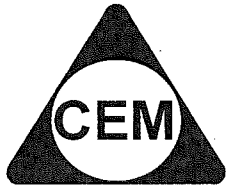


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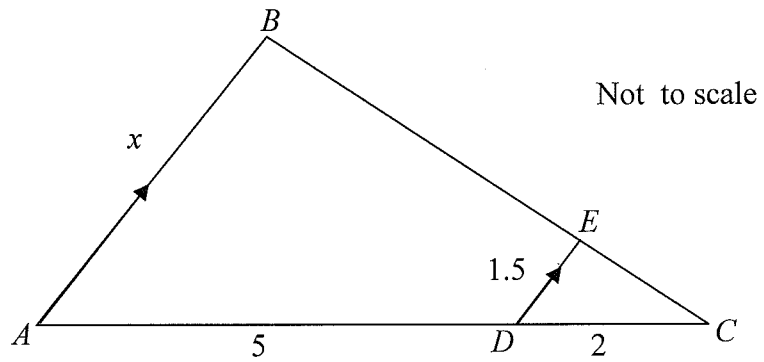
**YEAR 12 – ADVANCED MATHS**

**REVIEW TOPIC (SP1)  
CONGRUENCY & SIMILARITY**

**PAST EXAMINATION QUESTIONS:**

**HSC 2000**

(3) (b)



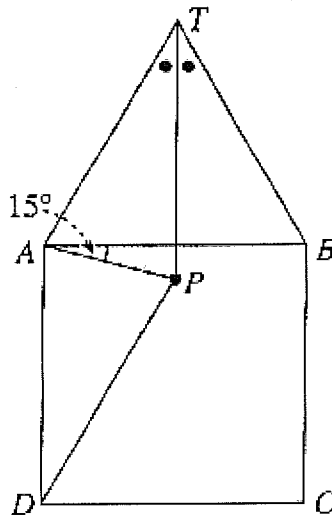
In the diagram,  $AB$  is parallel to  $DE$ ,  $AD$  is 5 cm,  $DC$  is 2 cm and  $DE$  is 1.5 cm.

Find the length of  $AB$ .

5.25 cm

(4) (a)

6

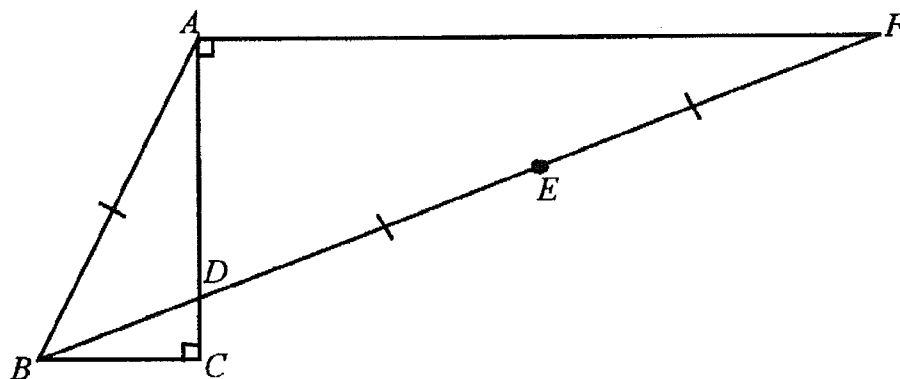


In the diagram,  $ABCD$  is a square and  $ABT$  is an equilateral triangle.  
The line  $TP$  bisects  $\angle ATB$ , and  $\angle PAB = 15^\circ$ .

- (i) Copy the diagram into your Writing Booklet and explain why  $\angle PAT = 75^\circ$ .
- (ii) Prove that  $\triangle TAP \cong \triangle DAP$ .
- (iii) Prove that triangle  $DAP$  is isosceles.

**HSC '99**  
(10)(b)

**Marks**  
**6**



In the diagram,  $AC \perp BC$ ,  $AC \perp AF$  and  $AB = DE = EF$ .

Copy or trace the diagram into your Writing Booklet.

(i) Show that  $\angle DBC = \angle DFA$ .

