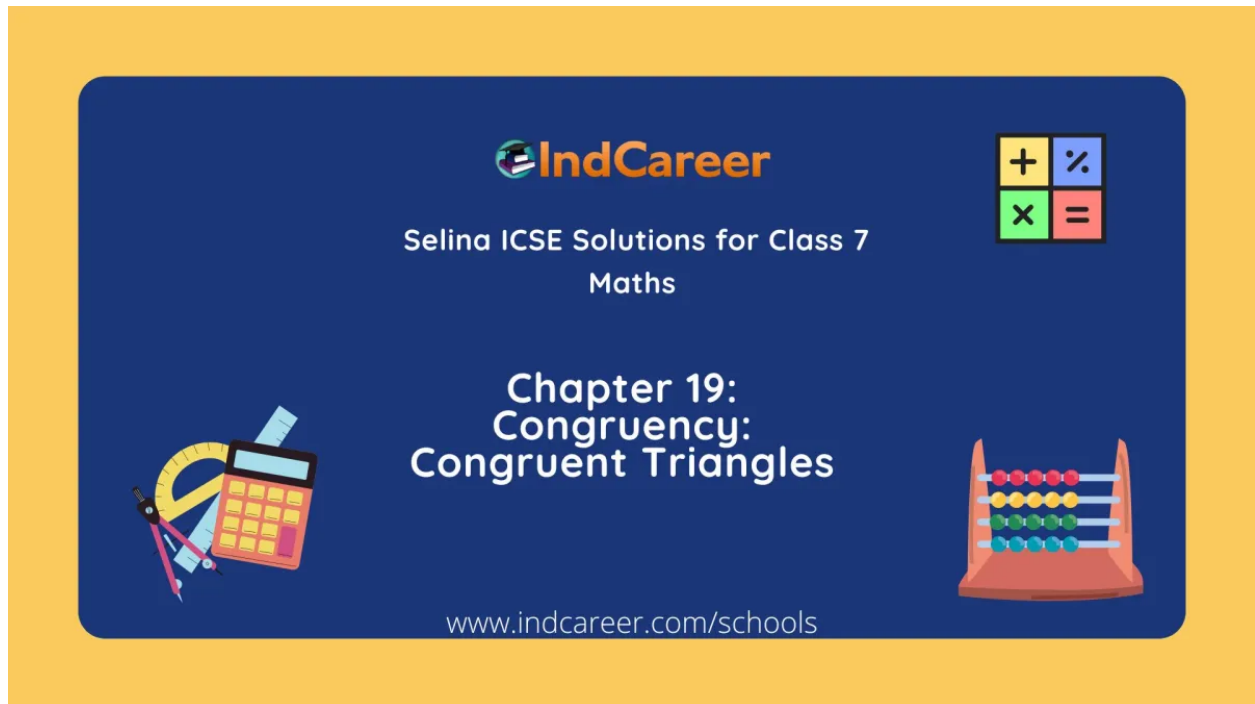


Selina Class 7 ICSE Solutions Mathematics : Chapter 19- Congruency: Congruent Triangles



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Selina Class 7 ICSE Solutions Mathematics :

Chapter 19- Congruency: Congruent Triangles

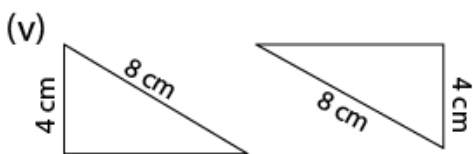
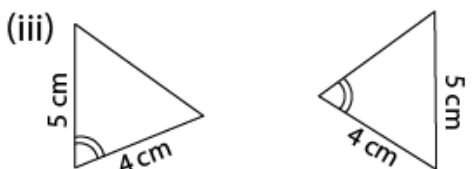
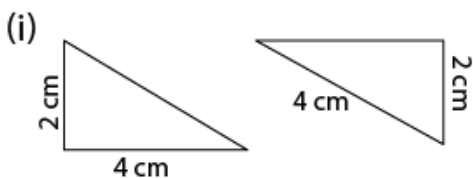
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Selina Class 7 ICSE Solutions Mathematics : Chapter 19- Congruency: Congruent Triangles

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Exercise 19 page: 213

1. State, whether the pairs of triangles given in the following figures are congruent or not:



(vii) $\triangle ABC$ in which $AB = 2$ cm, $BC = 3.5$ cm and $\angle C = 80^\circ$ and, $\triangle DEF$ in which $DE = 2$ cm, $DF = 3.5$ cm and $\angle D = 80^\circ$.

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Solution:

(i) In the given figure, corresponding sides of the triangles are not equal.

Therefore, the given triangles are not congruent.

(ii) In the first triangle

$$\text{Third angle} = 180^\circ - (40^\circ + 30^\circ)$$

By further calculation

$$= 180^\circ - 70^\circ$$

So we get

$$= 110^\circ$$

In the two triangles, the sides and included angle of one are equal to the corresponding sides and included angle.

Therefore, the given triangles are congruent. (SAS axiom)

(iii) In the given figure, corresponding two sides are equal and the included angles are not equal.

Therefore, the given triangles are not congruent.

(iv) In the given figure, the corresponding three sides are equal.

