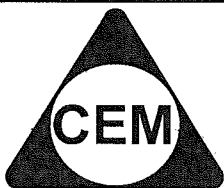


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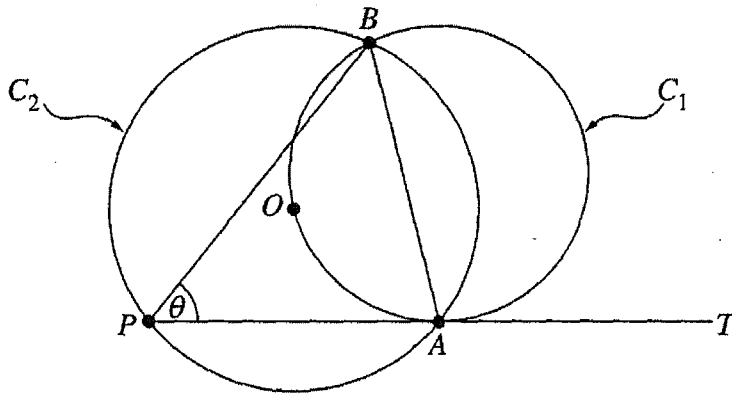
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**YEAR 12 – EXT.1 MATHS**

**REVIEW TOPIC (SP3)  
CIRCLE GEOMETRY**

PAST HSC EXAMINATION QUESTIONS:HSC 01

(3) (b)



Two circles,  $C_1$  and  $C_2$ , intersect at points  $A$  and  $B$ . Circle  $C_1$  passes through the centre  $O$  of circle  $C_2$ . The point  $P$  lies on circle  $C_2$  so that the line  $PAT$  is tangent to circle  $C_1$  at point  $A$ . Let  $\angle APB = \theta$ .

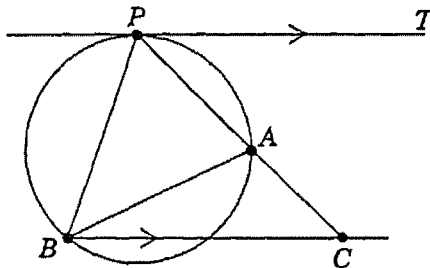
Copy or trace the diagram into your writing booklet.

- (i) Find  $\angle AOB$  in terms of  $\theta$ . Give reasons for your answer. 1
- (ii) Explain why  $\angle TAB = 2\theta$ . 1
- (iii) Deduce that  $PA = BA$ . 2

**HSC 2000**

(5) (a)

4



In the diagram,  $A$ ,  $P$  and  $B$  are points on the circle. The line  $PT$  is tangent to the circle at  $P$ , and  $PA$  is produced to  $C$  so that  $BC$  is parallel to  $PT$ . Copy the diagram.

(i) Show that  $\angle PBA = \angle PCB$ .

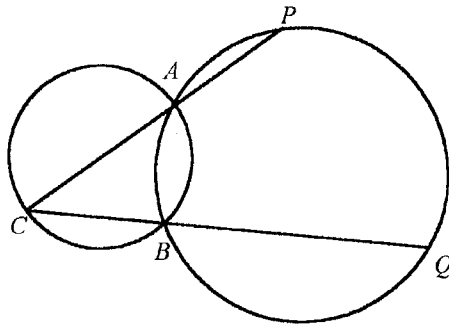
(ii) Deduce that  $PB^2 = PA \times PC$ .

HSC '99

(3)(c)

Marks

2



Two circles intersect at two points  $A$  and  $B$  as shown in the diagram. The diameter of one circle is  $CA$  and this line intersects the other circle at  $A$  and  $P$ . The line  $CB$  intersects the second circle at  $B$  and  $Q$ .

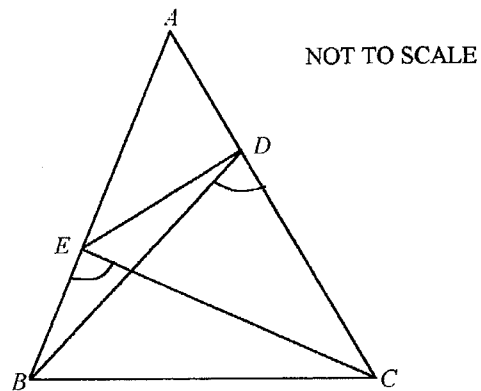
Copy or trace the diagram into your Writing Booklet.

