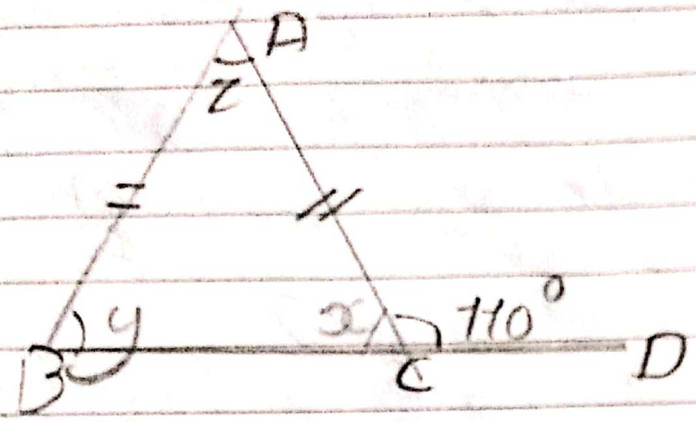
Ex 14.4

General Section

1) Find the unknown size of angles.

a)



$x + 110° = 180°$ [∵ Linear pair]

or, $x = 180° - 110°$

or, $x = 70°$

$\Rightarrow y = x$ [∵ Base of isoceles △)

$y = 70°$

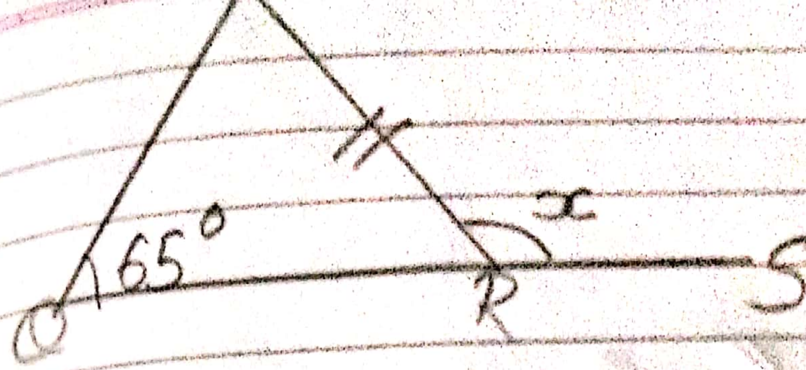
$\Rightarrow x° + y° + z° = 180°$ (Sum of ∠ of △)

$\Rightarrow 70° + 70° + z = 180°$

$\Rightarrow 140 + z = 180°$

$\Rightarrow z = 40°$

b)



Sol^n

$\Rightarrow \angle P = \angle Q$ [$\because$ Base angle of isosceles $\triangle$]

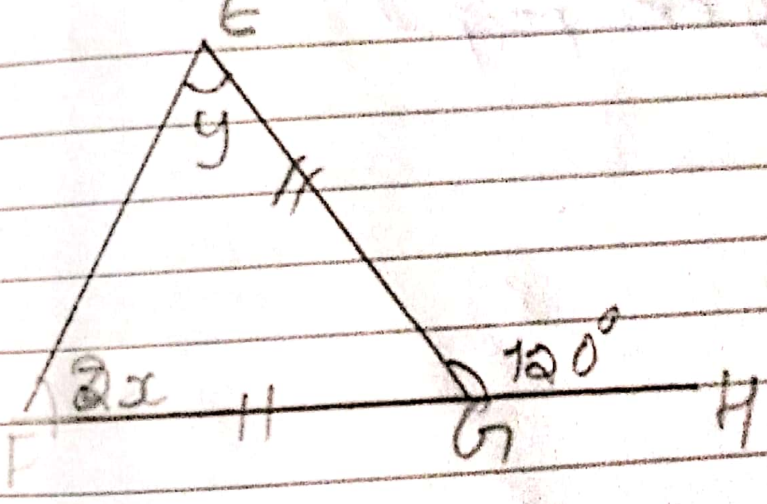
$\therefore \angle P = 65°$

$\Rightarrow x° = \angle Q + \angle P$ [$\because$ ext. property]

$\Rightarrow x° = 65° + 65°$

$x° = 130°$

c)



Sol^n

$\Rightarrow y = 2x$ [$\because$ Base $\angle$ of $\triangle$]

