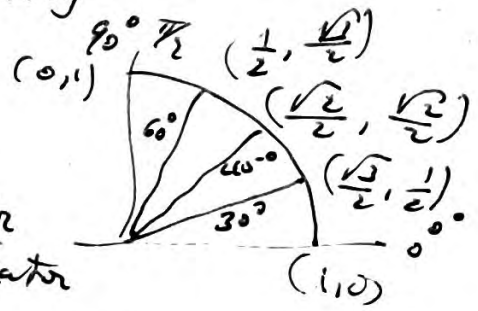
Assignment due Thursday

1 unit circle

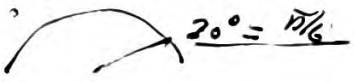


$\frac{y}{x}$ = tangent $\frac{\text{sine numerator}}{\text{cos numerator}}$

2 → (new page)

3 → (new page)

$30° = 30° \frac{\pi}{180°} = \frac{\pi}{6}$



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

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

cosine cos(angle) = [−1, 1]

sine sin(angle)

~~cos = 1~~

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

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

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

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

$$= \sqrt{400 + 900 - 2(20)(30)\cos 60^\circ}$$

$$= \sqrt{1300 - 1200\left(\frac{1}{2}\right)}$$

$$= \sqrt{1300 - 600}$$

$$= \sqrt{700}$$

$$= 10\sqrt{7} \text{ in}$$

$\sqrt{100000}$

$100\sqrt{x}$

$\sqrt{1000}$

$10\sqrt{10}$

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

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

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

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

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

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

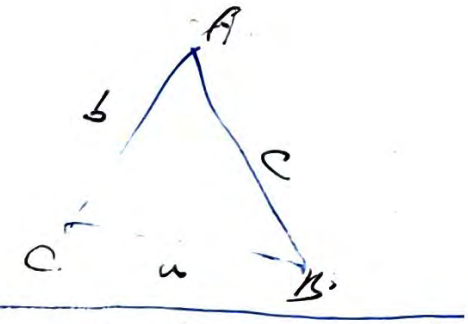
$$= \sin^{-1}\left(\frac{2}{\sqrt{7}} \cdot \frac{\sqrt{3}}{2}\right)$$

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

Ex $AC = 259 = b$

$BC = 423 = a$

$\angle ACB = 132° 40' = C$



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

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

≈ 628 m

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3 sides only a, b, & c

missing all 3 angles A, B, & C.

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

Ex $a = 34$ $b = 20$ $c = 18$ [km]

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

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

$\approx 25°$

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

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

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

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

→ sides →

Area :→ Heron's Formula.

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

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

Ex.

If 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

23 Given: $r = 6$ $\theta = 30^\circ = \frac{\pi}{6}$

s?

$s = r\theta$

$= 6 \frac{\pi}{6}$

$= \pi$ units

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

$\text{Area} = \frac{1}{2} r^2 \theta$

$= \frac{1}{2}(25)\frac{\pi}{3}$

$= \frac{25}{6}\pi$ units^2

6.3

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

$\sin\theta = -\frac{4}{5}$ $\cos\theta = \frac{3}{5}$ $\tan\theta = -\frac{4}{3}$

$\csc\theta = -\frac{5}{4}$ $\sec\theta = \frac{5}{3}$ $\cot\theta = -\frac{3}{4}$

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

$\sin\theta = -\frac{5}{13}$ $\cos\theta = \frac{12}{13}$ $\tan\theta = -\frac{5}{12}$

$\csc\theta = -\frac{13}{5}$ $\sec\theta = \frac{13}{12}$ $\cot\theta = -\frac{12}{5}$

#5. Given: $a = 3 \quad b = 7 \quad A = 60^\circ$

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

$$\sin B = \frac{7}{3} \sin 60^\circ$$

$$= \frac{7}{3} \frac{\sqrt{3}}{2} > 1$$

no triangle.

