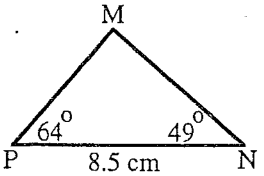
Zain

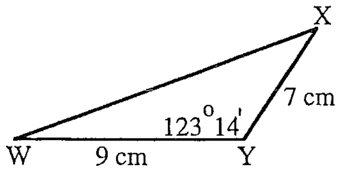
Year 11 **Trigonometry Test 2** - EXT. I

1.



Find the length of MP.
(correct to 3 significant figures)

2.



Find, correct to 1 decimal place:

(a) the length of XW.

(b) the area of triangle XYW.

3. In triangle RST, RS = 18 cm, ST = 20 cm and TR = 13 cm.

Find, to the nearest minute, the size of the largest angle of triangle RST.

4. In triangle PQR, QR = 15.3 cm, PQ = 7.8 cm and $\angle PRQ = 23^0 40'$.

Find, to the nearest minute, the size of $\angle RPQ$.

5. In parallelogram ABCD, AB = 19 cm, AD = 14 cm and $\angle BAD = 135^0$.

Find, in its simplest surd form, the exact value of the area of parallelogram ABCD.

6. The angle of elevation of the top of a tower D from a point A is 27^0.
On walking 120 m towards the tower, the angle of elevation from a point B is 41^0.
Given the points A and B are in line with the foot of the tower C:

(a) draw a diagram to illustrate this information.

(b) find, correct to 1 decimal place, the height of the tower.

7. A hiker starts from point P and walks 8 km on a bearing of 143^0T to point Q.
He then walks 12 km on a bearing of 292^0T to point R.

(a) Draw a diagram to illustrate this information.

(b) Find the distance of R from P.
(correct to 1 decimal place)

(c) Find the bearing of R from P.
(to the nearest degree)

*8. To find the height of an inaccessible tower, the elevation of its summit is observed from two points A and B which are on the same level as the foot of the tower.

From point A, due south of the tower, the angle of elevation is 26^0 and from point B, due east of the tower, the angle of elevation is 34^0.
The distance between the points A and B is 200 metres.

(a) Draw a diagram to illustrate this information.

(b) Show that the height, h, of the tower is given by

$$h = \frac{200}{\sqrt{\cot^2 26^0 + \cot^2 34^0}}.$$

(c) Hence find the height of the tower.
(to the nearest metre)

*9. A person walking along a straight horizontal road observes the summit of a tower on a bearing of 056^0T, at an elevation of 13^0.
After walking 1200 metres, the summit of the tower bears 312^0T, at an elevation of 28^0.

(a) Draw a diagram to illustrate this information.

(b) Show that the height, h, of the tower is given by

$$h = \frac{1200}{\sqrt{\cot^2 13^0 + \cot^2 28^0 - 2\cot 13^0 \cot 28^0 \cos 104^0}}$$

(c) Hence find the height of the tower.
(to the nearest metre)

Solutions

Trigonometry Test 2.

$\angle M = 180^\circ - 64^\circ - 49^\circ$
$= 67^\circ$

$\frac{n}{\sin N} = \frac{m}{\sin M}$

$\frac{MP}{\sin 49^\circ} = \frac{8.5}{\sin 67^\circ}$

$MP = \frac{8.5}{\sin 67^\circ} \times \sin 49^\circ$

$MP = 6.97$ cm (c.t. 3 sig fig.)

$y^2 = x^2 + w^2 - 2xw\cos Y$

$XW^2 = 9^2 + 7^2 - 2\times 9\times 7 \cos 123^\circ 14'$

$XW^2 = 130 - 126 \cos 123^\circ 14'$

$\therefore XW^2 = 199.05$ (c.t. 2 dec. pl)

$XW = \sqrt{199.05}$

$XW = 14.1$ cm (c.t. 1 dec. pl.)

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area of ΔXYW

$= \frac{1}{2} xw \sin Y$

$= \frac{1}{2} \times 9 \times 7 \times \sin 123^\circ 14'$

$= 31.5 \sin 123^\circ 14'$

$= 26.3$ cm² (c.t. 1 dec. pl)

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largest angle is opposite the longest side

$\therefore$ largest angle is $\angle R$.