$\Rightarrow y + 2x = 120°$ [By ext prop]

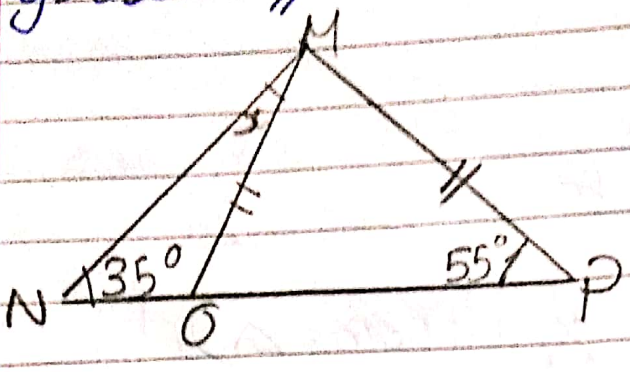
$\Rightarrow 2x + 2x = 120°$

or, $4x = 120°$

or, $x = \frac{120°}{4}$

$\therefore 2x = 2 \times 30 = 60$ //
$\therefore y = 2x = 60$ //

d)

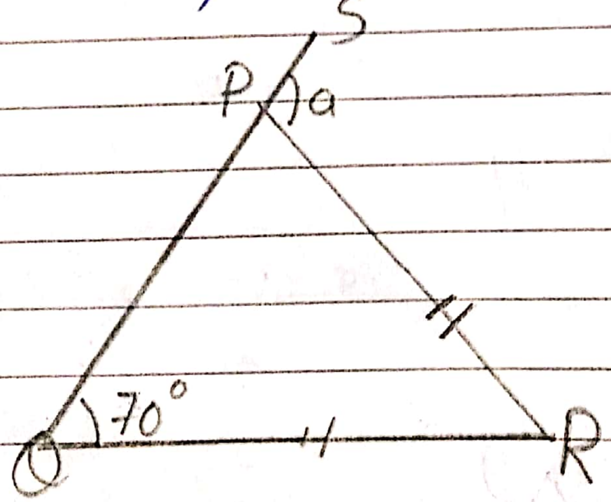


Sol'n

$\Rightarrow \angle O = 55°$ [$\because$ Being $\angle$ of ~~isosle~~ isoceles $\triangle$)

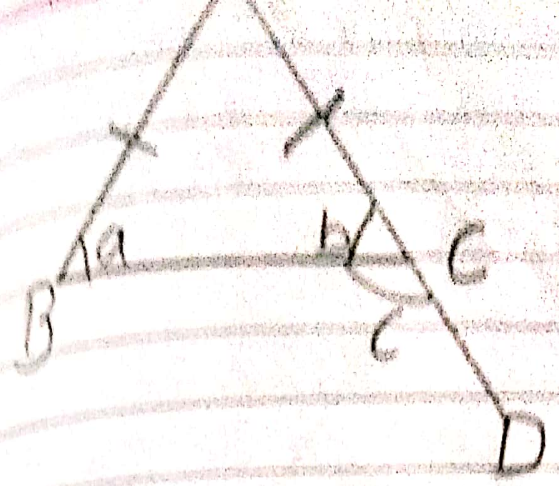
$\Rightarrow x + 35° = 55°$ [By ext prop]
$\Rightarrow x = 55° - 35°$
$\Rightarrow x = 20°$ //

e)



$\angle QPR = 70°$ [$\because$ Base angle of isoceles $\triangle$)

$\Rightarrow a + \angle QPR = 180°$ (Linear pair)
$\Rightarrow a + 70° = 180°$
$\Rightarrow a = 180° - 70°$
$\Rightarrow a = 110°$ //



Sol^n

$\Rightarrow a = b$ (isoceles Δ)

