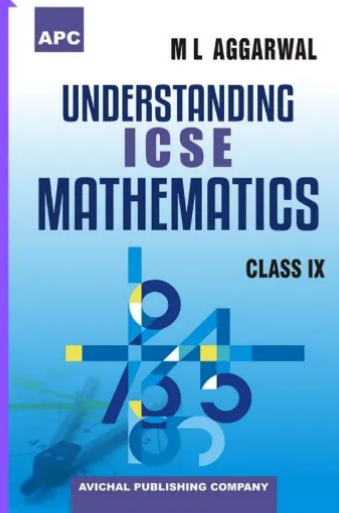


ML Aggarwal Solutions for Class 9 Maths

Chapter 10- Triangles



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ML Agrawal Solutions

CLASS 9 MATHS

Chapter 10: Triangles

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ML Aggarwal 9th Maths Chapter 10, Class 9 Maths Chapter 10 solutions

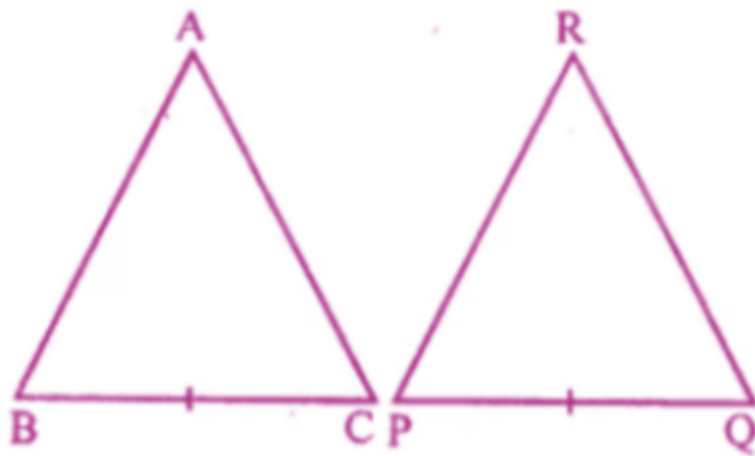
Exercise 10.1

1. It is given that $\triangle ABC \cong \triangle RPQ$. Is it true to say that $BC = QR$? Why?

Solution:

Given $\triangle ABC \cong \triangle RPQ$

Therefore, their corresponding sides and angles are equal.



Therefore $BC = PQ$

Hence it is not true to say that $BC = QR$

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2. "If two sides and an angle of one triangle are equal to two sides and an angle of another triangle, then the two triangles must be congruent." Is the statement true? Why?

Solution:

No, it is not true statement as the angles should be included angle of there two given sides.

3. In the given figure, $AB=AC$ and $AP=AQ$. Prove that

(i) $\triangle APC \cong \triangle AQB$

(ii) $CP = BQ$

(iii) $\angle APC = \angle AQB$.



Solution:

(i) In $\triangle APC$ and $\triangle AQB$

$AB=AC$ and $AP=AQ$ [given]

From the given figure, $\angle A = \angle A$ [common in both the triangles]

Therefore, using SAS axiom we have $\triangle APC \cong \triangle AQB$

(ii) In $\triangle APC$ and $\triangle AQB$

$AB=AC$ and $AP=AQ$ [given]

From the given figure, $\angle A = \angle A$ [common in both the triangles]

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By using corresponding parts of congruent triangles concept we have

$$BQ = CP$$

(iii) In $\triangle APC$ and $\triangle AQB$

$$AB = AC \text{ and } AP = AQ \text{ [given]}$$

From the given figure, $\angle A = \angle A$ [common in both the triangles]

By using corresponding parts of congruent triangles concept we have

$$\angle APC = \angle AQB.$$

4. In the given figure, $AB = AC$, P and Q are points on BA and CA respectively such that $AP = AQ$. Prove that

(i) $\triangle APC \cong \triangle AQB$

(ii) $CP = BQ$

(iii) $\angle ACP = \angle ABQ$.



Solution:

(i) In the given figure $AB = AC$

P and Q are point on BA and CA produced respectively such that $AP = AQ$

Now we have to prove $\triangle APC \cong \triangle AQB$

By using corresponding parts of congruent triangles concept we have

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$$CP = BQ$$

$$\angle ACP = \angle ABQ$$

$$(ii) CP = BQ$$

$$(iii) \angle ACP = \angle ABQ$$

In $\triangle APC$ and $\triangle AQB$

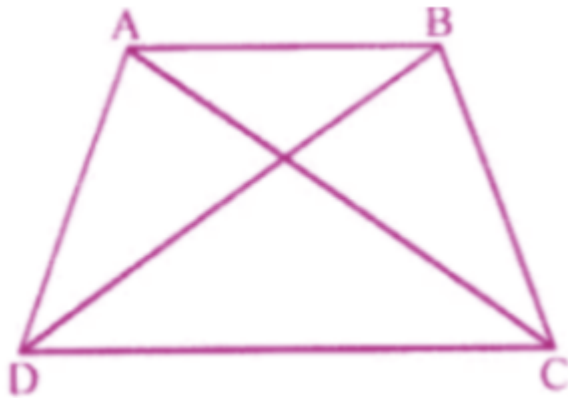
$$AC = AB \text{ (Given)}$$

$$AP = AQ \text{ (Given)}$$

$$\angle PAC = \angle QAB \text{ (Vertically opposite angle)}$$

5. In the given figure, $AD = BC$ and $BD = AC$. Prove that :

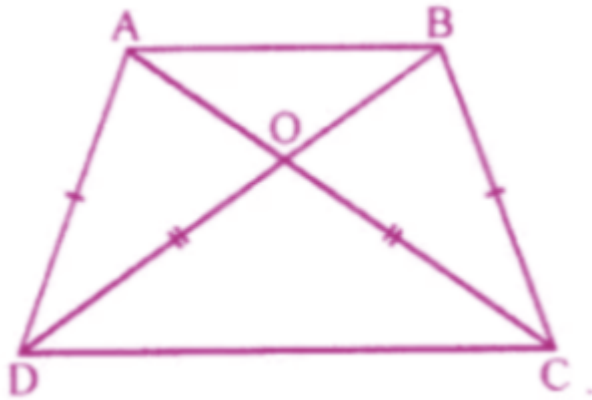
$$\angle ADB = \angle BCA \text{ and } \angle DAB = \angle CBA.$$



Solution:

Given: in the figure, $AD = BC$, $BD = AC$

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To prove :

(i) $\angle ADB = \angle BCA$

(ii) $\angle DAB = \angle CBA$

Proof : in $\triangle ADB$ and $\triangle ACB$

$AB = AB$ (Common)

$AD = BC$ (given)

$DB = AC$ (Given)

$\triangle ADB = \triangle ACB$ (SSS axiom)

$\angle ADB = \angle BCA$

$\angle DAB = \angle CBA$

6. In the given figure, ABCD is a quadrilateral in which $AD = BC$ and $\angle DAB = \angle CBA$. Prove that

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

(ii) $BD = AC$

(iii) $\angle ABD = \angle BAC$.