Prove that  $\angle CPQ$  is a right angle.

**HSC '98**

(4) (c)

2



$ABC$  is an acute-angled triangle.  $D$  is a point on  $AC$ ,  $E$  is a point on  $AB$ , and  $\angle BEC = \angle BDC$ , as shown in the diagram.

Sonya was asked to prove that  $\angle AED = \angle ACB$ . She provided a two-step proof but did not give reasons.

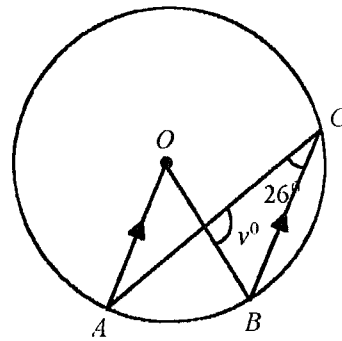
(i) State a reason for her correct statement that  $EDCB$  is a cyclic quadrilateral.

(ii) State a reason why she could correctly conclude that  $\angle AED = \angle ACB$ .

**HSC '97**

(2) (a) The points  $A, B,$  and  $C$  lie on a circle with centre  $O$ . The lines  $AO$  and  $BC$  are parallel, and  $OB$  and  $AC$  intersect at  $D$ . Also,  $\angle ACB = 26^\circ$  and  $\angle BDC = y^\circ$ , as shown in the diagram. Copy and trace the diagram into your writing booklet.

(i) State why  $\angle AOB = 52^\circ$ .



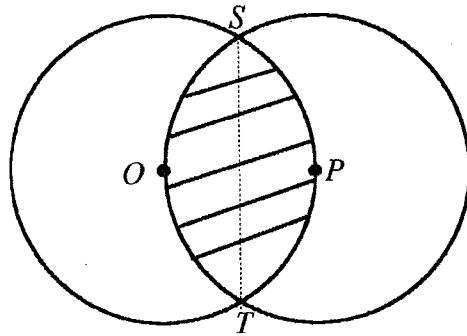
(ii) Find  $y$ . Justify your answer.

$$y = 102$$

**HSC '96**

- (2) (c) The points  $O$  and  $P$  in the plane are  $d$  cm apart. A circle centre  $O$  is drawn to pass through  $P$ , and another circle centre  $P$  is drawn to pass through  $O$ . The two circles meet at  $S$  and  $T$ , as in the diagram.

5



- (i) Show that triangle  $SOP$  is equilateral.
- (ii) Show that the size of angle  $SOT$  is  $120^\circ$ .

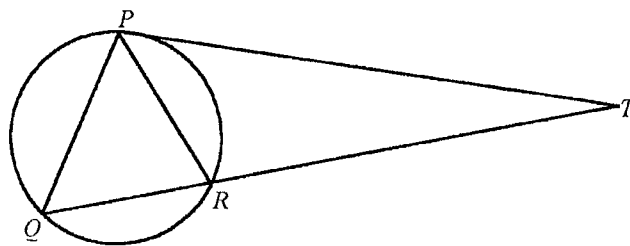
(iii) Hence find the area of the shaded region in terms of  $d$ .

$$d^2 \left( \frac{2\pi}{3} - \frac{\sqrt{3}}{2} \right) \text{ units}^2$$



**HSC '95**

(6) (a)



$PT$  is a tangent to the circle  $PRQ$ , and  $QR$  is a secant intersecting the circle in  $Q$  and  $R$ .  
The line  $QR$  intersects  $PT$  at  $T$ .

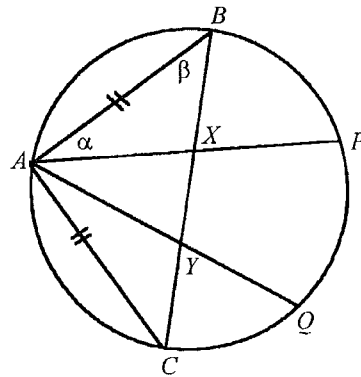
Copy or trace the diagram into your Writing Booklet.

