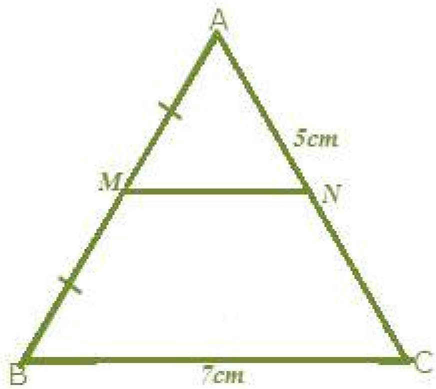
EXERCISE 12(A) PAGE: 150

1. **In triangle ABC, M is mid-point of AB and a straight line through M and parallel to BC cuts AC at N. Find the lengths of AN and MN, if BC = 7cm and AC = 5cm.**

Solution:

The triangle is shown below,



Since M is the midpoint of AB and MN||BC hence N is the midpoint of AC.Therefore

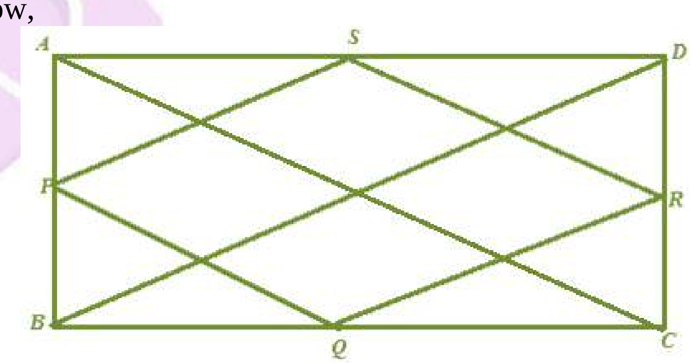
$MN = \frac{1}{2}BC = \frac{1}{2} \times 7 = 3.5cm$

And $AN = \frac{1}{2}AC = \frac{1}{2} \times 5 = 2.5cm$

2. **Prove that the figure obtained by joining the mid-points of the adjacent sides of a rectangle is a rhombus.**

Solution:

The figure is shown below,



Let ABCD be a rectangle where P,Q,R,S are the midpoint of AB,BC, CD, DA.We need to show that PQRS is a rhombus

For help we draw two diagonal BD and AC as shown in figure

Where BD=AC(Since diagonal of rectangle are equal)

Proof:

From ΔABD and ΔBCD

$PS = \frac{1}{2}BD = QR$ and PS||BD||QR

$2PS = 2QR$ =BD and PS||QR ------ (1)

Similarly 2PQ=2SR=AC and PQ||SR----- (2)

From (1) and (2) we get

PQ=QR=RS=PS

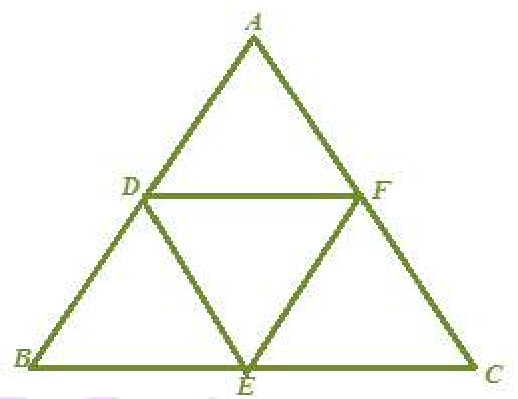
Therefore PQRS is a rhombus.

Hence proved

3. D, E and F are the mid-points of the sides AB, BC and CA of an isosceles triangle ABC in which AB=BC. Prove that triangle DEF is also isosceles.

Solution:

The figure is shown below



Given that ABC is an isosceles triangle where AB=AC.

Since D,E,F are midpoint of AB,BC,CA therefore

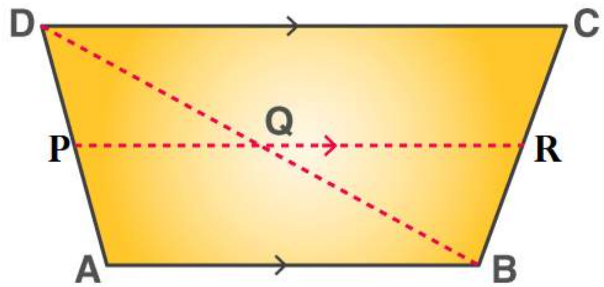
2DE=AC and 2EF=AB this means DE=EF

Therefore DEF is an isosceles triangle an DE=EF.

Hence proved

4. The following figure shows a trapezium ABCD in which AB||DC. P is the mis-point of AD and PR||AB. Prove that:

$$PR = \frac{1}{2}(AB + CD)$$



Solution:

Here from triangle ABD P is the midpoint of AD and PR||AB, therefore Q is the midpoint of BD

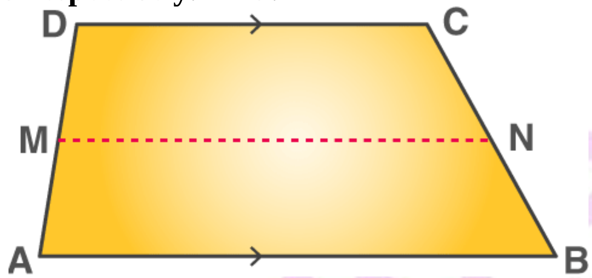
Similarly R is the midpoint of BC as PR||CD||AB

From triangle ABD 2PQ=AB …….(1)
From triangle BCD 2QR=CD …..(2)
Now (1)+(2)=>
2(PQ+QR)=AB+CD

