BY: JENNIFER WU

1a) 21.8

b) 16.86

c) 12.919 cm

d) 18.29

e) 3.38

f) 13.06

2) $\angle DHC = 8.14°$

$\angle BHC = 18.43°$

3) 55 mm

4) 6.7°

5) 35.39 m

6) Height of building = 65.84 m

Distance from eyes to top of building = 71.09 m

7) 5.53 m

8) $125\frac{1}{3}$

9) $\frac{(OA)^2}{H}$

10) 3.43

11) 2533.74 cm^2

12) a) RQ = 20 b) 204 c) $\angle PRS = \arctan\left(\frac{12}{9}\right) = 53.13°$

$\angle QPR = \arctan\left(\frac{20}{15}\right) = 53.13°$

d) $90 - \angle PRS + \angle QPR = 90°$

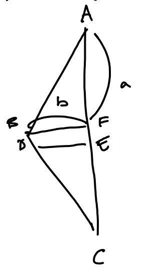
$\angle SPQ = 90°$

$\sqrt{25^2 + 12^2} = \sqrt{769}$

13) $AC = \sqrt{10^2 + 10^2} = 10\sqrt{2}$

$AD = AC - DC = 10\sqrt{2} - 10$

14)



$\tan(41) = \frac{a-25}{b} = 0.869$

$\tan(59) = \frac{a+25}{b} = 1.664$

$1.664 = 0.869 + \frac{50}{b}$

$b = 62.893$

$\tan(41) = \frac{a-25}{62.893}$

$a = 80.02$

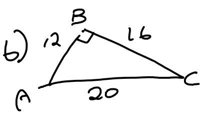
15) $3\sin(x) = \cos(15)$

$\sin(x) = 0.321975$

$x = \arcsin(0.321975)$

$x = 18.7824 \rightarrow 18.8°$

16)



$\sin C = \frac{3}{5} \rightarrow \frac{O}{H} \rightarrow \frac{AB}{AC} \rightarrow \frac{12}{20}$

$AB : BC : AC = 3 : 4 : 5$

$BC = 16$

17) $3\left(\frac{O}{H}\right) - 2 = 0$

$3\left(\frac{O}{H}\right) = 2$

$\frac{O}{H} = \frac{2}{3}$

$x = \arcsin\left(\frac{2}{3}\right)$

$x = 41.81°$

18) $\sin^6\theta = (\sin^2\theta)^3$

$\sin^2 x = (\sin x)^2$ doesn't affect x

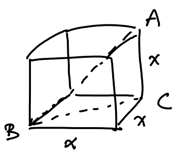
$\sin x = N$

$N = \frac{-1 \pm \sqrt{1+24}}{12}$

$\rightarrow \frac{-1-5}{12} \rightarrow -\frac{1}{2} \rightarrow \sin^{-1}N = -30 \rightarrow \cancel{330}°$

$\rightarrow \frac{-1+5}{12} = \frac{1}{3} \rightarrow \sin^{-1}N = 19.47°$

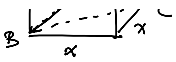
19)



$BC = \sqrt{x^2 + x^2} = x\sqrt{2}$

$\tan \angle ABC = \frac{x}{x\sqrt{2}} \rightarrow \angle ABC = \arctan\left(\frac{1}{\sqrt{2}}\right) \rightarrow \angle ABC = 35.264°$

$X = (4)$



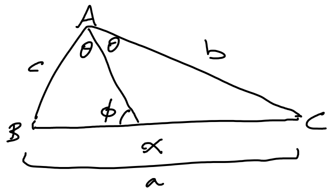
$\tan \angle ABC = \frac{[illegible]}{x\sqrt{2}} \longrightarrow \angle ABC = \arctan\left(\frac{[illegible]}{\sqrt{2}}\right) \longrightarrow \angle ABC = [illegible]$

$x = 4$

20) $\frac{\sin x}{\sin y}$ $\quad y = 30$

21) $xy \sin\theta$

22)



$$\triangle ABC = \frac{1}{2} ab \sin C = \frac{1}{2} bc \sin A = \frac{1}{2} ac \sin B$$

