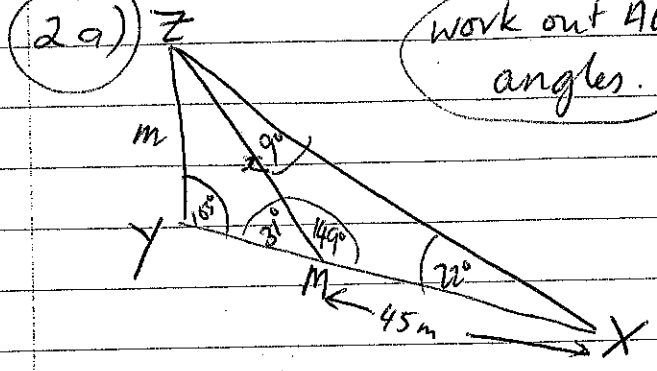
EX 1.5 Q. 2a + d 4 5 6 9.

(2a)



work out ALL angles.

- first find x in ΔXZM.
- We have one pair (9° and 45m)
- so use sine rule.

$$\frac{x}{\sin X} = \frac{z}{\sin Z}$$

$$\frac{x}{\sin 22^\circ} = \frac{45}{\sin 9^\circ}$$

$$x = \frac{45 \sin 22^\circ}{\sin 9^\circ}$$

$$= 107.8 \text{ m}$$

- now in 2nd ΔYMZ we have one pair (107.8m and 105°)

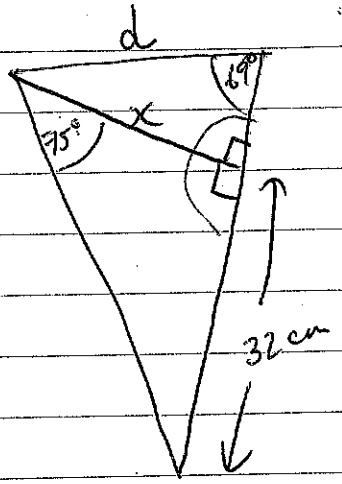
$$\frac{m}{\sin M} = \frac{x}{\sin Y}$$

$$\frac{m}{\sin 31^\circ} = \frac{107.8}{\sin 105^\circ}$$

$$m = \frac{107.8 \sin 31^\circ}{\sin 105^\circ}$$

$$= 57.46 \text{ m}$$

(2d)



- This is all right Δ's.
- need to do 2 steps.
- use tan θ to find x

$$\tan\theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 75^\circ = \frac{32}{x}$$

$$x = \frac{32}{\tan 75^\circ}$$

$$= 8.6$$

- now in 2nd Δ.

$$\sin\theta = \frac{\text{opp}}{\text{hyp}}$$

$$\sin 69^\circ = \frac{8.6}{d}$$

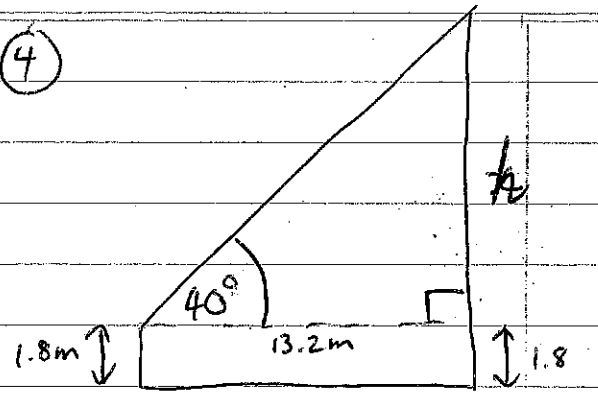
$$d = \frac{8.6}{\sin 69}$$

$$= 9.2$$

EX 1.5 — page 2.

13 14 16 18 19.

(4)



Right-angled Δ.