$\Rightarrow a + b + 42^\circ = 180^\circ$

$\Rightarrow 2a + 42^\circ = 180^\circ$

$\Rightarrow a = 69^\circ$

$\Rightarrow b = 69^\circ$ //

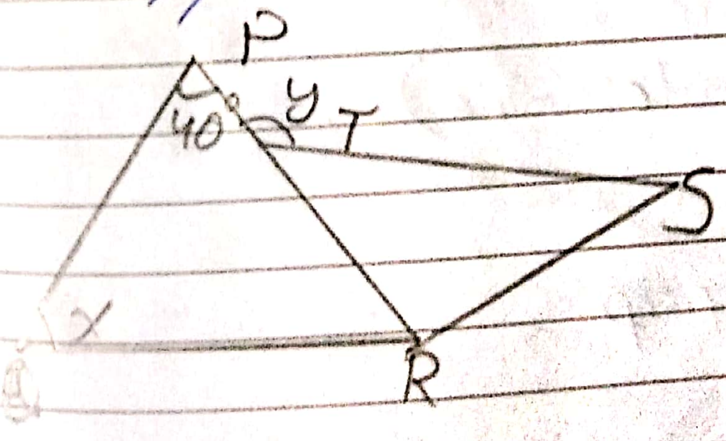
$\Rightarrow b^\circ + c^\circ = 180^\circ$ [Linear pair]

$\Rightarrow 69^\circ + c^\circ = 180^\circ$

$\therefore c^\circ = 180^\circ - 69^\circ$

$\therefore c^\circ = 111^\circ$ //

9)



Sol^n

$\Rightarrow \angle QRP = x^\circ$ [isoceles Δ)

$\Rightarrow 40^\circ + x + x = 180^\circ$ [$\because$ sum of Δ)

$\Rightarrow 2x = 140^\circ$

$\Rightarrow x = 70^\circ$

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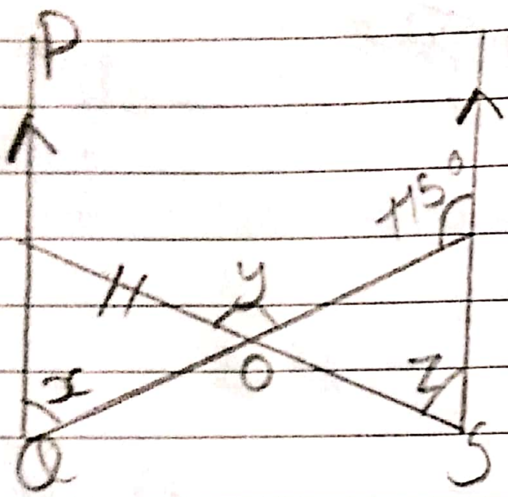
$\angle TRS + \angle PRQ = 180°$ [Linear pair]

$\angle TRS = 180° - 70°$

$\angle TRS = 110°$

$y = TRS + 130°$

$y = 140°$



Sol'n

$x° + 115° = 180°$ [$\because$ co-interior $\angle$]

$x = 65°$

$z = x$ [$\because$ alternate angle]

$z = 65°$

$y = z + x$ [By ext prop

$y = 65 + 65°$

$y = 130°$

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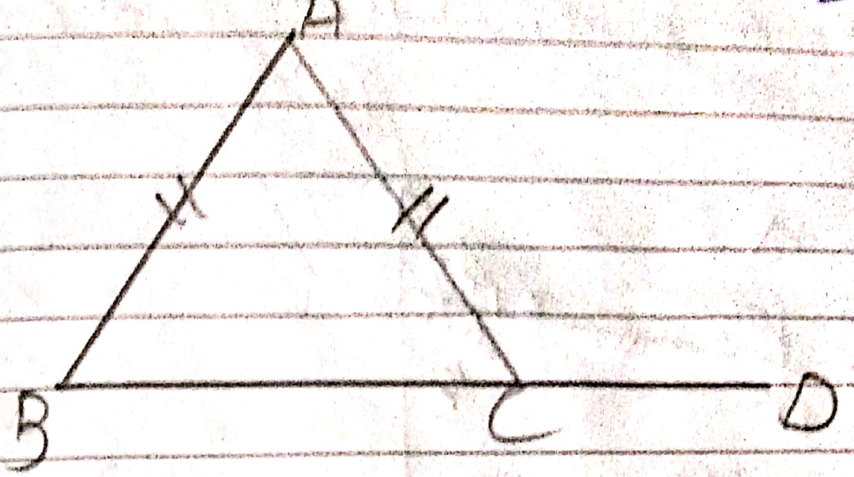
Q. In the given fig $AB = AC$ and $\angle ACD = 110°$
What will be the measure of $\angle BDC + \angle ACB$?