Therefore, the given triangles are congruent. (SSS Axiom)

(v) In the right triangles, one side and diagonal of one triangle are equal to the corresponding side and diagonal of the other.

Therefore, the given triangles are congruent. (RHS Axiom)

(vi) In the given figure, two sides and one angle of one triangle are equal to the corresponding sides and one angle of the other.

Therefore, the given triangles are congruent. (SSA Axiom)

(vii) In $\triangle ABC$,

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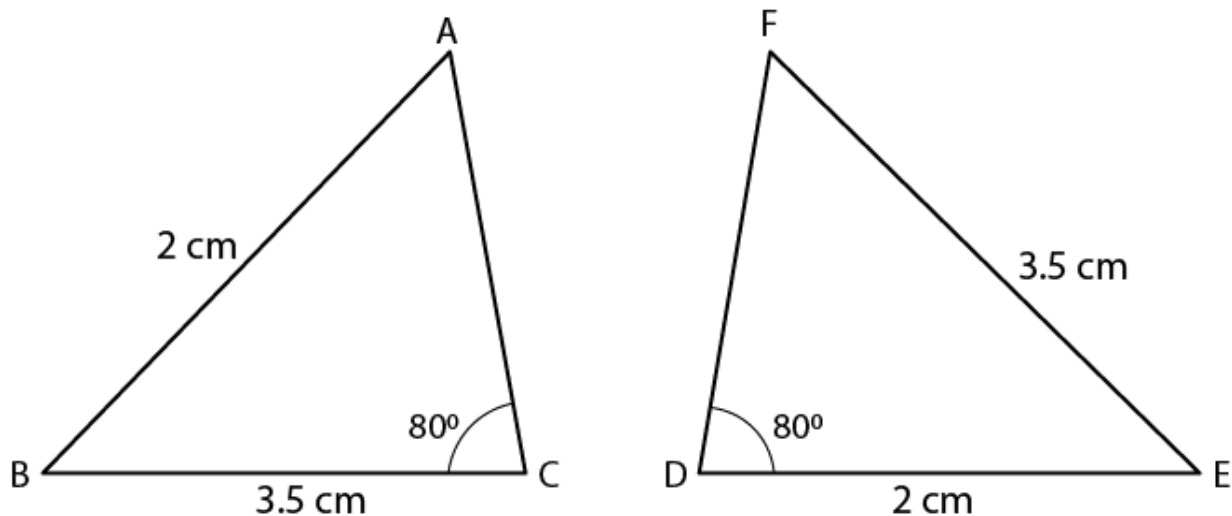
It is given that

$AB = 2\text{ cm}$, $BC = 3.5\text{ cm}$, $\angle C = 80^\circ$

In $\triangle DEF$,

It is given that

$DE = 2\text{ cm}$, $DF = 3.5\text{ cm}$ and $\angle D = 80^\circ$



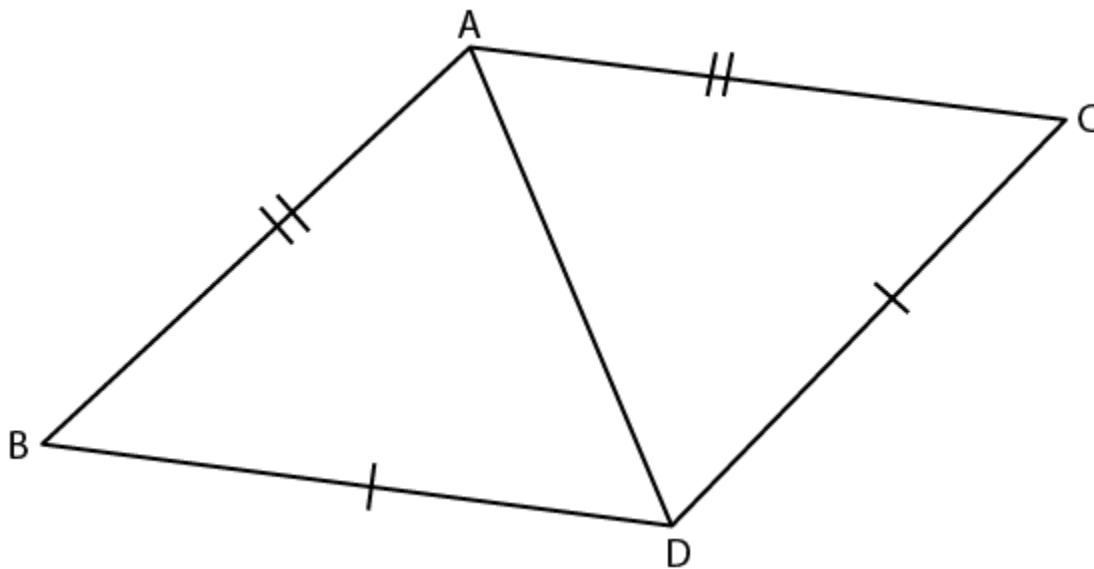
We get to know that two corresponding sides are equal but the included angles are not equal.

Therefore, the triangles are not congruent.