$PR=\frac{1}{2}(AB+CD)$

Hence proved

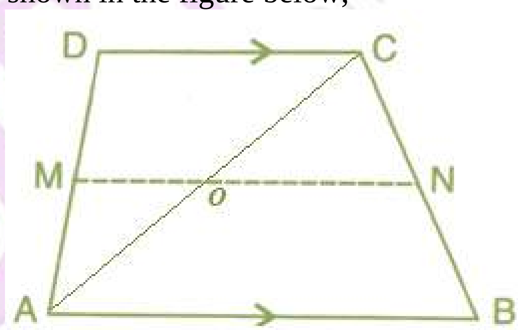
5. **The figure given below, shows a trapezium ABCD. M and N are the mid-points of the non-parallel sides AD and BC respectively. Find:**



(i) **MN, if AB = 11 cm and DC = 8 cm**
(ii) **AB, if DC = 20 cm and MN = 27 cm**
(iii) **DC, if MN = 15 cm and AB = 23 cm**

Solution:

Let we draw a diagonal AC as shown in the figure below,



(i) Given that AB=11cm,CD=8cm
From triangle ABC

$ON=\frac{1}{2}AB=\frac{1}{2}\times 11=5.5cm$

From triangle ACD

$OM=\frac{1}{2}CD=\frac{1}{2}\times 8=4cm$

Hence MN=OM+ON=(4+5.5)=9.5cm
(ii) Given that CD=20cm,MN=27cm
From triangle ACD

$OM=\frac{1}{2}CD=\frac{1}{2}\times 20=10cm$

Therefore ON=27-10=17cm

From triangle ABC

$AB = 2ON = 2 \times 17 = 34cm$

(iii) Given that AB=23cm,MN=15cm

From triangle ABC

$ON = \frac{1}{2} AB = \frac{1}{2} \times 23 = 11.5cm$

Therefore OM=15-11.5=3.5cm

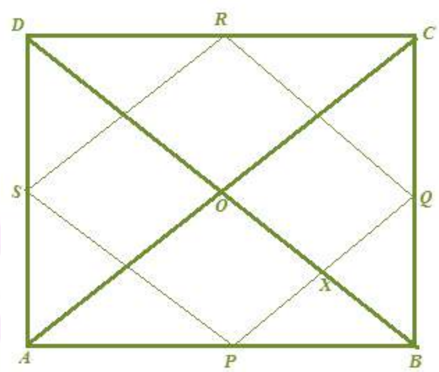
From triangle ACD

$CD = 2OM = 2 \times 3.5 = 7cm$

6. The diagonals of a quadrilateral intersect at right angles. Prove that the figure obtained by joining the mid-points of the adjacent sides of the quadrilateral is a rectangle.

Solution:

The figure is shown below



Let ABCD be a quadrilateral where P,Q,R,S are the midpoint of AB,BC,CD,DA. Diagonal AC and BD intersects at right angle at point O. We need to show that PQRS is a rectangle

Proof:

From ΔABC and ΔADC

2PQ=AC and PQ||AC …..(1)

2RS=AC and RS||AC …..(2)

From (1) and (2) we get,

PQ=RS and PQ||RS

Similarly we can show that PS=RQ and PS||RQ

Therefore PQRS is a parallelogram.

Now PQ||AC, therefore $\angle AOD = \angle PXO = 90°$ [Corresponding angle]

Again BD||RQ, therefore $\angle PXO = \angle RQX = 90°$ [Corresponding angle]

Similarly $\angle QRS = \angle RSP = \angle SPQ = 90°$

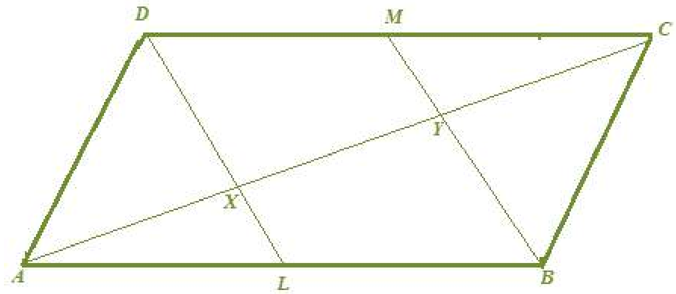
Therefore PQRS is a rectangle.

Hence proved

7. L and M are the mid-points of sides AB and DC respectively of parallelogram ABCD. Prove that segments DL and BM trisect diagonal AC.

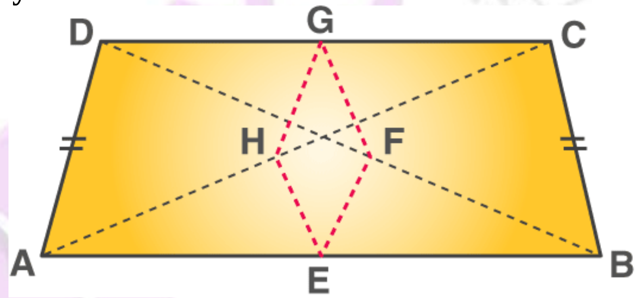
Solution:

The required figure is shown below



From figure,
BL=DM and BL||DM and BLMD is a parallelogram, therefore BM||DL
From triangle ABY
L is the midpoint of AB and XL||BY, therefore x is the midpoint of AY.ie AX=XY …..(1)
Similarly for triangle CDX
CY=XY …..(2)
From (1) and (2)
AX=XY=CY and AC=AX+XY+CY
Hence proved

8. ABCD is a quadrilateral in which AD = BC. E, F, G and H are the mid-points of AB, BD, CD and AC respectively. Prove that EFGH is a rhombus.