Sol^n

$\angle ACB + 110° = 180°$ (linear pair)

or $\angle ACB = 70°$

$\Rightarrow \angle ABC = \angle ACB$ [$\because$ 180 Δ)

$\therefore \angle ABC = 70°$

$\Rightarrow \angle A + \angle B + \angle C = 180°$ (Sum of 3 $\angle$ of Δ)

$\angle A = 180° - 140°$

$\angle A = 40°$

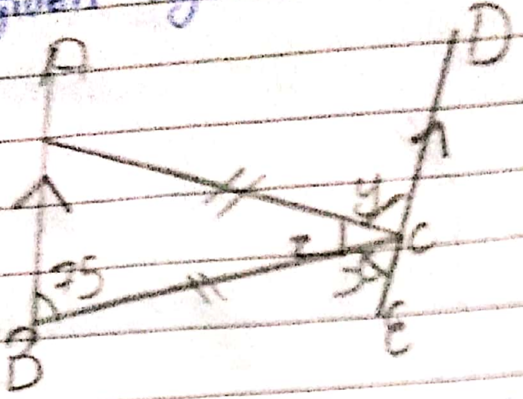
Now,

$\angle BAC + \angle ACB = 40° + 70°$

$= 110°$

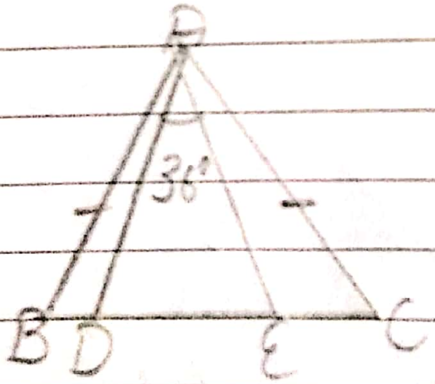
Creative Section

In the given figure, find the sizes of $\angle x$, $\angle y$ and $\angle z$



(i) $x = 75°$ (Being alternate angle)
(ii) $\angle BAC = 75°$ ($\because$ Being $\angle$ of isoceles $\triangle$)
(iii) $y = \angle BAC$ [alternate angles]
$\therefore y = 75°$
(iv) $x° + y° + z° = 180°$ [$\because$ straight line]
$75° + 75° + z = 180°$
or, $z = 180° - 150°$
$\therefore z = 30°$

In the given figure, $AB = AC$, $BD = EC$ and $\angle DAE = 36°$, Prove that $\triangle ADE$ is an isosceles triangle. Also, calculate the size of $\angle ADE$.



Sol'n
In $\triangle ABC$, $AB = AC$, and $BD = EC$

To prove: ΔADE is an isoceles Δ.

Statement	
1. In ΔABD and ΔAEC	
i) $AB = AC$ (S)	Given
~~$\measuredangle BD = EC$~~	
~~$\therefore \Delta AB$~~	
ii) $\measuredangle B = \measuredangle C$ (A)	Base angle of iso. Δ
iii) $BD = EC$ (S)	Given
iv) $\therefore \Delta ABD \cong \Delta AEC$	By S.A.S axiom
$AD = DE$	
2. $AD = AE$	By C.P.C.T
3. $\therefore ADE$ is an iso. Δ	From (3) proved.

In

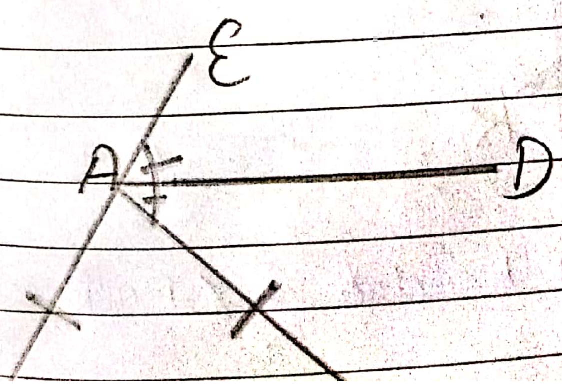
$\measuredangle DAE + \measuredangle ADE + \measuredangle AED = 180°$ (Sum of $\measuredangle$ of Δ)

or, $36° + \measuredangle ADE + \measuredangle ADE = 180°$ (Base $\measuredangle$ of iso. Δ)

or, $2\measuredangle ADE = 180° - 36°$

or, $\measuredangle ADE = 72°$

b) In the fig. alongside $AB = AC$ and AD bisect $\measuredangle CAC$. Prove that $AD // BC$.



