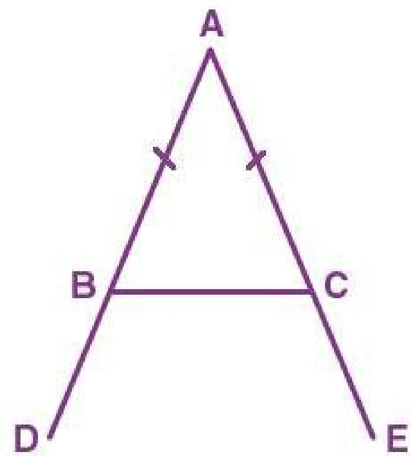
Exercise 10(B)

1. If the equal sides of an isosceles triangle are produced, prove that the exterior angles so formed are obtuse and equal.

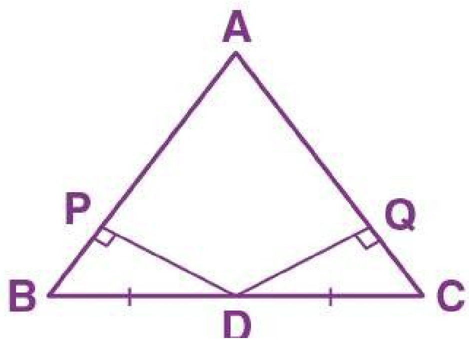
Solution:



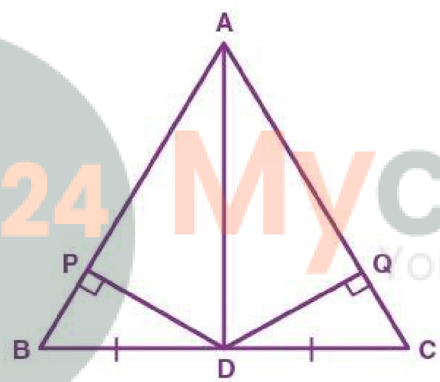
Construction: AB is produced to D and AC is produced to E so that exterior angles ∠DBC and ∠ECB are formed.

In △ABC, we have
AB = AC [Given]
∴ ∠C = ∠B …(i) [Angles opposite to equal sides are equal]
Since, ∠B and ∠C are acute they cannot be right angles or obtuse angles
Now,
∠ABC + ∠DBC = 180^0 [ABD is a straight line]
∠DBC = 180^0 - ∠ABC
∠DBC = 180^0 - ∠B …(ii)
Similarly,
∠ACB + ECB = 180^0 [ABD is a straight line]
∠ECB = 180^0 - ∠ACB
∠ECB = 180^0 - ∠C …(iii)
∠ECB = 180^0 - ∠B …(iv) [from (i) and (iii)]
∠DBC = ∠ECB [from (ii) and (iv)]
Now,
∠DBC = 180^0 - ∠B
But, ∠B is an acute angle
⇒ ∠DBC = 180^0 – (acute angle) = obtuse angle
Similarly,
∠ECB = 180^0 - ∠C
But, ∠C is an acute angle
⇒ ∠ECB = 180^0 – (acute angle) = obtuse angle
Therefore, exterior angles formed are obtuse and equal.

2. In the given figure, AB = AC. Prove that:



(i) DP = DQ
(ii) AP = AQ
(iii) AD bisects ∠A
Solution:



Construction: Join AD.
In △ABC, we have
AB = AC [Given]
∴ ∠C = ∠B …(i) [Angles opposite to equal sides are equal]
(i) In △BPD and △CQD, we have
∠BPD = ∠CQD [Each = 90°]
∠B = ∠C [Proved]
BD = DC [Given]
Thus, △BPD ≅ △CQD by AAS congruence criterion
∴ DP = DQ by CPCT

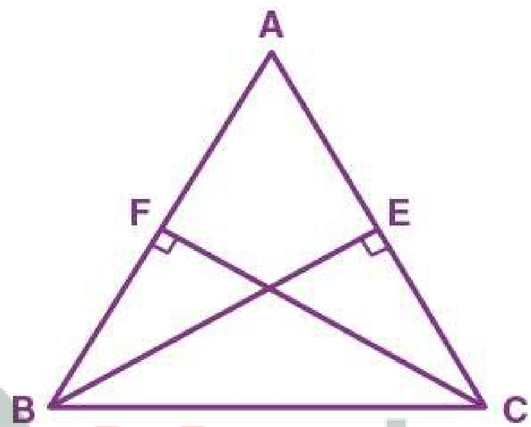
(ii) Since, △BPD ≅ △CQD
Therefore, BP = CQ [CPCT]
Now,
AB = AC [Given]
AB - BP = AC - CQ
AP = AQ

(iii) In △APD and △AQD, we have

DP = DQ [Proved]
AD = AD [Common]
AP = AQ [Proved]
Thus, △APD ≅ △AQD by SSS congruence criterion
∠PAD = ∠QAD by CPCT
Hence, AD bisects angle A.

3.

4. In triangle ABC, AB = AC; BE ⊥ AC and CF ⊥ AB. Prove that:

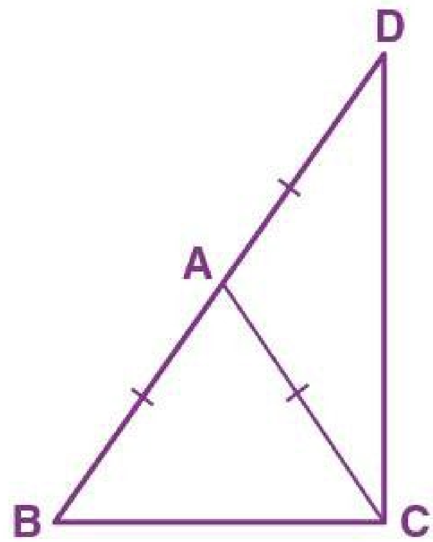


(i) BE = CF
(ii) AF = AE
Solution:

(i) In △AEB and △AFC, we have
∠A = ∠A [Common]
∠AEB = ∠AFC = 90° [Given : BE ⊥ AC and CE ⊥ AB]
AB = AC [Given]
Thus, △AEB ≅ △AFC by AAS congruence criterion
∴ BE = CF by CPCT