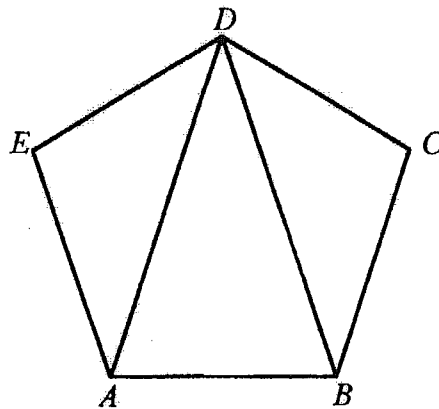
(ii) On your diagram, mark the point  $G$  on the line  $AF$  such that  $EG \parallel AC$ .  
Show that  $\triangle AGE \cong \triangle FGE$ .

(iii) Prove that  $\angle ABD = 2\angle DBC$ .

**HSC '98**

(5) (a)

8



The diagram shows a regular pentagon  $ABCDE$ . Each of the sides  $AB, BC, CD, DE$  and  $EA$  is of length  $x$  metres. Each of the angles  $\angle ABC, \angle BCD, \angle CDE, \angle DEA$  and  $\angle EAB$  is  $108^\circ$ . Two diagonals,  $AD$  and  $BD$ , have been drawn.

Copy or trace the diagram into your Writing Booklet.

(i) State why triangle  $BCD$  is isosceles, and hence find  $\angle CBD$ .

 $36^\circ$ 

(ii) Show that triangle  $BCD$  and  $DEA$  are congruent.

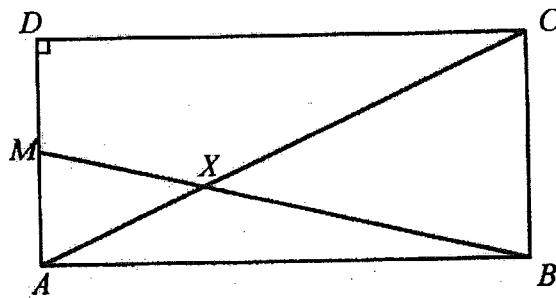
(iii) Find the size of  $\angle ADB$ .

$36^\circ$

(iv) Find an expression for the area of the pentagon in terms of  $x$  and trigonometric ratios.

$$x^2 \sin 108^\circ + \frac{x^2 \tan 72^\circ}{4} \text{ or } x^2 \sin 108^\circ \left( 1 + \frac{\sin 108^\circ}{2 \sin 36^\circ} \right)$$

(9) (c)



6

In the diagram,  $ABCD$  is a rectangle and  $AB = 2AD$ . The point  $M$  is the midpoint of  $AD$ . The line  $BM$  meets  $AC$  at  $X$ .

(i) Show that the triangles  $AXM$  and  $BXC$  are similar.

(ii) Show that  $3CX = 2AC$ .



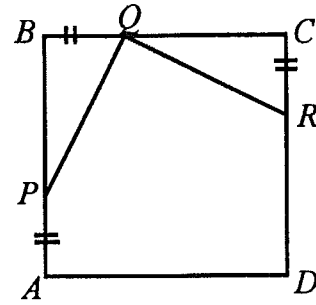
(iii) Show that  $9(CX)^2 = 5(AB)^2$ .

**HSC '97**

4

(7) (a) In the diagram,  $ABCD$  is a square. The points  $P$ ,  $Q$ , and  $R$  lie on  $AB$ ,  $BC$  and  $CD$  respectively, such that  $AP = BQ = CR$ .

(i) Prove that triangles  $PBQ$  and  $QCR$  are congruent.

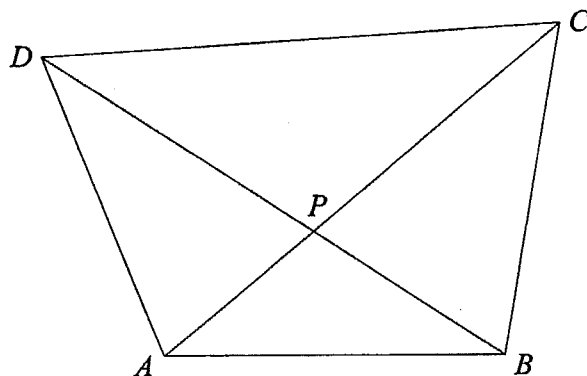


(ii) Prove that  $\angle PQR$  is a right angle.

**HSC 96**

(7)

(b)



NOT TO SCALE

7

*ABCD* is a quadrilateral. The diagonals *AC* and *BD* intersect at *P*.  
*AD = BC* and *AC = BD*.

