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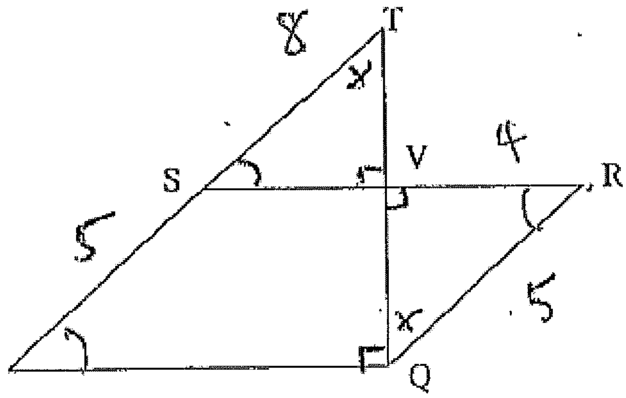
YEAR 12 – MATHEMATICS

SPECIMEN PAPER 2

TOPIC : CONGRUENCY & SIMILARITY

ASCHAM 2001 Q5

c)



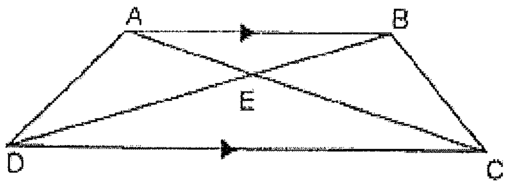
PQRS is a parallelogram and PT is a straight line though S.
TQ is perpendicular to PQ.

i) Prove ΔVRQ///ΔQPT

ii) If QR = 5, VR = 4, ST = 8
find TP and QP and hence SV.

ASCHAM 2000 Q7

(c)



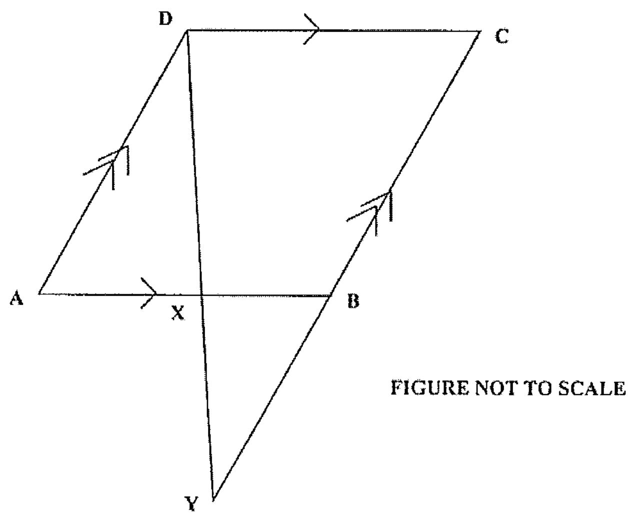
The diagonals of the trapezium ABCD intersect at E.

(ii) Prove that the triangles BAE and DCE are similar.

(iii) Hence prove that AE.DE = BE.CE

CSSA 2000 Q6

(b) 5



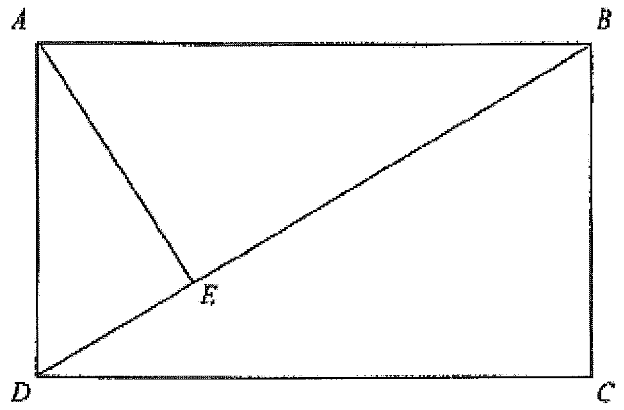
In the diagram, ABCD is a parallelogram. X is a point on AB. DX and CB are both produced to Y.

(ii) Prove that ΔADX is similar to ΔCYD.

(iii) Hence find the length of XY given AX = 8 cm, DC = 12 cm and DX = 10 cm.

CSSA 2002 Q9

(a) $ABCD$ is a rectangle and $AE \perp BD$. $AE = 5$ cm and $DE = 2$ cm.