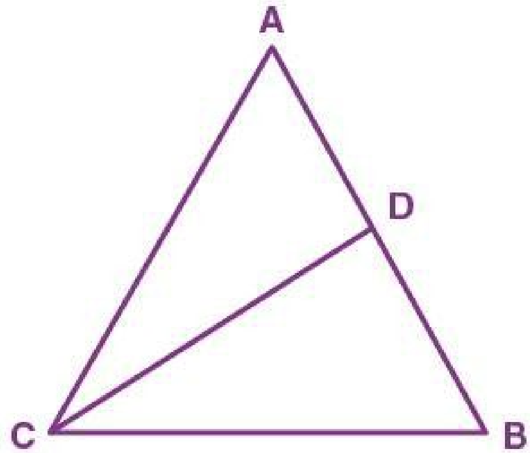
(ii) Since, △AEB ≅ △AFC
∠ABE = ∠AFC
∴ AF= AE by CPCT

5. In isosceles triangle ABC, AB = AC. The side BA is produced to D such that BA = AD. Prove that: ∠BCD = 90°
Solution:



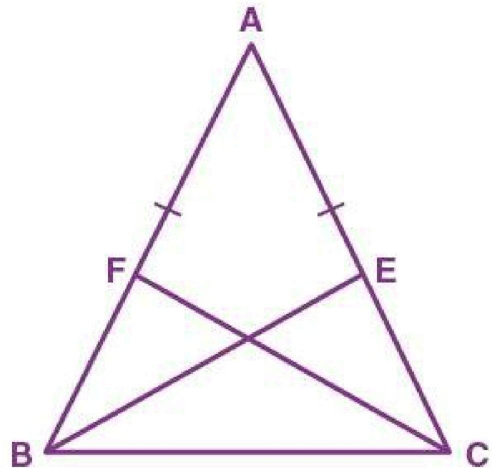
Construction: Join CD.
In $\triangle ABC$, we have
AB = AC [Given]
$\therefore \angle C = \angle B$ … (i) [Angles opposite to equal sides are equal]
In $\triangle ACD$, we have
AC = AD [Given]
$\therefore \angle ADC = \angle ACD$ … (ii)
Adding (i) and (ii), we get
$\angle B + \angle ADC = \angle C + \angle ACD$
$\angle B + \angle ADC = \angle BCD$ … (iii)
In $\triangle BCD$, we have
$\angle B + \angle ADC + \angle BCD = 180^o$
$\angle BCD + \angle BCD = 180^o$ [From (iii)]
$2\angle BCD = 180^o$
$\therefore \angle BCD = 90^o$

6. (i) In $\triangle ABC$, AB = AC and $\angle A = 36°$. If the internal bisector of $\angle C$ meets AB at point D, prove that AD = BC.
(ii) If the bisector of an angle of a triangle bisects the opposite side, prove that the triangle is isosceles.
Solution:



Given, AB = AC and ∠A = 36^o
So, ∆ABC is an isosceles triangle.
∠B = ∠C = $(180^0 – 36^o)/2 = 72^o$
∠ACD = ∠BCD = 36^o [∵ CD is the angle bisector of ∠C]
Now, ∆ADC is an isosceles triangle as ∠DAC = ∠DCA = 36^o
∴ AD = CD …(i)
In ∆DCB, by angle sum property we have
∠CDB = 180^o – (∠DCB + ∠DBC)
= $180^o – (36^o + 72^o)$
= $180^o - 108^o$
= 72^o
Now, ∆DCB is an isosceles triangle as ∠CDB = ∠CBD = 72^o
∴ DC = BC …(ii)
From (i) and (ii), we get
AD = BC
- Hence Proved.

7. Prove that the bisectors of the base angles of an isosceles triangle are equal.
Solution:



In ∆ABC, we have

AB = AC [Given]

∴ ∠C = ∠B …(i) [Angles opposite to equal sides are equal]

½∠C = ½∠B

⇒ ∠BCF = ∠CBE …(ii)

Now, in ∆BCE and ∆CBF, we have

∠C = ∠B [From (i)]

∠BCF = ∠CBE [From (ii)]

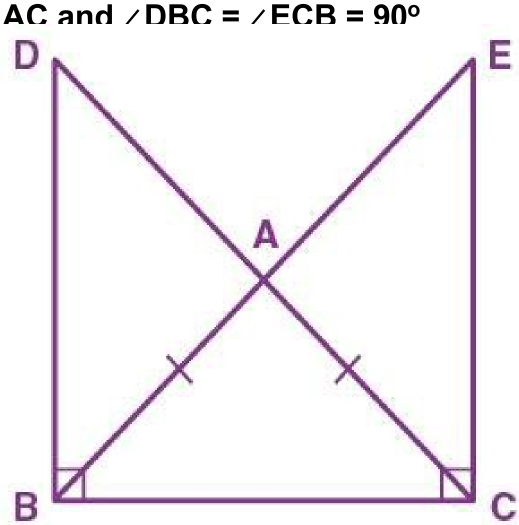
BC = BC [Common]

∴ ∆BCE ≅ ∆CBF by AAS congruence criterion

Thus, BE = CF by CPCT

8.

9. **In the given figure, AB = AC and ∠DBC = ∠ECB = 90º**



Prove that:

(i) BD = CE

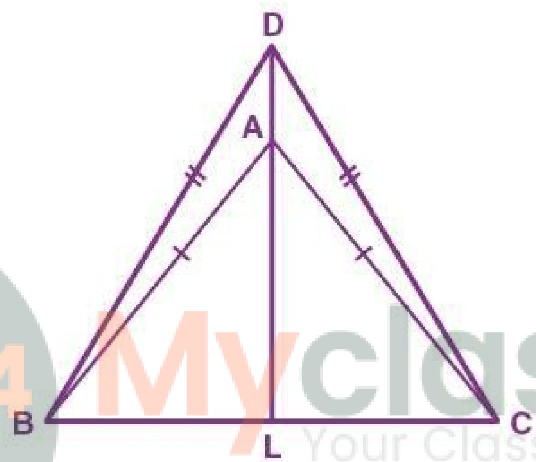
(ii) AD = AE

Solution:

In △ABC, we have
AB = AC [Given]
∴ ∠ACB = ∠ABC [Angles opposite to equal sides are equal]
⇒ ∠ABC = ∠ACB … (i)
∠DBC = ∠ECB = 90° [Given]
⇒ ∠DBC = ∠ECB …(ii)
Subtracting (i) from (ii), we get
∠DCB - ∠ABC = ∠ECB - ∠ACB
∠DBA = ∠ECA … (iii)
Now,
In ΔDBA and ΔECA, we have
∠DBA = ∠ECA [From (iii)]
∠DAB = ∠EAC [Vertically opposite angles]
AB = AC [Given]