2. In the given figure, prove that:

$\triangle ABD \cong \triangle ACD$

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Solution:

In $\triangle ABD$ and $\triangle ACD$

$AD = AD$ is common

It is given that

$AB = AC$ and $BD = DC$

Here $\triangle ABD \cong \triangle ACD$ (SSS Axiom)

Therefore, it is proved.

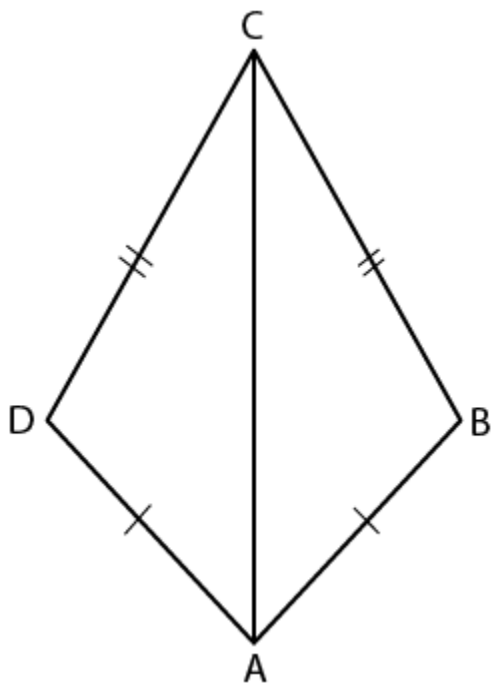
3. Prove that:

(i) $\triangle ABC \cong \triangle ADC$

(ii) $\angle B = \angle D$

(iii) AC bisects angle DCB.

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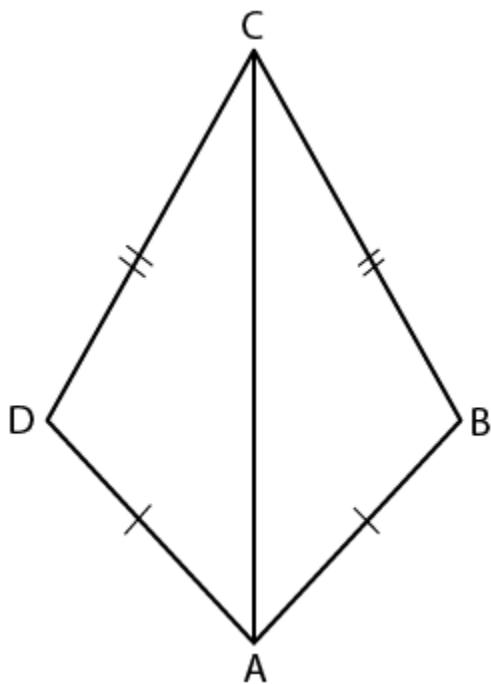


Solution:

In the figure

$AB = AD$ and $CB = CD$

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In $\triangle ABC$ and $\triangle ADC$

$AC = AC$ is common

It is given that

$AB = AD$ and $CB = CD$

Here $\triangle ABC \cong \triangle ADC$ (SSS Axiom)

$\angle B = \angle D$ (c. p. c. t)

So we get

$\angle BCA = \angle DCA$

Therefore, AC bisects $\angle DCB$.

