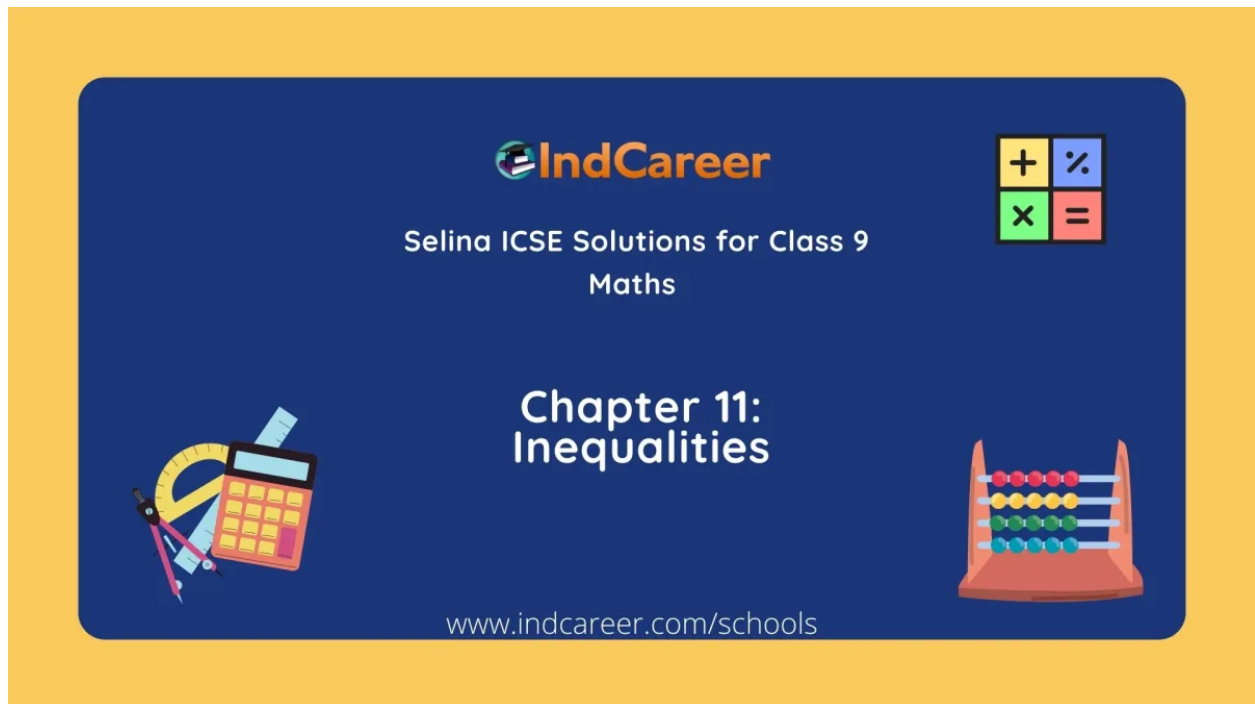


Selina Class 9 ICSE Solutions Mathematics :

Chapter 11- Inequalities



For any clarifications or questions you can write to **info@indcareer.com**

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Selina Class 9 ICSE Solutions Mathematics :

Chapter 11- Inequalities

Class 9: Maths Chapter 11 solutions. Complete Class 9 Maths Chapter 11 Notes.

Selina Class 9 ICSE Solutions Mathematics : Chapter 11- Inequalities

Selina 9th Maths Chapter 11, Class 9 Maths Chapter 11 solutions

Exercise 11

Solution 1:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>

In $\triangle ABC$,

$$AB = AC [\text{Given}]$$

$$\therefore \angle ACB = \angle B [\text{angles opposite to equal sides are equal}]$$

$$\angle B = 70^\circ [\text{Given}]$$

$$\Rightarrow \angle ACB = 70^\circ \dots\dots\dots(i)$$

Now,

$$\angle ACB + \angle ACD = 180^\circ [\text{BCD is a straight line}]$$

$$\Rightarrow 70^\circ + \angle ACD = 180^\circ$$

$$\Rightarrow \angle ACD = 110^\circ \dots\dots\dots(ii)$$

In $\triangle ACD$,

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

$$\Rightarrow \angle CAD + 110^\circ + \angle D = 180^\circ [\text{From (ii)}]$$

$$\Rightarrow \angle CAD + \angle D = 70^\circ$$

$$\text{But } \angle D = 40^\circ [\text{Given}]$$

$$\Rightarrow \angle CAD + 40^\circ = 70^\circ$$

$$\Rightarrow \angle CAD = 30^\circ \dots\dots\dots(iii)$$

In $\triangle ACD$,

$$\angle ACD = 110^\circ [\text{From (ii)}]$$

$$\angle CAD = 30^\circ [\text{From (iii)}]$$

$$\angle D = 40^\circ [\text{Given}]$$

$$\therefore \angle D > \angle CAD$$

$$\Rightarrow AC > CD$$

[Greater angle has greater side opposite to it]