(i) Prove that the triangles  $PRT$  and  $QPT$  are similar.

(ii) Hence prove that  $PT^2 = QT \times RT$

**HSC '94**

(2) (b) Let  $ABPQC$  be a circle such that  $AB = AC$ ,  $AP$  meets  $BC$  at  $X$ , and  $AQ$  meets  $BC$  at  $Y$ , as in the diagram. Let  $\angle BAP = \alpha$  and  $\angle ABC = \beta$ .



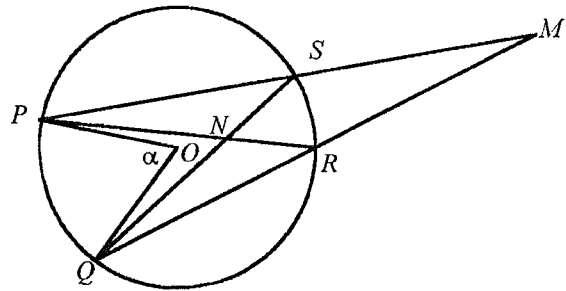
(i) Copy the diagram into your Writing Booklet and state why  $\angle AXC = \alpha + \beta$ .

(ii) Prove that  $\angle BQP = \alpha$ .

(iii) Prove that  $\angle BQA = \beta$ .

(iv) Prove that  $PQYX$  is a cyclic quadrilateral.

(3) (c) In the diagram  $P, Q, R,$  and  $S$  are points on a circle centre  $O$ , and  $\angle POQ = \alpha$ . The lines  $PS$  and  $QR$  intersect at  $M$  and the lines  $QS$  and  $PR$  intersect at  $N$ .

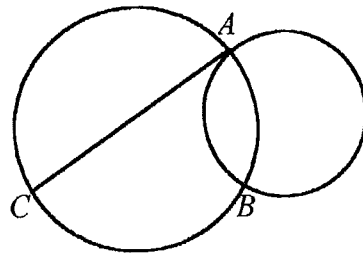


(i) Explain why  $\angle PRM = 180^\circ - \frac{1}{2}\alpha$ .

(ii) Show that  $\angle PNQ + \angle PMQ = \alpha$ .

**HSC '91**

(2) (c) The diagram shows two circles intersecting at  $A$  and  $B$ . The diameter of one circle is  $AC$ . Copy this diagram into your examination booklet.



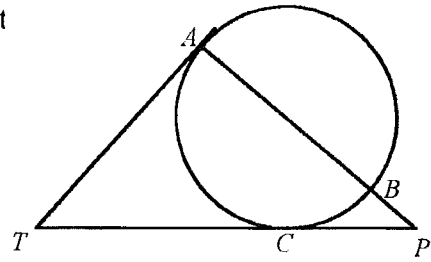
- (i) On your diagram draw a straight line through  $A$ , parallel to  $CB$ , to meet the second circle in  $D$ .
- (ii) Prove that  $BD$  is the diameter of the second circle.

(iii) Suppose that  $BD$  is parallel to  $CA$ . Prove that the circles have equal radii.

**HSC '90**

(3) (a)  $AB$  is a diameter of a circle  $ABC$ . The tangents at  $A$  and  $C$  meet at  $T$ . The lines  $TC$  and  $AB$  are produced to meet at  $P$ .

Copy the diagram into your examination booklet.  
Join  $AC$  and  $CB$ .



(i) Prove that  $\angle CAT = 90^\circ - \angle BCP$

(ii) Hence, or otherwise, prove that  $\angle ATC = 2\angle BCP$ .

**HSC '89**

(5) (a)  $AB$  and  $CD$  are intersecting chords of a circle and  $CD$  is parallel to the tangent to the circle at  $B$ .

- (i) Draw a neat sketch of the above information in your writing booklet.
- (ii) Prove that  $AB$  bisects  $\angle CAD$ .