4. Prove that:

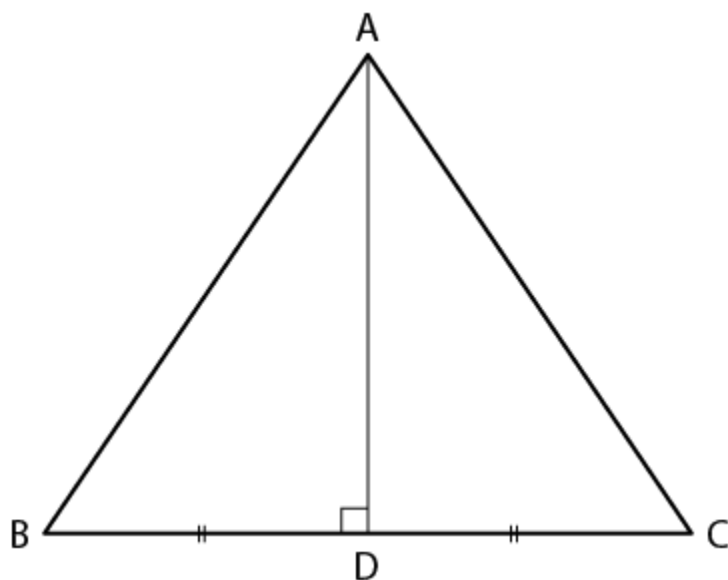
(i) $\triangle ABD \cong \triangle ACD$

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(ii) $\angle B = \angle C$

(iii) $\angle ADB = \angle ADC$

(iv) $\angle ADB = 90^\circ$

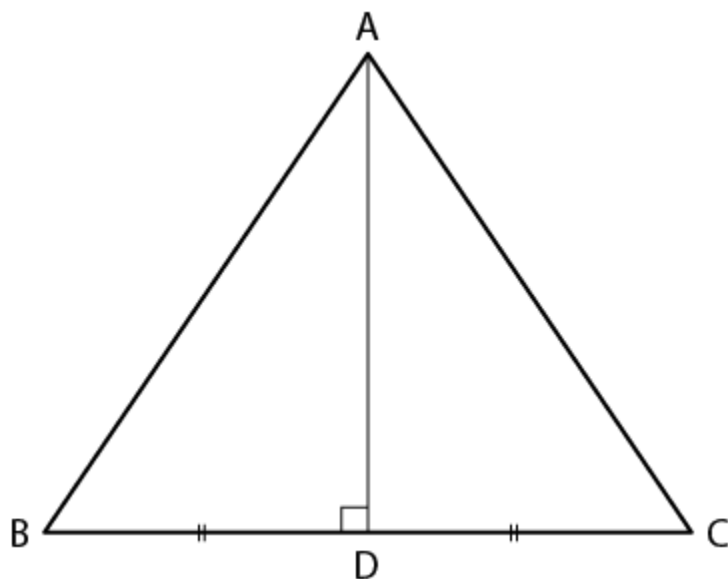


Solution:

From the figure

$AD = AC$ and $BD = CD$

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In $\triangle ABD$ and $\triangle ACD$

$AD = AD$ is common

(i) $\triangle ABD \cong \triangle ACD$ (SSS Axiom)

(ii) $\angle B = \angle C$ (c. p. c. t)

(iii) $\angle ADB = \angle ADC$ (c. p. c. t)

(iv) We know that

$\angle ADB + \angle ADC = 180^\circ$ is a linear pair

Here $\angle ADB = \angle ADC$

So we get

$$\angle ADB = 180^\circ/2$$

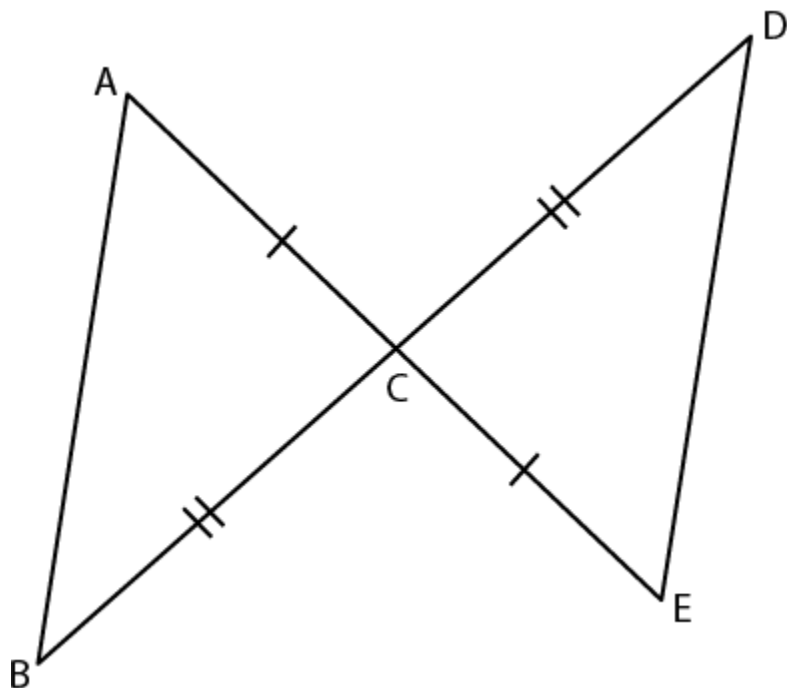
$$\angle ADB = 90^\circ$$

5. In the given figure, prove that:

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(i) $\triangle ACB \cong \triangle ECD$

(ii) $AB = ED$



Solution:

(i) In $\triangle ACB$ and $\triangle ECD$

It is given that $AC = CE$ and $BC = CD$

$\angle ACB = \angle DCE$ are vertically opposite angles

Hence, $\triangle ACB \cong \triangle ECD$ (SAS Axiom)

(ii) Here $AB = ED$ (c. p. c. t)

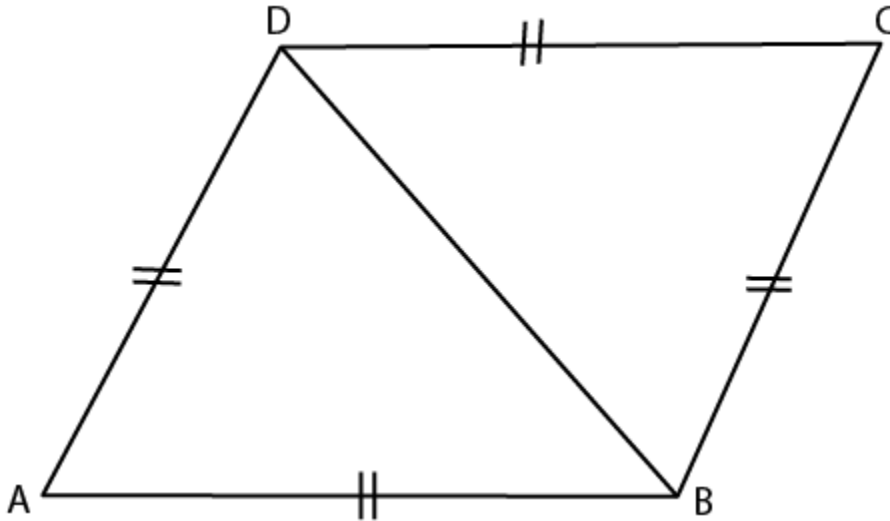
Therefore, it is proved.