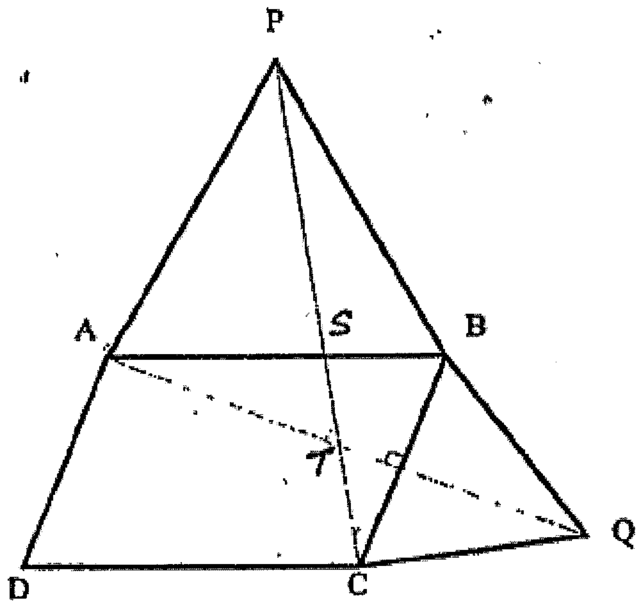
(i) Copy the diagram and prove that triangles AED and BCD are similar. **2**

(ii) Hence, show that $AD^2 = BD.DE$. **1**

(iii) Find the area of $ABCD$. **3**

JAMES RUSE 2002 Q4

(b) $ABCD$ is a parallelogram. ΔAPB and ΔBQC are equilateral.

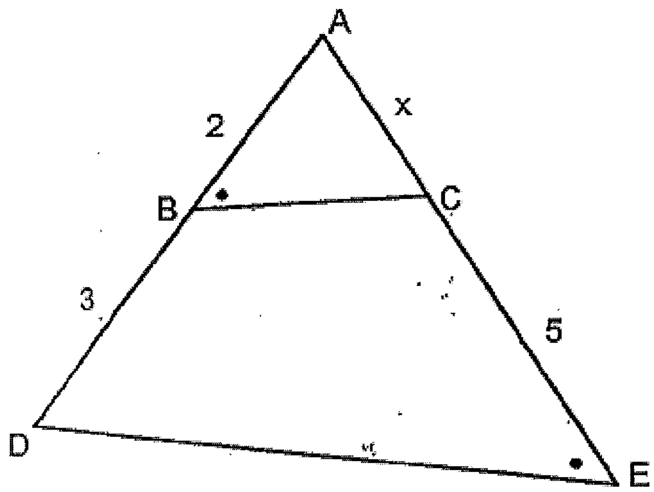


(i) Prove that $\Delta ABQ \equiv \Delta PBC$.

(ii) Find the size of the acute angle between AQ and PC. (Give reasons)

INDEPENDENT 2002 Q4

(b)



In the diagram above, $\angle ABC = \angle AED$, AE = 2, BD = 3, AC = 5 and AC = x.

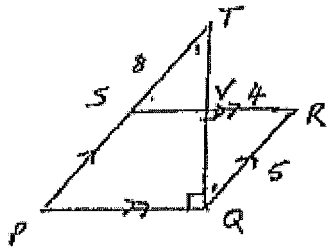
(i) Prove that triangle ABC is similar to triangle AED. **3**

(ii) Hence find the value of x. **2**

SOLUTIONS

ASCHAM 2001 Q5

c)



i) In Δs VRQ, QPT

$\angle PQR = \angle QVR = 90^\circ$ (alt ∠s, SR ∥ PQ)

$\angle RQV = \angle STV$ (alt ∠s, PT ∥ QR) ✓✓

∴ $\Delta VRQ \parallel\mid \Delta QPT$ (equiangular)

ii) $SP = 5$ (opp sides of ∥gram) ✓

∴ $PT = 13$ (PS+ST)

$\frac{VR}{QP} = \frac{RQ}{PT} = \frac{VQ}{QT}$ (corr sides of sim Δs) ✓

$\frac{4}{PQ} = \frac{5}{13} = \frac{VQ}{QT}$

$5PQ = 52$ ✓ (6)

$PQ = 10\cdot4$

∴ $SR = 10\cdot4$ (opp sides of ∥gram)

$SV = 10\cdot4 - 4$

ASCHAM 2000 Q7

ii.) In ΔBAE and ΔDCE,

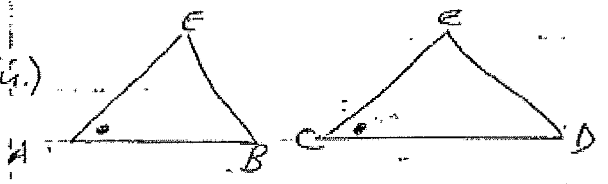
① $\angle AEB = \angle DEC$ (vert. opp $\angle$ equal) ✓

② $\angle BAE = \angle ECD$ (alt $\angle$ on $AB \parallel DC$) ✓

③ $\angle ABE = \angle EDC$ (" ")

$\therefore \Delta BAE \parallel\!| \Delta DCE$ (equiangular) ✓

iii.)