∴ ΔDBA ≅ ΔECA by ASA congruence criterion
Thus, by CPCT
BD = CE
And, also
AD = AE

10. ABC and DBC are two isosceles triangles on the same side of BC. Prove that:
(i) DA (or AD) produced bisects BC at right angle.
(ii) ∠BDA = ∠CDA.
Solution:



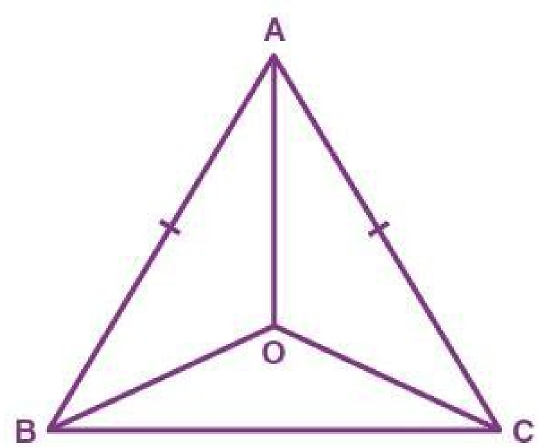
DA is produced to meet BC in L
In ΔABC, we have
AB = AC [Given]
∴ ∠ACB = ∠ABC … (i) [Angles opposite to equal sides are equal]
In ΔDBC, we have
DB = DC [Given]
∴ ∠DCB = ∠DBC … (ii) [Angles opposite to equal sides are equal]
Subtracting (i) from (ii), we get
∠DCB - ∠ACB = ∠DBC - ∠ABC
∠DCA = ∠DBA …(iii)

Now,
In ΔDBA and ΔDCA, we have
DB = DC [Given]
∠DBA = ∠DCA [From (iii)]
AB = AC [Given]
∴ ΔDBA ≅ ΔDCA by SAS congruence criterion
∠BDA = ∠CDA …(iv) [By CPCT]
In ΔDBA, we have
∠BAL = ∠DBA + ∠BDA …(v) [Exterior angle = sum of opposite interior angles]

From (iii), (iv) and (v), we get
∠BAL = ∠DCA + ∠CDA …(vi) [Exterior angle = sum of opposite interior angles]
In ∆DCA, we have
∠CAL = ∠DCA + ∠CDA …(vi)
From (vi) and (vii)
∠BAL = ∠CAL …(viii)

In ∆BAL and ∆CAL,
∠BAL = ∠CAL [From (viii)]
∠ABL = ∠ACL [From (i)
AB = AC [Given]
∴ ∆BAL ≅ ∆CAL by ASA congruence criterion
So, by CPCT
∠ALB = ∠ALC
And, BL = LC …(ix)
Now,
∠ALB + ∠ALC = 180°
∠ALB + ∠ALB = 180° [Using (ix)]
2∠ALB = 180°
∠ALB = 90°
∴ AL ⊥ BC
Or DL ⊥ BC and BL ⊥ LC
Therefore, DA produced bisects BC at right angle.

11. The bisectors of the equal angles B and C of an isosceles triangle ABC meet at O. Prove that AO bisects angle A.
Solution:



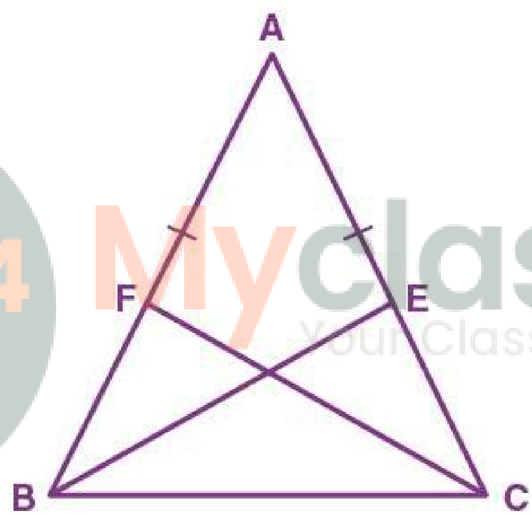
In ∆ABC, we have AB = AC
∠B = ∠C [Angles opposite to equal sides are equal]
½∠B = ½∠C
∠OBC = ∠OCB …(i)

⇒ OB = OC …(ii) [Sides opposite to equal angles are equal]

Now,
In ∆ABO and ∆ACO, we have
AB = AC [Given]
∠OBC = ∠OCB [From (i)]
OB = OC [From (ii)]
Thus, ∆ABO ≅ ∆ACO by SAS congruence criterion
So, by CPCT
∠BAO = ∠CAO
Therefore, AO bisects ∠BAC.

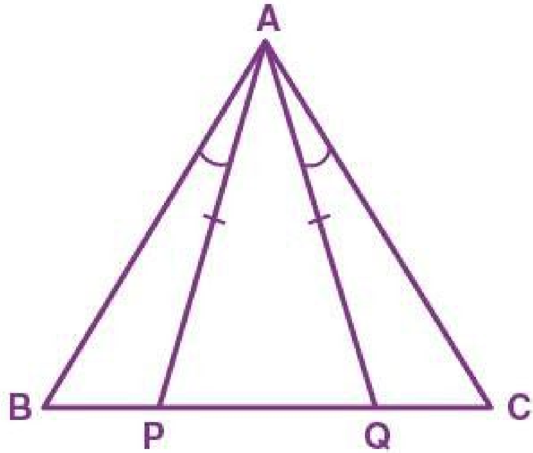
12. Prove that the medians corresponding to equal sides of an isosceles triangle are equal.

Solution:



In ∆ABC, we have
AB = AC [Given]
∠C = ∠B … (i) [Angles opposite to equal sides are equal]
Now,
½ AB = ½ AC
BF = CE … (ii)
In ∆BCE and ∆CBF, we have
∠C = ∠B [From (i)]
BF = CE [From (ii)]
BC = BC [Common]
∴ ∆BCE ≅ ∆CBF by SAS congruence criterion
So, CPCT
BE = CF

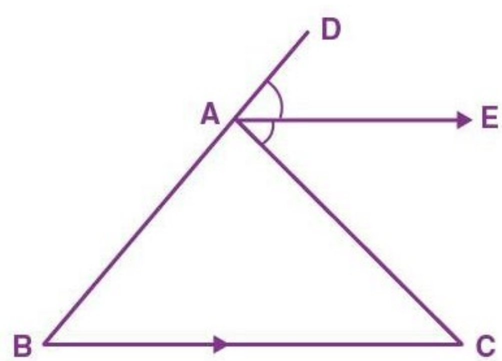
13. Use the given figure to prove that, AB = AC.



