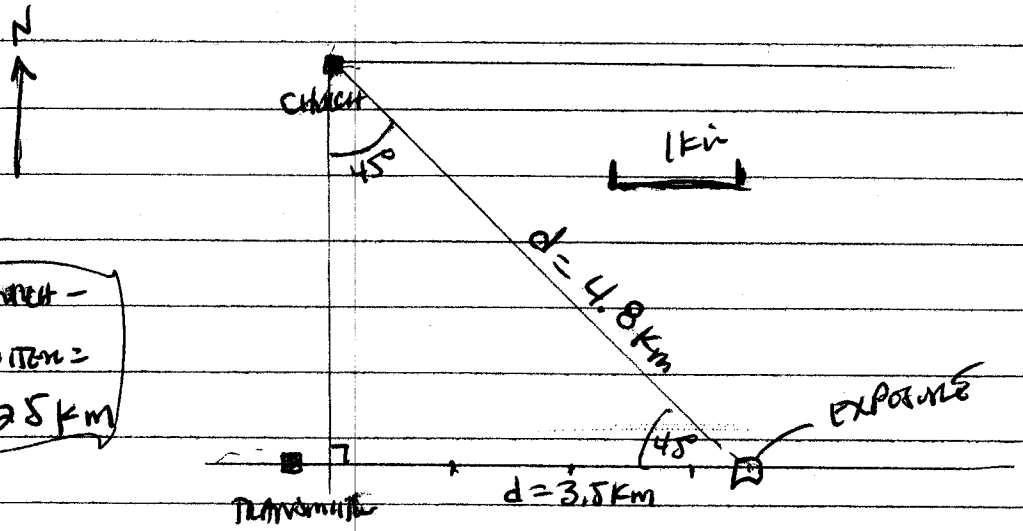
IRIG EXPLORERS

G 302 HW #4 KEY

5.2



DIST CHURCH - TRANSMITTER = 3.25 Km

- CHURCH - EXPOSURE = 4.8 Km
- TRANSMITTER - EXPOSURE = 3.5 Km

5.3

$\frac{2\pi}{360^\circ}$

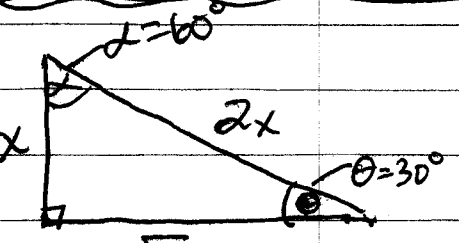
(i) $180^\circ \frac{2\pi}{360^\circ} = \pi$

(ii) $90^\circ \left(\frac{2\pi}{360^\circ}\right) = \pi/2 = 0.5\pi$

(iii) $270^\circ \frac{2\pi}{360^\circ} = 1.5\pi = \frac{3\pi}{2}$

IV $(100^\circ)\left(\frac{2\pi}{360^\circ}\right) = 0.56\pi$

5.4



$a^2 + b^2 = c^2$

$x^2 + b^2 = (2x)^2$

$x^2 + b^2 = 4x^2$

$b^2 = 4x^2 - x^2 = 3x^2$

$b = \sqrt{3x^2} = \sqrt{3}\,x$

$\sqrt{3}x^2$

$\theta = 30^\circ$ $\cos\theta = \frac{Adj}{Hyp} = \frac{\sqrt{3}x}{2x} = \frac{\sqrt{3}}{2} = 0.866$

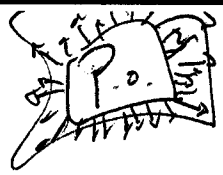
$\theta = 30^\circ$ $\sin\theta = \frac{Opp}{Hyp} = \frac{x}{2x} = 1/2 = 0.5$

$\theta = 30^\circ$ $\tan\theta = Opp/Adj = x/\sqrt{3}x = 1/\sqrt{3} = 0.577$

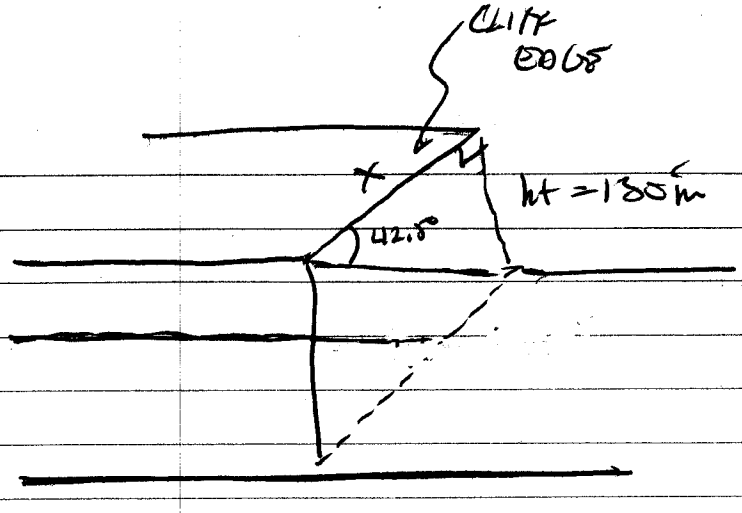
$\cos\alpha = Adj/Hyp = \frac{x}{2x} = 1/2 = 0.5$ $\alpha = 60^\circ$

