

TRIGONOMETRY (Q 4 & 5, PAPER 2)

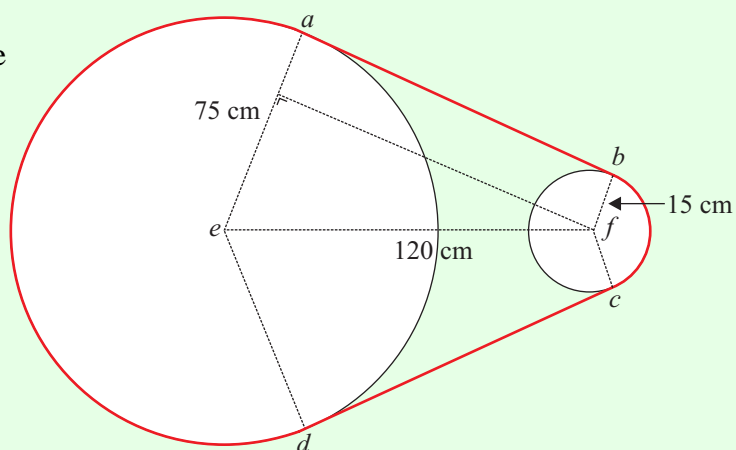
2002

4 (a) Find the value of  $\theta$  for which  $\cos \theta = -\frac{\sqrt{3}}{2}$ ,  $0^\circ \leq \theta \leq 180^\circ$ .

4 (b) (i) Use the formula  $\sin^2 A = \frac{1}{2}(1 - \cos 2A)$  to express  $\sin^2 \frac{1}{2}x$  in terms of  $\cos x$ .

(ii) Hence, or otherwise, find all the solutions of the equation  $\sin^2 \frac{1}{2}x - \cos^2 x = 0$  in the domain  $0^\circ \leq \theta \leq 360^\circ$ .

4 (c) A chain passes around two circular wheels as shown. One wheel has a radius 75 cm and the other has radius 15 cm. The centres,  $e$  and  $f$ , of the wheels are 120 cm apart. The chain consists of the common tangent  $[ab]$ , the minor arc  $bc$ , the common tangent  $[cd]$  and the major arc  $da$ .

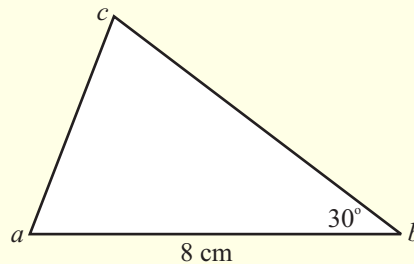


(i) Find the measure of  $\angle aef$ .

(ii) Find  $|ab|$  in surd form.

(iii) Find the length of the chain, giving your answer in the form  $k\pi + l\sqrt{3}$  where  $k, l \in \mathbf{Z}$ .

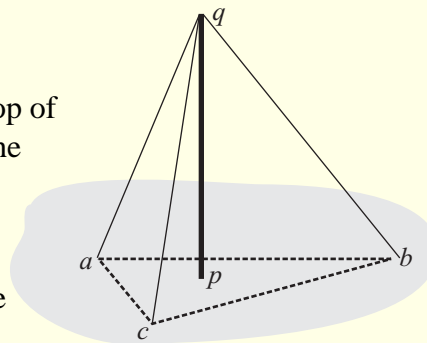
- 5 (a) The area of triangle  $abc$  is  $12 \text{ cm}^2$ .  $|ab| = 8 \text{ cm}$   
and  $|\angle abc| = 30^\circ$ . Find  $|bc|$ .



- 5 (b) (i) Prove that  $\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$ .

(ii) Hence, or otherwise, prove that  $\tan 22\frac{1}{2}^\circ = \sqrt{2} - 1$ .

- 5 (c) A vertical radio mast  $[pq]$  stands on flat horizontal ground. It is supported by three cables that join the top of the mast,  $q$ , to the points  $a$ ,  $b$  and  $c$  on the ground. The foot of the mast,  $p$ , lies inside the triangle  $abc$ . Each cable is  $52 \text{ m}$  long and the mast is  $48 \text{ m}$  high.



- (i) Find the (common) distance from  $p$  to each of the points  $a$ ,  $b$  and  $c$ .
- (ii) Given that  $|ac| = 38 \text{ m}$  and  $|ab| = 34 \text{ m}$ , find  $|bc|$  correct to one decimal place.

**ANSWERS**

4 (a)  $150^\circ$

4 (b) (ii)  $60^\circ, 180^\circ, 300^\circ$

4 (c) (i)  $60^\circ$     (ii)  $60\sqrt{3}$     (iii)  $110\pi + 120\sqrt{3}$

5 (a)  $6 \text{ cm}$

5 (c) (i)  $20 \text{ m}$     (ii)  $30.6 \text{ m}$