Solution:

In △APQ, we have
AP = AQ [Given]
∴ ∠APQ = ∠AQP …(i) [Angles opposite to equal sides are equal]
In △ABP, we have
∠APQ = ∠BAP + ∠ABP …(ii) [Exterior angle is equal to sum of opposite interior angles]
In △AQC, we have
∠AQP = ∠CAQ + ∠ACQ …(iii) [Exterior angle is equal to sum of opposite interior angles]
From (i), (ii) and (iii), we get
∠BAP + ∠ABP = ∠CAQ + ∠ACQ
But, ∠BAP = ∠CAQ [Given]
∠CAQ + ABP = ∠CAQ + ∠ACQ
∠ABP = ∠CAQ + ∠ACQ - ∠CAQ
∠ABP = ∠ACQ
∠B = ∠C
So, in △ABC, we have
∠B = ∠C
⇒ AB = AC [Sides opposite to equal angles are equal]

14. In the given figure; AE bisects exterior angle CAD and AE is parallel to BC. Prove that: AB = AC.



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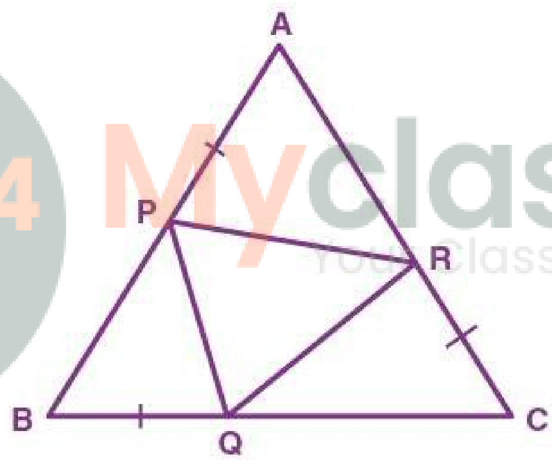
Solution:

Since, AE || BC and DAB is the transversal
∴ ∠DAE = ∠ABC = ∠B [Corresponding angles]
Since, AE || BC and AC is the transversal
∠CAE = ∠ACB = ∠C [Alternate angles]
But, AE bisects ∠CAD
∴ ∠DAE = ∠CAE
∠B = ∠C
⇒ AB = AC [Sides opposite to equal angles are equal]

15. In an equilateral triangle ABC; points P, Q and R are taken on the sides AB, BC and CA respectively such that AP = BQ = CR. Prove that triangle PQR is equilateral.
Solution:

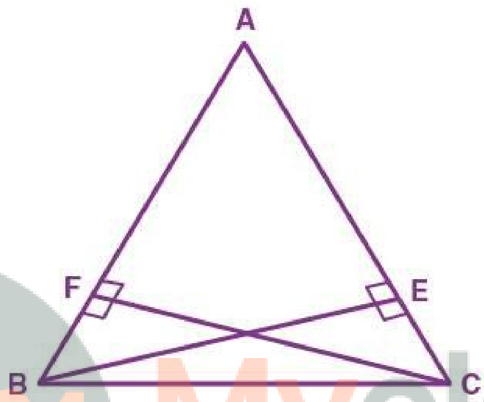


Given, AB = BC = CA (Since, ABC is an equilateral triangle) …(i)
and AP = BQ = CR …(ii)
Subtracting (ii) from (i), we get
AB - AP = BC - BQ = CA - CR
BP = CQ = AR …(iii)
∴ ∠A = ∠B = ∠C …(iv) [Angles opposite to equal sides are equal]
In ΔBPQ and ΔCQR, we have
BP = CQ [From (iii)]
∠B = ∠C [From (iv)]
BQ = CR [Given]
∴ ΔBPQ ≅ ΔCQR by SAS congruence criterion
So, PQ = QR [by CPCT] … (v)

In ΔCQR and ΔAPR, we have
CQ = AR [From (iii)]
∠C = ∠A [From (iv)]

CR = AP [Given]
∴ ΔCQR ≅ ΔAPR by SAS congruence criterion
So, QR = PR [By CPCT] … (vi)
From (v) and (vi), we get
PQ = QR = PR
Therefore, PQR is an equilateral triangle.

16. In triangle ABC, altitudes BE and CF are equal. Prove that the triangle is isosceles.
Solution:



In ΔABE and ΔACF, we have
∠A = ∠A [Common]
∠AEB = ∠AFC = 90^0 [Given: BE ⊥ AC and CF ⊥ AB]
BE = CF [Given]
∴ ΔABE ≅ ΔACF by AAS congruence criterion
So, by CPCT
AB = AC
Therefore, ABC is an isosceles triangle.

17. Through any point in the bisector of angle, a straight line is drawn parallel to either arm of the angle. Prove that the triangle so formed is isosceles.
Solution:

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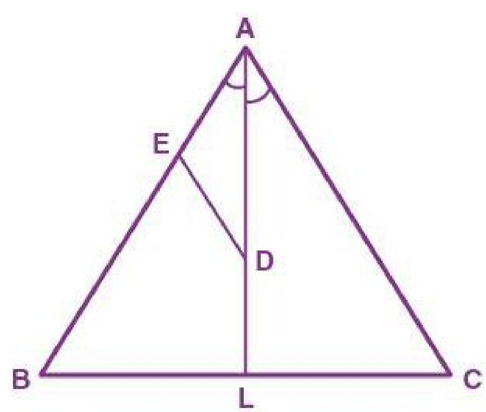
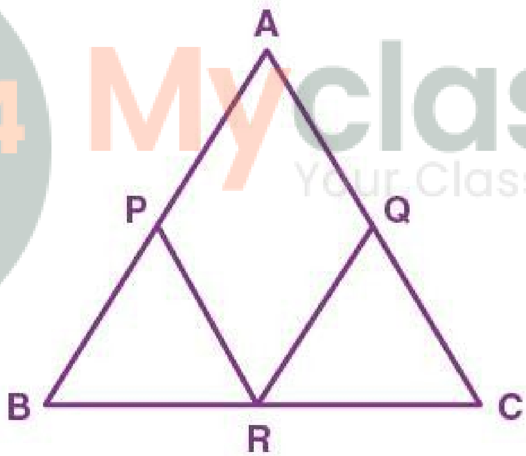


Let's consider ∆ABC, AL is bisector of ∠A.
Let D is any point on AL.
From D, a straight-line DE is drawn parallel to AC.
DE || AC [Given]
So, ∠ADE = ∠DAC ...(i) [Alternate angles]
∠DAC = ∠DAE … (ii) [AL is bisector of ∠A]
From (i) and (ii), we get
∠ADE = ∠DAE
∴ AE = ED [Sides opposite to equal angles are equal]
Therefore, AED is an isosceles triangle.

