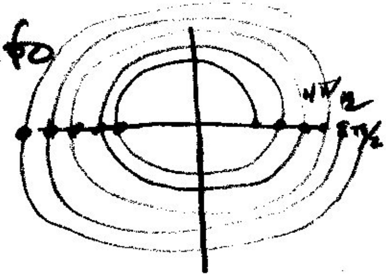
2. For $t = {}^{19\pi}/_2$ find

a) the reference number, t-bar & quadrant info

+1

$\bar{t} = 20\pi/2 - 19\pi/2 = \boxed{\pi/2 \text{ between QIII \& QIV}}$

+½ +½



b) the terminal point, P(x, y)

+1

$(0, -1)$

agrees

c) exact value of the **sin** t

+1

$\boxed{\sin t = -1}$

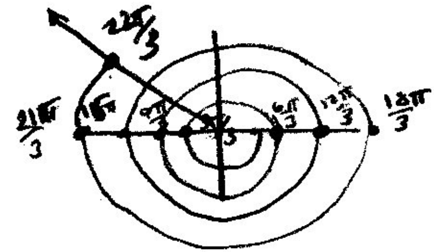
agrees

3. For $t = {}^{-22\pi}/_3$ find

a) the reference number, t-bar & Quad info

+1

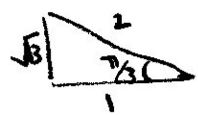
$\bar{t} = \dfrac{22\pi}{3} - \dfrac{21\pi}{3} = \boxed{\dfrac{\pi}{3} \text{ in QII}}$



b) the terminal point, P(x, y)

+1

$\boxed{\left(\dfrac{-1}{2}, \dfrac{\sqrt{3}}{2}\right)}$



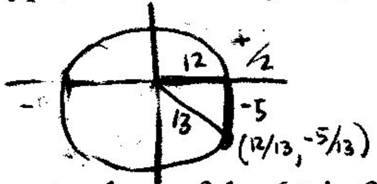
c) exact value of the **cos** t

+1

$\boxed{\cos t = -\tfrac{1}{2}}$

5. If the terminal point of t is determined by $(^{12}/_{13}, -^{5}/_{13})$ Give the values of

a) +2 Draw a triangle in standard position to represent t and label x, y & r or opp, adj, hyp (either one is acceptable)



x = 12 or adj = 12 +½

y = -5 or opp = -5 +½

r = 13 hyp = 13 +½

b) +6 Find the exact values of the 6 trig functions

$\sin t = \frac{-5}{13}$ $\csc t = -\frac{13}{5}$

$\cos t = \frac{12}{13}$ $\sec t = \frac{13}{12}$

$\tan t = \frac{-5}{12}$ $\cot t = -\frac{12}{5}$

6. Find the approximate value of cos (-6.1) to 6 decimals

$\cos -6.1 \doteq \boxed{0.983268}$ Sign & value 6 decimals

7. Express **tan** t in terms of **sin** t if the terminal point determined by t is in QIII.

S A

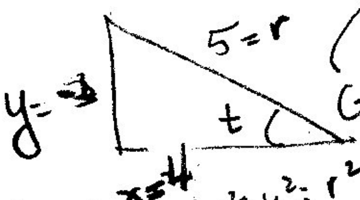
T C

$\tan = \frac{-\sin}{-\cos} = \frac{-\sin t}{-\sqrt{1-\sin^2 t}} = \frac{\sin t}{\sqrt{1-\sin^2 t}}$

+1 +1 sign +½

8. Find the ~~sec~~ t given that $\sin t = {}^{-3}/_{5}$ and ~~tan~~ cos t $t > 0$

QIII or QIV QI or QIV



Gets y & r info

$x^2+y^2=r^2$

$x^2=25-9$

$=16 \Rightarrow x=4$ finds x +1

y neg QIV where?