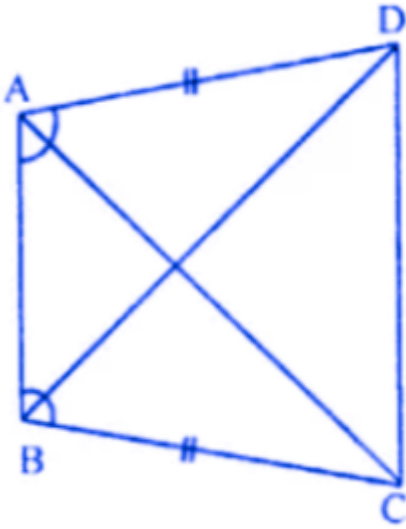
Solution:

Given : in the figure ABCD is a quadrilateral

In which $AD = BC$

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$$\angle DAB = \angle CBA$$



To prove :

(i) $\triangle ABD = \triangle BAC$

(ii) $\angle ABD = \angle BAC$

Proof : in $\triangle ABD$ and $\triangle ABC$

$$AB = AB \text{ (common)}$$

$$\angle DAB = \angle CBA \text{ (Given)}$$

$$AD = BC$$

(i) $\triangle ABD \cong \triangle ABC$ (SAS axiom)

(ii) $BD = AC$

(ii) $\angle ABD = \angle BAC$

7. In the given figure, $AB = DC$ and $AB \parallel DC$. Prove that $AD = BC$.

Solution :

Given: in the given figure.

$$AB = DC, AB \parallel DC$$

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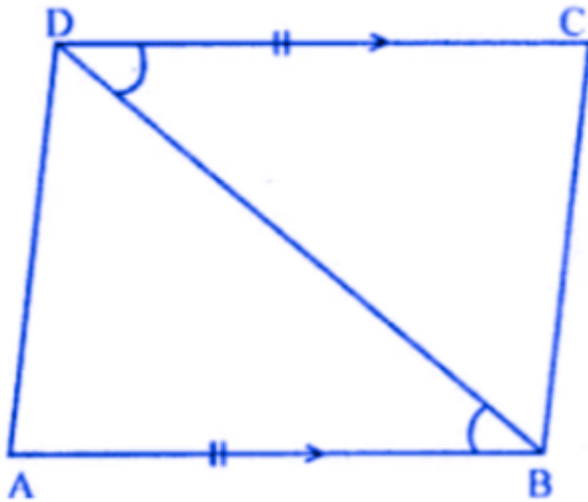
To prove : $AD = BC$

Proof : $AB \parallel DC$

$\angle ABD = \angle CDB$ (Alternate angles)

In $\triangle ABD$ and $\triangle CDB$

$AB = DC$



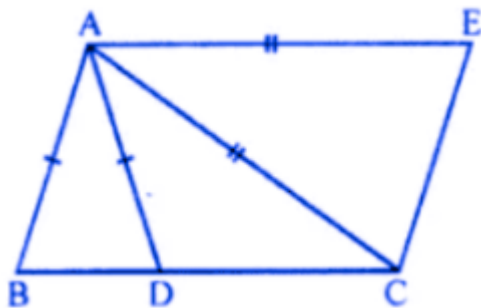
$\angle ABD = \angle CDB$ (Alternate angles)

$BD = BD$ (common)

$\triangle ABD \cong \triangle CDB$ (SAS axiom)

$AD = BC$

8. In the given figure. $AC = AE$, $AB = AD$ and $\angle BAD = \angle CAE$. Show that $BC = DE$.



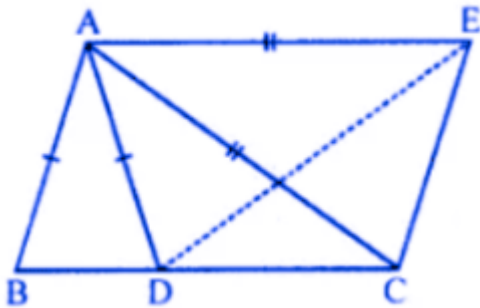
Solution:

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Given: in the figure, $AC = AE$, $AB = AD$

$$\angle BAD = \angle CAE$$

To prove : $BC = DE$



Proof : in $\triangle ABC$ and $\triangle ADE$

$$AB = AD \text{ (given)}$$

$$AC = AE \text{ (given)}$$

$$\angle BAD + \angle DAC + \angle CAE$$

$$\angle BAC = \angle DAE$$

$$\triangle ABC = \triangle ADE \text{ (SAS axiom)}$$

$$BC = DE$$

9. In the adjoining figure, $AB = CD$, $CE = BF$ and $\angle ACE = \angle DBF$. Prove that

(i) $\triangle ACE \cong \triangle DBF$

(ii) $AE = DF$.