6. Prove that

(i) $\triangle ABC \cong \triangle ADC$

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(ii) $\angle B = \angle D$



Solution:

(i) In $\triangle ABC$ and $\triangle ADC$

It is given that

$AB = DC$ and $BC = AD$

$AC = AC$ is common

Hence, $\triangle ABC \cong \triangle ADC$ (SSS Axiom)

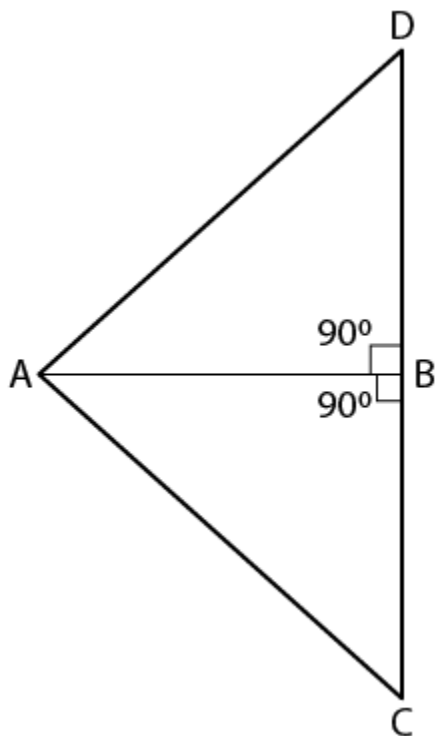
(ii) Here $\angle B = \angle D$ (c. p. c. t)

Therefore, it is proved.

7. In the given figure, prove that:

$BD = BC$.

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Solution:

In right $\triangle ABD$ and $\triangle ABC$

$AB = AB$ is common

It is given that

$AD = AC$

Hence, $\triangle ABD \cong \triangle ABC$ (RHS Axiom)

Here $BD = BC$ (c. p. c. t)

Therefore, it is proved.

8. In the given figure, $\angle 1 = \angle 2$ and $AB = AC$.

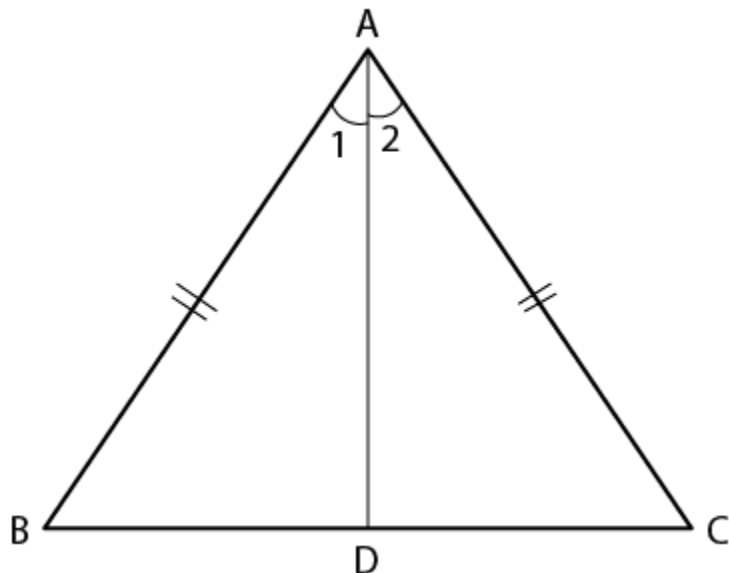
Prove that:

(i) $\angle B = \angle C$

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(ii) $BD = DC$

(iii) AD is perpendicular to BC .



Solution:

In $\triangle ADB$ and $\triangle ADC$

It is given that

$AB = AC$ and $\angle 1 = \angle 2$

$AD = AD$ is common

Hence, $\triangle ADB \cong \triangle ADC$ (SAS Axiom)

(i) $\angle B = \angle C$ (c. p. c. t)

(ii) $BD = DC$ (c. p. c. t)

(iii) $\angle ADB = \angle ADC$ (c. p. c. t)

We know that

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$\angle ADB + \angle ADC = 180^\circ$ is a linear pair

