CBSE Class 9 Mathematics

NCERT Solutions

CHAPTER 7

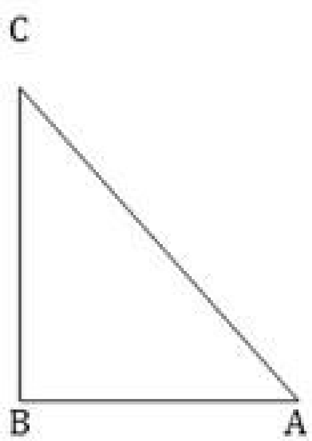
Triangles(Ex. 7.4)

1. Show that in a right angles triangle, the hypotenuse is the longest side.

Ans. Given: Let ABC be a right angled triangle, right angled at B.

To prove: Hypotenuse AC is the longest side.

Proof: In right angled triangle ABC,



$\angle$A + $\angle$B + $\angle$C = 180°

$\Rightarrow$ $\angle$A + 90° + $\angle$C = 180° [$\because$ $\angle$B = 90°]

$\Rightarrow$ $\angle$A + $\angle$C = $180^\circ - 90^\circ$

=>$\angle A + \angle C = 90^0$

And $\angle$B = 90°

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

Since the greater angle has a longer side opposite to it.

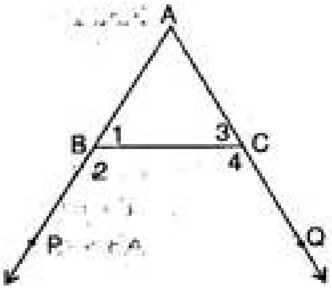
$\Rightarrow$ AC > AB and AC > BC

Therefore $\angle$B being the greatest angle has the longest opposite side AC, i.e. hypotenuse.

Hence, proved.

2. In figure, sides AB and AC of $\triangle$ABC are extended to points P and Q respectively. Also

∠PBC < ∠QCB. Show that AC > AB.



Ans. Given: In △ABC, ∠PBC < ∠QCB

To prove: AC > AB

Proof: In the given figure,

∠4 > ∠2 [Given]

Now ∠1 + ∠2 = 180° [Linear pair]

=> $\angle 1 = 180^0 - \angle 2$

And, ∠3 + ∠4 = 180°

=> $\angle 3 = 180^0 - \angle 4$

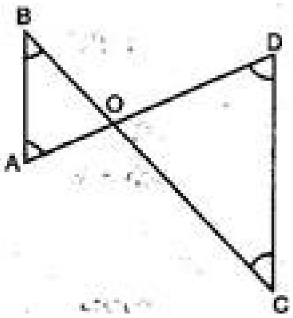
Because, ∠4 is greater than ∠2, therefore when we will subtract it from 180° we will get a value which would be lesser than the quantity obtained on deducting ∠2 from 180°.

∴ ∠1 > ∠3

⟹ AC > AB [Side opposite to greater angle is longer]

Hence, proved.

3. In figure, ∠B < ∠A and ∠C < ∠D. Show that AD < BC.



Ans. In $\triangle$AOB,

$\angle$A > $\angle$B [Given]

$\Rightarrow$ OB > OA ....(i) [Side opposite to greater angle is longer]

Similarly, In $\triangle$COD,

$\angle$D > $\angle$C [Given]

$\Rightarrow$ OC > OD ....(ii) [Side opposite to greater angle is longer]

Adding eq. (i) and (ii),

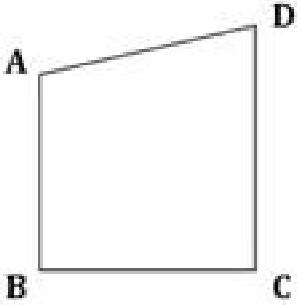
OB + OC > OA + OD

=> BC > AD

$\Rightarrow$ AD < BC

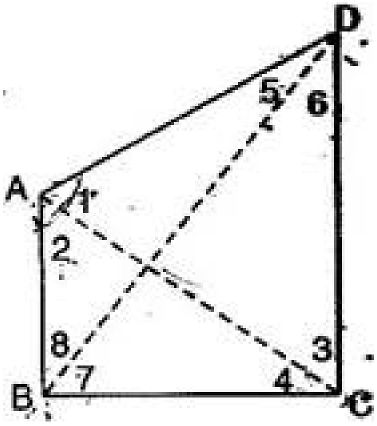
Hence, proved.

4. AB and CD are respectively the smallest and longest sides of a quadrilateral ABCD (See figure). Show that $\angle$A > $\angle$C and $\angle$B > $\angle$D.



Ans. Given: ABCD is a quadrilateral with AB as smallest and CD as longest side.
To prove: **(i)** $\angle$A > $\angle$C **(ii)** $\angle$B > $\angle$D
Construction: Join AC and BD.