Solution:

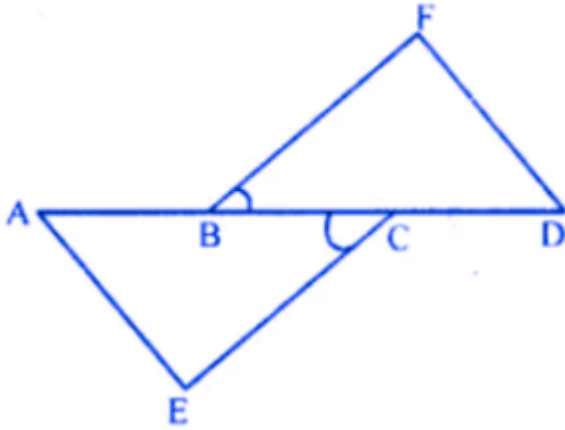
Given : in the given figure

$$AB = CD$$

$$CE = BF$$

$$\angle ACE = \angle DBF$$

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To prove : (i) $\triangle ACE \cong \triangle DBF$

(i) $\triangle ACE \cong \triangle DBF$ (SAS axiom)

$AE = DE$

(ii) $AE = DF$

Proof : $AB = CD$

Adding BC to both sides

$AB + BC = BC + CD$

$AC = BD$

Now in $\triangle ACE$ and $\triangle DBF$

$AC = BD$ (Proved)

$CE = BF$ (Given)

$\angle ACE = \angle DBF$ (SAS axiom)

Exercise 10.2

1. In triangles ABC and PQR, $\angle A = \angle Q$ and $\angle B = \angle R$. Which side of APQR should be equal to side AB of AABC so that the two triangles are congruent? Give reason for your answer.

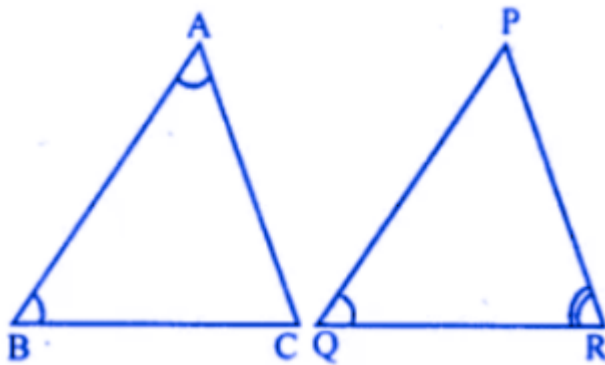
Solution:

In triangle ABC and triangle PQR

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$$\angle A = \angle Q$$

$$\angle B = \angle R$$



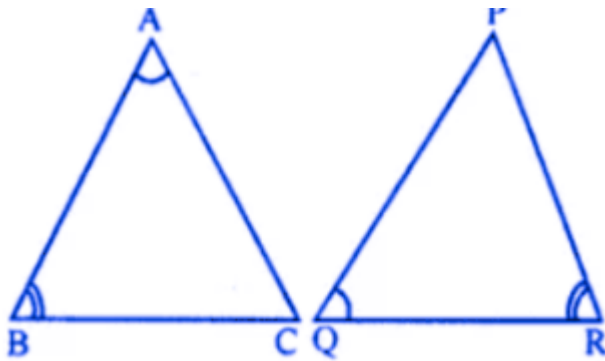
$$AB = QP$$

Because triangles are congruent of their corresponding two angles and included sides are equal

2. In triangles ABC and PQR, $\angle A = \angle Q$ and $\angle B = \angle R$. Which side of APQR should be equal to side BC of AABC so that the two triangles are congruent? Give reason for your answer.

Solution:

In $\triangle ABC$ and $\triangle PQR$



$$\angle A = \angle Q$$

$$\angle B = \angle R$$

Their included sides AB and QR will be equal for their congruency.

Therefore, $BC = PR$ by corresponding parts of congruent triangles.

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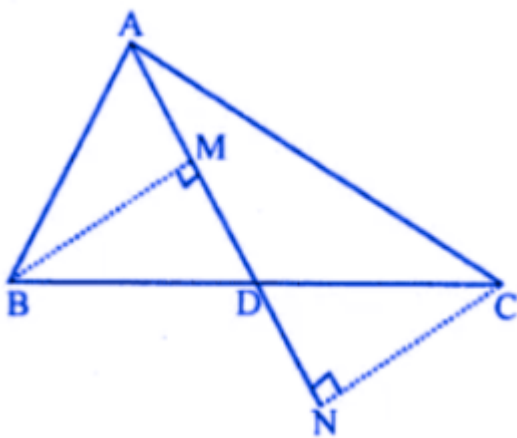
3. "If two angles and a side of one triangle are equal to two angles and a side of another triangle, then the two triangles must be congruent". Is the statement true? Why?

Solution:

The given statement can be true only if the corresponding (included) sides are equal otherwise not.

4. In the given figure, AD is median of $\triangle ABC$, BM and CN are perpendiculars drawn from B and C respectively on AD and AD produced. Prove that $BM = CN$.

Solution:



Given in $\triangle ABC$, AD is median BM and CN are perpendicular to AD from B and C respectively.

To prove:

$BM = CN$

Proof:

In $\triangle BMD$ and $\triangle CND$

$BD = CD$ (because AD is median)

$\angle M = \angle N$

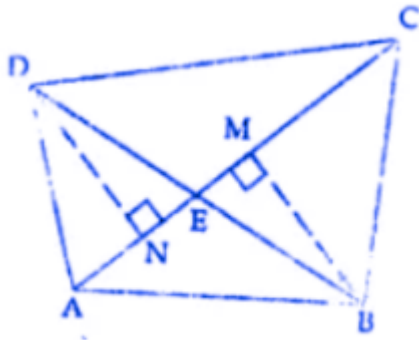
$\angle BDM = \angle CDN$ (vertically opposite angles)

$\triangle BMD \cong \triangle CND$ (AAS axiom)

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Therefore, $BM = CN$.

5. In the given figure, BM and DN are perpendiculars to the line segment AC . If $BM = DN$, prove that AC bisects BD .



Solution:

Given in figure BM and DN are perpendicular to AC

$BM = DN$

To prove:

AC bisects BD that is $BE = ED$

Construction:

Join BD which intersects AC at E

Proof:

In $\triangle BEM$ and $\triangle DEN$

$BM = DN$

$\angle M = \angle N$ (given)

$\angle DEN = \angle BEM$ (vertically opposite angles)

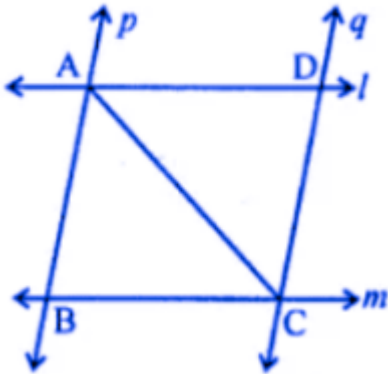
$\triangle BEM \cong \triangle DEN$

$BE = ED$

Which implies AC bisects BD

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6. In the given figure, l and m are two parallel lines intersected by another pair of parallel lines p and q . Show that $\triangle ABC \cong \triangle CDA$.