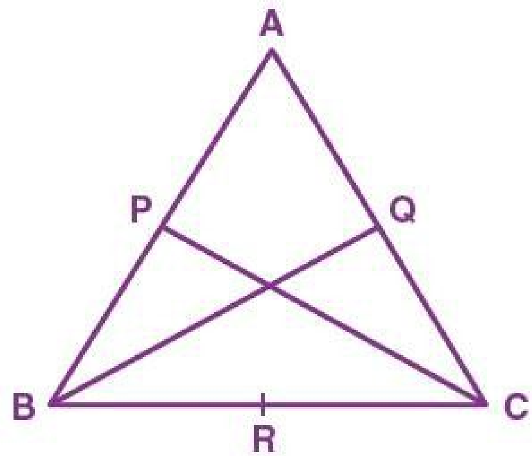
18. In triangle ABC; AB = AC. P, Q and R are mid-points of sides AB, AC and BC respectively. Prove that:
(i) PR = QR (ii) BQ = CP
Solution:

(i)



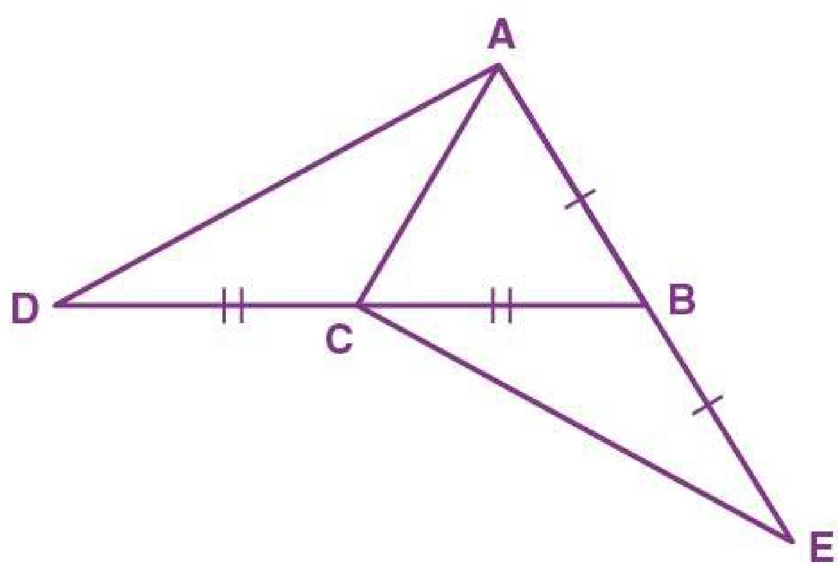
In ∆ABC, we have
AB = AC
½ AB = ½ AC
AP = AQ ... (i) [Since P and Q are mid - points]
In ∆BCA, we have
PR = ½ AC [PR is line joining the mid - points of AB and BC]
PR = AQ … (ii)
In ∆CAB, we have
QR = ½ AB [QR is line joining the mid - points of AC and BC]
QR = AP …(iii)
From (i), (ii) and (iii), we get
PR = QR

(ii)



Given, AB = AC
⇒ ∠B = ∠C
Also,
½ AB = ½ AC
BP = CQ [P and Q are mid – points of AB and AC]
Now, in ∆BPC and ∆CQB, we have
BP = CQ
∠B = ∠C
BC = BC (Common)
Therefore, ∆BPC ≅ CQB by SAS congruence criterion
∴ BP = CP by CPCT

19. From the following figure, prove that:
(i) ∠ACD = ∠CBE
(ii)
(iii)AD = CE

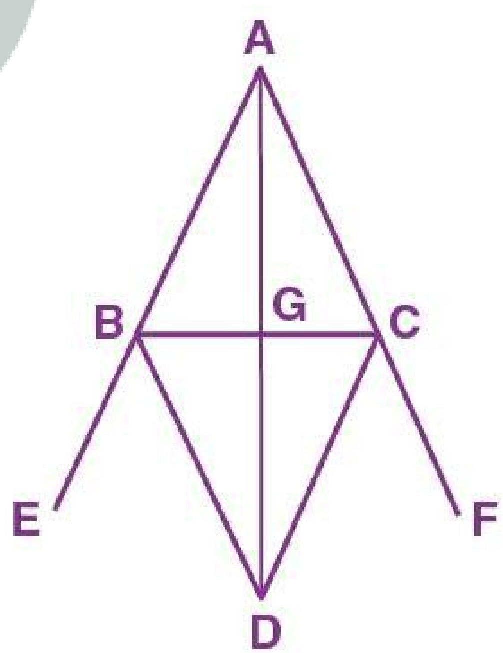


Solution:

(i) In ∆ACB, we have
AC = AC [Given]
∴ ∠ABC = ∠ACB …(i) [Angles opposite to equal sides are equal]
∠ACD + ∠ACB = 180^0 … (ii) [Since, DCB is a straight line]
∠ABC + ∠CBE = 180^0 …(iii) [Since, ABE is a straight line]
Equating (ii) and (iii), we get
∠ACD + ∠ACB = ∠ABC + ∠CBE
∠ACD + ∠ACB = ∠ACB + ∠CBE [From (i)]
⇒ ∠ACD = ∠CBE

(ii) In ∆ACD and ∆CBE, we have
DC = CB [Given]
AC = BE [Given]
∠ACD = ∠CBE [Proved above]
∴ ∆ACD ≅ ∆CBE by SAS congruence criterion
Hence, by CPCT
AD = CE

20. Equal sides AB and AC of an isosceles triangle ABC are produced. The bisectors of the exterior angle so formed meet at D. Prove that AD bisects angle A.
Solution:

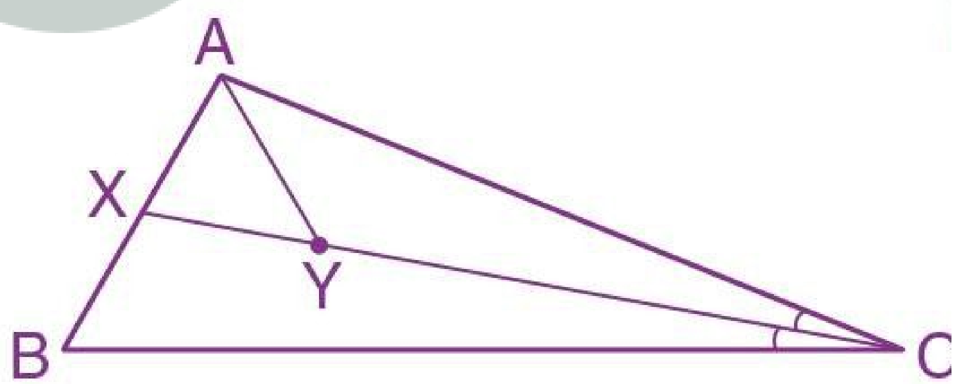


AB is produced to E and AC is produced to F. BD is bisector of angle CBE and CD is bisector of angle BCF. BD and CD meet at D.
In ∆ABC, we have
AB = AC [Given]

∴ ∠C = ∠B [angles opposite to equal sides are equal]

∠CBE = 180^0 - ∠B [ABE is a straight line]
∠CBD = (180° - ∠B)/ 2 [BD is bisector of ∠CBE]
∠CBD = 90° - ∠B/ 2 …(i)
Similarly,
∠BCF = 180^0 - ∠C [ACF is a straight line]
∠BCD = (180° - ∠C)/ 2 [CD is bisector of ∠BCF]
∠BCD = 90° - ∠C/2 …(ii)
Now,
∠CBD = 90° - ∠C/2 [∵∠B = ∠C]
∠CBD = ∠BCD
In ∆BCD, we have
∠CBD = ∠BCD
∴ BD = CD
In ∆ABD and ∆ACD, we have
AB = AC [Given]
AD = AD [Common]
BD = CD [Proved]
∴ ∆ABD ≅ ∆ACD by SSS congruence criterion
So, ∠BAD = ∠CAD [By CPCT]
Therefore, AD bisects ∠A.

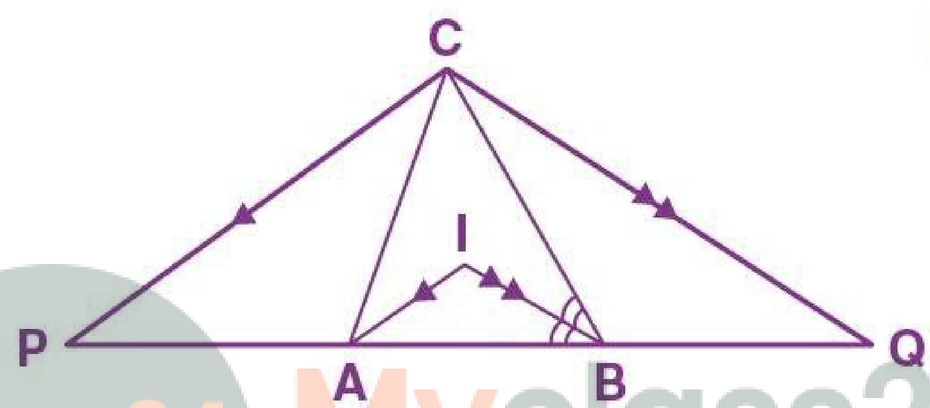
21. ABC is a triangle. The bisector of the angle BCA meets AB in X. A point Y lies on CX such that AX = AY. Prove that ∠CAY = ∠ABC.
Solution:



In ∆ABC, we have
CX is the angle bisector of ∠C
So, ∠ACY = ∠BCX …(i)
In ∠AXY, we have
AX = AY [Given]
∠AXY = ∠AYX ...(ii) [Angles opposite to equal sides are equal]
Now, ∠XYC = ∠AXB = 180° [Straight line angle]

∠AYX + ∠AYC = ∠AXY + ∠BXY
∠AYC = ∠BXY… (iii) [From (ii)]
In ∆AYC and ∆BXC, we have
∠AYC + ∠ACY + ∠CAY = ∠BXC + ∠BCX + ∠XBC = 180°
∠CAY = ∠XBC [From (i) and (iii)]
Thus, ∠CAY = ∠ABC

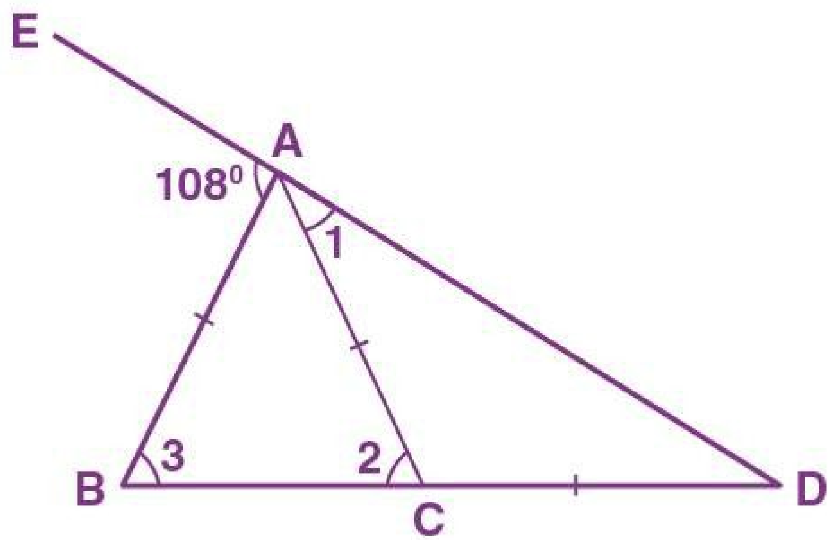
22. In the following figure; IA and IB are bisectors of angles CAB and CBA respectively. CP is parallel to IA and CQ is parallel to IB.