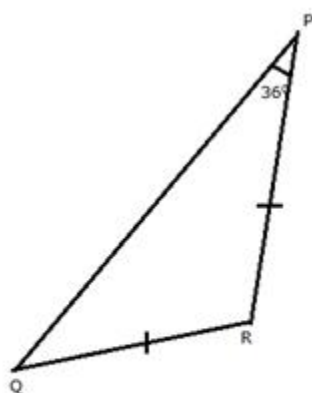
Also,

$$AB = AC [\text{Given}]$$

Therefore, $AB > CD$.

Solution 2:

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In $\triangle PQR$,

$QR = PR$ [Given]

$\therefore \angle P = \angle Q$ [angles opposite to equal sides are equal]

$\angle P = 36^\circ$ [Given]

$\Rightarrow \angle Q = 36^\circ$

In $\triangle PQR$,

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

$\Rightarrow 36^\circ + 36^\circ + \angle R = 180^\circ$

$\Rightarrow \angle R + 72^\circ = 180^\circ$

$\Rightarrow \angle R = 108^\circ$

Now,

$\angle R = 108^\circ$

$\angle P = 36^\circ$

$\angle Q = 36^\circ$

Since $\angle R$ is the greatest, therefore, PQ is the largest side.

Solution 3:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>

The sum of any two sides of the triangle is always greater than third side of the triangle.

$$\text{Third side} < 13 + 8 = 21 \text{ cm.}$$

The difference between any two sides of the triangle is always less than the third side of the triangle.

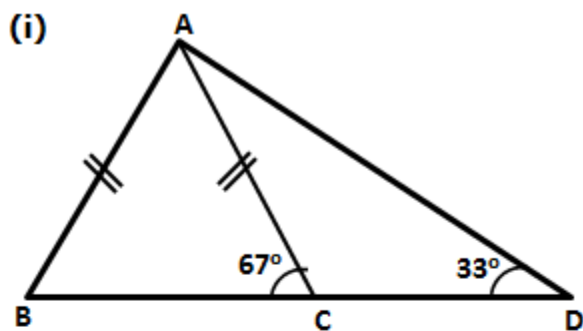
$$\text{Third side} > 13 - 8 = 5 \text{ cm.}$$

Therefore, the length of the third side is between 5 cm and 21 cm, respectively.

The value of $a = 5$ cm and $b = 21$ cm.

Solution 4:

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In $\triangle ABC$,

$$AB = AC$$

$\Rightarrow \angle ABC = \angle ACB$ (angles opposite to equal sides are equal)

$$\Rightarrow \angle ABC = \angle ACB = 67^\circ$$

$\Rightarrow \angle BAC = 180^\circ - \angle ABC - \angle ACB$ (angle sum property)

$$\Rightarrow \angle BAC = 180^\circ - 67^\circ - 67^\circ = 46^\circ$$

Since $\angle BAC < \angle ABC$, we have

$$BC < AC \quad \dots(1)$$

Now, $\angle ACD = 180^\circ - \angle ACB$ (linear pair)

$$\Rightarrow \angle ACD = 180^\circ - 67^\circ = 113^\circ$$

Thus, in $\triangle ACD$,

$$\angle CAD = 180^\circ - \angle ACD - \angle ADC$$

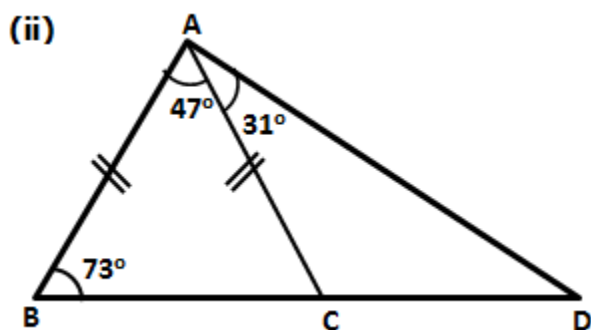
$$\Rightarrow \angle CAD = 180^\circ - 113^\circ - 33^\circ = 34^\circ$$

