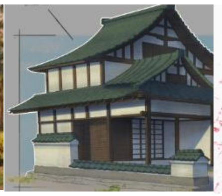
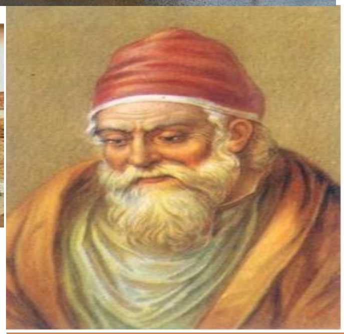
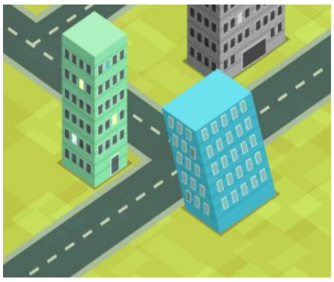
Unit: 13 Geometry- Area of Triangles and Quadrilaterals



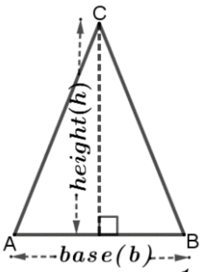



Figures: Real Life Related!!

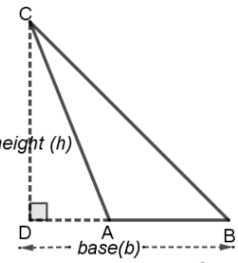


Father of Geometry:Euclid, Greek Eukleides, (flourished c. 300 BCE, Alexandria, Egypt)

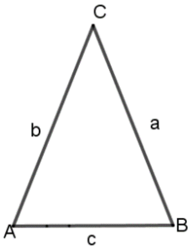
Review: Area of plane figures:



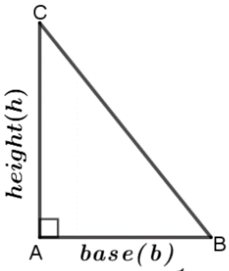
$Area of\ \Delta ABC = \frac{1}{2} b \times h$



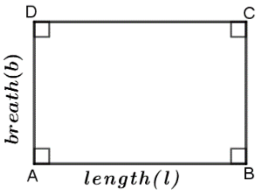
$Area\ of\ \Delta ABC = \frac{1}{2} b \times h$



$Area\ of\ \Delta ABC$
$= \sqrt{s(s-a)(s-b)(s-c)}$

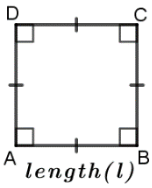


$Area of\ \Delta ABC = \frac{1}{2} b \times h$



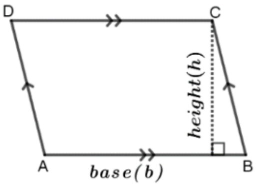
Rectangle

$A = l \times b$



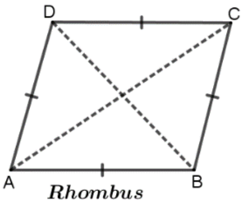
Square

$A = l^2$



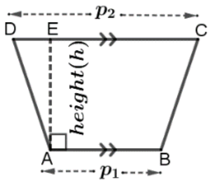
Parallelogram

$A = b \times h$



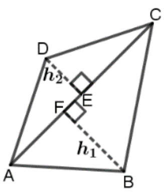
Rhombus

$A = \frac{1}{2}(d_1 \times d_2)$



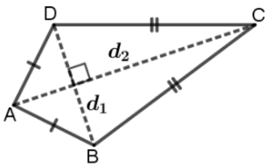
Trapezium

$A = \frac{1}{2} h(p_1 + p_2)$



Quadrilateral

$A = \frac{1}{2} AC(h_1 + h_2)$



Kite

$A = \frac{1}{2}(d_1 \times d_2)$

13.1 Relation between the area of triangles and quadrilaterals:

Theorem 1:

Parallelograms standing on the same base and lying between the same parallels are equal in area.

Experimental verification:

Step 1: Draw three different figures of different sizes with parallelograms ABCD and ABEF on the same base AB and between the same parallels AB and DE.

Step 2: Draw CN $\perp$ AB in each figure, where CN is the height (altitude) of the parallelograms.

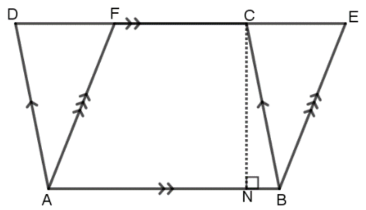


Figure (i)

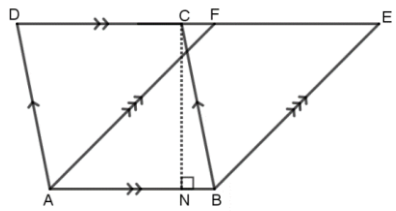


Figure (ii)

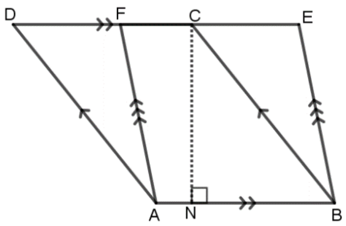


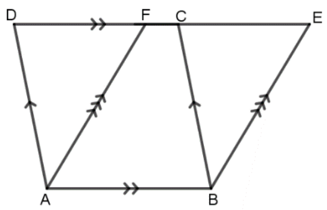
Figure (iii)

Step 3: Measure the base AB and height CN. Then calculate the areas of ▱ABCD and ▱ABEF.