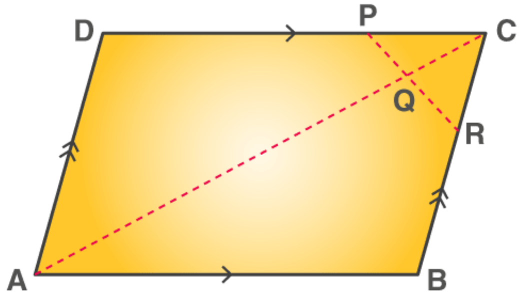


Solution:

Given that AD=BC …..(1)
From the figure,
For triangle ADC and triangle ABD
2GH=AD and 2EF=AD, therefore 2GH=2EF=AD …..(2)
For triangle BCD and triangle ABC
2GF=BC and 2EH=BC, therefore 2GF=2EH=BC …..(3)
From (1),(2),(3) we get,
2GH=2EF=2GF=2EH
GH=EF=GF=EH
Therefore EFGH is a rhombus.
Hence proved

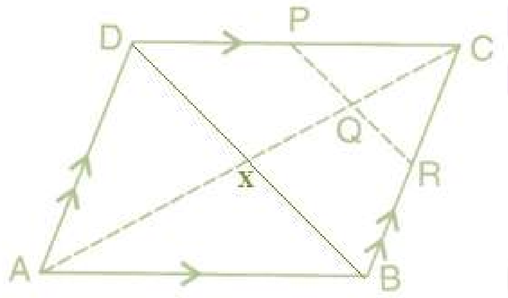
9. A parallelogram ABCD has P the mid-point of DC and Q a point of AC such that CQ = $\frac{1}{4}$AC. PQ produced meets BC at R.
Prove that:
(i) R is the mid-point of BC,

(ii) **$PR=\frac{1}{2}DB$**



Solution:

For help we draw the diagonal BD as shown below



The diagonal AC and BD cuts at point X.

We know that the diagonal of a parallelogram intersects equally each other. Therefore AX=CX and BX=DX

Given,

$$CQ=\frac{1}{4}AC$$

$$CQ=\frac{1}{4}\times 2CX$$

$$CQ=\frac{1}{2}CX$$

Therefore Q is the midpoint of CX.

(i) For triangle CDX PQ||DX or PR||BD

Since for triangle CBX

Q is the midpoint of CX and QR||BX. Therefore R is the midpoint of BC

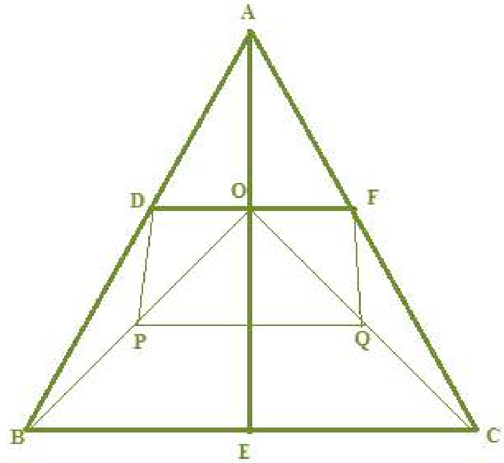
(ii) For triangle BCD

As P and R are the midpoint of CD and BC, therefore $PR=\frac{1}{2}DB$

10. D, E and F are the mid-points of the sides AB, BC and CA respectively of triangle ABC. AE meets DF at O. P and Q are the mid-points of OB and OC respectively. Prove that DPQF is a parallelogram.

Solution:

The required figure is shown below



For triangle ABC and OBC
2DE=BC and 2PQ=BC, therefore DE=PQ …..(1)
For triangle ABO and ACO
2PD=AO and 2FQ=AO, therefore PD=FQ …..(2)
From (1),(2) we get that PQFD is a parallelogram.
Hence proved

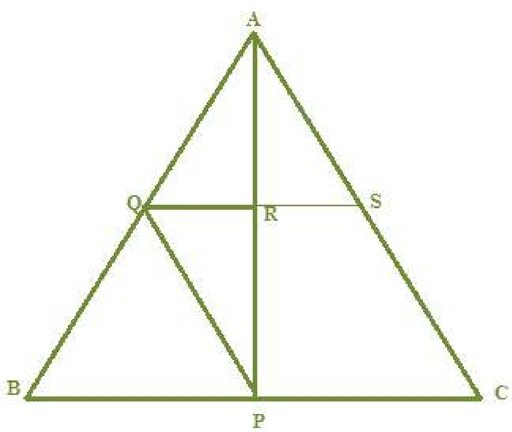
11. In a triangle ABC, P is the mid-point of side BC. A line through P and parallel to CA meets AB at point Q; and a line through Q and parallel to BC meets median AP at point R. Prove that:

(i) AP = 2AR

(ii) BC = 4QR

Solution:

The required figure is shown below



From the figure it is seen that P is the midpoint of BC and PQ||AC and QR||BC
Therefore Q is the midpoint of AB and R is the midpoint of AP

(i) Therefore AP=2AR

(ii) Here we increase QR so that it cuts AC at S as shown in the figure.

(iii) From triangle PQR and triangle ARS

$\angle PQR = \angle ARS \quad (Opposite\ angle)$

$PR = AR$

$PQ = AS \quad \left[PQ = AS = \frac{1}{2}AC\right]$

$\Delta PQR \cong \Delta ARS \quad \text{(SAS Postulate)}$

Therefore QR=RS

Now

$BC = 2QS$

$BC = 2 \times 2QR$

$BC = 4QR$

Hence proved

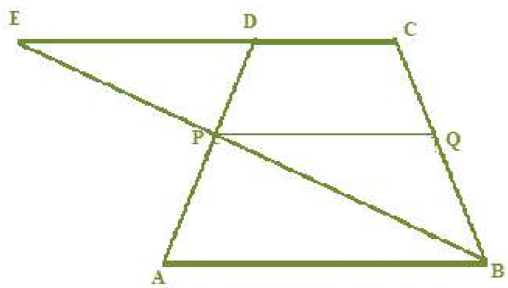
12. In trapezium ABCD, AB is parallel to DC; P and Q are the mid-points of AD and BC respectively. BP produced meets CD produced at point E. Prove that:

(i) Point P bisects BE,

(ii) PQ is parallel to AB.