$\sin\alpha = Opp/Hyp = \sqrt{3}x/2x = \sqrt{3}/2 = 0.866$ $\alpha = 60^\circ$

$\tan\alpha = Opp/Adj = \sqrt{3}x/x = \sqrt{3} = 1.73$ $\alpha = 60^\circ$



Q5.5

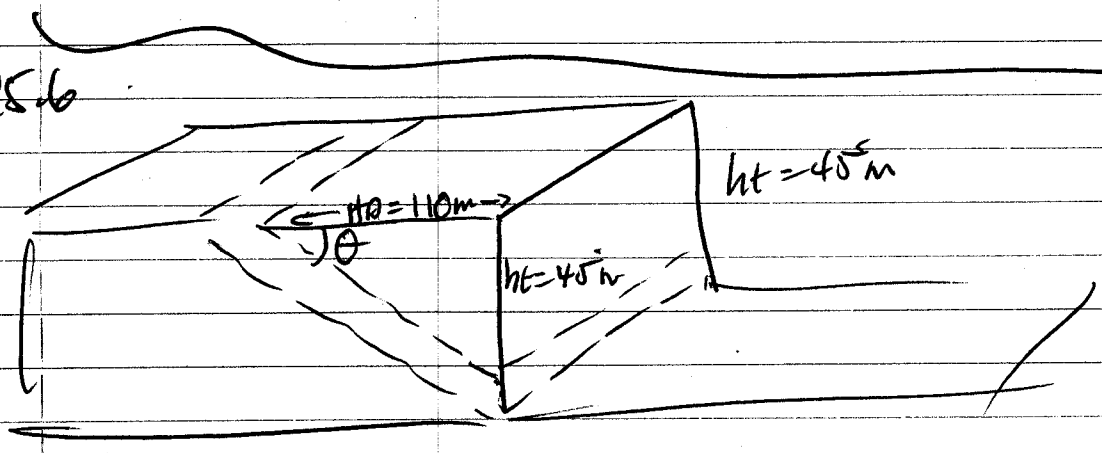


$$\tan\theta = \frac{HT}{X} = \frac{130m}{X} = 0.916$$

$$130m = (0.916)x$$

$$141.9m = x$$

Q5.6



$$Dip = \theta$$

$$\tan\theta = \frac{HT}{HO} = \frac{45m}{110m} = 0.41$$

$$\theta = 22.2^\circ$$

Q 5.7

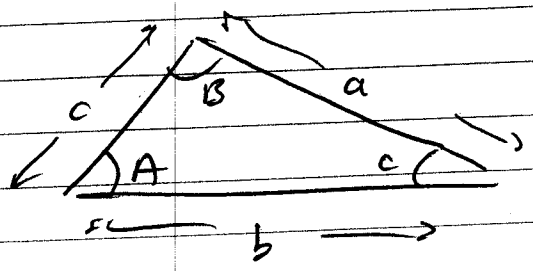


FIG. 5.2

SIN RULE $\frac{a}{\sin(A)} = \frac{b}{\sin(B)} = \frac{c}{\sin(C)}$

COS RULE $a^2 = b^2 + c^2 - 2bc(\cos A)$

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

$c^2 = a^2 + b^2 - 2ab(\cos C)$

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i $A = 70^\circ \quad B = 70^\circ \quad C = ?$

$A + B + C = 180^\circ$

$70^\circ + 70^\circ + C = 180^\circ$

$140^\circ + C = 180^\circ$

$C = 180 - 140 = 40^\circ$

ii $\frac{b}{\sin(B)} = \frac{c}{\sin(C)}$ $\quad b = 3\text{km}$ $c = 2\text{km}$ $C = 40^\circ$ $B = ?$

$\frac{3\text{km}}{\sin B} = \frac{2\text{km}}{\sin(40)}$

$\frac{3\text{km}}{\sin B} = 3.11\text{km}$

$0.965 = \frac{3\text{km}}{3.11\text{km}} = \sin(B) \longrightarrow B = 74.7^\circ$

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

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

Q5.7 (CONT.)