Solution:

In the given figure, two lines l and m are parallel to each other and lines p and q are also a pair of parallel lines intersecting each other at A , B , C and D . AC is joined.

To prove:

$$\triangle ABC \cong \triangle CDA$$

Proof:

In $\triangle ABC$ and $\triangle CDA$

$$AC = AC \text{ (common)}$$

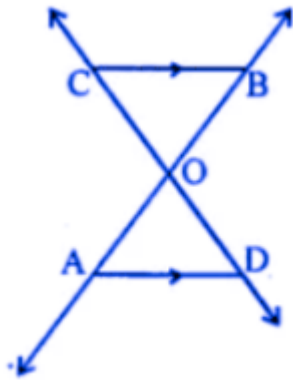
$$\angle ACB = \angle CAD \text{ (alternate angles)}$$

$$\angle BAC = \angle ACD \text{ (alternate angles)}$$

$$\triangle ABC \cong \triangle DCA \text{ (ASA axiom)}$$

7. In the given figure, two lines AB and CD intersect each other at the point O such that $BC \parallel DA$ and $BC = DA$. Show that O is the mid-point of both the line segments AB and CD .

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**Solution:**

In the given figure, lines AB and CD intersect each other at O such that $BC \parallel AD$ and $BC = DA$

To prove:

O is the midpoint of AB and CD

Proof:

Consider $\triangle AOD$ and $\triangle BOC$

$AD = BC$ (given)

$\angle OAD = \angle OBC$ (alternate angles)

$\angle ODA = \angle OCB$ (alternate angles)

$\triangle AOD \cong \triangle BOC$ (SAS axiom)

Therefore, $OA = OB$ and $OD = OC$

Therefore O is the midpoint of AB and CD.

Exercise 10.3

1. ABC is a right angled triangle in which $\angle A = 90^\circ$ and $AB = AC$. Find $\angle B$ and $\angle C$.

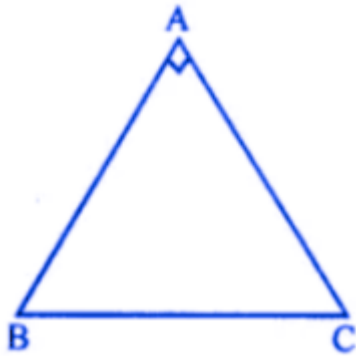
Solution:

In right angled triangle ABC, $\angle A = 90^\circ$

$$\angle B + \angle C = 180^\circ - \angle A$$

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$$= 180^\circ - 90^\circ = 90^\circ$$



Because $AB = AC$

$\angle C = \angle B$ (Angles opposite to equal sides)

$$\angle B + \angle B = 90^\circ (2\angle B = 90^\circ)$$

$$\angle B = 90^\circ / 2 = 45^\circ$$

$$\angle B = \angle C = 45^\circ$$

$$\angle B = \angle C = 45^\circ$$

2. Show that the angles of an equilateral triangle are 60° each.

Solution:

$\triangle ABC$ is an equilateral triangle

$$AB = BC = CA$$

$$\angle A = \angle B = \angle C \text{ (opposite to equal sides)}$$

But $\angle A + \angle B + \angle C = 180^\circ$ (sum of angles of a triangle)

$$3\angle A = 180^\circ (\angle A = 180^\circ / 3 = 60^\circ)$$

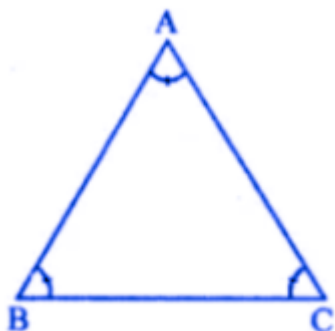
$$\angle A = \angle B = \angle C = 60^\circ$$

3. Show that every equiangular triangle is equilateral.

Solution:

$\triangle ABC$ is an equiangular

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$$\angle A = \angle B = \angle C$$

In $\triangle ABC$

$$\angle B = \angle C$$

$AC = AB$ (sides opposite to equal angles)

Similarly, $\angle C = \angle A$

$$BC = AB$$

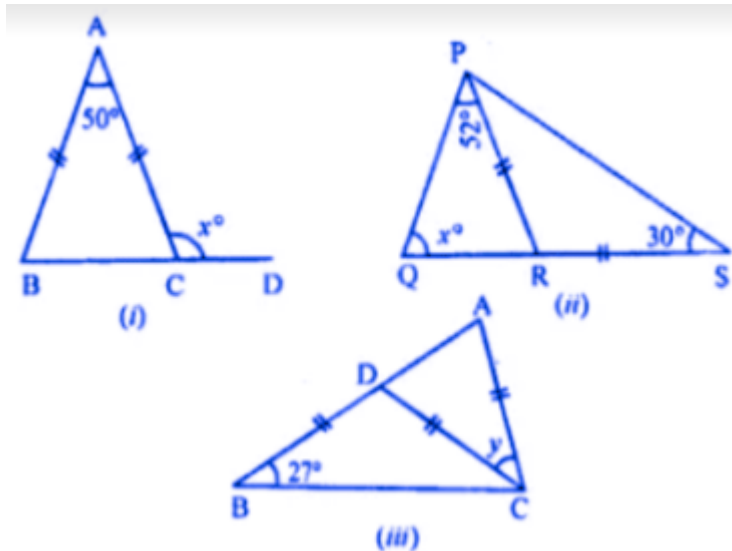
From (i) and (ii)

$$AB = BC = AC$$

$\triangle ABC$ is an equilateral triangle

4. In the following diagrams, find the value of x:

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Solution:

(i) in following diagram given that $AB = AC$

That is $\angle B = \angle ACB$ (angles opposite to equal sides in a triangle are equal)

In a triangle are equal)