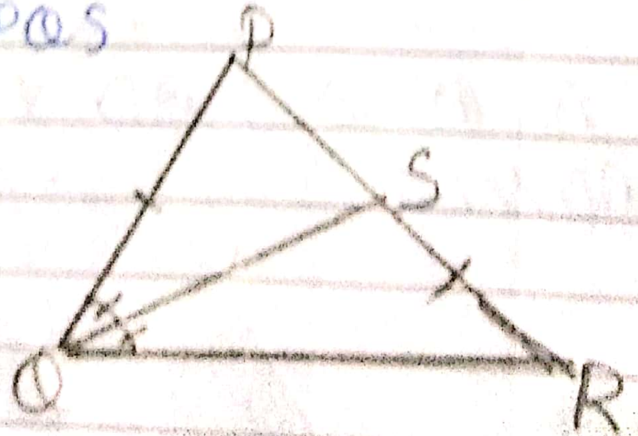
In $\triangle ABC$, $AB = AC$ and AD bis...

i.e. $\angle CAD = \angle EAD$

To prove: $AD \parallel BC$

Statement	Reason
$\angle ABC = \angle ACB$	1) Base angle of iso. $\triangle$
$\angle CAE = \angle ABC + \angle ACB$	2) Sum of 2 inte. $\angle$ is equal to its ext. $\angle$
or, $\angle CAD + \angle EAD = \angle ABC + \angle ACB$	$\because$ whole part axiom $\angle CAE = \angle CAD + \angle EAD$
$\angle CAD + \angle CAD = \angle ACB + \angle ACB$	$\because \angle CAD = \angle EAD$ and $\angle ACB = \angle ABC$
$2\angle CAD = 2\angle ACB$	
$\angle CAD = \angle ACB$	
$AD \parallel BC$	3) $\angle CAD = \angle ACB$ alternate $\angle$ are equal proved.,

In the triangle given alongside, $PQ = PR$. The bisector of $\angle PQR$ meets PR at S. Prove that $\angle PSQ = 3\angle PQS$



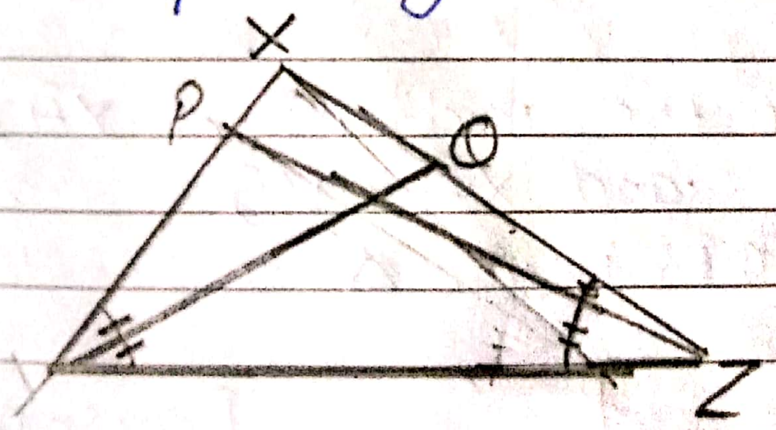
Sol'n

In $\triangle PQR$ $PQ = PR$ and bisector of $\angle PQR$...

To prove $\angle PSQ = 3\angle PQS$

Statement	Reason
1) $\angle PQS = \angle SQR$	1) QS is the bisector of $\angle PQR$.
2) $\angle PQR = \angle QRP$ $\therefore 2\angle PQS = \angle QRP$	2) Base angle of iso $\triangle$.
3) $\angle PSQ = \angle SQR + \angle SRQ$ or, $PSQ = \angle PQS + 2\angle PQS$ $\angle PSQ = 3\angle PQS$	3) By exterior property. [from (1) and (2)]
	Proved.

e) In the adjoining figure, $XY = XZ$. YQ and ZP are the bisectors of $\angle XYZ$ and $\angle XZY$ respectively. Prove that $YQ = ZP$