Solution:

The required figure is shown below



(i)

$From\ \Delta PED\ and\ \Delta ABP$

$PD = AP \quad [\text{P is the midpoint of AD}]$

$\angle DPE = \angle APB \quad [Opposite\ angle]$

$\angle PED = \angle PBA \quad [AB \| CE]$

$\therefore \quad \Delta PED \cong \Delta ABP \quad [ASA\ \text{postulate}]$

$\therefore EP = BP$

(ii) For tiangle ECB PQ||CE

Again CE||AB

Therefore PQ||AB

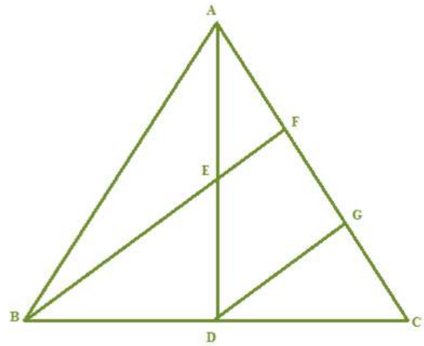
Hence proved

13. In a triangle ABC, AD is a median and E is mid-point of median AD. A line through B and E meets AC at poin F.

Prove that: AC = 3AF

Solution:

The required figure is shown below



For help we draw a line DG||BF

Now from triangle ADG, DG||BF and E is the midpoint of AD

Therefore F is the midpoint of AG,ie AF=GF …..(1)

From triangle BCF, DG||BF and D is the midpoint of BC

Therefore G is the midpoint of CF,ie GF=CF …(2)

AC=AF+GF+CF

AC=3AF(From (1) and (2))

Hence proved

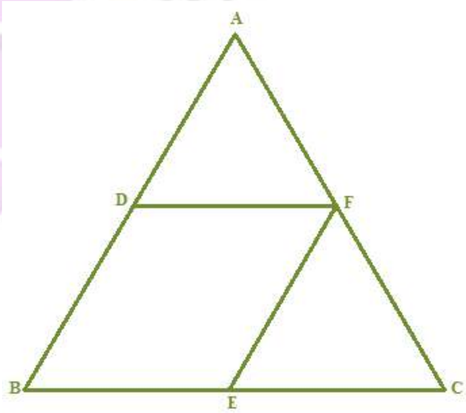
14. D and F are mid-points of sides AB and AC of a triangle ABC. A line through F and parallel to AB meets BC at point E.

(i) Prove that BDFE is a parallelogram.

(ii) Find AB, if EF = 4.8 cm.

Solution:

The required figure is shown below



(i) Since F is the midpoint and EF||AB.

Therefore E is the midpoint of BC

So $BE = \frac{1}{2} BC$ and $EF = \frac{1}{2} AB$ …..(1)

Since D and F are the midpoint of AB and AC

Therefore DE||BC

So $DF = \frac{1}{2}BC$ and $DB = \frac{1}{2}AB$ …..(2)

From (1),(2) we get

BE=DF and BD=EF

Hence BDEF is a parallelogram.

(ii) Since

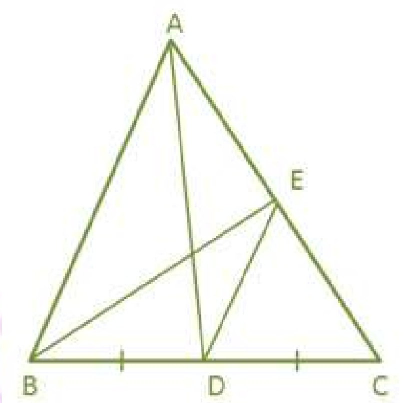
$AB = 2EF$

$= 2 \times 4.8$

$= 9.6cm$

15. In triangle ABC, AD is the median and DE, drawn parallel to side BA, meets AC at point E. Show that BE is also a median.

Solution:



In ΔABC,

AD is the median of BC

$\Rightarrow$ D is the mid - point of BC.

Given that DE P BA

By the Converse of the Mid - point theorem,

$\Rightarrow$ DE bisects AC

$\Rightarrow$ E is the mid - point of AC

$\Rightarrow$ BE is the median of AC,

that is BE is also a median.

16. In triangle ABC, AD is the median and DE, drawn parallel to side BA, meets AC at point E. Show that BE is also a median.

Solution:

Construction : Draw $DY \parallel BQ$

In ΔBCQ and ΔDCY,

$\angle BCQ = \angle DCY$ (Common)

$\angle BQC = \angle DYC$ (Corresponding angles)

So, $\Delta BCQ \sim \Delta DCY$ (AA Similarity criterion)

$\Rightarrow \frac{BQ}{DY} = \frac{BC}{DC} = \frac{CQ}{CY}$ (Corresponding sides are proportional)

$\Rightarrow \frac{BQ}{DY} = \frac{2CD}{CD}$ (D is the mid-point of BC)