Prove that:
PQ = The perimeter of the ∆ABC.
Solution:

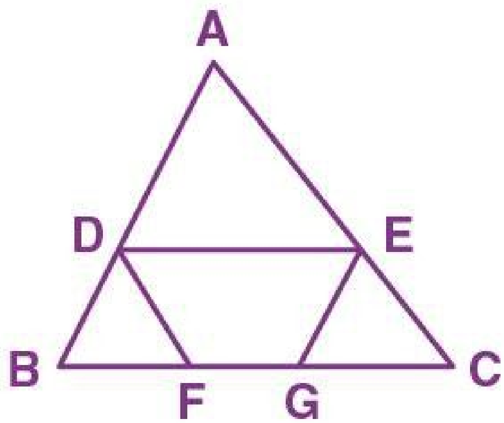
Since IA || CP and CA is a transversal
We have, ∠CAI = ∠PCA [Alternate angles]
Also, IA || CP and AP is a transversal
We have, ∠IAB = ∠APC [Corresponding angles]
But ∴ ∠CAI = ∠IAB [Given]
∴ ∠PCA = ∠APC
AC = AP
Similarly, BC = BQ
Now,
PQ = AP + AB + BQ
= AC + AB + BC
= Perimeter of ∆ABC

23. Sides AB and AC of a triangle ABC are equal. BC is produced through C upto a point D such that AC = CD. D and A are joined and produced upto point E. If angle BAE = 108°; find angle ADB.
Solution:



In $\triangle$ABD, we have
$\angle BAE = \angle 3 + \angle ADB$
$108^0 = \angle 3 + \angle ADB$
But, AB = AC
$\angle 3 = \angle 2$
$108^0 = \angle 2 + \angle ADB$ … (i)
Now,
In $\triangle$ACD, we have
$\angle 2 = \angle 1 + \angle ADB$
But, AC = CD
$\angle 1 = \angle ADB$
$\angle 2 = \angle ADB + \angle ADB$
$\angle 2 = 2\angle ADB$
Putting this value in (i), we get
$108^0 = 2\angle ADB + \angle ADB$
$3\angle ADB = 108^0$
$\therefore \angle ADB = 36^0$

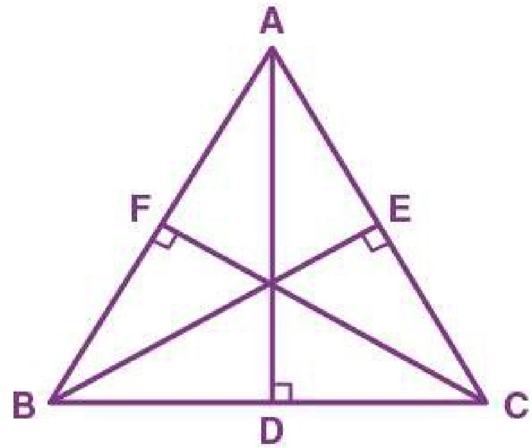
24. The given figure shows an equilateral triangle ABC with each side 15 cm. Also, DE || BC, DF || AC and EG || AB. If DE + DF + EG = 20 cm, find FG.



Solution:

Given, ABC is an equilateral triangle.
AB = BC = AC = 15 cm
$\angle A = \angle B = \angle C = 60^\circ$
In $\triangle ADE$, we have DE ll BC
$\angle AED = 60^\circ$ [$\because \angle ACB = 60^\circ$]
$\angle ADE = 60^\circ$ [$\because \angle ABC = 60^\circ$]
$\angle DAE = 180^\circ - (60^\circ + 60^\circ)$
$= 60^\circ$
Thus, $\triangle ADE$ is an equilateral triangle
Similarly, $\triangle BDF$ and $\triangle GEC$ are equilateral triangles
Now,
Let AD = x, AE = x and DE = x [$\because \triangle ADE$ is an equilateral triangle]
Let BD = y, FD = y and FB = y [$\because \triangle BDF$ is an equilateral triangle]
Let EC = z, GC = z and GE = z [$\because \triangle GEC$ is an equilateral triangle]
Now, AD + DB = 15
x + y = 15 … (i)
AE + EC = 15
x + z = 15 … (ii)
Given, DE + DF + EG = 20
x + y + z = 20
15 + z = 20 [From (i)]
z = 5
From (ii), we get, x = 10
$\therefore$ y = 5
Also, BC = 15
BF + FG + GC = 15
y + FG + z = 15
$\therefore$ FG = 5

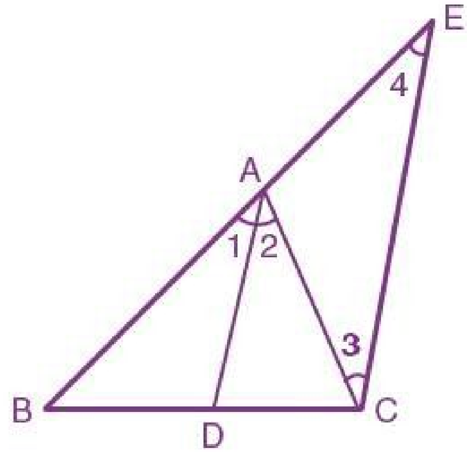
25. If all the three altitudes of a triangle are equal, the triangle is equilateral. Prove it.
Solution:



In right ∆BEC and ∆BFC, we have
BE = CF [Given]
BC = BC [Common]
∠BEC = ∠BFC [Each = 90^0]
∴ ∆BEC ≅ ∆BFC by RHS congruence criterion
By CPCT, we get
∠B = ∠C
Similarly,
∠A = ∠B
Hence, ∠A = ∠B = ∠C
⇒ AB = BC = AC
Therefore, ABC is an equilateral triangle.

26. In a ∆ABC, the internal bisector of angle A meets opposite side BC at point D. Through vertex C, line CE is drawn parallel to DA which meets BA produced at point E. Show that ∆ACE is isosceles.