So we get

$$\angle ADB = \angle ADC = 90^\circ$$

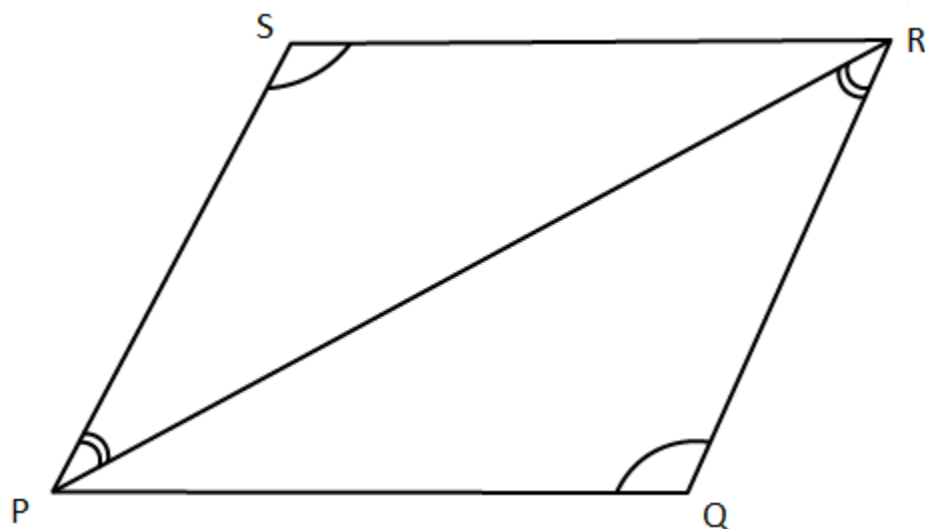
Here, AD is perpendicular to BC

Therefore, it is proved.

9. In the given figure, prove that:

(i) $PQ = RS$

(ii) $PS = QR$



Solution:

In $\triangle PQR$ and $\triangle PSR$

$PR = PR$ is common

It is given that

$$\angle PRQ = \angle RPS \text{ and } \angle PQR = \angle PSR$$

$\triangle PQR \cong \triangle PSR$ (AAS Axiom)

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(i) $PQ = RS$ (c. p. c. t)

(ii) $QR = PS$ or $PS = QR$ (c. p. c. t)

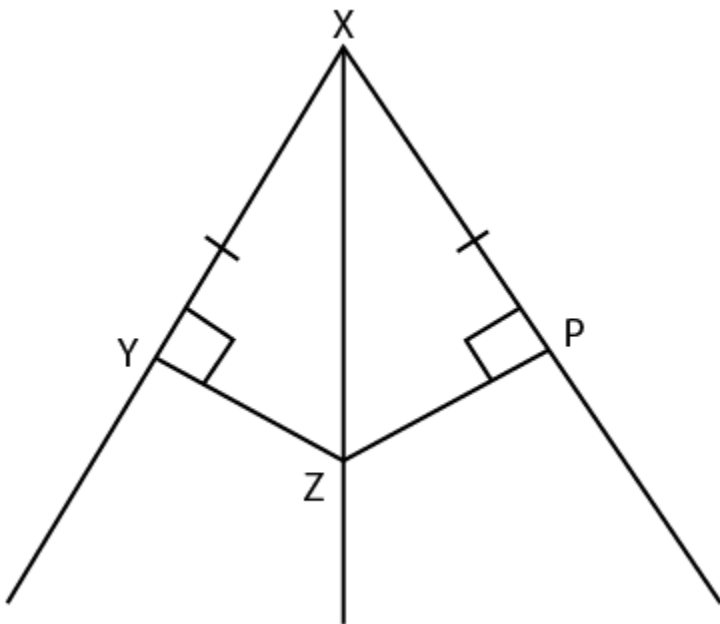
Therefore, it is proved.

10. In the given figure, prove that:

(i) $\triangle XYZ \cong \triangle XPZ$

(ii) $YZ = PZ$

(iii) $\angle YXZ = \angle PXZ$



Solution:

In $\triangle XYZ$ and $\triangle XPZ$

It is given that

$XY = XP$

$XZ = XZ$ is common

(i) $\triangle XYZ \cong \triangle XPZ$ (RHS Axiom)

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(ii) $YZ = PZ$ (c. p. c. t)

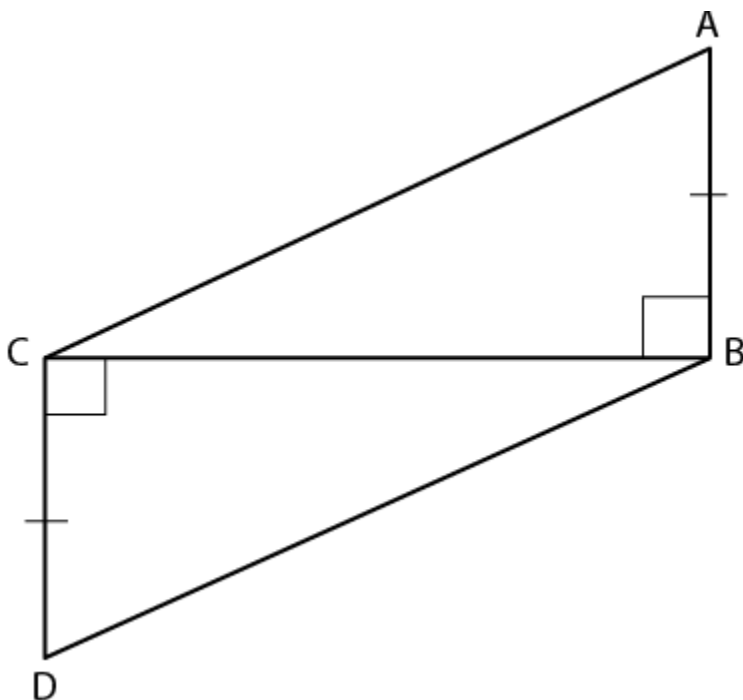
(iii) $\angle YXZ = \angle PXZ$ (c. p. c. t)

Therefore, it is proved.