Now, $\angle A + \angle B + \angle ACB = 180^\circ$

(sum of all angles in a triangle is 180°)



$$50 + \angle B + \angle B = 180^\circ$$

$$(\angle A = 50^\circ \text{ (given)} \quad \angle B = \angle ACB)$$

$$50^\circ + 2 \angle B = 180^\circ \quad (2 \angle B = 180^\circ - 50^\circ)$$

$$2 \angle B = 130^\circ \quad (\angle B = 130/2 = 65^\circ)$$

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$$\angle ACB = 65^\circ$$

Also $\angle ACB + x^\circ = 180^\circ$ (Linear pair)

$$65^\circ + x^\circ = 180^\circ \quad (x^\circ = 180^\circ - 65^\circ)$$

$$x^\circ = 115^\circ$$

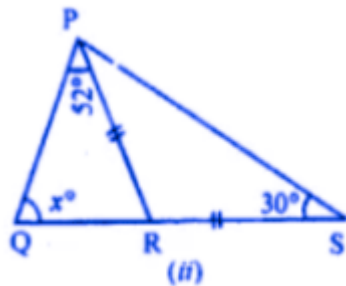
Hence, Value of $x = 115$

(ii) in $\triangle PRS$,

Given that $PR = RS$

$$\angle PSR = \angle RPS$$

(Angles opposite in a triangle, equal sides are equal)



$$30^\circ = \angle RPS \quad (\angle RPS = 30^\circ \dots\dots (1))$$

$$\angle QPS = \angle QPR + \angle RPS$$

$$\angle QPS = 52^\circ + 30^\circ$$

(Given, $\angle QPR = 52^\circ$ and from (i), $\angle RPS = 30^\circ$)

$$\angle QPS = 82^\circ$$

Now, In $\triangle PQS$

$$\angle QPS + \angle QSP + \angle PQS = 180^\circ$$

(sum of all angles in a triangle is 180°)

$$= 82^\circ + 30^\circ + x^\circ = 180^\circ$$

(from (2) $\angle QPS = 82^\circ$ and $\angle QSP = 30^\circ$ (given))

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$$112^\circ + x^\circ = 180^\circ (x^\circ = 180^\circ - 112^\circ)$$

Hence, Value of $x = 68$

(iii) In the following figure, Given

That, $BD = CD = AC$ and $\angle DBC = 27^\circ$

Now in $\triangle BCD$

$BD = CD$ (Given)

$$\angle DBC = \angle BCD \dots\dots(1)$$

(in a triangle sides opposite equal angles are equal)

$$\text{Also,, } \angle DBC = 27^\circ \text{ (given) } \dots\dots\dots(2)$$

From (1) and (2) we get

$$\angle BCD = 27^\circ$$

$$\text{Now, ext } \angle CDA = \angle DBC + \angle BCD$$

(exterior angles is equal to sum of two interior opposite angles)

$$\text{Ext } \angle CDA = 27^\circ + 27^\circ \text{ (from (2) and (3))}$$

$$\angle CDA = 54^\circ \text{ (from (4)) } \dots\dots\dots(5)$$

Also, in $\triangle ACD$

$$\angle CAD + \angle CDA + \angle ACD = 180^\circ$$

(sum of all angles in a triangle is 180°)

$$54^\circ + 54^\circ + Y = 180^\circ$$

$$108^\circ + Y = 180^\circ (Y = 180^\circ - 108^\circ)$$

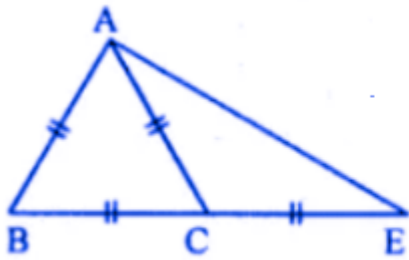
$$y = 72^\circ$$

5. (a) In the figure (1) given below, ABC is an equilateral triangle. Base BC is produced to E , such that $BC' = CE$. Calculate $\angle ACE$ and $\angle AEC$.

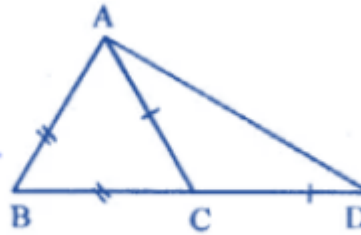
(b) In the figure (2) given below, prove that $\angle BAD : \angle ADB = 3 : 1$.

(c) In the figure (3) given below, $AB \parallel CD$. Find the values of x , y and $\angle$.

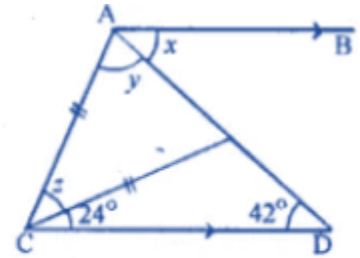
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(1)



(2)



(3)

Solution:

(a) in following figure

Given. ABC is an equilateral triangle $BC = CE$

To find. $\angle ACE$ and $\angle AEC$



(1)

As given that ABC is an equilateral triangle,

That is $\angle BAC = \angle B = \angle ACB = 60^\circ$ (1)

(each angle of an equilateral triangle is 60°)

Now, $\angle ACE = \angle BAC + \angle B$

(Exterior angle is equal to sum of two interior opposite angles)

($\angle ACE = 60^\circ + 60^\circ$)

$\angle ACE = 120^\circ$

Then, in $\triangle ACE$

Given, $AC = CE$... [because $AC = BC = CE$]

$\angle CAE = \angle AEC$... (2)

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We know that, in a triangle equal sides have equal angles opposite to them.

$$\text{So, } \angle CAE + \angle AEC + 120^\circ = 180^\circ$$

$$\angle AEC + \angle AEC + 120^\circ = 180^\circ \dots [\text{by equation (2) we get}]$$

$$2\angle AEC = 180^\circ - 120^\circ$$

$$2\angle AEC = 60^\circ$$

$$\angle AEC = 60^\circ/2$$

$$\angle AEC = 30^\circ$$

Therefore, $\angle ACE = 120^\circ$ and $\angle AEC = 30^\circ$.

(b) In given figure,

Given, $\triangle ABD$, AC meets BD in C. $AB = BC$, $AC = CD$.