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

$\tan 40° = \frac{h}{13.2}$

$h = 13.2 \tan 40°$

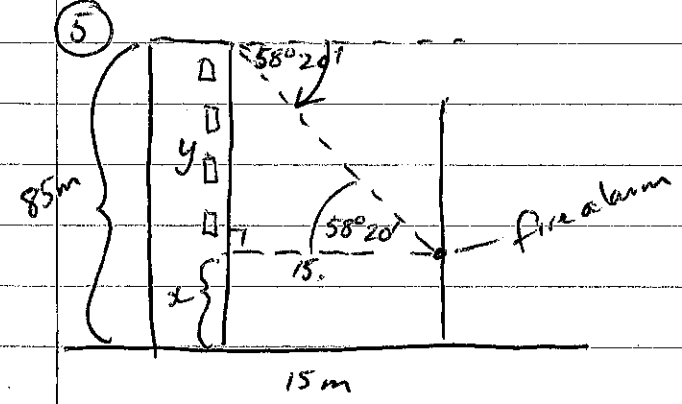
$= 11.1$ m

So from base, pole is

$= (11.1 + 1.8)$ m

$= \underline{12.9 \text{ m}}$ high

(5)



a) find y. $\tan\theta = \frac{\text{opp}}{\text{adj}}$

$\tan 58°20' = \frac{y}{15}$

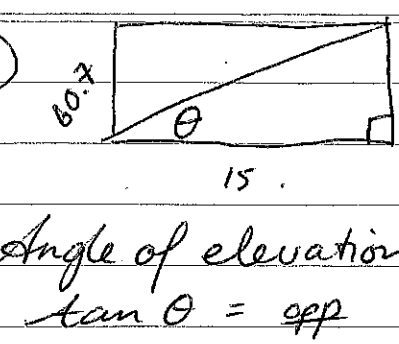
$y = 15 \tan 58°20'$

$= \underline{24.3}$

So height $= (85 - 24.3)$

$= \underline{60.7 \text{m}}$

(6)



Angle of elevation in new Δ

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

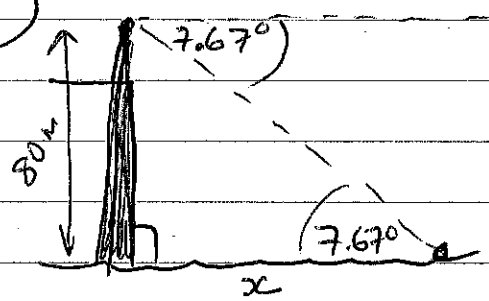
$= \frac{60.7}{15}$

$\theta = \tan^{-1}(4.05)$

$= 76.1°$

∴ angle of elevation is $\underline{76.1°}$

(6)



$\tan\theta = \frac{\text{opp}}{\text{adj}}$

$\tan 7.67° = \frac{80}{x}$

$x = 80 / \tan 7.67°$

$= 594$ m.

Boat has travelled 594m in 5 min.

5 min = ~~5/60~~ $\frac{5}{60}$ hr

speed $= \frac{\text{distance}}{\text{time}}$

$= \frac{0.594 \text{ km}}{5/60 \text{ hr}}$

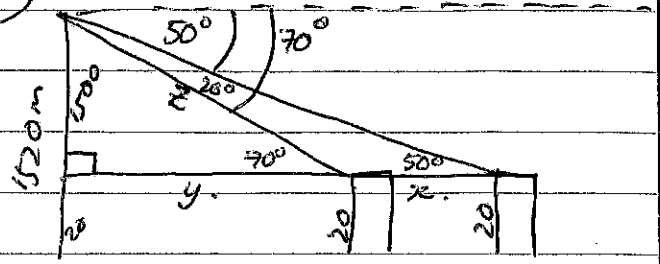
$= 7.13$ km/h

∴ Boat travelled at $\underline{7.13 \text{ km/h}}$

$\frac{5}{09} \times 4625.0$

EX 1.5 - #3.

(9)



Use right-angled Δ to find z.