$\Rightarrow \frac{BQ}{DY} = 2 \ldots.(i)$

Similarly, $\Delta AEQ \sim \Delta ADY$

$\Rightarrow \frac{EQ}{DY} = \frac{AE}{ED} = \frac{1}{2}$ (E is the mid-point of AD)

that is $\frac{EQ}{DY} = \frac{1}{2} \ldots\ldots(ii)$

Dividing (i) by (ii), we get

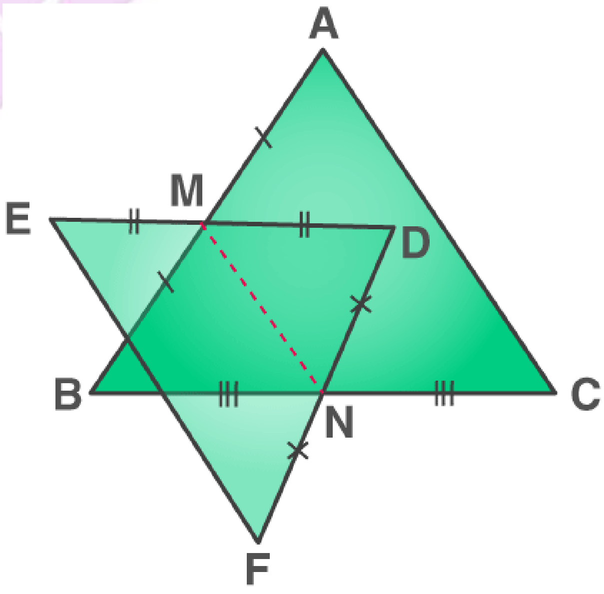
$\Rightarrow \frac{BQ}{EQ} = 4$

$\Rightarrow BE + EQ = 4EQ$

$\Rightarrow BE = 3EQ$

$\Rightarrow \frac{BE}{EQ} = \frac{3}{1}$

17. In the given figure, M is mid-point of AB and DE, whereas N is mid-point of BC and DF. Show that: EF = AC.



Solution:

In ΔEDF,

M is the mid - point of AB and N is the mid - point of DE.

$\Rightarrow MN = \frac{1}{2}EF$ (Mid - point theorem)

$\Rightarrow EF = 2MN$......(i)

In ΔABC,

M is the mid - point of AB and N is the mid - point of BC.

$\Rightarrow MN = \frac{1}{2}AC$ (Mid - point theorem)

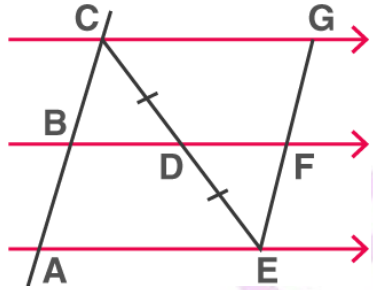
$\Rightarrow AC = 2MN$......(ii)

From (i) and (ii), we get

$\Rightarrow EF = AC$

EXERCISE 12(B) PAGE: 153

1. **Use the following figure to find:**
   (i) BC, if AB = 7.2 cm.
   (ii) GE, if FE = 4 cm.
   (iii) AE, if BD = 4.1 cm.
   (iv) DF, if CG = 11 cm.



Solution:

According to equal intercept theorem since CD=DE
Therefore AB=BC and EF=GF

(i) BC=AB=7.2cm

(ii) GE=EF+GF=2EF=2×4=8cm

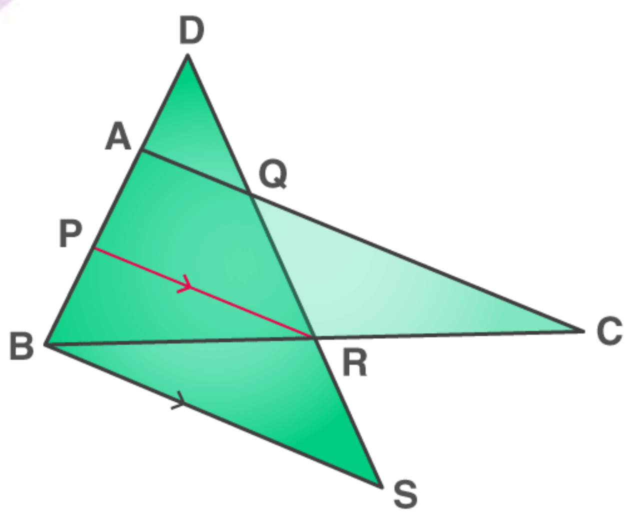
Since B,D,F are the midpoint and AE||BF||CG
Therefore AE=2BD and CG=2DF

(iii) AE=2BD=2×4.1=8.2

(iv)

$$DF=\frac{1}{2}CG=\frac{1}{2}\times11=5.5cm$$

2. **In the figure, given below, 2AD = AB, P is mid-point of AB, Q is mid-point of DR and PR||BS. Prove that:**
   (i) AQ || BS,
   (ii) DS = 3RS



Solution:

Given that AD=AP=PB as 2AD=AB and p is the midpoint of AB

(i) From triangle DPR, A and Q are the midpoint of DP and DR.

Therefore AQ||PR

Since PR||BS ,hence AQ||BS

(ii) From triangle ABC, P is the midpoint and PR||BS

Therefore R is the midpoint of BC

$From\ \Delta BRS\ and\ \Delta QRC$

$\angle BRS = \angle QRC$

$BR = RC$

$\angle RBS = \angle RCQ$

$\therefore\ \Delta BRS \cong \Delta QRC$

$\therefore\ QR = RS$

DS=DQ+QR+RS=QR+QR+RS=3RS

3. The side AC of a triangle ABC is produced to point E so that CE= $\frac{1}{2}$ AC. D is the mid-point of BC and ED produced meets AB at F. Lines through D and C are drawn parallel to AB which meet AC at point P and EF at point R respectively. Prove that:

(i) 3DF = EF

(ii) 4CR = AB

Solution:

Given that *D* is the midpoint of *BC* and *DP* is parallel to *AB*, therefore *P* is the midpoint of *AC*

$PD = \frac{1}{2}AB$

(i) Again from the triangle *AEF* we have *AE* ||*PD*||*CR* and $AP = \frac{1}{3}AE$

Therefore $DF = \frac{1}{3}EF$ or we can say that 3DF = EF .