Since $\angle ADC < \angle CAD$, we have

$$AC < CD \quad \dots(2)$$

From (1) and (2), we have

$$BC < AC < CD$$



In $\triangle ABC$,

$$\angle BAC < \angle ABC$$

$$\Rightarrow BC < AC \quad \dots(1)$$

$$\text{Now, } \angle ACB = 180^\circ - \angle ABC - \angle BAC$$

$$\Rightarrow \angle ACB = 180^\circ - 73^\circ - 47^\circ$$

$$\Rightarrow \angle ACB = 60^\circ$$

$$\text{Now, } \angle ACD = 180^\circ - \angle ACB$$

$$\Rightarrow \angle ACD = 180^\circ - 60^\circ = 120^\circ$$

Now, in $\triangle ACD$,

$$\angle ADC = 180^\circ - \angle ACD - \angle CAD$$

$$\Rightarrow \angle ADC = 180^\circ - 120^\circ - 31^\circ$$

$$\Rightarrow \angle ADC = 29^\circ$$

Since $\angle ADC < \angle CAD$, we have

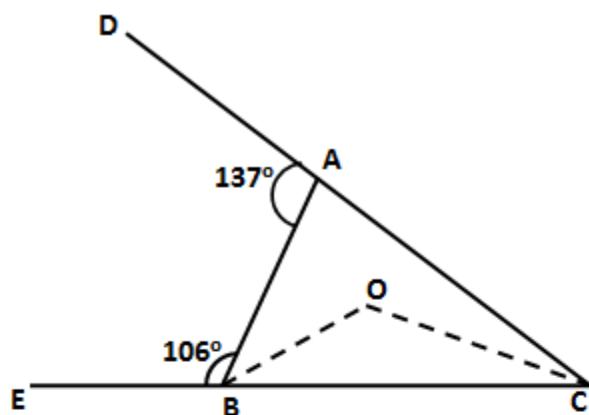
$$AC < CD \quad \dots(2)$$

From (1) and (2), we have

$$BC < AC < CD$$

Solution 5:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>



$$\angle BAC = 180^\circ - \angle BAD = 180^\circ - 137^\circ = 43^\circ$$

$$\angle ABC = 180^\circ - \angle ABE = 180^\circ - 106^\circ = 74^\circ$$

Thus, in $\triangle ABC$,

$$\angle ACB = 180^\circ - \angle BAC - \angle ABC$$

$$\Rightarrow \angle ACB = 180^\circ - 43^\circ - 74^\circ = 63^\circ$$

Now, $\angle ABC = \angle OBC + \angle ABO$

$$\Rightarrow \angle ABC = 2\angle OBC \quad (\text{OB is bisector of } \angle ABC)$$

$$\Rightarrow 74^\circ = 2\angle OBC$$

$$\Rightarrow \angle OBC = 37^\circ$$

Similarly,

$$\angle ACB = \angle OCB + \angle ACO$$

$$\Rightarrow \angle ACB = 2\angle OCB \quad (\text{OC is bisector of } \angle ACB)$$

$$\Rightarrow 63^\circ = 2\angle OCB$$

$$\Rightarrow \angle OCB = 31.5^\circ$$

Now, in $\triangle BOC$,

$$\angle BOC = 180^\circ - \angle OBC - \angle OCB$$

$$\Rightarrow \angle BOC = 180^\circ - 37^\circ - 31.5^\circ$$

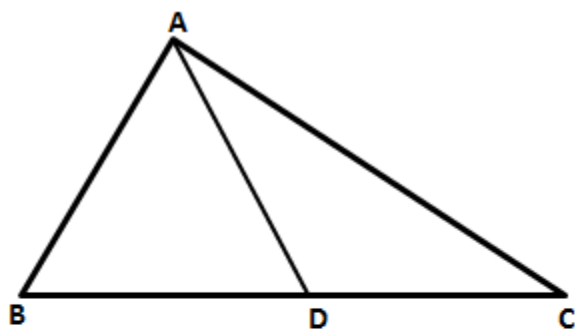
$$\Rightarrow \angle BOC = 111.5^\circ$$

Since, $\angle BOC > \angle OBC > \angle OCB$, we have

$$BC > OC > OB$$

Solution 6:

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$AD > AC$ (given)

$\Rightarrow \angle C > \angle ADC$ (1)

Now, $\angle ADC > \angle B + \angle BAC$ (Exterior Angle Property)

$\Rightarrow \angle ADC > \angle B$ (2)

From (1) and (2), we have

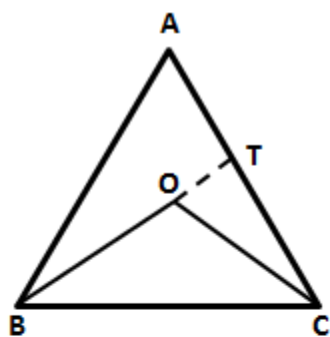
$\angle C > \angle ADC > \angle B$

$\Rightarrow \angle C > \angle B$

$\Rightarrow AB > AC$

Solution 7:

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Construction: Produce BO to meet AC at T.