11. In the given figure, prove that:

(i) $\triangle ABC \cong \triangle DCB$

(ii) $AC = DB$



Solution:

In $\triangle ABC$ and $\triangle DCB$

$CB = CB$ is common

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$$\angle ABC = \angle BCD = 90^\circ$$

It is given that

$$AB = CD$$

(i) $\triangle ABC \cong \triangle DCB$ (SAS Axiom)

(ii) $AC = DB$ (c. p. c. t)

Therefore, it is proved.

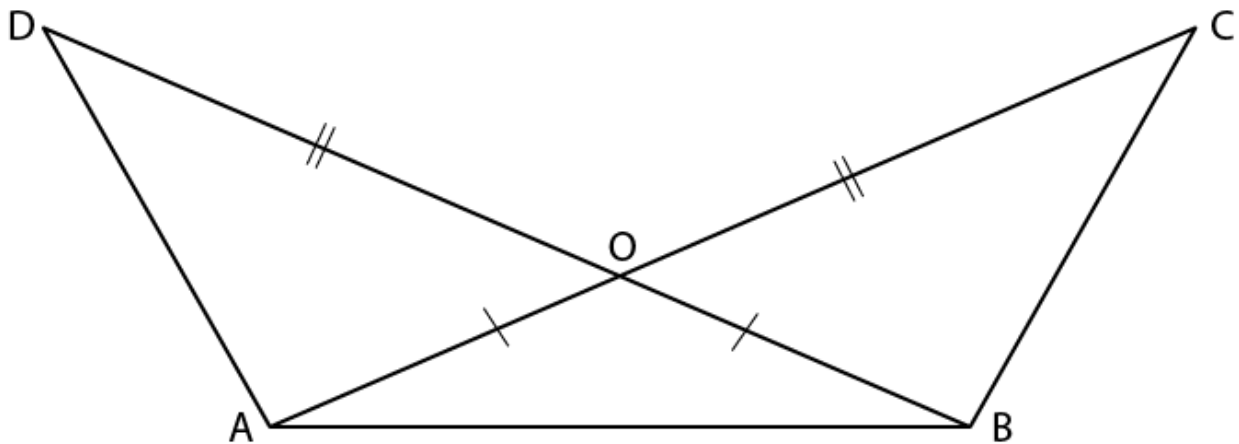
12. In the given figure, prove that:

(i) $\triangle AOD \cong \triangle BOC$

(ii) $AD = BC$

(iii) $\angle ADB = \angle ACB$

(iv) $\triangle ADB \cong \triangle BCA$



Solution:

In $\triangle AOD$ and $\triangle BOC$

It is given that

$OA = OB$ and $OD = OC$

$\angle AOD = \angle BOC$ are vertically opposite angles

(i) $\triangle AOD \cong \triangle BOC$ (SAS Axiom)

(ii) $AD = BC$ (c. p. c. t)

(iii) $\angle ADB = \angle ACB$ (c. p. c. t)

(iv) $\triangle ADB \cong \triangle BCA$

It is given that

$\triangle ADB \cong \triangle BCA$

$AB = AB$ is common

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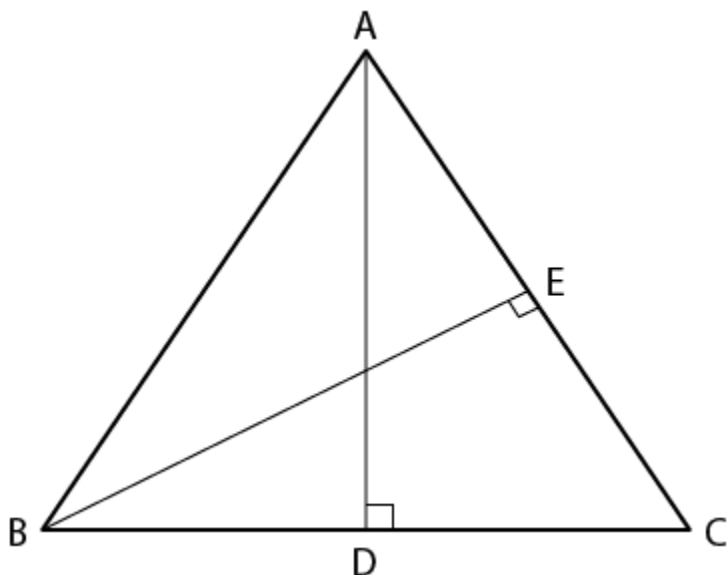
Here $\triangle AOB \cong \triangle BCA$

Therefore, it is proved.