Hence it is shown.

(ii) From the triangle *PED* we have *PD*||*CR* and *C* is the midpoint of *PE* therefore $CR = \frac{1}{2}PD$

Now

$PD = \frac{1}{2}AB$

$\frac{1}{2}PD = \frac{1}{4}AB$

$CR = \frac{1}{4}AB$

$4CR = AB$

Hence it is shown.

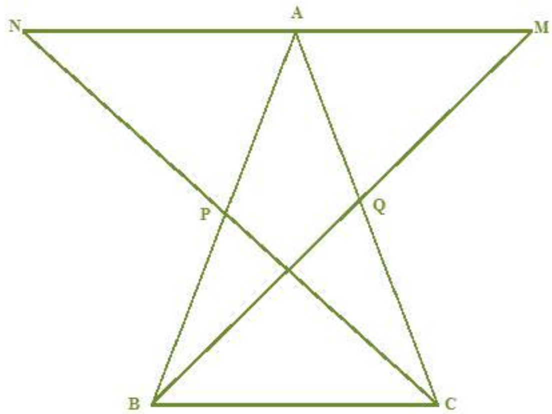
4. In triangle ABC, the medians BP and CQ are produced upto points M and N respectively such that BP = PM and CQ = QN. Prove that:

(i) M, A and N are collinear.

(ii) A is the mid-point of MN.

Solution:

The figure is shown below



(i)

From triangle BPC and triangle APN

$\angle BPC = \angle APN$ [Opposite angle]

$BP = AP$

$PC = PN$

$\therefore \Delta BPC \cong \Delta APN$ [SAS postulate]

$\therefore \angle PBC = \angle PAN$ ..... (1)

And BC=AN ……(3)

Similarly $\angle QCB = \angle QAN$ …..(2)

And BC=AM ……(4)

Now

$\angle ABC + \angle ACB + \angle BAC = 180°$

$\angle PAN + \angle QAM + \angle BAC = 180°$ [(1),(2) we get]

Therefore M,A,N are collinear

(ii)

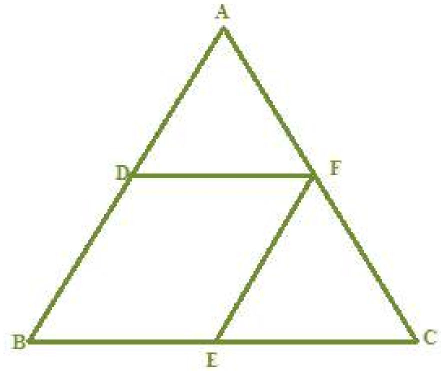
From (3) and (4) MA=NA

Hence A is the midpoint of MN

5. In triangle ABC, angle B is obtuse. D and E are mid-points of sides AB and BC respectively and F is a point on side AC such that EF is parallel to AB. Show that BEFD is a parallelogram.

Solution:

The figure is shown below

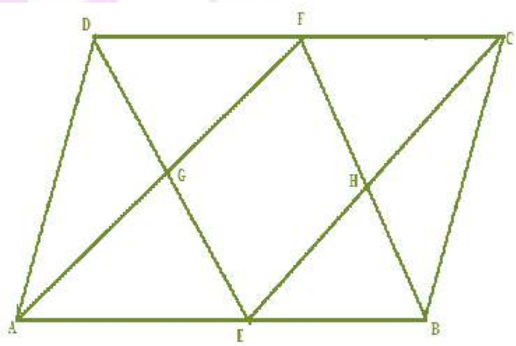


From the figure EF||AB and E is the midpoint of BC.
Therefore F is the midpoint of AC.
Here EF||BD, EF=BD as D is the midpoint of AB
BE||DF, BE=DF as E is the midpoint of BC.
Therefore BEFD is a parallelogram.

6. In parallelogram ABCD, E and F are mid-points of the sides AB and CD respectively. The line segments AF and BF meet the line segments ED and EC at points G and H respectively.
Prove that:
(i) Triangles HEB and FHC are congruent;
(ii) GEHF is a parallelogram.

Solution:

The figure is shown below



(i)

$$\begin{aligned}&\text{From } \Delta HEB \text{ and } \Delta FHC\\&BE = FC\\&\angle EHB = \angle FHC \quad [\text{Opposite angle}]\\&\angle HBE = \angle HFC\\&\therefore \Delta HEB \cong \Delta FHC\\&\therefore EH = CH, BH = FH\end{aligned}$$

(ii)

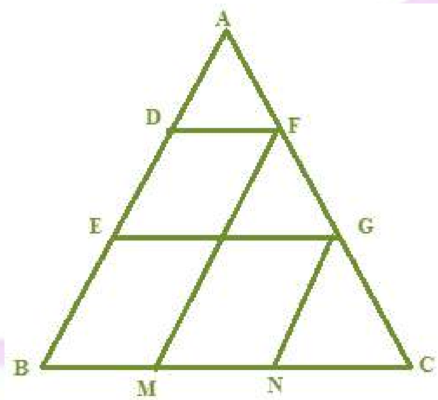
Similarly AG=GF and EG=DG …..(1)
For triangle ECD, F and H are the midpoint of CD and EC.

Therefore HF||DE and $HF = \frac{1}{2} DE$ …..(2)
(1),(2) we get, HF=EG and HF||EG
Similarly we can show that EH=GF and EH||GF
Therefore GEHF is a parallelogram.