$b = 3Km$

$c = 1Km$

$A = 37°$

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

$a^2 = (3Km)^2+(1Km)^2-[2(3Km)(1Km)\cos(37)]$

$a^2 = 10Km^2-(4.79Km^2)$

$a^2 = 5.21Km^2$

$a = \sqrt{5.21Km^2} = 2.28Km$

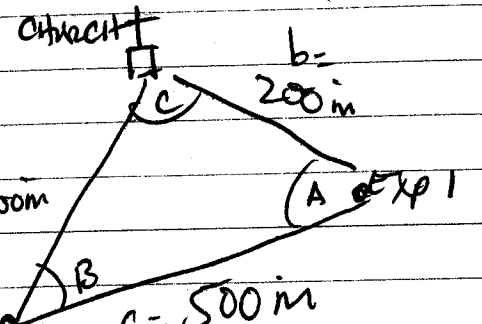
Q5.8

$a^2 = b^2+c^2-2bc(\cos 90)$

$a^2 = b^2+c^2-2bc(0)$

$a^2 = b^2+c^2$

Q.5.9



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

$\cos A = \frac{(200m)^2+(500m)^2+(400m)^2}{2(200m)(500m)}$

$\cos A = \frac{450,000m^2}{200,000m^2} = 2.25$

$A = 66°$

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

$\cos B = \frac{(400m)^2+(500m)^2-(200m)^2}{2(400m)(500m)}$

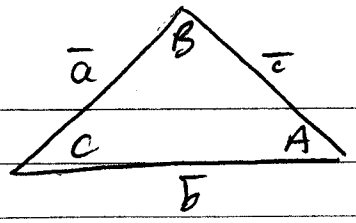
$\cos B = \frac{370,000m^2}{400,000m^2}$

$\cos B = 0.925$

$B = 22°$

$C = 180-(A+B)$

$C = 180-88 = 92°$



5.10

(1) $A = 40^\circ \quad b = 5\,km \quad c = 2\,km$

FIND B, C, a

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

$$a^2 = (5\,km)^2 + (2\,km)^2 - [2 \cdot 5\,km \cdot 2\,km(\cos 40^\circ)]$$

$$a^2 = 25\,km^2 + 4\,km^2 - 15.32\,km^2$$

$$a^2 = 13.68\,km^2$$

$$\bar{a} = \sqrt{13.68\,km^2} = 3.70\,km$$

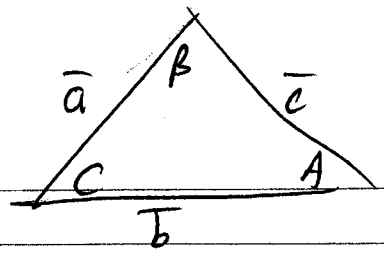
$$\cos B = \frac{a^2 + c^2 - b^2}{2ac} = \frac{(3.70\,km)^2 + (2\,km)^2 - (5\,km)^2}{2(3.70\,km)(2\,km)}$$

$$\cos B = \frac{(13.69\,km^2 + 4\,km^2) - 25\,km^2}{14.8\,km^2} = -0.494$$

$$B = 119.6^\circ$$

$$C = 180 - (A + B) = 180 - (119.6^\circ + 40^\circ) = 20.4^\circ$$

5.10 (CONT.)



(ii)

$A = 40^\circ \quad b = 3\,km \quad a = 2\,km$

FIND B, C, c

~~$a^2 = A^2 + b^2 + c^2 - 2bc$~~

$$\frac{a}{\sin(A)} = \frac{b}{\sin(B)} \Longrightarrow \frac{2\,km}{\sin 40} = \frac{3\,km}{\sin B}$$

$$\sin B = 3\,km \frac{\sin 40}{2\,km} = 0.964$$

$$\boxed{B = 74.6^\circ}$$

$$C = 180 - (A + B)$$

$$C = 180 - (40^\circ + 74.6^\circ)$$

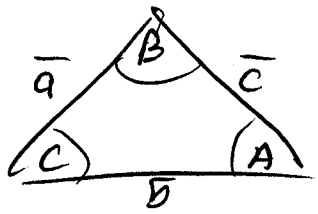
$$\boxed{C = 180 - 114.6 = 65.4^\circ}$$

$$c^2 = a^2 + b^2 - 2ab[\cos C)$$

$$c^2 = (2\,km)^2 + (3\,km)^2 - [2 \cdot 2\,km \cdot 3\,km \cdot \cos(65.4)]$$

$$c^2 = 13\,km^2 - 4.99\,km^2 = 8.0\,km^2$$

$$\boxed{c = \sqrt{8.0\,km^2} = 2.83\,km}$$



5.10 (CONT.)

iii $A = 40°$ $B = 60°$ $\bar{a} = 3\,Km$

FIND C, $\bar{b}$, $\bar{c}$

* $\frac{a}{SinA} = \frac{b}{SinB} \Rightarrow \frac{3Km}{Sin40} = \frac{\bar{b}}{Sin60}$