F.N.	*Base (AB)*	*Height (CN)*	*Area of ▱ABCD=AB×CN*	*Area of ▱ABEF=AB×CN*	*Result*
(i)					*▱ABCD=▱ABEF*
(ii)					*▱ABCD=▱ABEF*
(iii)					*▱ABCD=▱ABEF*

Conclusion: *Parallelograms standing on the same base and lying between the same parallels are equal in area.*

Theoretical proof:



Given: Parallelograms ABCD and ABEF are on the same base AB and between the same parallels AB and DE.

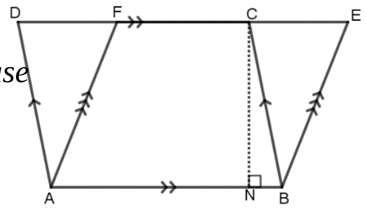
To prove: Area of ▱ABCD = Area of ▱ABEF

Proof:

S.N.	*Statements*	*S.N.*	*Reasons*
1.	*In Δ^s ADF and BCE*	*1.*	
(i)	*$\angle$ADF = $\angle$BCE (A)*	*(i)*	*Being AB // DE and corresponding angles*
(ii)	*$\angle$AFD = $\angle$BEC (A)*	*(ii)*	*Being AF // BE and corresponding angles*
(iii)	*AF = BE (S)*	*(iii)*	*Being opposite sides of ▱ABEF*
(iv)	*Δ ADF $\cong$ Δ BCE*	*(iv)*	*By A.A.S. axiom*
2.	*Δ ADF = Δ BCE*	*2.*	*Being area of congruent triangles*
3.	*Δ ADF + quadrilateral ABCF = Δ BCE + quadrilateral ABCF*	*3.*	*By adding the same trapezium ABCF to both sides of statement (2)*
4.	*▱ABCD = ▱ABEF*	*4.*	*By whole part axiom*

Hence, proved.

Alternatively,



Given: *Parallelograms ABCD and ABEF are on the same base AB and between the same parallels AB and DE.*

To prove: Area of ▱ABCD = Area of ▱ABEF

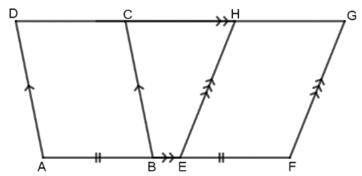
Construction: Draw, $CN \perp AB$ where CN is the height of the parallelograms.

Proof:

S.N.	Statements	S.N.	Reasons
1.	Area of ▱ $ABCD = AB \times CN$	1.	Area of parallelogram $=$ $base \times height$
2.	Area of ▱ABEF $= AB \times CN$	2.	Reason same as statement (1).
3.	Area of ▱ABCD = Area of ▱ ABEF	3.	From statements (1) and (2)

Proved.

Corollary:



Parallelograms on the equal bases and between the same parallels are equal in area.

Here, in the figure: AH // DG and AB = EF. So that area of ▱ABCD = Area of ▱EFGH.

Theorem 2:

The area of a triangle is equal to half of the area of a parallelogram standing on the same base and between the same parallels.

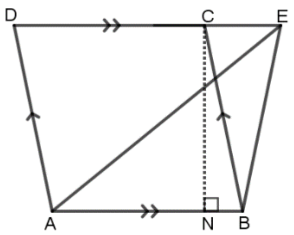
OR

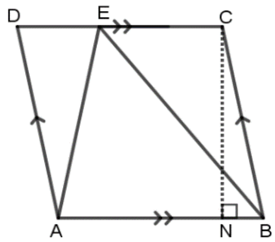
The area of a parallelogram is equal to double of the area of a triangle standing on the same base and between the same parallels.

Experimental verification:

Step 1: Draw three different figures with a parallelogram ABCD and a triangle ABE on the same base AB and between the same parallels AB and DC.

Step 2: Draw CN $\perp$ AB in each figure. CN is the height of the ▱ABCD and Δ ABE.





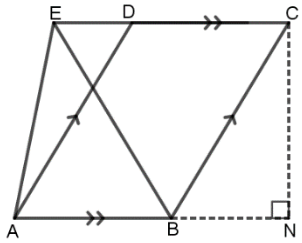


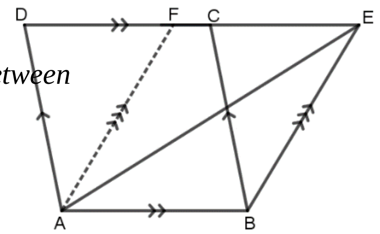
Figure (i) *Figure (ii)*
Figure (iii)

Step 3: Measure the base AB and the height CN in each figure. Then calculate the areas of ▱ ABCD and ΔABE.