$\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\sin 70° = \frac{1500}{z}$

$z = \frac{1500}{\sin 70°}$

$= 1596.3$

NOW you have a PAIR in 2nd Δ.
(1596.3 m and 50°)

$\frac{x}{\sin 20°} = \frac{1596.3}{\sin 50°}$

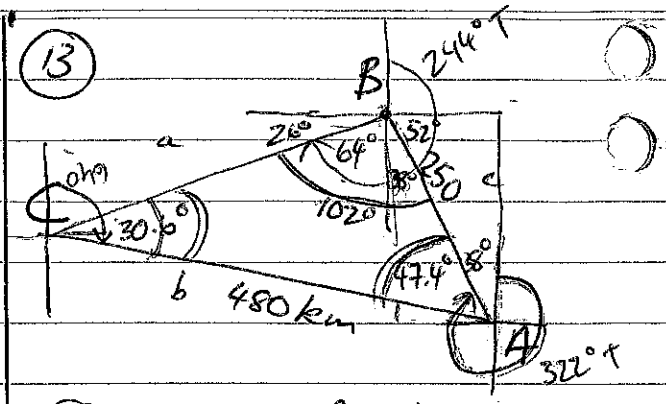
$x = \frac{1596.3 \sin 20°}{\sin 50°}$

$= 712.7$

So the two towers are 713 m apart

NOTE – other methods are possible to answer this question. You can use ALL right Δ's if you like.

(13)



(a) means find "a"
- insert 38° using Z angles
- find 52° in ⊾
- find 64° = (180° − 52° − 38° − 26°)
- Add to get 102° in Δ

- NOW you have a pair.
(102° and 480 km)

- find C (need it to find other bits)

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

$\sin C = \frac{250 \sin 102°}{480}$

$= 0.509$

$C = \sin^{-1}(0.509)$

$= 30.6°$ or ~~140.4°~~ too big.

$A = 180° - 102° - 30.6°$

$= 47.4°$

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

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

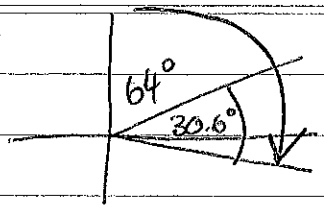
$= \frac{480 \sin 47.4°}{\sin 102°}$ ✓

$= 361$

So Distance BC is 361 km

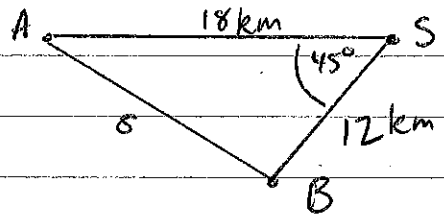
EX 1.5 – #4.

b)



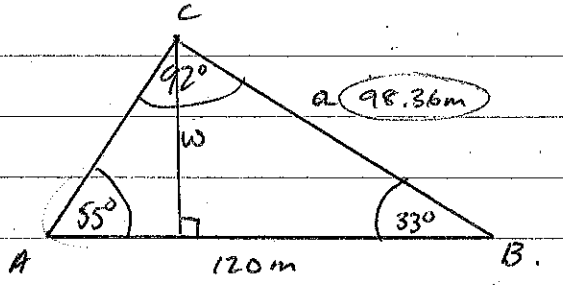
from diagram
bearing is $64° + 30.6°$
$= 095°T$ ✓

(14)



$s^2 = a^2 + b^2 - 2ab\cos S$
$= 12^2 + 18^2 - 2\times12\times18\cos45°$
$s^2 = 162.5$
$s = 12.75$ ✓
bikes are 12.8 km apart.