In $\triangle ABT$,

$AB + AT > BT$ (Sum of two sides of a $\triangle$ is greater than third side)

$$\Rightarrow AB + AT > BO + OT \quad \dots(1)$$

Also, in $\triangle OCT$,

$$OT + TC > OC \quad \dots(2)$$

Adding (1) and (2), we have

$$AB + AT + OT + TC > BO + OT + OC$$

$$\Rightarrow AB + AT + TC > BO + OC$$

$$\Rightarrow AB + AC > OB + OC$$

$$\Rightarrow OB + OC < AB + AC$$

Solution 8:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>

In $\triangle BEC$,

$$\angle B + \angle BEC + \angle BCE = 180^\circ$$

$$\angle B = 65^\circ \text{ [Given]}$$

$$\angle BEC = 90^\circ \text{ [CE is perpendicular to AB]}$$

$$\Rightarrow 65^\circ + 90^\circ + \angle BCE = 180^\circ$$

$$\Rightarrow \angle BCE = 180^\circ - 155^\circ$$

$$\Rightarrow \angle BCE = 25^\circ = \angle DCF \text{(i)}$$

In $\triangle CDF$,

$$\angle DCF + \angle FDC + \angle CFD = 180^\circ$$

$$\angle DCF = 25^\circ \text{ [From (i)]}$$

$$\angle FDC = 90^\circ \text{ [AD is perpendicular to BC]}$$

$$\Rightarrow 25^\circ + 90^\circ + \angle CFD = 180^\circ$$

$$\Rightarrow \angle CFD = 180^\circ - 115^\circ$$

$$\Rightarrow \angle CFD = 65^\circ \text{(ii)}$$

Now, $\angle AFC + \angle CFD = 180^\circ$ [AFD is a straight line]

$$\Rightarrow \angle AFC + 65^\circ = 180^\circ$$

$$\Rightarrow \angle AFC = 115^\circ \text{(iii)}$$

In $\triangle ACE$,

$$\angle ACE + \angle CEA + \angle BAC = 180^\circ$$

$$\angle BAC = 60^\circ [\text{Given}]$$

$$\angle CEA = 90^\circ [\text{CE is perpendicular to AB}]$$

$$\Rightarrow \angle ACE + 90^\circ + 60^\circ = 180^\circ$$

$$\Rightarrow \angle ACE = 180^\circ - 150^\circ$$

$$\Rightarrow \angle ACE = 30^\circ \dots\dots\dots(\text{iv})$$

In $\triangle AFC$,

$$\angle AFC + \angle ACF + \angle FAC = 180^\circ$$

$$\angle AFC = 115^\circ [\text{From (iii)}]$$

$$\angle ACF = 30^\circ [\text{From (iv)}]$$

$$\Rightarrow 115^\circ + 30^\circ + \angle FAC = 180^\circ$$

$$\Rightarrow \angle FAC = 180^\circ - 145^\circ$$

$$\Rightarrow \angle FAC = 35^\circ \dots\dots\dots(\text{v})$$

In $\triangle AFC$,

$$\angle FAC = 35^\circ [\text{From (v)}]$$

$$\angle ACF = 30^\circ [\text{From (iv)}]$$

$$\therefore \angle FAC > \angle ACF$$

$$\Rightarrow CF > AF$$

In $\triangle CDF$,

$$\angle DCF = 25^\circ [\text{From (i)}]$$

$$\angle CFD = 65^\circ [\text{From (ii)}]$$

$$\therefore \angle CFD > \angle DCF$$

$$\Rightarrow DC > DF$$

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Solution 9:

$$\angle ACB = 74^{\circ} \dots\dots(i)[\text{Given}]$$

$$\angle ACB + \angle ACD = 180^{\circ}[\text{BCD is a straight line}]$$

$$\Rightarrow 74^{\circ} + \angle ACD = 180^{\circ}$$

$$\Rightarrow \angle ACD = 106^{\circ} \dots\dots(ii)$$

In $\triangle ACD$,

$$\angle ACD + \angle ADC + \angle CAD = 180^{\circ}$$

Given that $AC = CD$

$$\Rightarrow \angle ADC = \angle CAD$$

$$\Rightarrow 106^{\circ} + \angle CAD + \angle CAD = 180^{\circ}[\text{From (ii)}]$$

$$\Rightarrow 2\angle CAD = 74^{\circ}$$

$$\Rightarrow \angle CAD = 37^{\circ} = \angle ADC \dots\dots(iii)$$

Now,

$$\angle BAD = 110^{\circ}[\text{Given}]$$

$$\angle BAC + \angle CAD = 110^{\circ}$$

$$\angle BAC + 37^{\circ} = 110^{\circ}$$

$$\angle BAC = 73^{\circ} \dots\dots(iv)$$

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In $\triangle ABC$,

$$\angle B + \angle BAC + \angle ACB = 180^\circ$$

$$\Rightarrow \angle B + 73^\circ + 74^\circ = 180^\circ \text{ [From (i) and (iv)]}$$