$\cos R = \frac{s^2 + t^2 - r^2}{2st}$

$\cos R = \frac{13^2 + 18^2 - 20^2}{2 \times 13 \times 18}$

$= \frac{93}{468}$

$\angle R = 78^\circ 32'$

$\frac{\sin P}{p} = \frac{\sin R}{r}$

$\frac{\sin P}{15.3} = \frac{\sin 23^\circ 40'}{7.8}$

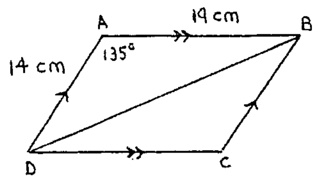
$\sin P = 15.3 \times \frac{\sin 23^\circ 40'}{7.8}$

$\sin P = 0.787$ (c.t. 3 dec. pl.)

$\angle P = 51^\circ 57'$, $(180^\circ - 51^\circ 57')$

$\angle P = 51^\circ 57'$ $128^\circ 3'$

5/



area of parallelogram ABCD

$= 2 \times$ area of ΔBAD

$= 2 \times \frac{1}{2} bd \sin A$

$= 2 \times \frac{1}{2} \times 14 \times 19 \times \sin 135^\circ$

$= 266 \times \sin 45^\circ$

$= 266 \times \frac{1}{\sqrt{2}}$

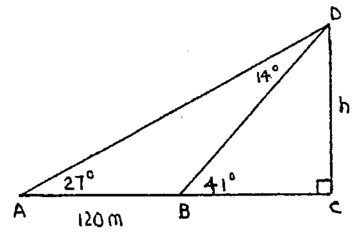
$= \frac{266}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{266\sqrt{2}}{2}$

$= 133\sqrt{2}$ cm²

6/

a/



$\angle ADB = 41^\circ - 27^\circ$
$= 14^\circ$

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b/

in ΔADB

$\frac{a}{\sin A} = \frac{d}{\sin D}$

$\frac{DB}{\sin 27^\circ} = \frac{120}{\sin 14^\circ}$

$DB = \frac{120 \sin 27^\circ}{\sin 14^\circ}$ — ①

in ΔBDC

$\sin B = \frac{DC}{DB}$

$\sin 41^\circ = \frac{DC}{DB}$

$DC = DB \sin 41^\circ$ — ②

sub ① into ②

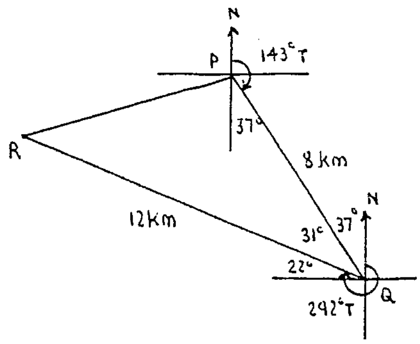
$DC = \frac{120 \sin 27^\circ}{\sin 14^\circ} \times \sin 41^\circ$

$DC = 147.7$ (c.t. 1 dec. pl.)

$\therefore$ the height of the tower is 147.7 m.

7/

a/



$\angle PQR = 90^\circ - [(180^\circ - 143^\circ) + (292^\circ - 270^\circ)]$

$= 90^\circ - (37^\circ + 22^\circ)$

$= 90^\circ - 59^\circ$

$= 31^\circ$

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b/

$q^2 = p^2 + r^2 - 2pr\cos Q$

$PR^2 = 12^2 + 8^2 - 2 \times 12 \times 8 \times \cos 31^\circ$

$PR^2 = 208 - 192 \cos 31^\circ$

$PR^2 = 43.42$ (c.t. 2 dec pl)

$PR = \sqrt{43.42}$

$PR = 6.6$ km (c.t. 1 dec. pl.)

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c/

$\cos P = \frac{q^2 + r^2 - p^2}{2qr}$

$\cos P = \frac{6.6^2 + 8^2 - 12^2}{2 \times 6.6 \times 8}$

$= \frac{-36.44}{105.6}$

$\angle P = 110^\circ$ (to nearest degree)

$\therefore$ the bearing of R from P is $(143 + 110)^\circ T = 253^\circ T$

m.Y.

