## Trigonometry (Q 5, Paper 2)

## 2010

5 (a) In the triangle $A B C$,
$|A B|=6 \mathrm{~cm},|B C|=5 \mathrm{~cm}$
and $|\angle A B C|=135^{\circ}$.

Calculate the area of the triangle, correct to the nearest square centimetre.

(b) Consider the right-angled triangle shown in the diagram.
(i) Find the value of $x$.
(ii) Write down, as a fraction, the value of $\sin \theta$.
(iii) Write down, as a fraction, the value of $\cos \theta$.

(iv) Find the value of $\sin 2 \theta$.
(c) A vertical mast $[P Q]$ is supported by two straight cables $[P S]$ and $[P R]$, as shown.

The cables are joined to level ground at $S$ and $R$ where $|S R|=15 \mathrm{~m},|R Q|=17.4 \mathrm{~m}$ and $|\angle P R Q|=50^{\circ}$.
(i) Find $|P R|$, correct to the nearest metre.

(ii) Find $|P S|$, correct to the nearest metre.

## Solution

5 (a)
Area $=\frac{1}{2} \times$ Product of 2 sides $\times$ Sine of the included angle


Area $=\frac{1}{2}(6)(5) \sin 135^{\circ}=10.6 \mathrm{~cm}^{2} \approx 11 \mathrm{~cm}^{2}$

5 (b) (i)
$x^{2}+15^{2}=17^{2} \quad x^{2}+y^{2}=r^{2}$
$x^{2}+225=289$
$x^{2}=289-225=64$
$x=\sqrt{64}=6$
5 (b) (ii)
$\sin \theta=\frac{15}{17}$

$$
\sin A=\frac{y}{r}=\frac{\text { Opposite }}{\text { Hypotenuse }}
$$



5 (b) (iii)
$\cos \theta=\frac{8}{17}$

$$
\cos A=\frac{x}{r}=\frac{\text { Adjacent }}{\text { Hypotenuse }}
$$

5 (b) (iv)
$\sin 2 \theta=2\left(\frac{15}{17}\right)\left(\frac{8}{17}\right)=\frac{240}{289} \quad \sin 2 A=2 \sin A \cos A$

## 5 (c) (i)

Consider the right-angled triangle $P Q R$.

$$
\cos A=\frac{x}{r}=\frac{\text { Adjacent }}{\text { Hypotenuse }}
$$

$\cos 50^{\circ}=\frac{17.4}{|P R|} \Rightarrow|P R|=\frac{17.4}{\cos 50^{\circ}}=27 \mathrm{~m}$


## 5 (c) (ii)

Consider the right-angled triangle $P R S$.

$$
\begin{aligned}
& \quad a^{2}=b^{2}+c^{2}-2 b c \cos A \\
& a^{2}=27^{2}+15^{2}-2(27)(15) \cos 130^{\circ} \\
& a^{2}=729+225-810 \cos 130^{\circ} \\
& a^{2}=1474.66 \\
& a=\sqrt{1474.66}=38 \mathrm{~m}
\end{aligned}
$$