$$\Rightarrow \angle B + 147^\circ = 180^\circ$$

$$\Rightarrow \angle B = 33^\circ \dots\dots\dots(v)$$

$$\therefore \angle BAC > \angle B \quad \text{[From (iv) and (v)]}$$

$$\Rightarrow BC > AC$$

But,

$$AC = CD \quad \text{[Given]}$$

$$\Rightarrow BC > CD$$

Solution 10:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>

(i) $\angle ADC + \angle ADB = 180^\circ$ [BDC is a straight line]

$\angle ADC = 90^\circ$ [Given]

$$90^\circ + \angle ADB = 180^\circ$$

$$\angle ADB = 90^\circ \dots\dots\dots(i)$$

In $\triangle ADB$,

$$\angle ADB = 90^\circ \text{ [From (i)]}$$

$$\therefore \angle B + \angle BAD = 90^\circ$$

Therefore, $\angle B$ and $\angle BAD$ are both acute, that is less than 90° .

$\therefore AB > BD \dots\dots(ii)$ [Side opposite 90° angle is greater than side opposite acute angle]

(ii) In $\triangle ADC$,

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

$$\therefore \angle C + \angle DAC = 90^\circ$$

Therefore, $\angle C$ and $\angle DAC$ are both acute, that is less than 90° .

$\therefore AC > CD \dots\dots(iii)$ [Side opposite 90° angle is greater than side opposite acute angle]

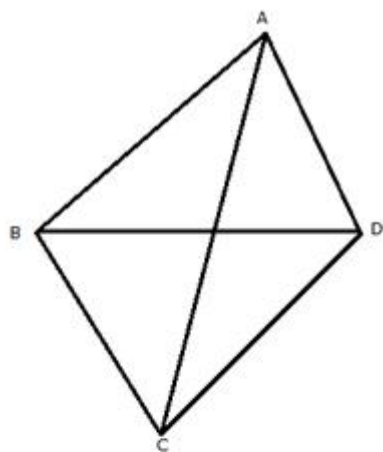
Adding (ii) and (iii)

$$AB + AC > BD + CD$$

$$\Rightarrow AB + AC > BC$$

Solution 11:

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Const: Join AC and BD.

(i) In $\triangle ABC$,

$AB + BC > AC$(i) [Sum of two sides is greater than the third side]

In $\triangle ACD$,

$AC + CD > DA$(ii) [Sum of two sides is greater than the third side]

Adding (i) and (ii)

$$AB + BC + AC + CD > AC + DA$$

$$AB + BC + CD > AC + DA - AC$$

$$AB + BC + CD > DA \text{(iii)}$$

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(ii) In $\triangle ACD$,

$CD + DA > AC$(iv) [Sum of two sides is greater than the third side]

Adding (i) and (iv)

$$AB + BC + CD + DA > AC + AC$$

$$AB + BC + CD + DA > 2AC$$

(iii) In $\triangle ABD$,

$AB + DA > BD$(v) [Sum of two sides is greater than the third side]

In $\triangle BCD$,

$BC + CD > BD$(vi) [Sum of two sides is greater than the third side]

Adding (v) and (vi)

$$AB + DA + BC + CD > BD + BD$$

$$AB + DA + BC + CD > 2BD$$

Solution 12:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>

(i) In $\triangle ABC$,

$AB = BC = CA$ [ABC is an equilateral triangle]

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

$$\therefore \angle A = \angle B = \angle C = \frac{180^\circ}{3}$$

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

In $\triangle ABP$,

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

$$\angle ABP < 60^\circ$$

$$\therefore \angle A > \angle ABP$$

$$\Rightarrow BP > PA$$

[Side opposite to greater side is greater]

(ii) In $\triangle BPC$,

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

$$\angle CBP < 60^\circ$$

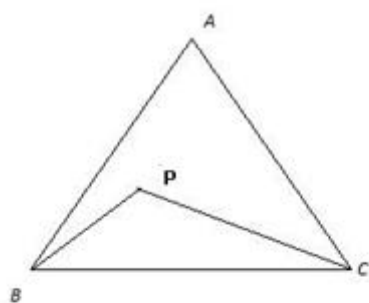
$$\therefore \angle C > \angle CBP$$

$$\Rightarrow BP > PC$$

[Side opposite to greater side is greater]