sign +½

$\sec t = \frac{r}{x} = \frac{5}{4}$

ration +½

+17

9. For $y = -{}^{3}/_{4} \sin 2(x - {}^{\pi}/_{3})$

a) Find the amplitude $|-{}^{3}/_{4}| = \boxed{3/4}$ positive

+1

b) Find the period $2\pi/2 = \pi$

+1

c) Find the phase shift $\pi/3$

+1

0 to π broken into 1/4's

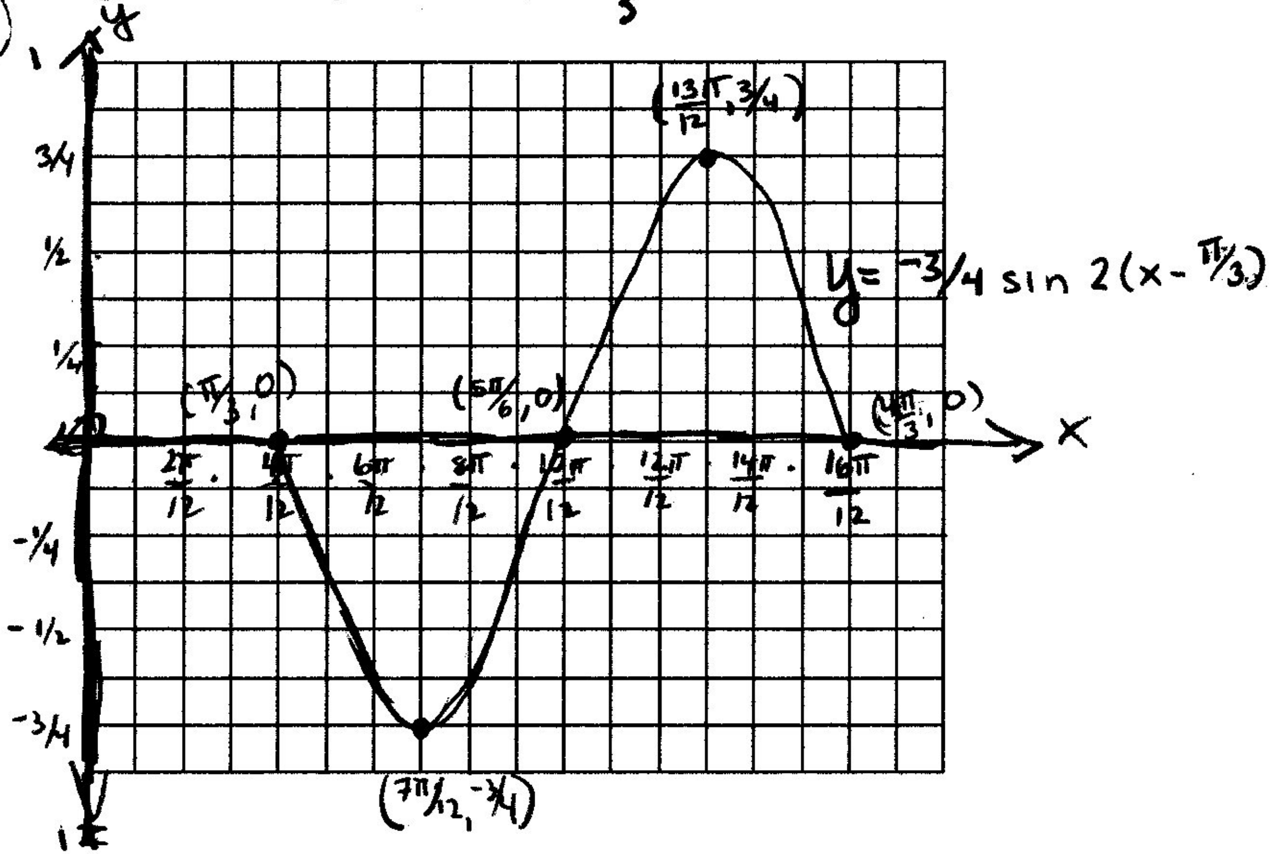
add $\pi/3$ to period adj

+5 d) Complete the following table:

x (for y = sin x)	y (for y = sin x)	x′ (period)	x″(phase shift)	y′ (amplitude)
0	0	0	$\pi/3 = 4\pi/12$	0
$\pi/2$	1	$\pi \cdot 1/4 = \pi/4$	$7\pi/12$	$-3/4$
π	0	$\pi \cdot 1/2 = \pi/2$	$5\pi/6 = 10\pi/12$	0
$3\pi/2$	-1	$\pi \cdot 3/4 = 3\pi/4$	$\frac{9\pi}{12} + \frac{4\pi}{12} = 13\pi/12$	$3/4$
2π	0	π	$\frac{12\pi}{12} + \frac{4\pi}{12} = 16\pi/12$	0
+1	+1	+1	+1	+1