7. In triangle ABC, D and E are points on side AB such that AD = DE = EB. Through D and E, lines are drawn parallel to BC which meet side AC at points F and G respectively. Through F and G, lines are drawn parallel to AB which meet side BC at points M and N respectively. Prove that: BM = MN = NC.

Solution:

The figure is shown below

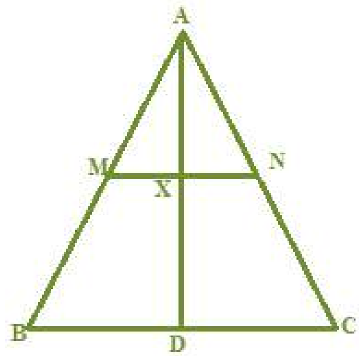


For triangle AEG
D is the midpoint of AE and DF||EG||BC
Therefore F is the midpoint of AG.
AF=GF …..(1)
Again DF||EG||BC DE=BE, therefore GF=GC …..(2)
(1),(2) we get AF=GF=GC.
Similarly GN||FM||AB and AF=GF,
therefore BM=MN=NC
Hence proved

8. In triangle ABC; M is mid-point of AB, N is mid-point of AC and D is any point in base BC. Use Intercept Theorem to show that MN bisects AD.

Solution:

The figure is shown below

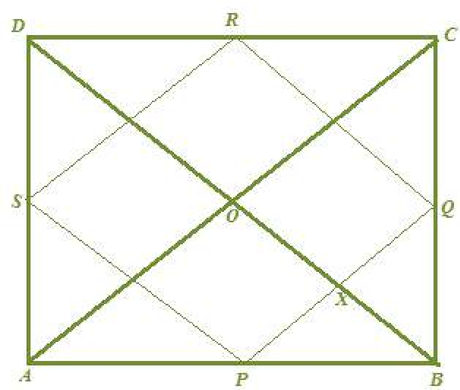


Since M and N are the midpoint of AB and AC, MN||BC
According to intercept theorem Since MN||BC and AM=BM,
Therefore AX=DX. Hence proved

9. If the quadrilateral formed by joining the mid-points of the adjacent sides of quadrilateral ABCD is a rectangle, show that the diagonals AC and BD intersect at right angle.

Solution:

The figure is shown below



Let ABCD be a quadrilateral where P, Q, R, S are the midpoint of AB, BC, CD, DA. PQRS is a rectangle. Diagonal AC and BD intersect at point O. We need to show that AC and BD intersect at right angle.

Proof:

PQ||AC, therefore $\angle AOD = \angle PXO \quad [Corresponding\ angle]$ …. (1)

||Again BD||RQ,

therefore $\angle PXO = \angle RQX = 90°[\text{Corresponding angle and angle of rectangle}]$ … (2)

From (1) and (2) we get,

$\angle AOD = 90°$

Similarly $\angle AOB = \angle BOC = \angle DOC = 90°$

Therefore diagonals AC and BD intersect at right angle

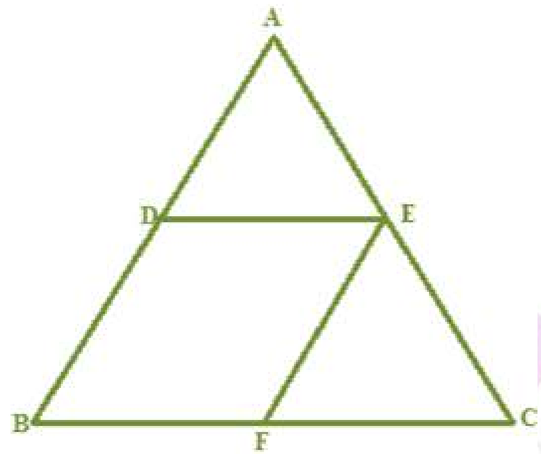
Hence proved

10. In triangle ABC; D and E are mid-points of the sides AB and AC respectively. Through E, a straight line is drawn parallel to AB to meet BC at F. Prove that BDEF is a

parallelogram.
If AB = 16 cm, AC = 12 cm and BC = 18 cm, find the perimeter of the parallelogram BDEF.

Solution:

The figure is shown below



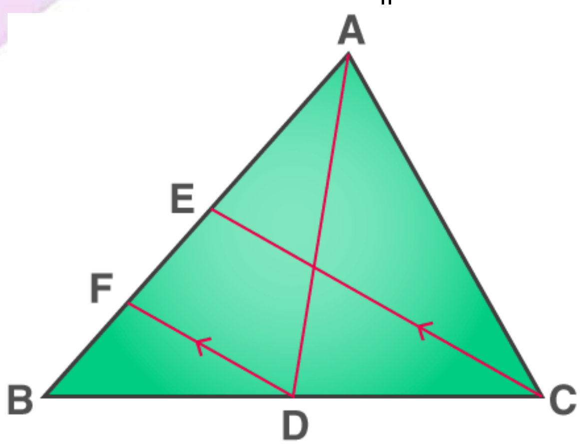
From figure since E is the midpoint of AC and EF||AB
Therefore F is the midpoint of BC and 2DE=BC or DE=BF
Again D and E are midpoint, therefore DE||BF and EF=BD
Hence BDEF is a parallelogram.
Now

$$BD = EF = \frac{1}{2}AB = \frac{1}{2}\times 16 = 8cm$$

$$BF = DE = \frac{1}{2}BC = \frac{1}{2}\times 18 = 9cm$$

Therefore perimeter of BDEF=2(BF+EF) = $2(9+8) = 34cm$

11. In the given figure, AD and CE are medians and DF||CE. Prove that: FB = $\frac{1}{4}$ AB.



Solution:

Given AD and CE are medians and DF || CE.
We know that from the midpoint theorem, if two lines are parallel and the starting point of

segment is at the midpoint on one side, then the other point meets at the midpoint of the other side.
Consider triangle BEC. Given DF || CE and D is midpoint of BC. So F must be the midpoint of BE.

