1.

Express $\sin 2A + \sin 2B$ as a product in sine and cosine.

If $A + B + C = 180°$, show that

$$\sin(A + B) = \sin C.$$

Hence, show that

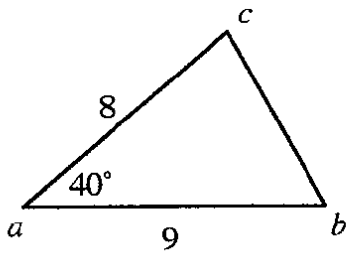
$$\sin 2A + \sin 2B - \sin 2C = 4 \cos A \cos B \sin C.$$

Note: $\cos(A + B) = -\cos C$.

2.

(a) In the triangle abc, $|ab| = 9$, $|ac| = 8$ and $|\angle cab| = 40°$.

Find the area of triangle abc, correct to two places of decimals.

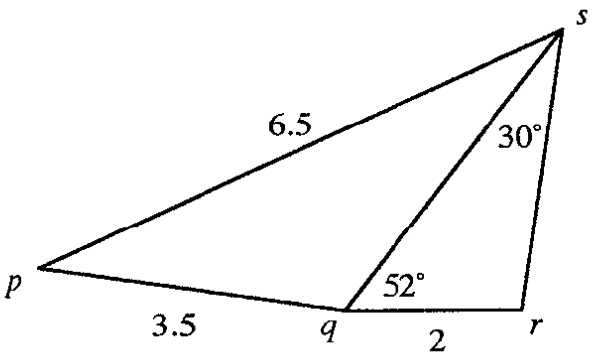


(b) In the triangles pqs and qrs, $|pq| = 3.5$, $|qr| = 2$, $|ps| = 6.5$, $|\angle qsr| = 30°$ and $|\angle sqr| = 52°$.

Calculate

(i) $|qs|$, correct to two places of decimals

(ii) $|\angle pqs|$, correct to the nearest degree.



(c) Express $\sin(135° - A)$ in terms of $\sin A$ and $\cos A$.

Express $\sin(135° - A)\cos(135° + A)$ in the form $k(1 + \sin pA)$, where $k, p \in \mathbf{R}$.

Find the values of A for which

$$\sin(135° - A)\cos(135° + A) = -\frac{3}{4}$$

3.

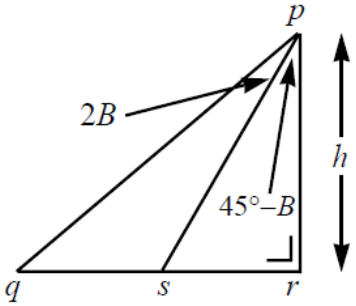
In the triangle pqr, $|\angle qrp| = 90°$ and $|rp| = h$.

s is a point on $[qr]$ such that $|\angle spq| = 2B$ and

$|\angle rps| = 45° - B$, $\quad 0° < B < 45°$.

(i) Show that $|sr| = h \tan(45° - B)$.

(ii) Hence, or otherwise, show that $|qs| = 2h\tan 2B$.

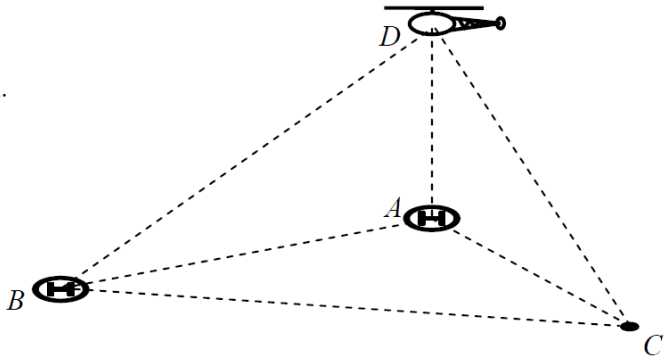


4.

A and B are two helicopter landing pads on level ground. C is another point on the same level ground. $|BC| = 800$ metres, $|AC| = 900$ metres, and $|\angle BCA| = 60^\circ$.
A helicopter at point D is hovering vertically above A.
A person at C observes the helicopter to have an angle of elevation of 30°.

(i) Find $|AD|$, in surd form.

(ii) Find $|BD|$.



5.

(a) The length of an arc of a circle is 10 cm. The radius of the circle is 4 cm.
The measure of the angle at the centre of the circle subtended by the arc is θ.

(i) Find θ in radians.

(ii) Find θ in degrees, correct to the nearest degree.

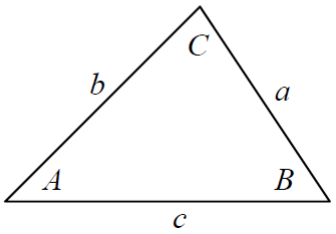
(b) **(i)** Write $\cos 2x$ in terms of $\sin x$.

(ii) Hence, find all the solutions of the equation

$$\cos 2x - \sin x = 1$$

in the domain $0^\circ \leq x \leq 360^\circ$.

(c) A triangle has sides a, b and c.
The angles opposite a, b and c are A, B and C, respectively.



(i) Prove that $a^2 = b^2 + c^2 - 2bc\cos A$.

(ii) Show that $c(b\cos A - a\cos B) = b^2 - a^2$.

6.

S_1 is a circle of radius 9 cm and S_2 is a circle of radius 3 cm.
S_1 and S_2 touch externally at f.
A common tangent touches S_1 at point a and S_2 at b.

(i) Find the area of the quadrilateral $abcd$.
Give your answer in surd form.

(ii) Find the area of the shaded region, which is bounded by $[ab]$ and the minor arcs af and bf.