e) Graph $y = -{}^{3}/_{4} \sin 2(x - {}^{\pi}/_{3})$

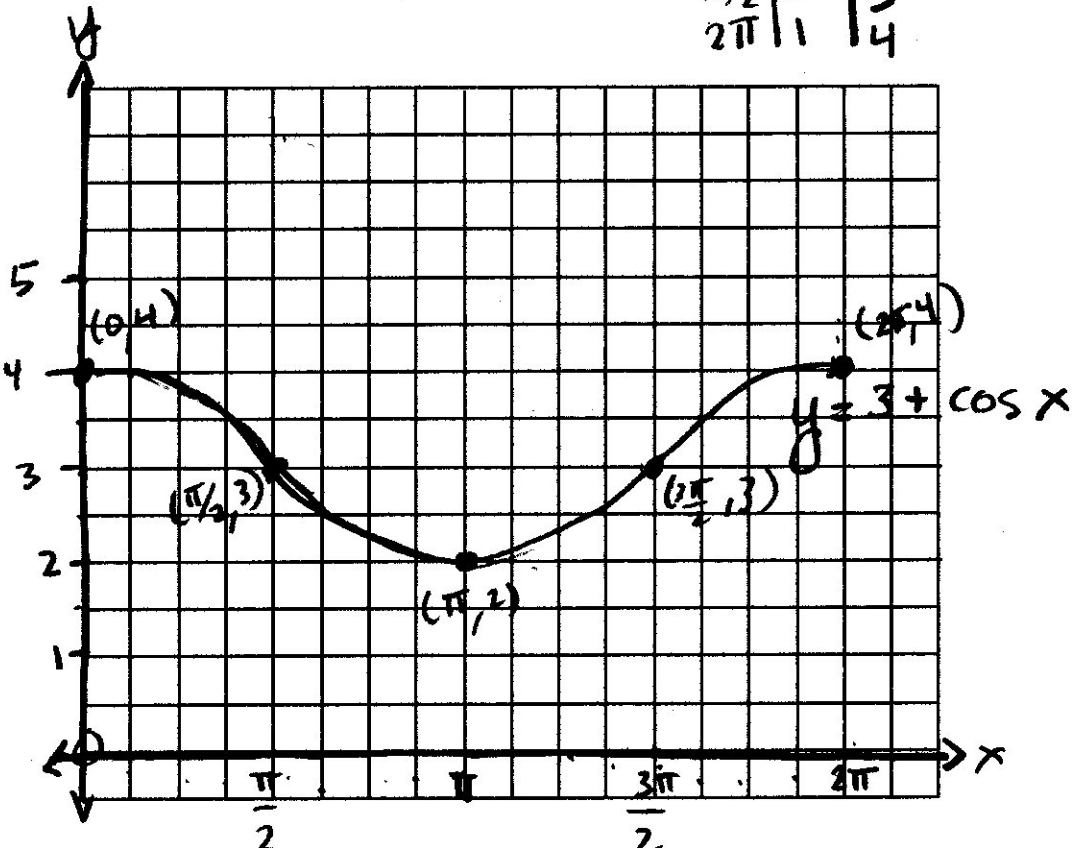
+3



10. Graph the following using 5 labeled ordered pairs (those discussed in class!!)

$$y = 3 + \cos x$$

x	y	y'
0	1	[illegible]
$\pi/2$	0	3
π	-1	2
$3\pi/2$	0	3
2π	1	4



13. Draw a diagram for the following and then find the angle of elevation for the sun.

A 95 foot tall tree casts a shadow that is 45 foot long. What is the angle of elevation for the sun? Round to the nearest degree.