Copy the diagram into your Writing Booklet.

(i) Show that triangles *ABC* and *ABD* are congruent.

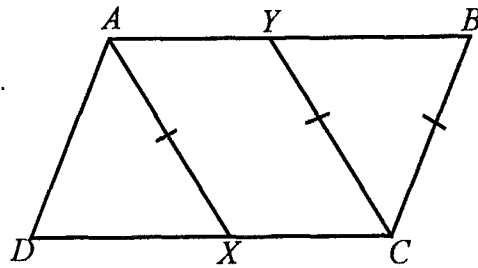
(ii) Show that triangle *ABP* is isosceles.

(iii) Hence show that triangle  $CDP$  is isosceles.

(iv) Show that  $AB$  is parallel to  $CD$ .

**HSC '95**

(7) (b)  $ABCD$  is a parallelogram. The point  $X$  lies on  $CD$ , the point  $Y$  lies on  $AB$ , and  $AX = CY = BC$ , as shown in the diagram.



(i) Copy the diagram into your Writing Booklet.

(ii) Explain why  $\angle ADX = \angle CBY$ .

(iii) Show that  $AD = AX$ .

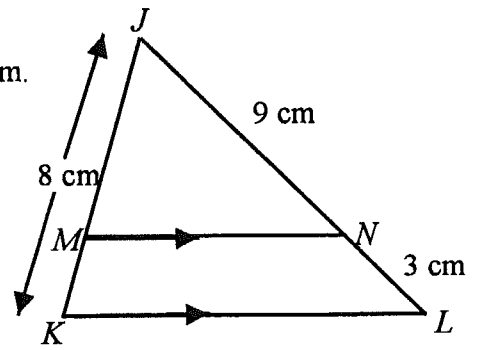
(iv) Show that triangles  $ADX$  and  $CBY$  are congruent.

(v) Hence prove that  $AYCX$  is a parallelogram.

**HSC '94**

(4) (b) The diagram shows a triangle  $JKL$ .  
 $MN \parallel KL$ ,  $JK = 8$  cm,  $JN = 9$  cm, and  $NL = 3$  cm.

(i) Prove that  $\triangle JMN$  is similar to  $\triangle JKL$ .



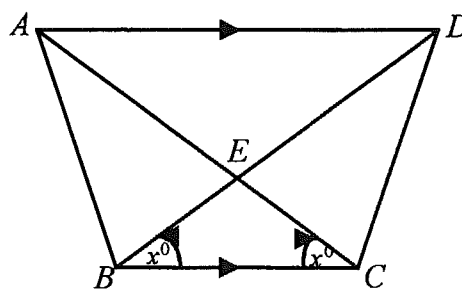
(ii) Find the length of  $MK$ .

2 cm

**HSC '92**

(5) (b) In the diagram  $AD$  is parallel to  $BC$   
and  $\angle DBC = \angle ACB = x^\circ$ .

(i) Show that  $AE = DE$ .



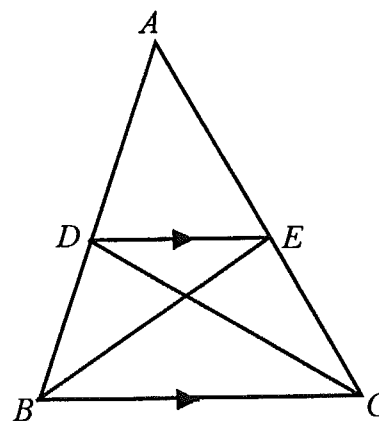
(ii) Prove that the triangles  $ABC$  and  $DCB$  are congruent.



**HSC '91**

(7)(a) In the diagram,  $ABC$  is an isosceles triangle where  $AB = AC$  and  $DE \parallel BC$ .

(i) Show that  $ADE$  is an isosceles triangle.



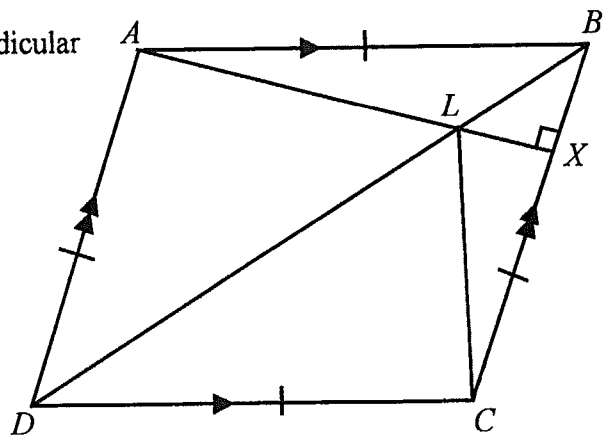
(ii) Show that  $DB = EC$ .