We have to prove that, $\angle BAD : \angle ADB = 3: 1$

Then, consider $\triangle ABC$,

$$AB = BC \dots [\text{given}]$$

$$\text{Therefore, } \angle ACB = \angle BAC \dots (1)$$

(In a triangle, equal sides have equal angles opposite to them)

In $\triangle ACD$,

$$AC = CD \dots [\text{given}]$$

$$\text{Therefore, } \angle ADC = \angle CAD$$

(In a triangle, equal sides have equal angles opposite to them)

$$\angle CAD = \angle ADC \dots (2)$$

From, adding (1) and (2), we get

$$\angle BAC + \angle CAD = \angle ACB + \angle ADC$$

$$\angle BAD = \angle ACB + \angle ADC \dots (3)$$

Now, in $\triangle ACD$

$$\text{Exterior } \angle ACB = \angle CAD + \angle ADC \dots (4)$$

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(In an triangle, exterior angle is equal to sum of two interior opposite angles)

Therefore, $\angle ACB = \angle ADC + \angle ADC \dots$ [from (2) and (4)]

$$\angle ACB = 2\angle ADC \dots (5)$$

Now, $\angle BAD = 2\angle ADC + \angle ADC \dots$ [from (3) and (4)]

$$\angle BAD = 3\angle ADC = (\angle BAD/\angle ADC) = 3/1$$

$$\angle BAD: \angle ADC = 3: 1$$

(c) In given figure,

Given, AB parallel to CD, $\angle ECD = 24^\circ$, $\angle CDE = 42^\circ$

We have to find the value of x, y and z.

Consider, $\triangle CDE$

Exterior, $\angle CEA = 24^\circ + 42^\circ$

(In a triangle exterior angle is equal to sum of two interior opposite angles)

$$\angle CEA = 66^\circ \dots (1)$$

Then, in $\triangle ACE$

$AC = CE \dots$ (given)

Therefore, $\angle CAE = \angle CEA$

(In a triangle equal side have equal angles opposite to them)

By equation (1),

$$Y = 66^\circ \dots (2)$$

Also, $y + z + \angle CEA = 180^\circ$

We know that, sum of all angles in a triangle is 180°

$$66^\circ + z + 66^\circ = 180^\circ$$

$$z + 132^\circ = 180^\circ$$

$$z = 180^\circ - 132^\circ$$

$$z = 48^\circ \dots (3)$$

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Then it is given that, AB is parallel to CD,

$$\angle x = \angle ADC \dots [\text{alternate angles}]$$

$$x = 42^\circ \dots (4)$$

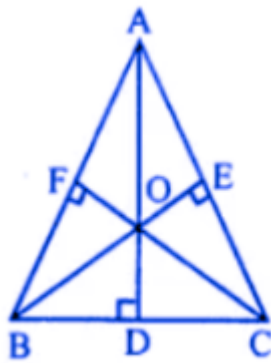
Therefore, from (2), (3) and (4) equation gives $x = 42^\circ$, $y = 66^\circ$ and $z = 48^\circ$.

6. In the given figure, AD, BE and CF are altitudes of $\triangle ABC$. If $AD = BE = CF$, prove that $\triangle ABC$ is an equilateral triangle.

Given : in the figure given,

AD, BE and CF are altitudes of $\triangle ABC$ and

$$AD = BE = CF$$



To prove : $\triangle ABC$ is an equilateral triangle

Proof: in the right $\triangle BEC$ and $\triangle BFC$

Hypotenuse $BC = BC$ (Common)

Side $BE = CF$ (Given)

$\triangle BEC \cong \triangle BFC$ (RHS axiom)

$$\angle C = \angle B$$

$AB = AC$ (sides opposite to equal angles)

Similarly we can prove that $\triangle CFA \cong \triangle ADC$

$$\angle A = \angle C$$

$$AB = BC$$

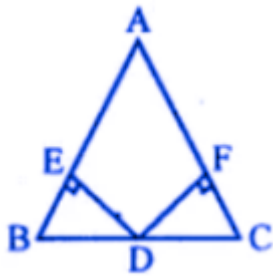
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From (i) and (ii)

$$AB = BC = AC$$

$\triangle ABC$ is an equilateral triangle

7. In the given figure, D is mid-point of BC, DE and DF are perpendiculars to AB and AC respectively such that $DE = DF$. Prove that ABC is an isosceles triangle.



Solution:

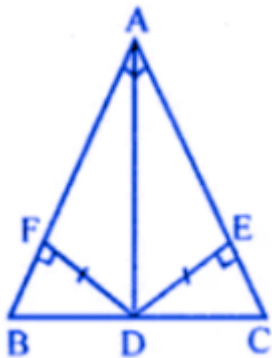
In triangle ABC

D is the midpoint of BC

DE perpendicular to AB

And DF perpendicular to AC

$$DE = DF$$



To prove:

Triangle ABC is an isosceles triangle

Proof:

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In the right angled triangle BED and CDF

Hypotenuse BD = DC (because D is a midpoint)

Side DF = DE (given)

$\triangle BED \cong \triangle CDF$ (RHS axiom)

$\angle C = \angle B$

AB = AC (sides opposite to equal angles)

$\triangle ABC$ is an isosceles triangle

Exercise 10.4

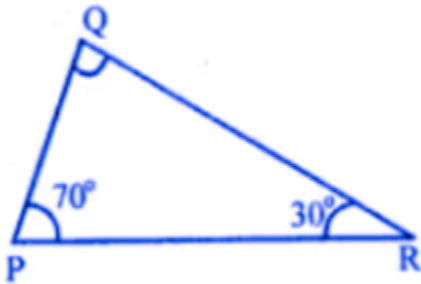
1. In $\triangle PQR$, $\angle P = 70^\circ$ and $\angle R = 30^\circ$. Which side of this triangle is longest? Give reason for your answer.