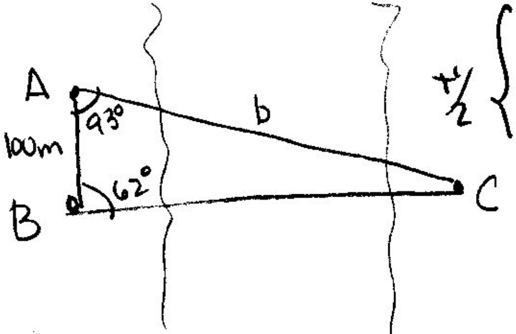
$\tan\theta = \frac{95}{45}$ setup +1

+½ $\tan^{-1}(\tan\theta) = \tan^{-1}\frac{95}{45}$

$\theta = 64.65382406$

$\boxed{\theta \approx 65^\circ}$ +½ round

15. To find the distance across a river a surveyor chooses points A & B that are 100 m apart and a reference point C on the other side of the river. Find the distance to the nearest tenth of a meter, b, between A & C given that ∠A = 93°, ∠B = 62°



$$\frac{\sin 62^\circ}{b} = \frac{\sin(\overset{25^\circ}{180-93-62})}{100}$$

$$b = \frac{100 \sin 62}{\sin 25} = 208.923492$$

$$b \approx \boxed{208.9\text{ m}}$$

16. **Find the exact value**

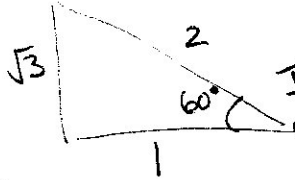
a) +1

$\sin^{-1}(-\sqrt{3}/2)$

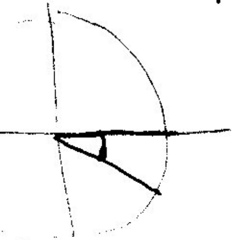
in QIV

Since $\sin^{-1}$ R: $[-\pi/2, \pi/2]$

QI & QIV



If they answer 300° or 240° $-\frac{1}{2}$

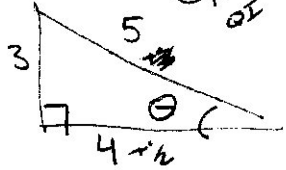


$\theta = -60°$

b) +1

$\cos(\sin^{-1}(3/5))$

means QI



$\boxed{\cos\theta = \frac{4}{5}}$ +½

c) +1

$\sin^{-1}(\sin 5\pi/6)$

$5\pi/6 = \pi/6$ in QII is positive

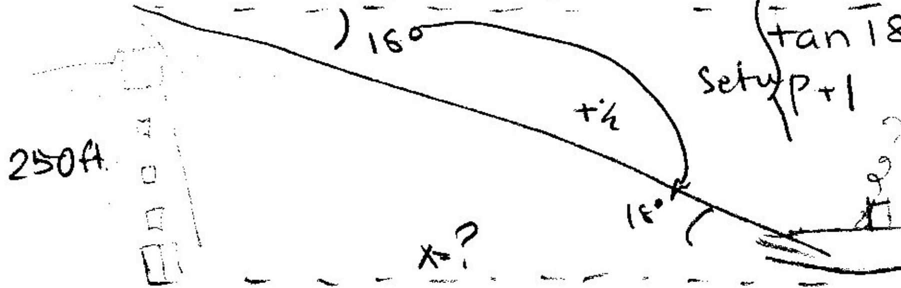
$\sin^{-1}(\sin \pi/6)$

$= \boxed{\pi/6}$

note: can't be $5\pi/6$ b/c not in $\sin^{-1}$ domain

$-\frac{1}{2}$ If they answer $5\pi/6$

17. From the top of a 250 foot lighthouse the angle of depression to a ship on the ocean is 18°. How far is the ship from the lighthouse? Round to the nearest foot.



Setup +1

$$\tan 18° = \frac{250}{x}$$

$$x = \frac{250}{\tan 18°}$$

+½

$$x = 769.4208843$$

$$\boxed{x \approx 769 \text{ ft.}}$$

18. Find the **exact** value of each of the following. Give the reference angle and or coterminal angle and quadrant info that helped you answer the question.