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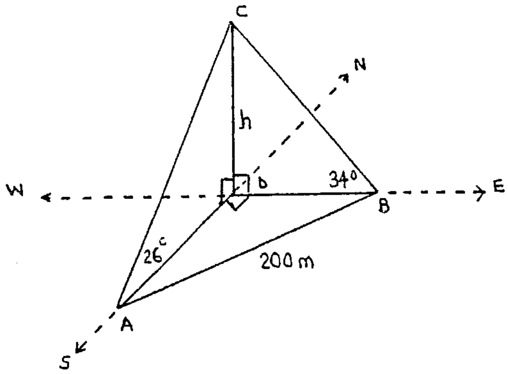
1/



2/

in $\triangle ACD$

$$\tan A = \frac{CD}{AD}$$

$$\tan 26^\circ = \frac{h}{AD}$$

$$AD = \frac{h}{\tan 26^\circ}$$

$$AD = h\cot 26^\circ$$

in $\triangle BCD$

$$\tan B = \frac{CD}{DB}$$

$$\tan 34^\circ = \frac{h}{BD}$$

$$BD = \frac{h}{\tan 34^\circ}$$

$$BD = h\cot 34^\circ$$

in $\triangle ADB$ (by Pythagoras)

$$AB^2 = AD^2 + BD^2$$

$$200^2 = (h\cot 26^\circ)^2 + (h\cot 34^\circ)^2$$

$$200^2 = h^2(\cot^2 26^\circ + \cot^2 34^\circ)$$

$$h^2 = \frac{200^2}{\cot^2 26^\circ + \cot^2 34^\circ}$$

$$h = \frac{200}{\sqrt{\cot^2 26^\circ + \cot^2 34^\circ}}$$

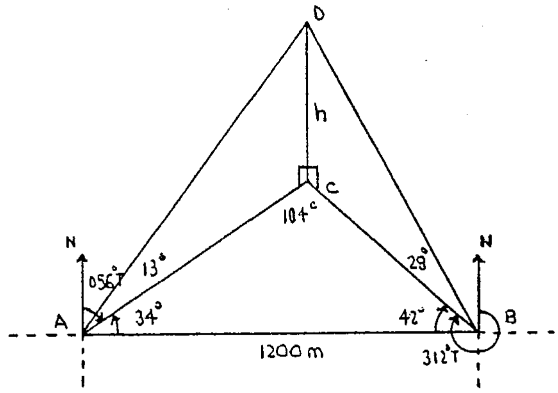
c/

$h = 79$ m (to nearest metre)

$\therefore$ tower is 79 m high

9/

a/



$$\angle ACB = 180^\circ - [(90^\circ - 56^\circ) + (312^\circ - 270^\circ)]$$

$$= 180^\circ - (34^\circ + 42^\circ)$$

$$= 104^\circ$$

b/

in $\triangle ADC$

$$\tan A = \frac{DC}{AC}$$

$$\tan 13^\circ = \frac{h}{AC}$$

$$AC = \frac{h}{\tan 13^\circ}$$

$$AC = h\cot 13^\circ$$

in $\triangle BDC$

$$\tan B = \frac{DC}{BC}$$

$$\tan 28^\circ = \frac{h}{BC}$$

$$BC = \frac{h}{\tan 28^\circ}$$

$$BC = h\cot 28^\circ$$

in $\triangle ACB$ (by the Cos Rule)

$$AB^2 = AC^2 + BC^2 - 2 \times AC \times BC \times \cos \angle ACB$$

$$1200^2 = (h\cot 13^\circ)^2 + (h\cot 28^\circ)^2 - 2 \times h\cot 13^\circ \times h\cot 28^\circ \times \cos 104^\circ$$

$$1200^2 = h^2(\cot^2 13^\circ + \cot^2 28^\circ - 2\cot 13^\circ \cot 28^\circ \cos 104^\circ)$$

$$h^2 = \frac{1200^2}{\cot^2 13^\circ + \cot^2 28^\circ - 2\cot 13^\circ \cot 28^\circ \cos 104^\circ}$$

$$h = \frac{1200}{\sqrt{\cot^2 13^\circ + \cot^2 28^\circ - 2\cot 13^\circ \cot 28^\circ \cos 104^\circ}}$$

c/

$h = 234$ m (to nearest metre)

$\therefore$ tower is 234 m high

m.Y.