Soln

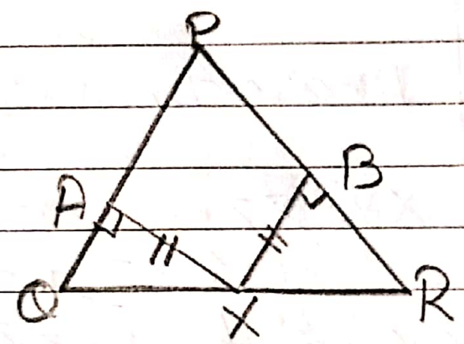
In Δxyz, $xy = xz$ yQ and ZP are the bisector of $\angle xyz$ and $\angle xzy$

To prove

$YQ = ZP$

Statement	Reason
1) In ΔPYZ and QYZ	
i $\angle PYZ = \angle QZY$	i) Base $\angle$ of Iso. Δ
ii $YZ = YZ$	ii) Common side by ASA axiom
2) $YQ = ZP$	2) Corresponding sides of congruent Δ.

f) In the given figure, X is the mid-point of QR, $XA \perp PQ$, $XB \perp PR$ and $XA = XB$. Prove that ΔPQR is an isoceles triangle.



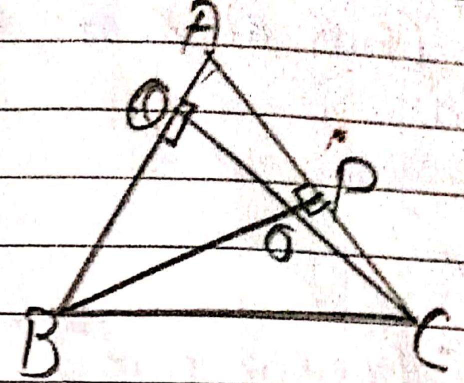
Given,

In ΔPQR · is the mid-point of $XA \perp PQ$, $XB \perp PR$ ·and $XA = XB$

To prove : ΔPQR is iso·Δ

Statement	Reason
1) In ΔAQX and ΔBRX	
i $\angle QAX = \angle RBX$ (R)	Right angle triangle
ii) $XQ = XR$ (H)	Given
iii) $AX = BX$ (S)	Given
iv) $\therefore \Delta AQX \cong \Delta BRX$	By R.H.S axiom
2) $\angle AQX = \angle BRX$	By C.P.C.T
3) $\angle PQR = \angle PRQ$	From stateme. 2
4) $\therefore \Delta PQR$ is iso Δ	From 3 Base angles are equal

g) In the given triangle ABC, AB=AC, BP ⊥ AC and CQ ⊥ AB. Prove that (i) BP=CQ (ii) OP=OQ.



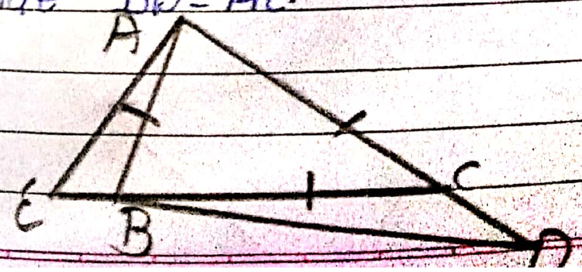
Given,
In △ABC · AB=AC BP ⊥ AC · and
CQ ⊥ AB

To prove,
BP=CQ
OP=OQ

Proof

Statement	Reason
1) In △BCQ and △BCP	
i) ∠BQC = ∠BPC (A)	i) Right angle given
ii) ∠QBC = ∠PCB (A)	ii) When AB=AC · Then base of the △
iii) BC=BC (S)	iii) Common side
iv) ∴ △BCQ ≅ △BCP	iv) By AAS axiom
2) ∴ BP=CQ	2) By C.P.C.T.

h) In the adjoining figure, ABC is an equilateral triangle. If ∠CAE = 75° and ∠BDC = 45°, prove that BD=AE.



