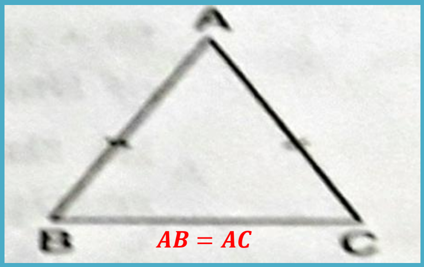
General instructions for Students: Whatever be the notes provided, everything must be copied in the Maths copy and then do the HOMEWORK in the same copy.

ISOSCELES TRIANGLE –

A triangle having two sides equal is called an isosceles triangle.

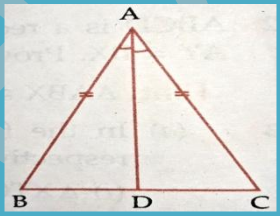


Theorem 10.1 **Statement:** *The angles opposite to equal sides of an isosceles triangle are equal.*

Given: In $\triangle ABC$, $AB = AC$

To Prove: $\angle B = \angle C$

Construction: Draw AD bisector of $\angle A$ to meet BC at D.



Proof: In $\triangle ABD$ and $\triangle ACD$,

$AB = AC$ (Given)

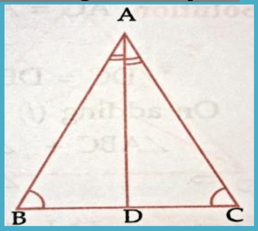
$\angle BAD = \angle CAD$ (By const.)

$AD = AD$ (common)

$\therefore \triangle ABD \cong \triangle ACD$ (SAS congruence rule)

$\therefore \angle B = \angle C$ (C.P.C.T.) **Proved**

Theorem 10.2 **Statement:** *The sides opposite to equal angles of a triangle are equal.*



Given: In $\triangle ABC$, $\angle B = \angle C$

To Prove: $AB = AC$

Construction: Draw AD bisector of $\angle A$ to meet BC at D.

Proof: In $\triangle ABD$ and $\triangle ACD$,

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

$\angle BAD = \angle CAD$ (By const.)

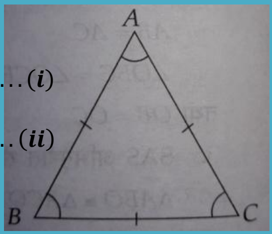
$AD = AD$ (common)

$\therefore \triangle ABD \cong \triangle ACD$ (AAS congruence rule)

$\therefore AB = AC$ (C.P.C.T.) **Proved.**

EXERCISE – 10.3

Q.No.2 Show that the angles of an equilateral triangle are 60° each.



Solution: In $\triangle ABC$, $AB = AC \implies \angle C = \angle B$ ($\angle s$ *opp. to equal sides are equal*) ……(i)

$AB = BC \implies \angle C = \angle A$ ($\angle s$ *opp. to equal sides are equal*) …..(ii)

From (i) *and* (ii), $\angle A = \angle B = \angle C$ ………………(iii)

We know that, $\angle A + \angle B + \angle C = 180°$ (*Angles sum prop. of a triangle*)

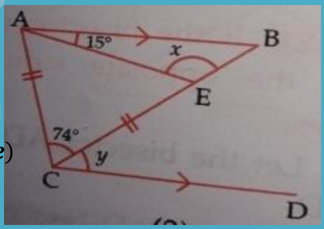
$\implies \angle A + \angle A + \angle A = 180°$ [*By* (iii)]

$\implies 3\angle A = 180°$

$\implies \angle A = 60°$

$\therefore \angle A = \angle B = \angle C = 60°$ *Proved.*

Q.No.6(c) In the figure, $AB \parallel CD$ and $CA = CE$. If $\angle ACE = 74°$ and $\angle BAE = 15°$, find the vaiues of x and y.



Solution: In $\triangle ACE$, $CA = CE$

$\angle CAE = \angle CEA$ ($\angle s$ *opp. to equal sides are equal*) … ….(i)

Now, $74° + \angle CAE + \angle CEA = 180°$ (*Angles sum prop. of a triangle*)

$\implies 74° + \angle CAE + \angle CAE = 180°$ [*By* (i)]

$\implies \angle CAE = 53° = \angle CEA$

Now, $\angle CEA + x = 180°$ (*linear pair*)

$\implies 53° + x = 180°$

$\implies x = 127°$

$\because$ $AB \parallel CD$ *and* AC *is a transversal*

$\therefore \angle CAB + \angle ACD = 180°$

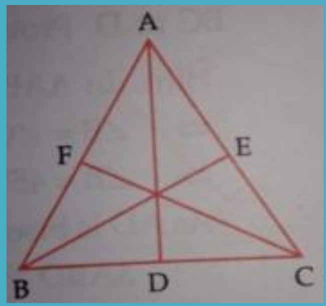
$\implies \angle CAE + \angle EAB + \angle ACE + \angle ECD = 180°$

$\implies 53° + 15° + 74° + y = 180°$

$\implies y = 38°$

Thus, $x = 127°$ *and* $y = 38°$ *Ans.*

Q.No.10 *In the adjoining figure, AD, BE and CF are altitudes of* $\triangle ABC$.



If $AD = BE = CF$, *prove that ABC is an equilateral triangle.*

Solution: In $\triangle ABE$ and $\triangle ACF$,

$BE = CF$ (Given)

$\angle AEB = \angle AFC$ $(= 90°)$

$\angle BAE = \angle CAF$ (Common)

$\therefore$ $\triangle ABD \cong \triangle ACD$ (AAS congruence rule)

$\therefore$ $AB = AC$ (C.P.C.T.) ……………….(i)

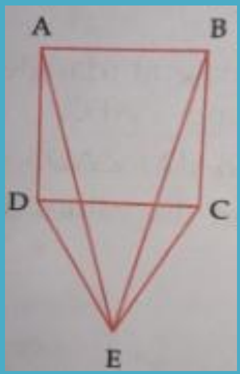
Similarly, $\triangle BCF \cong \triangle BDA$ (AAS congruence rule)

$\therefore$ $BC = AB$ (C.P.C.T.) …………………(ii)

From (i) and (ii), $AB = BC = CA$

Hence, ABC is an equilateral triangle. **Proved.**

Q.No.14(a) *In the figure, CDE is an equilateral triangle formed on a side CD of a square ABCD.*



Show that $\triangle ADE \cong \triangle BCE$ *and hence, AEB is an isosceles triangle.*

Solution : $\angle ADE = \angle ADC + \angle CDE$

$\angle ADE = 90° + 60° = 150°$ $(\angle ADC = 90°$ and $\angle CDE = 60°)$

Similarly, $\angle BCE = 150°$

In $\triangle ADE$ and $\triangle BCE$,

$AD = BC$ (ABCD is a square)

$\angle ADE = \angle BCE$ $(= 150°)$

$DE = CE$ (CDE is an equilateral triangle)

$\therefore$ $\triangle ADE \cong \triangle BCE$ (SAS congruence rule)

$\therefore$ $AE = BE$ (C.P.C.T.)

Hence, AEB is an isosceles triangle. **Proved.**

HOMEWORK

EXERCISE – 10.3

QUESTION NUMBERS: 3, 5(ii), (iii) ; 6(a), (b); 9, 11, 13 and 15