Solution 13:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>



Let $\angle PBC = x$ and $\angle PCB = y$

then,

$$\angle BPC = 180^\circ - (x + y) \dots\dots\dots(i)$$

Let $\angle ABP = a$ and $\angle ACP = b$

then,

$$\angle BAC = 180^\circ - (x + a) - (y + b)$$

$$\Rightarrow \angle BAC = 180^\circ - (x + y) - (a + b)$$

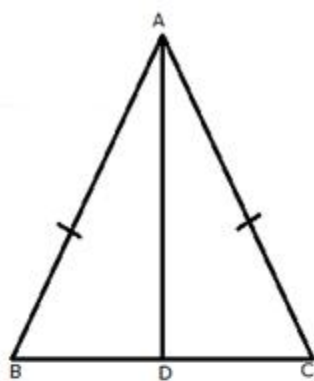
$$\Rightarrow \angle BAC = \angle BPC - (a + b)$$

$$\Rightarrow \angle BPC = \angle BAC + (a + b)$$

$$\Rightarrow \angle BPC > \angle BAC$$

Solution 14:

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We know that exterior angle of a triangle is always greater than each of the interior opposite angles.

$\therefore$ In $\triangle ABD$,

$$\angle ADC > \angle B \dots\dots(i)$$

In $\triangle ABC$,

$$AB = AC$$

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

From (i) and (ii)

$$\angle ADC > \angle C$$

(i) In $\triangle ADC$,

$$\angle ADC > \angle C$$

$$\therefore AC > AD \dots\dots(iii) \text{ [side opposite to greater angle is greater]}$$

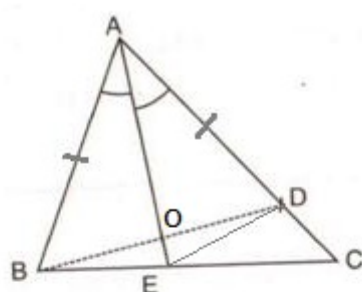
(ii) In $\triangle ABC$,

$$AB = AC$$

$$\Rightarrow AB > AD \text{ [From (iii)]}$$

Solution 15:

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Const: Join ED.

In $\triangle AOB$ and $\triangle AOD$,

$AB = AD$ [Given]

$AO = AO$ [Common]

$\angle BAO = \angle DAO$ [AO is bisector of $\angle A$]

$\therefore \triangle AOB \cong \triangle AOD$ [SAS criterion]

Hence,

$BO = OD$ (i) [cpct]

$\angle AOB = \angle AOD$ (ii) [cpct]

$\angle ABO = \angle ADO \Rightarrow \angle ABD = \angle ADB$ (iii) [cpct]

Now,

$\angle AOB = \angle DOE$ [Vertically opposite angles]

$\angle AOD = \angle BOE$ [Vertically opposite angles]

$\Rightarrow \angle BOE = \angle DOE$ (iv) [From (ii)]

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(i) In $\triangle BOE$ and $\triangle DOE$,

$BO = CD$ [From (i)]

$OE = OE$ [Common]

$\angle BOE = \angle DOE$ [From (iv)]

$\therefore \triangle BOE \cong \triangle DOE$ [SAS criterion]

Hence, $BE = DE$ [cpct]

(ii) In $\triangle BCD$,

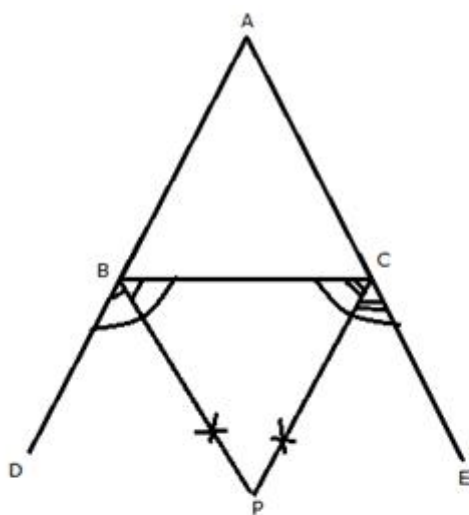
$\angle ADB = \angle C + \angle CBD$ [Ext. angle = sum of opp. int. angles]

$\Rightarrow \angle ADB > \angle C$

$\Rightarrow \angle ABD > \angle C$ [From (iii)]

Solution 16:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>



In $\triangle ABC$,

$AB > AC$,

$\Rightarrow \angle ABC < \angle ACB$

$\therefore 180^\circ - \angle ABC > 180^\circ - \angle ACB$

$\Rightarrow \frac{180^\circ - \angle ABC}{2} > \frac{180^\circ - \angle ACB}{2}$

$\Rightarrow 90^\circ - \frac{1}{2}\angle ABC > 90^\circ - \frac{1}{2}\angle ACB$