In $\triangle AEC$

$\Rightarrow \angle C = 60°$ [∵ Angle of equilateral $\triangle$]

$\angle A + \angle E + \angle C = 180°$ (Sum of $\angle$ of $\triangle$)

$75° + \angle E + 60° = 180°$

$\angle E = 45°$

$\Rightarrow \angle BAE = 75° - 60° = 15°$

In $\triangle BCD$

$\angle BCD = 180° - 60°$ [Linear pair]

$= 120°$

$\angle B + 120 + 45 = 180°$

or, $\angle B = 180° - 165$

or, $\angle B = 15°$

In $\triangle ABE$ and $\triangle CDB$

(i) $\angle AEB = \angle BDC$ [∵ same measure]

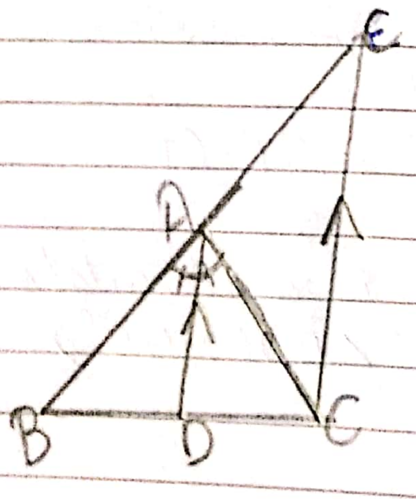
(ii) $\angle BAE = \angle CBD$ [∵ Same measure

iii $AB = BC$ (given)

(iv) ∴ $\triangle ABE \cong \triangle CDB$ [By A.A.S axiom]

∴ $BD = AE$ [C.P.C.T proved]

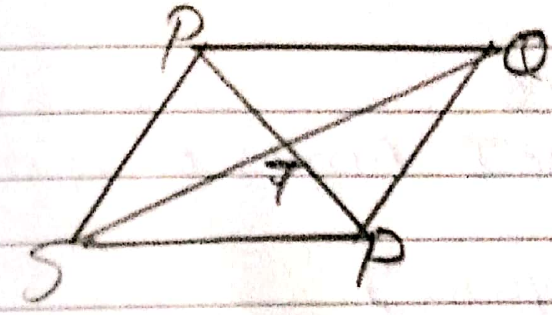
j) In the adjoining figure, AD is the bisector of $\angle BAC$ and $AD \parallel EC$. Prove that $AC = AE$



Soln

1. ∠BAD = ∠CAD [∵ AD is the bisector of ∠BAC
2. ∠ACE = ∠DAC [∵ alternate ∠as AD//CE
3. ∠AEC = ∠BAD [Corresponding ∠as AD//CE]
4. ∠ACE = ∠AEC [From ① ② ③]
5. ∴ AE = AC [∵ If ∠ are equal then its opposite sides are also equal]

In the given figure PQRS, SP = RQ and RP = SQ, Prove the RT and ST.



Given,
In the given fig. SP = RQ and RP = SQ
To prove RT = ST

Statement	Reason
1. In △QRS and △PRS	
i. RQ = SP (S)	① given
ii. SQ = RP (S)	given
iii. RS = RS (S)	Common side
2. ∴ △QRS ≅ △PRS	By S.S.S axiom
3. ∠SRP = ∠QSP	By C.P.C.T
4. ∠SRT = ∠TSR	From ③
5. ∴ RT = ST	④ If base ∠ are equal the its opp. sides are also equal

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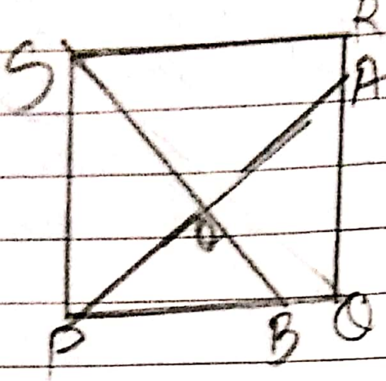
In the figure alongside PQRS is a square in which PA and SB intersect at O. If PA = SB, prove that PA = SB are perpendicular to each other at O.



Soln

In $\triangle SPB$ and $\triangle PAQ$

$\angle SPB = \angle PQR = 90°$ [$\because$ Angles of square]

$SB = PA$ (given)

$PS = PQ$ [Sides of square]

$\therefore \triangle SPB \cong \triangle PAB$ [R.H.S axiom]

$\angle SBP = \angle PAQ$ [By C.P.C.T]

$\angle QPA + \angle PAQ = 90°$ [$\because$ Sum of acute $\angle$ of right $\angle\triangle$

$\angle QPA + \angle SBP = 90°$

$\angle BPO + \angle OBP = \angle SOA$ [Sum of 2 int $\angle$ is equal to ext $\angle$]

$90 = \angle SOA$

PA and SB are pendiculas to each other.