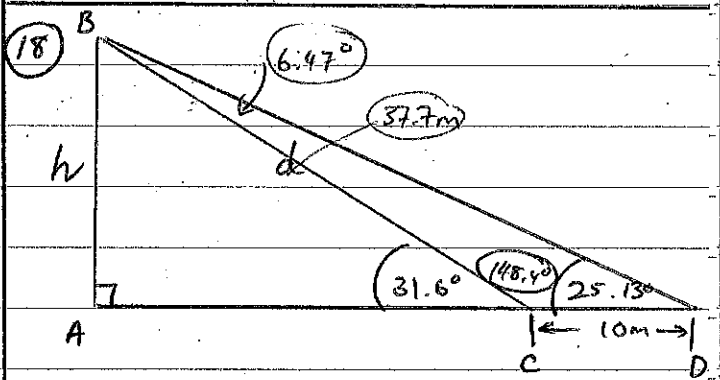
(16)



$C = 180° - 55° - 33°$
$= 92°$
find a using sine rule.
$\frac{a}{\sin A} = \frac{b}{\sin B}$
$\frac{a}{\sin 55°} = \frac{120}{\sin 92°}$
$a = \frac{120\sin 55°}{\sin 92°}$
$= 98.36$ m

now find w using sinθ.
$\sin\theta = \frac{opp}{hyp}$
$\sin 33° = \frac{w}{98.36}$
$w = 98.36\sin 33°$
$= 53.57$ ✓
∴ river is 53.6 m across

(18)

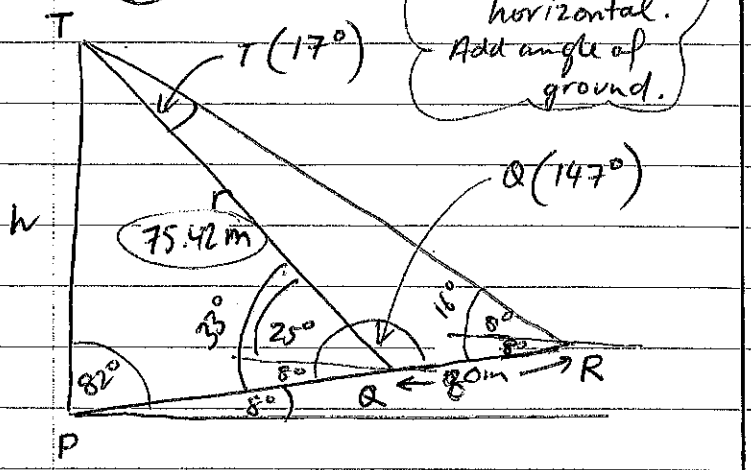


$C = 180° - 31.6°$
$= 148.4°$
$B = 180° - 148.4° - 25.13°$
$= 6.47°$
find d. in Δ DCB
$\frac{d}{\sin D} = \frac{b}{\sin B}$
$\frac{d}{\sin 25.13°} = \frac{10}{\sin 6.47°}$
$d = \frac{10\sin 25.13°}{\sin 6.47°}$
$= 37.7$ m
In Δ ABC
$\sin\theta = opp/hyp$
$\sin 31.6° = \frac{h}{37.7}$ ✓
$h = 37.7\sin 31.6$
$= 19.75$
So TREE is 19.75 m tall

EX 1.5 # 5.

* (19)

- An angle of elevation is measured from horizontal. Add angle of ground.



$Q = 180° - 33°$ $\quad P = 90° - 8°$

$= \underline{147°}$ $\quad = \underline{82°}$

in Δ TQR find r

$$\frac{r}{\sin R} = \frac{t}{\sin T}$$

$$\frac{r}{\sin 16°} = \frac{80}{\sin 17°}$$

$$r = \frac{80 \sin 16°}{\sin 17°}$$

$$= \underline{75.42 \text{ m}}$$

in Δ TQP

$$\frac{h}{\sin Q} = \frac{r}{\sin P}$$

$$\frac{h}{\sin 33°} = \frac{75.42}{\sin 82°}$$

$$h = \frac{75.42 \sin 33}{\sin 82}$$

$$= 41.5$$

✓

So height of tower is $\underline{41.5 \text{ m}}$