Solution:

In $\triangle PQR$, $\angle P = 70^\circ$, $\angle R = 30^\circ$

But $\angle P + \angle Q + \angle R = 180^\circ$

$100^\circ + \angle Q = 180^\circ$



$\angle Q = 180^\circ - 100^\circ = 80^\circ$

$\angle Q = 80^\circ$ the greatest angle

Its opposite side PR is the longest side

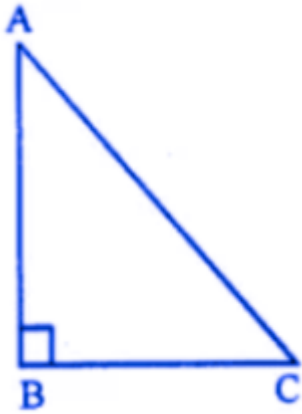
(side opposite to greatest angle is longest)

2. Show that in a right angled triangle, the hypotenuse is the longest side.

Solution:

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Given: in right angled $\triangle ABC$, $\angle B = 90^\circ$



To prove: AC is the longest side

Proof : in $\triangle ABC$,

$$\angle B = 90^\circ$$

$\angle A$ and $\angle C$ are acute angles

That is less than 90°

$\angle B$ is the greatest angle

Or $\angle B > \angle C$ and $\angle B > \angle A$

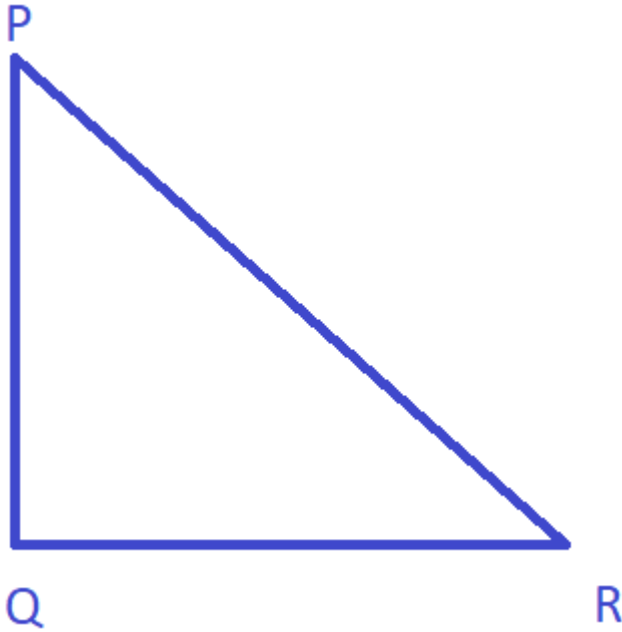
$AC > AB$ and $AC > BC$

Hence AC is the longest side

3. PQR is a right angle triangle at Q and $PQ : QR = 3:2$. Which is the least angle.

Solution:

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Here, PQR is a right angle triangle at Q. Also given that

$$PQ : QR = 3:2$$

Let $PQ = 3x$, then, $QR = 2x$

It is clear that QR is the least side,

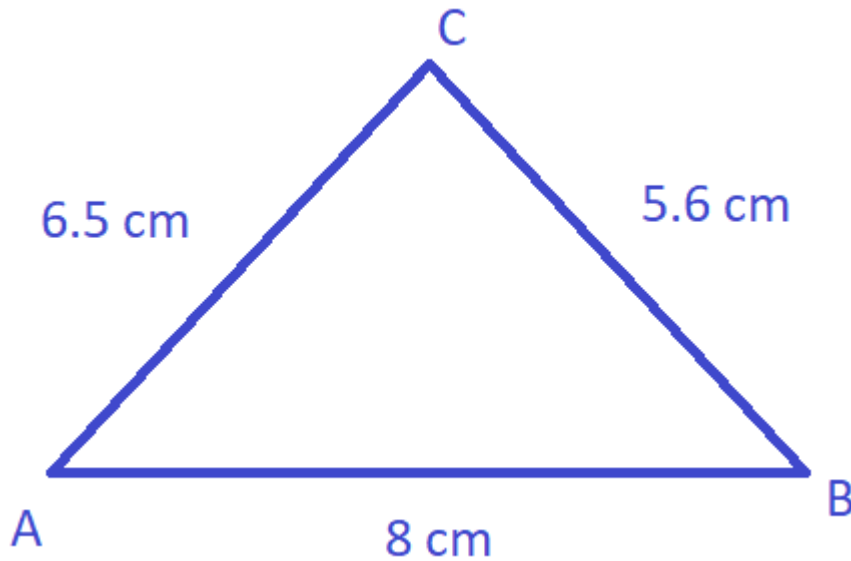
Then, we know that the least angle has least side

Opposite to it.

Hence $\angle P$ is the least angle

4. In $\triangle ABC$, $AB = 8$ cm, $BC = 5.6$ cm and $CA = 6.5$ cm. Which is (i) the greatest angle ?
(ii) the smallest angle ?

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**Solution:**

Given that $AB = 8 \text{ cm}$, $BC = 5.6 \text{ cm}$, $CA = 6.5 \text{ cm}$.

Here AB is the greatest side

Then $\angle C$ is the least angle

The greatest side has greatest angle opposite to it)

Also, BC is the least side

Then $\angle A$ is the least angle

(the least side has least angle opposite to it)

Chapter test

1. In triangles ABC and DEF, $\angle A = \angle D$, $\angle B = \angle E$ and $AB = EF$. Will the two triangles be congruent? Give reasons for your answer.

Solution:

In $\triangle ABC$ and $\triangle DEF$

$$\angle A = \angle D$$

$$\angle B = \angle E$$

$$AB = EF$$

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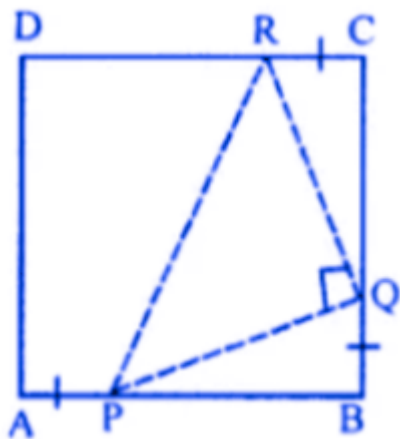
In $\triangle ABC$, two angles and included side is

Given but in $\triangle DEF$, corresponding angles are

Equal but side is not included of there angle.

Triangles Cannot be congruent.

