}}{2}$$

$$36 = \sqrt{3}(x+18)$$

$$\frac{36}{\sqrt{3}} = x+18$$

$$x = \frac{36\sqrt{3}}{3} - 18$$

$$= 12\sqrt{3} - 18$$



$A = 30^\circ, \quad r = 12$

$$\sin 30^\circ = \frac{12}{x+12} = \frac{1}{2}$$

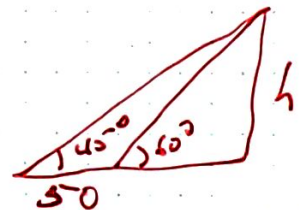
$$24 = x+12$$

$$x = 12$$

6.4  
#22

$$h = \frac{50 \tan 60^\circ \tan 45^\circ}{\tan 60^\circ - \tan 45^\circ}$$

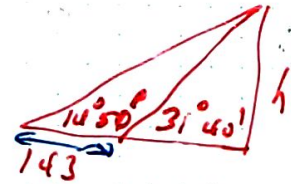
$$= \frac{50\sqrt{3}}{\sqrt{3} - 1}$$



$$\frac{h}{2}, \frac{h}{2}$$

6. cl #23

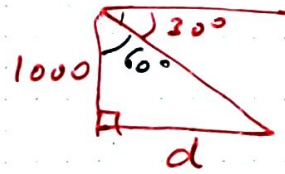
$$h = \frac{143 \tan(14^\circ 50') \tan(31^\circ 40')}{\tan(31^\circ 40') - \tan(14^\circ 50')}$$



#58

$$\tan 60^\circ = \frac{d}{1000}$$

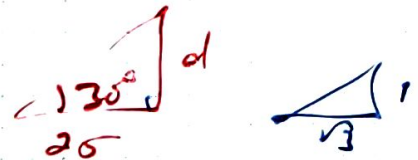
$$d = 1000(\sqrt{3})$$



#65

$$\tan 30^\circ = \frac{d}{25}$$

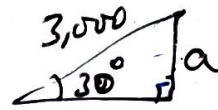
$$d = 25 \frac{1}{\sqrt{3}} \left[ \frac{25}{\sqrt{3}} \right]$$
$$= \frac{25\sqrt{3}}{3}$$



#72

$$\sin 30^\circ = \frac{a}{3000}$$

$$a = 3000\left(\frac{1}{2}\right)$$
$$= 1500 \text{ ft}$$



Right Triangle

Cosine  $\rightarrow$  adj  
Sine  $\rightarrow$  opp

Tangent  $\rightarrow$  (no hyp)  
opp  
adj



6.5.  
#21

$$\angle CAB = 180^\circ - 60^\circ = 120^\circ$$

$$\frac{AB}{\sin 120^\circ} = \frac{400}{\sin 30^\circ}$$

$$AB = 400 \left( \frac{\frac{1\frac{1}{2}}{2}}{\frac{1}{2}} \right) = 400 \sqrt{3}$$

$$400\sqrt{3} \text{ ? } 750$$

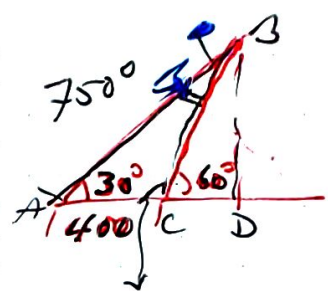
$$40\sqrt{3} \text{ ? } 75$$

$$(8\sqrt{3})^2 \text{ ? } (15)^2$$

$$64(3) \text{ ? } 15 \times 15$$

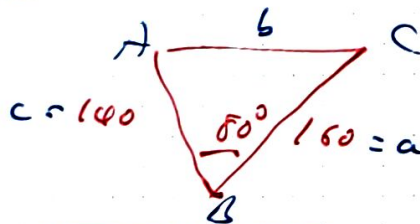
$$64 < 75$$

Tree <sup>not</sup> will be removed.



$$B = 180^\circ - 30^\circ - 120^\circ = 30^\circ$$

#98



$$b^2 = \sqrt{a^2 + c^2 - 2ac \cos B}$$

$$b = \sqrt{(140)^2 + (160)^2 - 2(140)(160) \cos 80^\circ}$$

$$S = \lambda \sigma$$

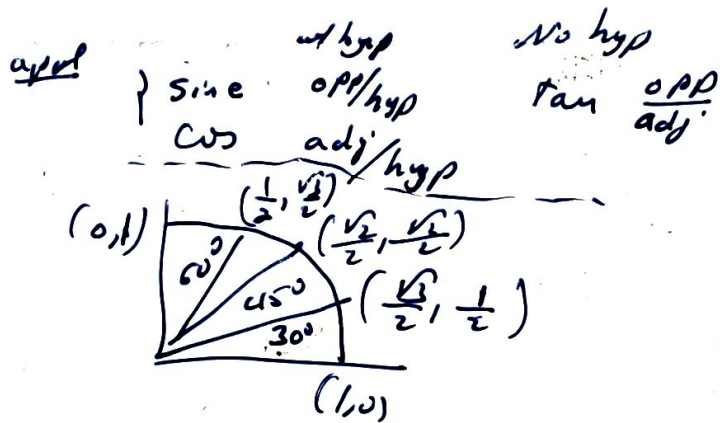
$$A = \frac{1}{2} \lambda^2 \sigma > \underline{\sigma_{rad}}$$

$$h = \frac{x \tan \alpha \tan \beta}{\tan \alpha - \tan \beta} \quad (\alpha > \beta)$$

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\text{Area} = \frac{1}{2} ab \sin C$$

$$a = \sqrt{b^2 + c^2 - 2bc \cos A}$$



~~you can't~~