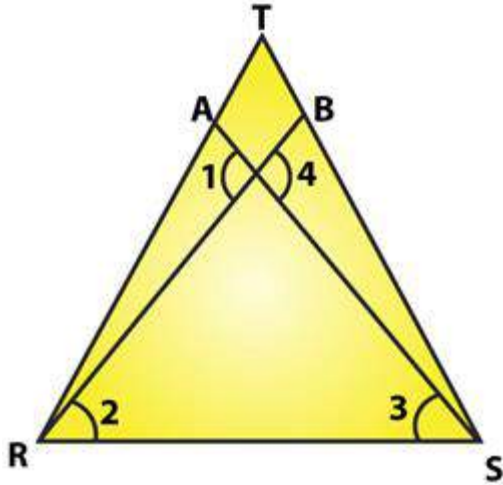


Exercise 10.2

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Question 1: In figure, it is given that $RT = TS$, $\angle 1 = 2\angle 2$ and $\angle 4 = 2(\angle 3)$. Prove that $\Delta RBT \cong \Delta SAT$.



Solution:

In the figure,

$$RT = TS \quad \text{.....(i)}$$

$$\angle 1 = 2\angle 2 \quad \text{.....(ii)}$$

$$\text{And } \angle 4 = 2\angle 3 \quad \text{.....(iii)}$$

To prove: $\Delta RBT \cong \Delta SAT$

Let the point of intersection RB and SA be denoted by O

$$\angle AOR = \angle BOS \quad [\text{Vertically opposite angles}]$$

$$\text{or } \angle 1 = \angle 4$$

$$2\angle 2 = 2\angle 3 \quad [\text{From (ii) and (iii)}]$$

$$\text{or } \angle 2 = \angle 3 \quad \text{.....(iv)}$$

Now in ΔTRS , we have $RT = TS$

$\Rightarrow \Delta TRS$ is an isosceles triangle

$$\angle TRS = \angle TSR \quad \dots\dots(v)$$

$$\text{But, } \angle TRS = \angle TRB + \angle 2 \quad \dots\dots(vi)$$

$$\angle TSR = \angle TSA + \angle 3 \quad \dots\dots(vii)$$

Putting (vi) and (vii) in (v) we get

$$\angle TRB + \angle 2 = \angle TSA + \angle 3$$

$$\Rightarrow \angle TRB = \angle TSA \quad [\text{From (iv)}]$$

Consider ΔRBT and ΔSAT

$$RT = ST \quad [\text{From (i)}]$$

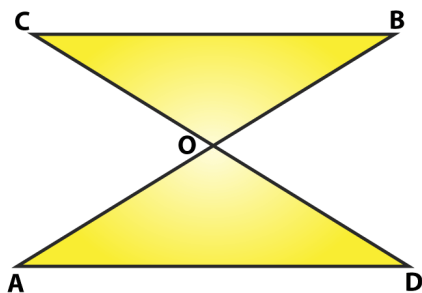
$$\angle TRB = \angle TSA \quad [\text{From (iv)}]$$

By ASA criterion of congruence, we have

$$\Delta RBT \cong \Delta SAT$$

Question 2: Two lines AB and CD intersect at O such that BC is equal and parallel to AD. Prove that the lines AB and CD bisect at O.

Solution: Lines AB and CD Intersect at O



Such that $BC \parallel AD$ and

$$BC = AD \quad \dots\dots(i)$$

To prove : AB and CD bisect at O.

First we have to prove that $\Delta AOD \cong \Delta BOC$

$$\angle OCB = \angle ODA \quad [AD \parallel BC \text{ and } CD \text{ is transversal}]$$

$$AD = BC \quad [\text{from (i)}]$$

$$\angle OBC = \angle OAD \quad [AD \parallel BC \text{ and } AB \text{ is transversal}]$$

By ASA Criterion:

$$\Delta AOD \cong \Delta BOC$$

$$OA = OB \text{ and } OD = OC \text{ (By c.p.c.t.)}$$

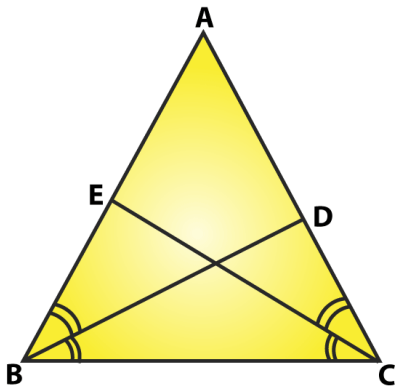
Therefore, AB and CD bisect each other at O.

Hence Proved.

Question 3: BD and CE are bisectors of $\angle B$ and $\angle C$ of an isosceles ΔABC with $AB = AC$. Prove that $BD = CE$.

Solution:

ΔABC is isosceles with $AB = AC$ and BD and CE are bisectors of $\angle B$ and $\angle C$ We have to prove $BD = CE$.
(Given)



Since $AB = AC$

$$\Rightarrow \angle ABC = \angle ACB \quad \dots\dots(i)$$

[Angles opposite to equal sides are equal]

Since BD and CE are bisectors of $\angle B$ and $\angle C$

$$\angle ABD = \angle DBC = \angle BCE = \angle ECA = \angle B/2 = \angle C/2 \quad \dots(ii)$$

Now, Consider $\Delta EBC = \Delta DCB$

$\angle EBC = \angle DCB$ [From (i)]

$BC = BC$ [Common side]

$\angle BCE = \angle CBD$ [From (ii)]

By ASA congruence criterion, $\Delta EBC \cong \Delta DCB$

Since corresponding parts of congruent triangles are equal.

$\Rightarrow CE = BD$

or, $BD = CE$

Hence proved.