2. In the adjoining figure, ABCD is a square. P, Q and R are points on the sides AB, BC and CD respectively such that $AP = BQ = CR$ and $\angle PQR = 90^\circ$. Prove that (a) $\triangle PBQ \cong \triangle QCR$ (b) $PQ = QR$ (c) $\angle PRQ = 45^\circ$



Solution:

Given : in the given figure, ABCD is a square

P, Q and R are the Points on the sides AB,

BC and CD respectively such that

$AP = BQ = CR$, $\angle PQR = 90^\circ$

To prove: (a) $\triangle PBQ \cong \triangle QCR$

(b) $PQ = QR$

(c) $\angle PRQ = 45^\circ$

Proof : $AB = BC = CD$ (Sides of Square)

And $AP = BQ = CR$ (Given)

Subtracting, we get

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$$AB - AP = BC - BQ = CD - CR$$

$$(PB = QC = RD)$$

Now in $\triangle PBQ$ and $\triangle QCR$

$$PB = QC \text{ (Proved)}$$

$$BQ = CR \text{ (Given)}$$

$$\angle B = \angle C \text{ (Each } 90^\circ)$$

$$\triangle PBQ \cong \triangle QCR$$

$$PQ = QR$$

$$\text{But } \angle PQR = 90^\circ$$

$$\angle RPQ = \angle PQR$$

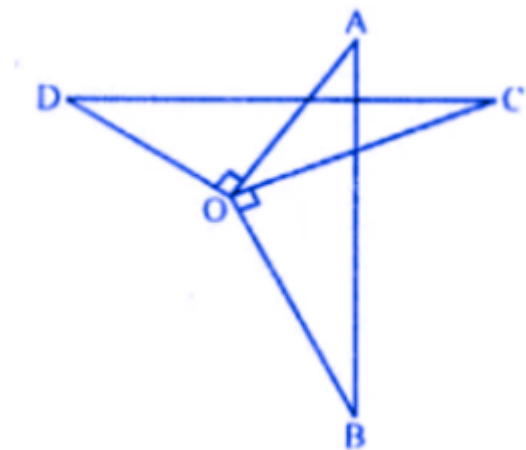
(Angles opposite to equal angles)

$$\text{But } \angle RPQ + \angle PRQ = 90^\circ$$

$$\angle RPQ = \angle PQR = 90^\circ$$

$$\angle RPQ = \angle PRQ = 90^\circ/2 = 45^\circ$$

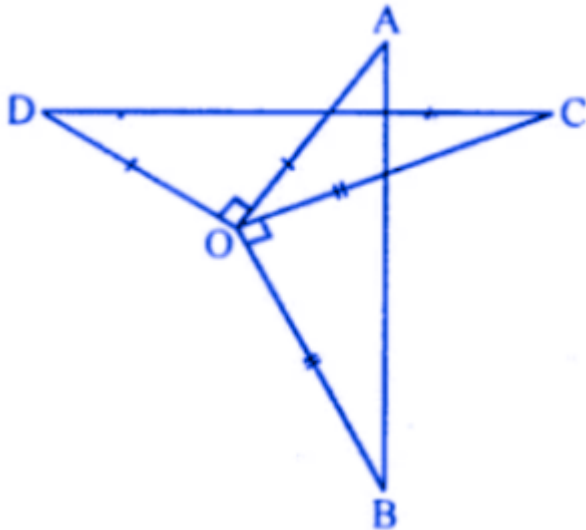
3. In the given figure, $OA \perp OD$, $OC \perp OB$, $OD = OA$ and $OB = OC$. Prove that $AB = CD$.



Solution :

Given : in the figure $OA \perp OD$, $OC \perp OB$.

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To prove : $AB = CD$

Proof : $\angle AOD = \angle COB$ (each 90°)

Adding $\angle AOC$

$$\angle AOD + \angle AOC = \angle AOC + \angle COB$$

$$\angle COD = \angle AOB$$

Now, in $\triangle AOB$ and $\triangle DOC$

$$OA = OD \text{ (Given)}$$

$$OB = OC \text{ (Given)}$$

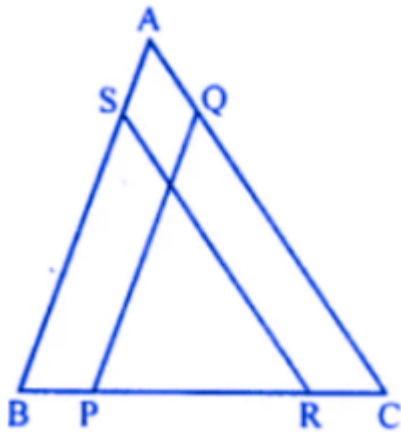
$$\angle AOB = \angle COD \text{ (Proved)}$$

$$\triangle AOB \cong \triangle DOC$$

$$AB = CD$$

4. In the given figure, $PQ \parallel BA$ and $RS \parallel CA$. If $BP = RC$, prove that: (i) $\triangle BSR \cong \triangle PQC$ (ii) $BS = PQ$ (iii) $RS = CQ$.

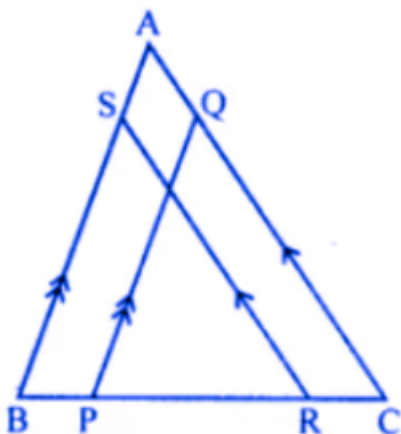
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Solution:

$PQ \parallel BA, RS \parallel CA$

$BP = RC$



To prove :

(i) $\triangle BSR \cong \triangle PQC$

(ii) $RS = CQ$

Proof : $BP = RC$

$BC - RC = BC - BP$

$BR = PC$

Now, in $\triangle BSR$ and $\triangle PQC$

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$\angle B = \angle P$ (Corresponding angles)

$\angle R = \angle C$ (Corresponding angles)

$BR = PC$ (Proved)

$\triangle BSR \cong \triangle PQC$

$BS = PQ$

$RS = CQ$



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M. L. Aggarwal, is an Indian mechanical engineer, educator. His achievements include research in solutions of industrial problems related to fatigue design. Recipient Best Paper award, Manipal Institute of Technology, 2004. Member of TSTE.

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