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

$$\sin B = \frac{7}{3} \sin 30^\circ$$

$$= \frac{7}{6} > 1 \quad \therefore \text{No triangle}$$

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

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

$$= \frac{1}{2} (6)(4) \sin 60^\circ$$

$$= 12 \frac{\sqrt{3}}{2}$$

$$= 6\sqrt{3} \text{ unit}^2$$

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

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

$$= \sqrt{400 + 100 - 2(20)(10) \cos 60^\circ}$$

$$= \sqrt{500 - 400\left(\frac{1}{2}\right)}$$

$$= \sqrt{500 - 200}$$

$$= \sqrt{300}$$

$$= 10\sqrt{3}$$

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

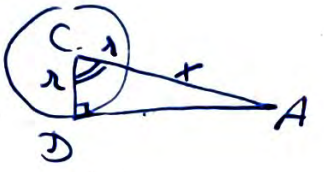
$$a = \sqrt{b^2 + c^2 - 2bc\cos A}$$

$$= \sqrt{100 + 400 - 2(10)(20)\cos 30^\circ}$$

$$= \sqrt{500 - 400\left(\frac{\sqrt{3}}{2}\right)}$$

$$= \sqrt{500 - 200\sqrt{3}}$$

6.4 $C = 30^\circ \qquad r = 18 \qquad x = ?$



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

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

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

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

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

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

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

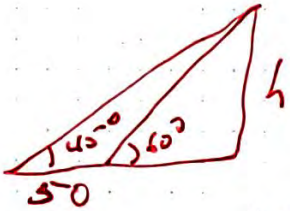
$$24 = x + 12$$

$$x = 12$$

6.4 #22

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

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



$\frac{x}{2}\ \frac{\sqrt{3}}{2}$

$\frac{\sqrt{2}}{2}\ \frac{\sqrt{2}}{2}$

6.cl #23

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

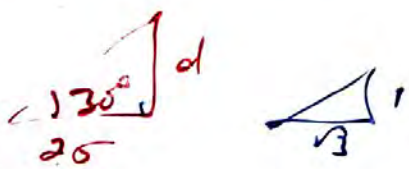
#57 $\tan 60° = \frac{d}{1000}$

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

#65 $\tan 30° = \frac{d}{25}$

$d = 25\left(\frac{1}{\sqrt{3}}\right)\left(\frac{\sqrt{3}}{\sqrt{3}}\right)$

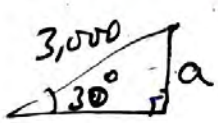
$= \frac{25\sqrt{3}}{3}$



#72 $\sin 30° = \frac{a}{3000}$

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

$= 1500$ ft



Right Triangle

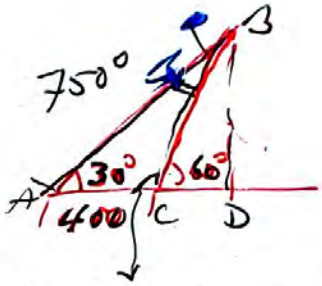
Cosine → adj / hyp

Sine → opp / hyp

Tangent (no hyp) opp / adj

6.5.
#21

$\angle ACB = 180° - 60°$
$= 120°$



$B = 180° - 30° - 120°$
$= 30°$

$$\frac{AB}{\sin 120°} = \frac{400}{\sin 30°}$$

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

$$= 400\sqrt{3}$$

$400\sqrt{3}$? 750

$40\sqrt{3}$? 75 divide by 5

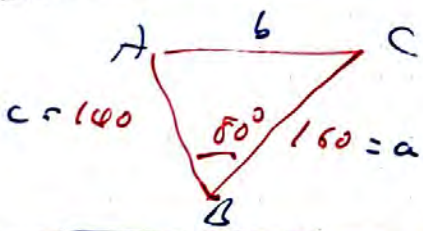
$(8\sqrt{3})^2$? $(15)^2$

$64(3)$? 15×15

$64 < 75$

Tree will be removed. Not

#28



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

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

$s = r\theta$

$A = \frac{1}{2} r^2 \theta$ > θ rad

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

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

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

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

	with hyp	No hyp
sine	opp/hyp	tan $\frac{opp}{adj}$
cos	adj/hyp