(iii) Show that the triangles  $DBC$  and  $ECB$  are congruent.

**HSC '90**

(7)(a)  $ABCD$  is a rhombus,  $AX$  is perpendicular to  $BC$  and intersects  $BD$  at  $L$ .

- (i) Copy the diagram into your examination booklet and state why  $\angle ADB = \angle CDB$ .



- (ii) Prove that the triangles  $ALD$  and  $CLD$  are congruent.

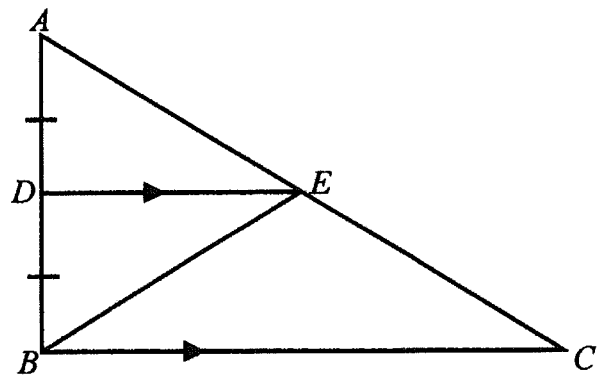
- (iii) Show that  $\angle DAL$  is a right angle.

- (iv) Hence or otherwise find the size of  $\angle LCD$ .

**HSC '88**

(6)(b) The triangle  $ABC$  has a right angle at  $B$ .  $D$  is the midpoint of  $AB$ .

- (i) Copy this diagram into your booklet. Prove that  $ADE$  is a right angle.

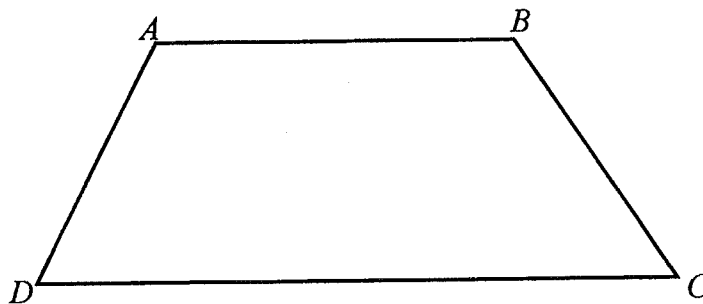


- (ii) Prove that  $\triangle AED$  is congruent to  $\triangle BED$ .

- (iii) Prove that  $BE = EC$ .

**HSC '87**

(4)(i)



$ABCD$  is a quadrilateral,  $\angle ADC = \angle BCD$  and  $AD = BC$ .

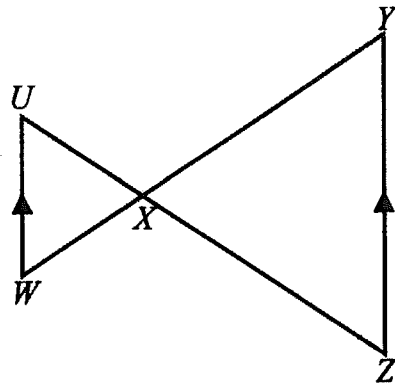
(a) In your examination booklet, draw a neat sketch and mark on it all the given information.

(b) Prove that  $\triangle ACD \cong \triangle CBD$ .

(c) Why are angles  $ACD$  and  $BDC$  equal ?

(d) Prove that  $\angle ADB = \angle ACB$ .

- (ii) The lines  $UZ$  and  $WY$  intersect at  $X$  as shown in the figure.  $UW \parallel YZ$ ,  $UW = 10$  cm  
 $WX = 8$  cm,  $UX = 7$  cm and  $XZ = 12$  cm.



- (a) In your examination book, draw a neat sketch and mark on it all the given information.
- (b) Prove that  $\triangle UWX \sim \triangle XYZ$ .

- (c) Hence, or otherwise, find the length of  $ZY$ .