Solution:



Given, DA || CE
∠1 = ∠4 … (i) [Corresponding angles]

∠2 = ∠3 … (ii) [Alternate angles]

But ∠1 = ∠2 …(iii) [As AD is the bisector of ∠A]

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

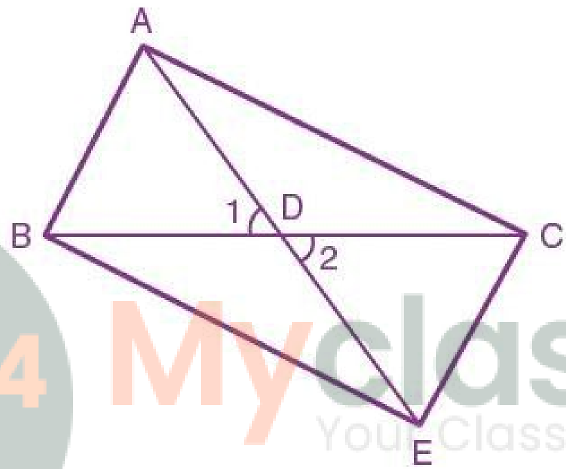
∠3 = ∠4

⇒AC = AE

Therefore, ∆ACE is an isosceles triangle.

27. In triangle ABC, bisector of angle BAC meets opposite side BC at point D. If BD = CD, prove that ∆ABC is isosceles.

Solution:



Let's produce AD up to E such that AD = DE.

In ∆ABD and ∆EDC, we have

AD = DE [By construction]

BD = CD [Given]

∠1 = ∠2 [Vertically opposite angles]

∴ ∆ABD ≅ ∆EDC by SAS congruence criterion

So, by CPCT,

AB = CE …(i)

And, ∠BAD = ∠CED

But, ∠BAD = ∠CAD [AD is bisector of ∠BAC]

∴ ∠CED = ∠CAD

AC = CE …(ii)

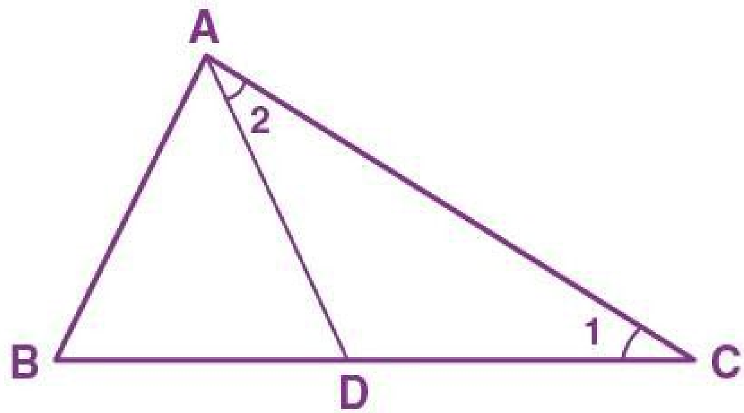
From (i) and (ii), we get

AB = AC

Hence, ABC is an isosceles triangle.

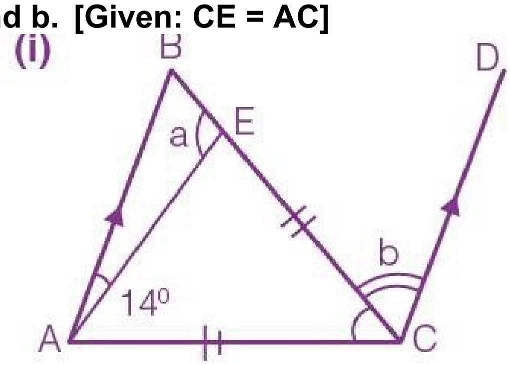
28. In ∆ABC, D is point on BC such that AB = AD = BD = DC. Show that: ∠ADC: ∠C = 4: 1.

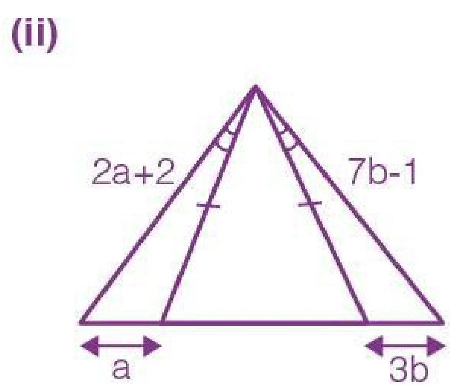
Solution:



As, AB = AD = BD, we have
ΔABD is an equilateral triangle.
$\therefore \angle ADB = 60^o$
Now,
$\angle ADC = 180^o - \angle ADB$
$= 180^o - 60^o$
$= 120^o$
Again in ΔADC, we have
AD = DC
$\therefore \angle 1 = \angle 2$
But,
$\angle 1 + \angle 2 + \angle ADC = 180^o$ [By angle sum property]
$2\angle 1 + 120^o = 180^o$
$2\angle 1 = 60^o$
$\angle 1 = 30^o$
$\angle C = 30^o$
$\Rightarrow \angle ADC : \angle C = 120^o : 30^o$
Therefore, $\angle ADC : \angle C = 4 : 1$

29. Using the information given in each of the following figures, find the values of a and b. [Given: CE = AC]





Solution:

(i) In ΔCAE, we have

$\angle CAE = \angle AEC$ [$\because$ CE = AC]

$= (180^o – 60^o)/2$

$= 56^o$

In $\angle BEA$, we have

$a = 180^o – 56^o = 124^o$

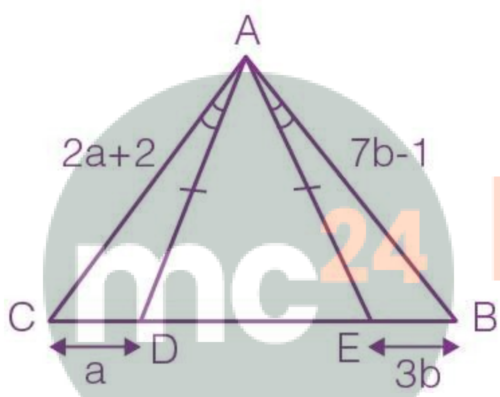
In ΔABE, we have

$\angle ABE = 180^o – (124^o + 14^o)$

$= 180^o - 138^o$

$= 42^o$

(ii)



In ΔAEB and ΔCAD, we have

$\angle EAB = \angle CAD$ [Given]

$\angle ADC = \angle AEB$ [$\because$ $\angle ADE = \angle AED$, since, AE = AD

$180^o - \angle ADE = 180^o - \angle AED$

$\angle ADC = \angle AEB$]

AE = AD [Given]

$\therefore$ $\Delta AEB \cong \Delta CAD$ by ASA congruence criterion

Thus, AC = AB by CPCT

$2a + 2 = 7b – 1$

$2a – 7b = - 3$ … (i)

CD = EB

$a = 3b$ … (ii)

Solving (i) and (ii) we get,

$a = 9$ and $b = 3$