a) +1/2 $\tan(-^{22\pi}/_3)$ $\frac{21\pi}{3}$ is mult of π in QII

$-\frac{22\pi}{3} = \frac{22\pi}{3} - \frac{21\pi}{3} = \frac{\pi}{3}$

tan is neg. in QII

$\tan \pi/3 = \boxed{-\sqrt{3}}$

b) +1/2 $\cos(405°)$ $405 - 360 = 45$ in QI

$\sqrt{2}$, 1, 1

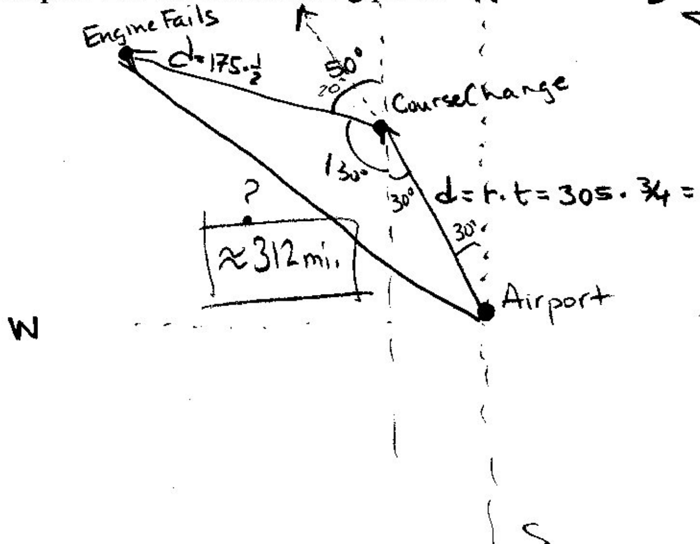
cos is +

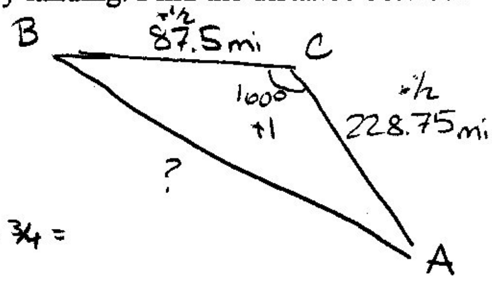
$\cos 45° = \boxed{\frac{\sqrt{2}}{2}}$

EC

$b \approx 87.7$ in $\approx$ rou

A pilot sets out from an aiport and heads in the direction N 30º W, flying at a constant speed of 305 mph. Forty-five minutes later the pilot makes a course and speed correction and now heads in the direction N 50º W and reduces her speed to 175 mph. Half an hour later, engine trouble forces her to make an emergency landing. Find the distance between the airport and the final landing point.





$$? = \sqrt{(87.5)^2+(228.75)^2-2(87.5)(228.75)\cos}$$

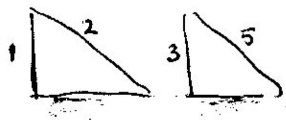
59982.8125 −

$$? = \sqrt{97599.88273} = 312.409$$

+1

1. Find the exact value of : $\sin\,[\overset{\Theta_1}{\sin^{-1}(3/5)} - \overset{\Theta_2}{\cos^{-1}(1/2)}]$

$$\sin(\Theta_1 - \Theta_2) = \sin\Theta_1\cos\Theta_2 - \sin\Theta_2\cos\Theta_1$$



$$= \sin(\sin^{-1}(3/5))\cos(\cos^{-1}(1/2)) - \sin(\cos^{-1}1/2)\cos(\sin^{-1}3/5)$$

$$= (3/5)(1/2) - (\sqrt{3}/2)(4/5) = \frac{3}{10} - \frac{4\sqrt{3}}{10} = \boxed{\frac{3-4\sqrt{3}}{10}}$$

HINT: Use substitution of θ_1 & θ_2 for the inverse functions and then a formula to simplify.

2. ~~Use a cofunction identity to simplify and find the value of:~~

Prove that

$$\cos(90-\Theta) = \sin\Theta$$

$$= \cos 90 \cos\Theta + \sin\Theta \sin 90 \quad +1$$

$$= (0)(\cos\Theta) + (\sin\Theta)(1) = \sin\Theta \Leftarrow RHS$$

$+1/2$ $+1/2$

3. Write $\dfrac{\sec x - \cos x}{\tan x}$ in terms of sin x & cos x and simplify

It's the change to sin & cos that gives +1

$$\frac{\frac{1}{\cos x} - \cos x}{\frac{\sin x}{\cos x}} \quad +1$$

$+1/2$ $+1$

$$= \frac{\sec x}{\tan x} - \frac{\cos x}{\tan x} = \frac{1}{\cos x}\cdot\frac{\cos x}{\sin x} - \frac{\cos x}{1}\cdot\frac{\cos x}{\sin x}$$

$$\left(\frac{1}{\cos x} - \cos x\right)\cdot\frac{\cos x}{\sin x}$$

$$= \frac{1}{\sin x} - \frac{\cos^2 x}{\sin x} = \frac{\sin^2 x}{\sin x} = \sin x \quad \text{simplifying } +1$$