$\frac{AE}{CE} = \frac{BE}{DE}$ (corresponding sides of $|||$ Δs are in same proportion) ✓

$\therefore AE \times DE = CE \times BE$ ✓

CSSA 2000 Q6

(ii) In ΔADX and ΔCYD

$\angle ADX = \angle CYD$ (alt. $\angle$s; $AD \parallel YC$)

$\angle DAX = \angle YCD$ (opp $\angle$s of parm)

$\therefore \Delta ADX \parallel\!| \Delta CYD$ (AA)

(iii) $\frac{DX}{YD} = \frac{AX}{CD}$ (corr. sides of similar

$\frac{10}{YD} = \frac{8}{12}$

$YD = \frac{120}{8}$ $\therefore YD = 15$ cm

Hence $XY = 15 - 10 = 5$ cm

CSSA 2002 Q9

(i) In Δs AED & BCD

$\angle AED = \angle BCD$
$= 90°$ ✓

(ABCD rect. & AE⊥BD)

$\angle ADE = \angle DBC$ (Alt. ∠s = AD∥BC) ✓

∴ $\angle DAE = \angle BDC$ (2 ∠s = Angle Sum Δ180°)

∴ ΔAED ||| ΔBCD (equiangular)

(ii) $\frac{AD}{BD} = \frac{DE}{BC}$ (Corresp. sides ||| Δs)

$AD = \frac{DE}{BC} . BD$ ✓

BC = AD (Opp. Sides Rect)

∴ $\underline{AD^2 = DE.BD}$

(iii) $AD^2 = 5^2 + 2^2$ ✓

$DE.BD = 29$

∴ $2BD = 29$ (DE = 2)

$BD = 14\frac{1}{2}$ ✓

Area ABCD = $14\frac{1}{2} \times 5$

$= \underline{72.5cm^2}$ ✓

JAMES RUSE 2002 Q4

(b) (i) In ΔABQ & ΔPBC

$AB = PB$ (equal sides of equilateral ΔAPB)

$BQ = BC$ (equal sides of equilateral ΔBQC)

$A\hat{B}Q = P\hat{B}C$ (both $60° + A\hat{B}C$, all angles of equilateral triangle are 60°)

$\therefore \Delta ABQ \equiv \Delta PBC$ (SAS)

(ii) Let $B\hat{P}C = \theta°$

$\therefore B\hat{A}Q = \theta°$ (corresponding angles in congruent triangles)

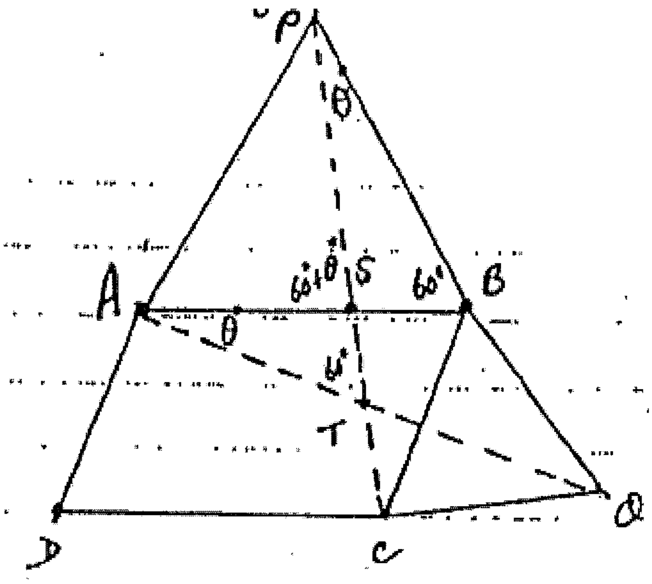
Let AB & PC meet at S.

$P\hat{S}A = \theta° + 60°$ (exterior angle of ΔPSB equals sum of opposite interior angles, $P\hat{B}S = 60°$)

Let AQ & PC meet at T

$\therefore P\hat{T}A = 60°$ (exterior angle of ΔAT equals sum of opposite interior angles)

$\therefore$ size of angle $= 60°$



INDEPENDENT 2002 Q4

(b)(i) In Δ's ABC, AED.

$\hat{A}$ is common

$A\hat{B}C = A\hat{E}D$ (data)

∴ ΔABC ||| ΔAED

(equiangular).

(ii) $\frac{AB}{AE} = \frac{AC}{AD}$ (corr sides in sim Δ's)

∴ $\frac{2}{x+5} = \frac{x}{5}$

$x^2 + 5x - 10 = 0$

$x = \frac{-5 \pm \sqrt{25 + 40}}{2}$

As $x > 0$

$x = \frac{-5 + \sqrt{65}}{2}$