$\Rightarrow \angle CBP > \angle BCP$ [BP is bisector of $\angle CBD$
and CP is bisector of $\angle BCE$]

$\Rightarrow PC > PB$ [side opposite to greater angle is greater]

Solution 17:

Since AB is the largest side and BC is the smallest side of the triangle ABC

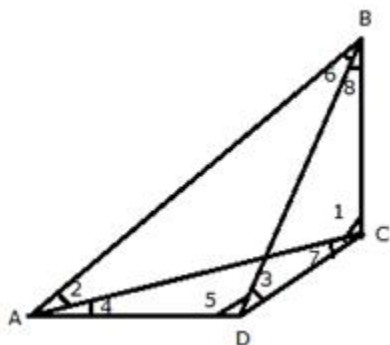
$$AB > AC > BC$$

$$\Rightarrow 180^\circ - z^\circ > 180^\circ - y^\circ > 180^\circ - x^\circ$$

$$\Rightarrow -z^\circ > -y^\circ > -x^\circ$$

$$\Rightarrow z^\circ < y^\circ < x^\circ$$

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Solution 18:


In the quad. ABCD,

Since AB is the longest side and DC is the shortest side.

$$(i) \angle 1 > \angle 2 [AB > BC]$$

$$\angle 7 > \angle 4 [AD > DC]$$

$$\therefore \angle 1 + \angle 7 > \angle 2 + \angle 4$$

$$\Rightarrow \angle C > \angle A$$

$$(ii) \angle 5 > \angle 6 [AB > AD]$$

$$\angle 3 > \angle 8 [BC > CD]$$

$$\therefore \angle 5 + \angle 3 > \angle 6 + \angle 8$$

$$\Rightarrow \angle D > \angle B$$

Solution 19:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>

(i) Since $AB > AC$

$$\angle ACB > \angle ABC$$

$$\Rightarrow 180^\circ - z > 180^\circ - y$$

$$\Rightarrow -z > -y$$

$$\Rightarrow z < y \dots \dots (i)$$

Also since $AC > BC$

$$\angle ABC > \angle BAC$$

$$\Rightarrow 180^\circ - y > 180^\circ - x$$

$$\Rightarrow -y > -x$$

$$\Rightarrow y < x \dots \dots (ii)$$

From (i) and (ii)

$$z < y < x$$

(ii) $y > x > z$ [Given]

Taking $y > x$

$$\Rightarrow (180^\circ - \angle ABC) > (180^\circ - \angle BAC)$$

$$\Rightarrow -\angle ABC > -\angle BAC$$

$$\Rightarrow \angle ABC < \angle BAC$$

$$\Rightarrow AC < BC \dots\dots\dots (i)$$

Again taking $x > z$

$$\Rightarrow (180^\circ - \angle BAC) > (180^\circ - \angle ACB)$$

$$\Rightarrow -\angle BAC > -\angle ACB$$

$$\Rightarrow \angle BAC < \angle ACB$$

$$\Rightarrow BC < AB \dots\dots\dots (ii)$$

From (i) and (ii)

$$AC < BC < AB$$

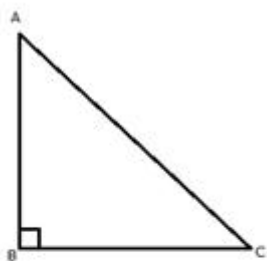
Writing in descending order

$$AB > BC > AC$$

Solution 20:

<https://www.indcareer.com/schools/selina-class-9-icse-solutions-mathematics-chapter-11-inequalities/>

(i)



$$\therefore \angle B = 90^\circ \quad [\text{Given}]$$

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

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

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

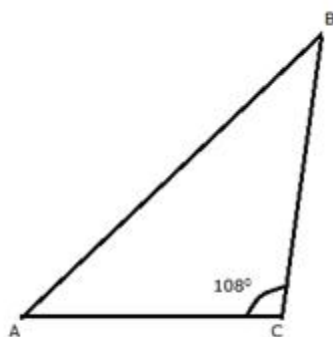
$$\Rightarrow \angle A < 90^\circ \text{ and } \angle C < 90^\circ$$

$$\text{Hence, } \angle B > \angle A \Rightarrow AC > BC$$

$$\text{Similarly, } \angle B > \angle C \Rightarrow AC > AB$$

Hence, hypotenuse is the greatest side.