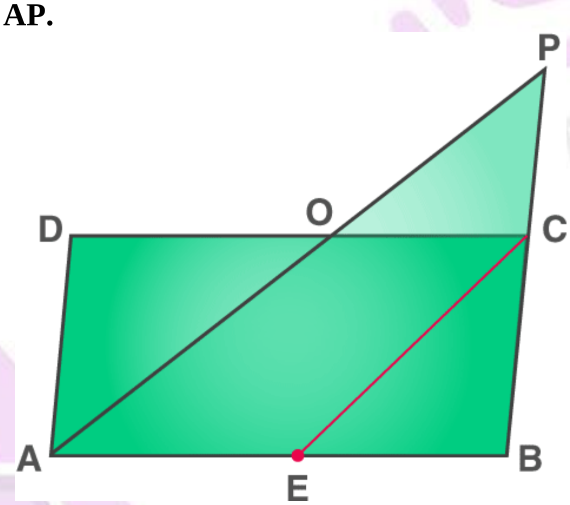
So $FB = \frac{1}{2}BE$ but $BE = \frac{1}{2}AB$

Substitute value of BE in first equation, we get

$FB = \frac{1}{4}AB$

Hence Proved

12. In parallelogram ABCD, E is the mid-point of AB and AP is parallel to EC which meets DC at point O and BC produced at P. Prove that:
(i) BP = 2AD
(ii) O is mid-point of AP.



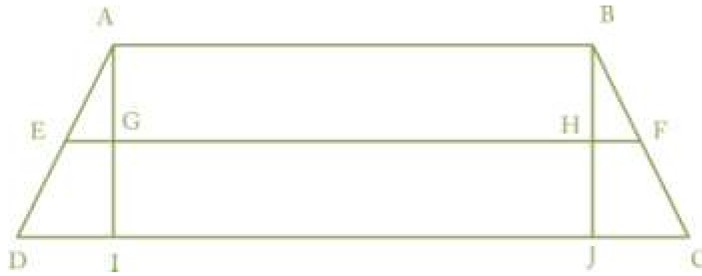
Solution:

Given ABCD is parallelogram, so AD = BC, AB = CD.
Consider triangle APB, given EC is parallel to AP and E is midpoint of side AB. So by midpoint theorem, C has to be the midpoint of BP.
So BP = 2BC, but BC = AD as ABCD is a parallelogram.
Hence BP = 2AD
Consider triangle APB, AB || OC as ABCD is a parallelogram. So by midpoint theorem, O has to be the midpoint of AP.
Hence Proved

13. In trapezium ABCD, sides AB and DC are parallel to each other. E is mid-point of AD and F is the mid-point of BC.
Prove that: AB + DC = 2EF

Solution:

Consider trapezium ABCD.
Given E and F are midpoints on sides AD and BC, respectively.



We know that AB = GH = IJ

From midpoint theorem,

$EG = \frac{1}{2}DI,\ HF = \frac{1}{2}JC$

Consider LHS,

AB + CD = AB + CJ + JI + ID = AB + 2HF + AB + 2EG

So AB + CD = 2(AB + HF + EG) = 2(EG + GH + HF) = 2EF

AB + CD = 2EF

Hence Proved

14. In triangle ABC, AD is the median and DE is parallel to BA, where E is a point in AC. Prove that BE is also a median.

Solution:

Given Δ ABC

AD is the median. So D is the midpoint of side BC.

Given DE || AB. By the midpoint theorem, E has to be midpoint of AC.

So line joining the vertex and midpoint of the opposite side is always known as median. So BE is also median of Δ ABC.

15. Adjacent sides of a parallelogram are equal and one of the diagonals is equal to any one of the sides of this parallelogram. Show that its diagonals are in the ratio $\sqrt{3}:1$.

Solution:

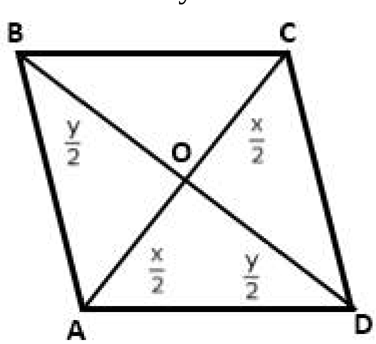
If adjacent sides of a parallelogram are equal, then it is rhombus.

Now, the diagonals of a rhombus bisect each other and are perpendicular to each other.

Let the lengths of the diagonals be x and y.

Diagonal of length y be equal to the sides of rhombus.

Thus, each side of rhombus = y



Now, in right-angles ΔBOC, by Pythagoras theorem

$OB^2 + OC^2 = BC^2$

$$\Rightarrow \left(\frac{y}{2}\right)^2 + \left(\frac{x}{2}\right)^2 = y^2$$

$$\Rightarrow \frac{x^2}{4} = y^2 - \frac{y^2}{4}$$

$$\Rightarrow \frac{x^2}{4} = \frac{4y^2 - y^2}{4}$$

$$\Rightarrow \frac{x^2}{4} = \frac{3y^2}{4}$$

$$\Rightarrow x^2 = 3y^2$$

$$\Rightarrow \frac{x^2}{y^2} = \frac{3}{1}$$

$$\Rightarrow \frac{x}{y} = \frac{\sqrt{3}}{1}$$

Thus, the diagonals are in the ratio $\sqrt{3} : 1$.