13. ABC is an equilateral triangle, AD and BE are perpendiculars to BC and AC respectively. Prove that:

(i) $AD = BE$

(ii) $BD = CE$



Solution:

In $\triangle ABC$

$AB = BC = CA$

We know that

AD is perpendicular to BC and BE is perpendicular to AC

In $\triangle ADC$ and $\triangle BEC$

$\angle ADC = \angle BEC = 90^\circ$

$\angle ACD = \angle BCE$ is common

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$AC = BC$ are the sides of an equilateral triangle

$\triangle ADC \cong \triangle BEC$ (AAS Axiom)

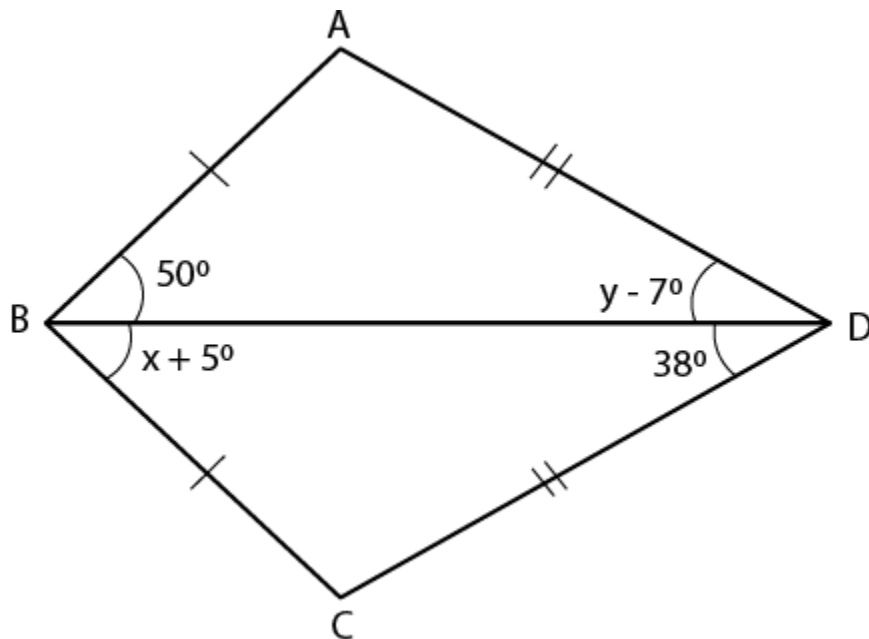
(i) $AD = BE$ (c. p. c. t)

(ii) $BD = CE$ (c. p. c. t)

Therefore, it is proved.

14. Use the informations given in the following figure to prove triangles ABD and CBD are congruent.

Also, find the values of x and y .



Solution:

In the figure

$AB = BC$ and $AD = DC$

$\angle ABD = 50^\circ$, $\angle ADB = y - 7^\circ$

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$$\angle CBD = x + 5^\circ, \angle CDB = 38^\circ$$

In $\triangle ABD$ and $\triangle CBD$

$BD = BD$ is common

It is given that

$AB = BC$ and $AD = CD$

Here $\triangle ABD \cong \triangle CBD$ (SSS Axiom)

$$\angle ABD = \angle CBD$$

So we get

$$50 = x + 5$$

$$x = 50 - 5 = 45^\circ$$

$$\angle ADB = \angle CDB$$

$$y - 7 = 38$$

$$y = 38 + 7 = 45^\circ$$

Therefore, $x = 45^\circ$ and $y = 45^\circ$.

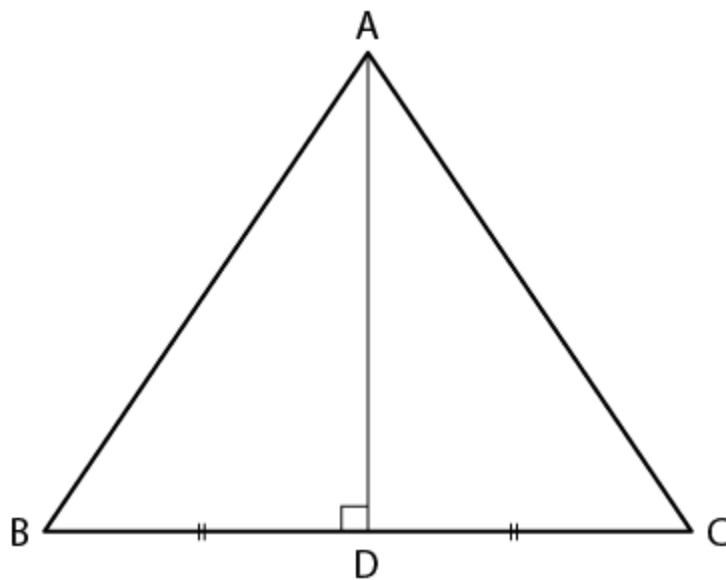
15. The given figure shows a triangle ABC in which AD is perpendicular to side BC and $BD = CD$. Prove that:

(i) $\triangle ABD \cong \triangle ACD$

(ii) $AB = AC$

(iii) $\angle B = \angle C$

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Solution:

(i) In $\triangle ABC$

AD is perpendicular to BC

$BD = CD$

In $\triangle ABD$ and $\triangle ACD$

AD = AD is common

$\angle ADB = \angle ADC = 90^\circ$

It is given that

$BD = CD$

$\triangle ABD \cong \triangle CAD$ (SAS Axiom)

(ii) $AB = AC$ (c. p. c. t)

(iii) $\angle B = \angle C$ as $\triangle ADB \cong \triangle ADC$

Therefore, it is proved.

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