Rest $= \dfrac{1-\cos^2 x}{\sin x} = \dfrac{\sin^2 x}{\sin x} = \boxed{\sin x}$ Rest $+1/2$

or $\sec x - \cos x \div \tan x$

$$\frac{1}{\cos x} - \cos x = \frac{1-\cos^2}{\cos} = \frac{\sin^2 x}{\cos x}\cdot\frac{\cos}{\sin}$$

4. Verify $\dfrac{1 + \sec^2 x}{1 + \tan^2 x} = 1 + \cos^2 x$

$= \dfrac{1}{\cos^2}$

+1

LHS $\Rightarrow$ RHS

LHS =

Mult by $\cos^2 x$

$$\frac{1 + \frac{1}{\cos^2 x}}{1 + \frac{\sin^2 x}{\cos^2 x}} = \frac{\cos^2 x + 1}{\cos^2 x + \sin^2 x} = \frac{\cos^2 x + 1}{1}$$

$1 + \sin^2 x \cos^2 x$

$\Uparrow$ RHS

or $\dfrac{1+\sec^2 x}{\sec^2 x} = \dfrac{1}{\sec^2 x} + \dfrac{\sec^2 x}{\sec^2 x} = \cos^2 x + 1$

Rest simplifying +1

or

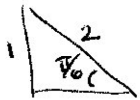
$$\frac{1+\sec^2 x}{\sec^2 x}$$

$$= (1+\sec^2 x)\div\sec^2 x = \left(\frac{\cos^2 x}{\cos^2 x} + \frac{1}{\cos^2 x}\right)\cdot\cos^2 x$$

+7

$[0, 2\pi)$

5. Find **all** solutions for: $\csc^2 x = 4$



$$\underbrace{\csc x = \pm\sqrt{4}}_{+\frac{1}{2}} \Rightarrow \csc x = \overset{+\frac{1}{2}}{\pm 2}$$

$$x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6} \quad +1$$

or $\dfrac{1}{\sin^2 x} = 4$

$$\sin^2 x = \frac{1}{4} \Rightarrow \sin x = \pm\sqrt{\frac{1}{4}} = \pm\frac{1}{2}$$

6. Find all solutions in $[0, 2\pi)$ for: $\sin x = \cos 2x$

$$\sin x = \overset{+1}{1 - 2\sin^2 x}$$

$$+1 \begin{cases} 2\sin^2 x + \sin x - 1 = 0 \\ (2\sin x - 1)(\sin x + 1) = 0 \end{cases}$$

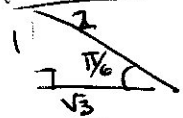
$2\sin x = 1$

$\sin x = \frac{1}{2}$

$\boxed{x = \frac{\pi}{6}, \frac{5\pi}{6}}$ +1

$\sin x = -1$

$\boxed{x = \frac{3\pi}{2}}$



HINT: Use substititution

7. Without using any approximation, find: $\dfrac{\tan 25^\circ + \tan 20^\circ}{1 - \tan 25^\circ \tan 20^\circ}$

Show your work!

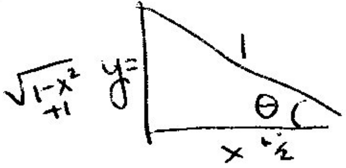
+1

$$\boxed{\tan(25^\circ + 20^\circ) = \overset{+\frac{1}{2}}{\tan} 45^\circ = 1}$$