Proof: **(i)** In $\triangle$ABC, AB is the smallest side.



$\therefore \angle 4 < \angle 2$ ....(i)

[Angle opposite to smaller side is smaller]

In $\triangle$ ADC, DC is the longest side.

$\therefore \angle 3 < \angle 1$ ....(ii)

[Angle opposite to smaller side is smaller]

Adding eq. (i) and (ii),

$\angle 4 + \angle 3 < \angle 1 + \angle 2$

$\Rightarrow \angle$ **C** < $\angle$ **A**

=> $\angle$ **A** > $\angle$ **C**

(ii) In $\triangle$ ABD, AB is the smallest side.

$\therefore \angle 5 < \angle 8$ ....(iii)

[Angle opposite to smaller side is smaller]

In $\triangle$ BDC, DC is the longest side.

$\therefore \angle 6 < \angle 7$ ....(iv)

[Angle opposite to smaller side is smaller]

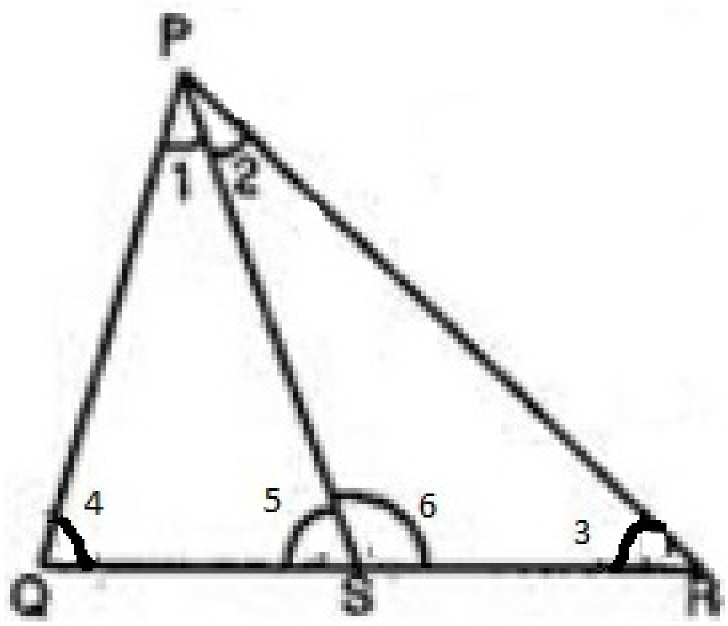
Adding eq. (iii) and (iv),

$\angle 5 + \angle 6 < \angle 7 + \angle 8$

$\Rightarrow$ $\angle$D < $\angle$B

=> **$\angle$B > $\angle$D**

5. In figure, PR > PQ and PS bisects $\angle$QPR. Prove that $\angle$PSR > $\angle$PSQ.



Ans. In $\triangle$PQR, PR > PQ [Given]

$\therefore$ $\angle$4 > $\angle$3 .....(i) [Angle opposite to longer side is greater]

Again $\angle$1 = $\angle$2 .....(ii) [$\because$ PS is the bisector of $\angle$P]

Now, $\angle$6 is exterior angle of ΔPQS,

=> $\angle 6 = \angle 4 + \angle 1$ ....(iii)

Again, $\angle$5 is exterior angle of ΔPSR

=> $\angle$5 = $\angle$2 + $\angle$3 ....(iv)

Adding (i) and (ii), we get :-

=> $\angle$4 + $\angle$1 > $\angle$2 + $\angle$3

=> $\angle$6 > $\angle$5 [From, (iii) and (iv)]

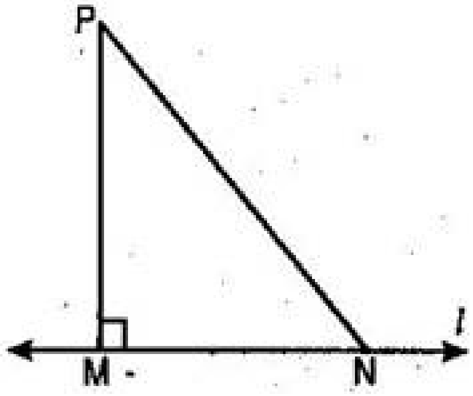
i.e. $\angle$PSR > $\angle$PSQ

Hence, Proved.

6. Show that all the line segments drawn from a given point not on it, the perpendicular line segment is the shortest.

Ans. Given: l is a line and P is point not lying on l. PM $\perp l$

N is any point on l other than M.



To prove: PM < PN

Proof: In $\triangle$PMN $\angle$M is the right angle.

$\therefore$ N is an acute angle. (Angle sum property of $\triangle$)

$\therefore$ $\angle$M > $\angle$N

$\therefore$ PN > PM [Side opposite greater angle]

$\Rightarrow$ PM < PN

Hence of all line segments drawn from a given point not on it, the perpendicular is the shortest.