$\bar{b} = 4.04\,Km$

* $C = 180 - (A+B) = 180 - (40° + 60°) = 180 - 100 = 80°$

* $\frac{\bar{a}}{SinA} = \frac{\bar{c}}{SinC} \Rightarrow \frac{3Km}{Sin40} = \frac{\bar{c}}{Sin80°}$

$\bar{c} = \frac{(Sin80)\,3Km}{Sin(40)} = 4.60\,Km$

Q 5.11

i $\cos 15 = 0.966$

ii $\sin(1.2 \text{ radians}) = \sin\left((1.2\,rad)\left(\frac{360°}{2\pi}\right)\right) = \sin(68.75°)$

$= 0.932$

iii $\tan^{-1} 0.5 = inv\text{-}\tan 0.5 = 26.56°$

iv $\cos^2(22°) = \cos(22) \times \cos(22) = 0.794$

v $(\tan(0.5))^{-1} = \frac{1}{\tan 0.5} = \frac{1}{0.009} = 111.11$

Q 5.18

$r = R(\cos\phi)$ where r = radius of circle of LATITUDE AT LATITUDE ϕ

R = EARTH RADIUS AT LAT 0°

AT EQUATOR $r = R$

$r = R(\cos 0°) =$

$r = R(1) = R$

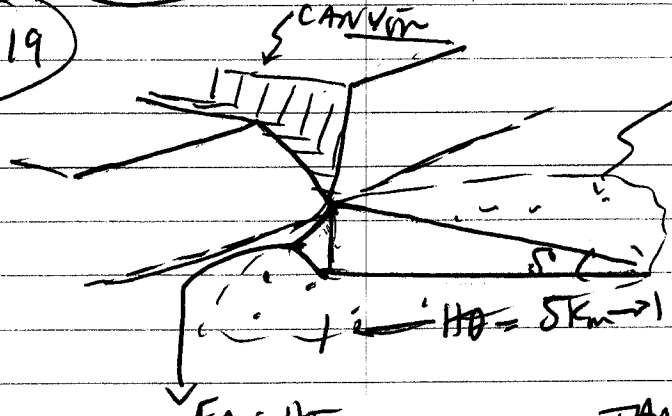
AT POLE $r = 0$

$r = R(\cos 90°)$

$r = R(0)$

$r = 0$

Q 5.19



$\tan 5° = \frac{FH}{HD} = \frac{FH}{5Km}$

$FH = \tan 5° \cdot 5Km = 0.437Km$

$= 0.437Km \frac{1000m}{Km} = 437m$

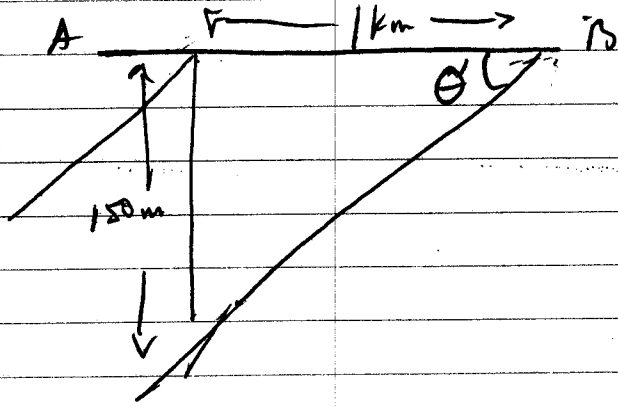
Q (5.20)

from EQ 5.32 on p. 82 of TEXT

$$\theta = \tan^{-1}\left[\frac{\tan(\theta')}{\cos\alpha}\right]$$

where θ = true dip
θ' = apparent dip
α = ANGLE BETWEEN LINE OF EXPOSURE AND TRUE DIP DIRECTION

STEP 1 DERIVE APPARENT DIP FROM CLIFF SECTION



θ' = apparent DIP

$$\tan\theta' = \frac{\text{OPP}}{\text{ADJ}} = \frac{150\text{m}}{1000\text{m}} = 0.150$$

$$\theta' = 8.53^\circ$$

STEP 2 DETERMINE DIP AZIMUTH

STRIKE AZIMUTH = 72°, FROM SECTION DIP IS TO THE NORTH, DIP IS AT 90° TO STRIKE

DIP DIRECTION = 360° − 18° = 342°

STEP 3 DETERMINE α

CLIFF FACE AZIMUTH = 130 + 180° = 310°

α = ∠ between DIP AZIMUTH & CLIFF AZIMUTH =

DIP Az − CLIFF Az = 342° − 310° = 32°

STEP 4 CALCULATE TRUE DIP

$$\theta = \tan^{-1}\left[\frac{\tan(8.53^\circ)}{\cos(32^\circ)}\right] = \tan^{-1}\left(\frac{0.150}{0.848}\right) = 10^\circ \text{ ★}$$

TRUE DIP = 10°