(ii)



$$\therefore \angle ACB = 108^\circ \quad [\text{Given}]$$

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

$$\Rightarrow \angle A + \angle B + 108^\circ = 180^\circ$$

$$\Rightarrow \angle A + \angle B = 72^\circ$$

$$\Rightarrow \angle A < 72^\circ \text{ and } \angle B < 72^\circ$$

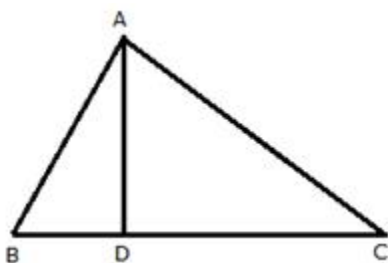
Hence, $\angle ACB > \angle A \Rightarrow AB > BC$

Similarly, $\angle ACB > \angle B \Rightarrow AB > AC$

Therefore, AB is the largest side.

Solution 21:

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In $\triangle ABD$,

$$AB + BD > AD \text{(i)}$$

In $\triangle ACD$,

$$AC + DC > AD \text{(ii)}$$

Adding (i) and (ii)

$$AB + BD + AC + DC > 2AD$$

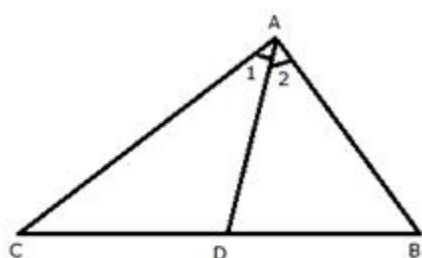
$$AB + BD + DC + AC > 2AD$$

$$AB + BC + AC > 2AD$$

Solution 22:

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In $\triangle ADC$,

$$\angle ADB = \angle 1 + \angle C \dots\dots\dots(i)$$

In $\triangle ADB$,

$$\angle ADC = \angle 2 + \angle B \dots\dots\dots(ii)$$

But $AC > AB$ [Given]

$$\Rightarrow \angle B > \angle C$$

Also given, $\angle 2 = \angle 1$ [AD is bisector of $\angle A$]

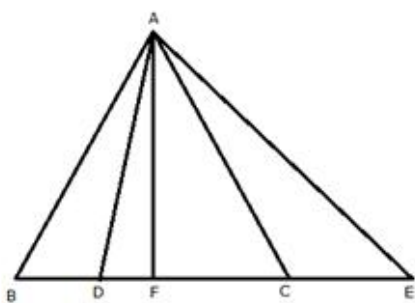
$$\Rightarrow \angle 2 + \angle B > \angle 1 + \angle C \dots\dots\dots(iii)$$

From (i), (ii) and (iii)

$$\Rightarrow \angle ADC > \angle ADB$$

Solution 23:

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We know that the bisector of the angle at the vertex of an isosceles triangle bisects the base at right angle.

Using Pythagoras theorem in $\triangle AFB$,

$$AB^2 = AF^2 + BF^2 \dots\dots\dots(i)$$

In $\triangle AFD$,

$$AD^2 = AF^2 + DF^2 \dots\dots\dots(ii)$$

We know ABC is isosceles triangle and $AB = AC$

$$AC^2 = AF^2 + BF^2 \dots\dots\dots(iii) [\text{From (i)}]$$

Subtracting (ii) from (iii)

$$AC^2 - AD^2 = AF^2 + BF^2 - AF^2 - DF^2$$

$$AC^2 - AD^2 = BF^2 - DF^2$$

$$\text{Let } 2DF = BF$$

$$AC^2 - AD^2 = (2DF)^2 - DF^2$$

$$AC^2 - AD^2 = 4DF^2 - DF^2$$

$$AC^2 = AD^2 + 3DF^2$$

$$\Rightarrow AC^2 > AD^2$$

$$\Rightarrow AC > AD$$

Similarly, $AE > AC$ and $AE > AD$.

Solution 24:

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The sum of any two sides of the triangle is always greater than the third side of the triangle.

In $\triangle CEB$,

$$CE + EB > BC$$

$$\Rightarrow DE + EB > BC \quad [CE = DE]$$

$$\Rightarrow DB > BC \dots\dots(i)$$

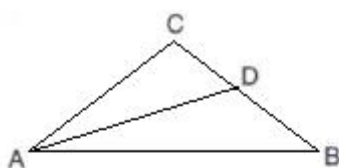
In $\triangle ADB$,

$$AD + AB > BD$$

$$\Rightarrow AD + AB > BD > BC \quad [\text{from}(i)]$$

$$\Rightarrow AD + AB > BC$$

Solution 25:



Given that, $AB > AC$

$$\Rightarrow \angle C > \angle B \dots\dots(i)$$

Also in $\triangle ADC$

$$\angle ADB = \angle DAC + \angle C \quad [\text{Exterior angle}]$$

$$\Rightarrow \angle ADB > \angle C$$

$$\Rightarrow \angle ADB > \angle C > \angle B \quad [\text{From}(i)]$$

$$\Rightarrow \angle ADB > \angle B$$

$$\Rightarrow AB > AD$$

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