$+\frac{1}{2}$

EC1 : $\sin(\cos^{-1} x) = \overset{+1/2}{\sqrt{1-x^2}}$

+2



$x^2+y^2=r^2$

$y = \pm\sqrt{1-x^2}$

so $+\sqrt{1-x^2}$

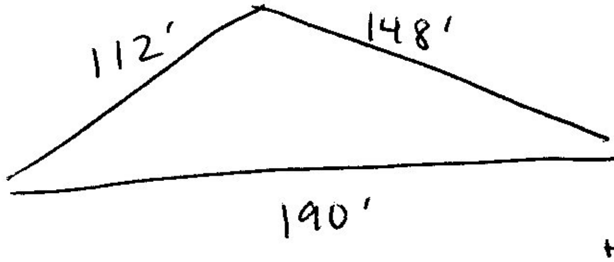
EC2; $\sin(\sin^{-1} x + \cos^{-1} x)$ $\quad \sin^{-1} x \underset{+1/2}{=} \theta$ & $\cos^{-1} x = \underset{+1/2}{90-\theta}$

+2

$$\sin(\underbrace{\theta + 90 - \theta}_{+1/2}) = \sin 90^\circ = \underset{+1/2}{\boxed{1}}$$

§6.6 (Either Edition)

#51/53 (E5/E6) p.516/p.483



Value = \$20/ft^2

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

Heron's Formula

semi perimeter $\Rightarrow s = \frac{1}{2}(a+b+c) = \frac{1}{2}(\underbrace{112+148+190}_{450}) = 225$

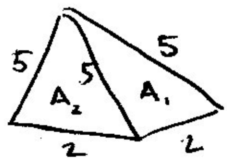
$A = \sqrt{225(\underbrace{225-112}_{113})(\underbrace{225-148}_{77})(\underbrace{225-190}_{35})} = \sqrt{68{,}520{,}375}$

≈ 8277.703486

Cost = Value • A = \$20 • A $\doteq$ $\boxed{\$165{,}554.07}$

#31/33 (E5/E6) You should be able to handle this one

#32/34 (E5/E6)

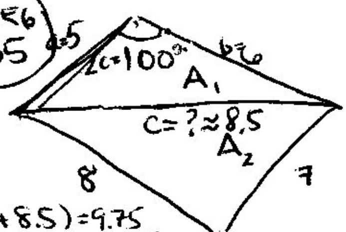


$A_1 = A_2 = \sqrt{6(\underbrace{6-5}_{1})(\underbrace{6-5}_{1})(\underbrace{6-2}_{4})} = \sqrt{24} = \sqrt{2^3 3}$

$2A_1 = 2 \cdot 2\sqrt{6} = \boxed{4\sqrt{6} \text{ units}^2}$

$s = \frac{1}{2}(\overbrace{5+5+2}^{12}) = 6$

#33/35 (E5/E6)



$c = \sqrt{25+36-60\cos 100°} \approx \sqrt{71.41889066}$

$= 8.450969806$

$A_1 + A_2$ = Area of Figure $\doteq 14.7 + 26.1$

$\doteq \boxed{40.8 \text{ units}^2}$

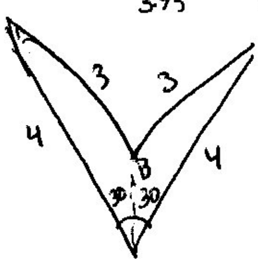
$s_1 = \frac{1}{2}(5+6+8.5) = 9.75$

$s_2 = \frac{1}{2}(8+7+8.5) = 11.75$

$A_1 = \sqrt{9.75(\underbrace{9.75-5}_{4.75})(\underbrace{9.75-6}_{3.75})(\underbrace{9.75-8.5}_{1.25})} \approx \sqrt{217.0898438} \doteq 14.7$

$A_2 = \sqrt{11.75(\underbrace{11.75-8}_{3.75})(\underbrace{11.75-7}_{4.75})(\underbrace{11.75-8.5}_{3.25})} \approx \sqrt{680.2148438} \approx 26.1$

#34/36 (E5/E6)



$\therefore\ 3^2 = 4^2 + B^2 - 2 \cdot 4B\cos 30° \Rightarrow B^2 - \frac{8\sqrt{3}}{2}B - 9 + 16 = 0$

$\Rightarrow B^2 - 4\sqrt{3}B + 7 = 0$ so by Quadratic Formula

$B = 2\sqrt{3} \pm \sqrt{5}$ so $B \approx 1.23$ or 5.7 (5.7 is too long so extraneous)

... so you can now get to $A \doteq 2.46$