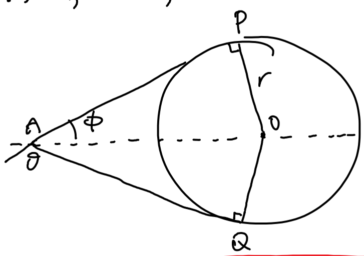
$$\hookrightarrow \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$\triangle ABX$ $\qquad \frac{\sin \frac{A}{2}}{BX} = \frac{\sin\phi}{c}$, $\qquad \triangle AXC$ $\qquad \frac{\sin\frac{A}{2}}{XC} = \frac{\sin(\pi - \phi)}{b}$

$$\frac{BX}{CX} = \frac{c}{b} \cdot \frac{\sin(\pi - \phi)}{\sin\phi} \longrightarrow \frac{c}{b} = \frac{\sin C}{\sin B}$$

23) i) , iii)

24)



$\angle PAO = \phi \rightarrow \phi = \frac{1}{2}(180 - \theta)$

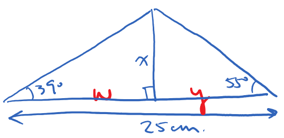
$\tan\phi = \tan\left[\frac{1}{2}(\pi - \theta)\right] = \frac{r}{AP}$

$\longrightarrow AP = r \cdot \frac{1}{\tan\left(\frac{\pi}{2} - \frac{\theta}{2}\right)} = r\tan\left(\frac{\theta}{2}\right)$

#1c)

THERE ARE TWO QUICK WAYS TO SOLVE FOR "x".

METHOD #1) LABEL THE BASE OF EACH RIGHT TRIANGLE AS "w" & "y"



① $\tan 39° = \frac{x}{w}$ $\qquad \tan 55° = \frac{x}{y}$

$w = \frac{x}{\tan 39°}$ $\qquad y = \frac{x}{\tan 55°}$

② $w + y = 25$

$\frac{x}{\tan 39°} + \frac{x}{\tan 55°} = 25.$

$1.234897x + 0.700207x = 25$

$1.93510x = 25$

$x = 12.919 \text{ cm}$ //.

FROM THIS POINT YOU CAN JUST USE THE CALCULATOR OR SOLVE ALGEBRAICALLY

OR ALGEBRA:

$\frac{\tan 55(x) + \tan 39(x)}{(\tan 39)(\tan 55°)} = 25.$

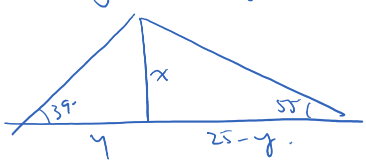
$x(\tan 55 + \tan 39) = 25(\tan 39)(\tan 55°)$

$x = \frac{25(\tan 39)(\tan 55°)}{(\tan 55 + \tan 39)}$

$x = \frac{28.91228632}{2.237932} = 12.919197.$

METHOD #2)

LABEL THE BASES OF THE TWO TRIANGLES AS "y" & "25−y"



① SOLVE FOR 'y', THEN SOLVE FOR "x"

$\tan 39° = \frac{x}{y}$ $\qquad \tan 55° = \frac{x}{25-y}$

$y \cdot \tan 39° = x$ $\qquad (25-y)\tan 55° = x.$

SINCE BOTH EQUATIONS ARE EQUAL TO 'x', EQUATE THEM & SOLVE FOR "y".

② $y \cdot \tan 39° = (25-y)\tan 55°$

$y \cdot \tan 39° = 25\tan 55° - y\tan 55°$

$y \cdot \tan 39° + y\tan 55° = 25\tan 55°$

$y(\tan 39° + \tan 55°) = 25 \tan 55°.$

$y = \frac{25(\tan 55°)}{[illegible]} = \frac{35.703700}{[illegible]}$

$y(\tan 39° + \tan 55°) = 25 \tan 55°$

$$y = \frac{25(\tan 55°)}{(\tan 39° + \tan 55°)} = \frac{35.703700}{2.2379320}$$

$y = 15.9538807$

③ $\tan 39° = \frac{x}{y}$

$y \cdot \tan 39° = x$

$15.95388(\tan 39°) = x$

$12.91919 = x$ //