F.N.	*Base (AB)*	*Height (CN)*	*Area of ▱ ABCD=AB×CN*	*Area of Δ ABE=* $\frac{1}{2}$ *AB×CN*	*Result*
(i)					$\Delta\, ABE = \frac{1}{2} \square\, ABCD$
(ii)					$\Delta\, ABE = \frac{1}{2} \square\, ABCD$
(iii)					$\Delta\, ABE = \frac{1}{2} \square\, ABCD$

Conclusion: The area of a triangle is equal to half of the area of a parallelogram standing on the same base and between the same parallels.

Theoretical proof:



Given: ▱ABCD and Δ ABE are on the same base and between the same parallels AB // DE.

To prove: $Area\ of\ \Delta\ ABE = Area\ of\ \frac{1}{2} \square\ ABCD.$

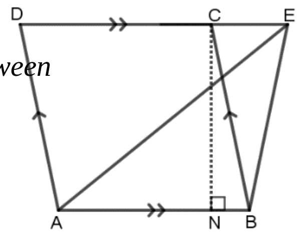
Construction: AF // BE is drawn where BF meets DE at F.

Proof:

S.N.	Statements	S.N.	Reasons
1.	ABEF is a parallelogram	1.	Since AB // FE and AF // BE
2.	Δ ABE= $\frac{1}{2}$ ▱ABEF	2.	Diagonal of a parallelogram bisect the parallelogram.
3.	▱ABEF= ▱ABCD	3.	They are standing on the same base AB and between the same parallels AB and DE.
4.	Δ ABE= $\frac{1}{2}$ ▱ABCD	4.	From statements (2) and (3)

proved.

Alternatively:



Given: ▱ABCD and Δ ABE are on the same base AB and between the same parallels AB // DE.

To prove: $Area\ of\ \Delta\ ABE = Area\ of\ \frac{1}{2} \square\ ABCD.$

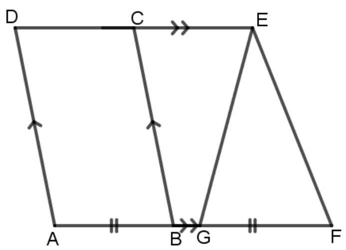
Construction: CN ⊥ AB is draw. CN is the height of the ▱ABCD and Δ ABE.

Proof:

S.N	Statements	S.N.	Reasons
1.	$\square\ ABCD = AB \times CN$	1.	Area of parallelogram is base × height.
2.	$\Delta\ ABE = \frac{1}{2}\ AB \times CN$	2.	Area of triangle is $\frac{1}{2}$ base × height.
3.	$\Delta\ ABE = \frac{1}{2}\ \square ABCD$	3.	From statements (1) and (2).

Hence, proved.

Corollary:



The area of the triangle is half of the area of the parallelogram standing on the equal base and between the same parallels.

In the figure alongside, AF // DE and AB=GF.

So, area of $\Delta\ EFG = Area\ of\ \frac{1}{2} \square\ ABCD.$

Theorem 3:

Triangles standing on the same base and between the same parallels are equal in area.

Experimental verification:

Step 1: Draw three pairs of triangles ABC and ABD with different sizes are drawn on the same base AB and between the same parallels AB and AD.

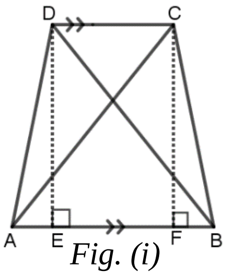


Fig. (i)

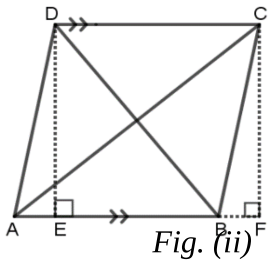


Fig. (ii)

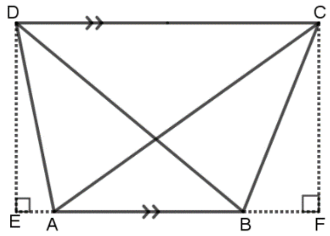


Fig. (iii)

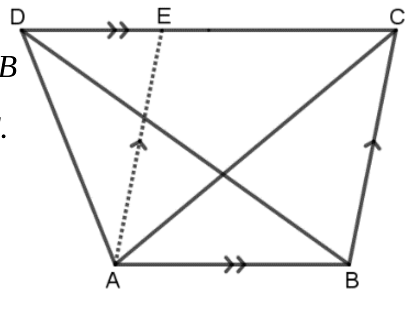
Step 2:Draw DE $\perp$ AB and CF $\perp$ AB.

Step 3: Measure the base AB and heights DE and DF of each figure. Then calculate the areas of Δ ABC and Δ ABD.

F.N.	*Base AB*	*Height CF*	*Area of Δ ABC*	*Base AB*	*Height DE*	*Area of Δ ABD*	*Result*
(i)							*Δ ABC=Δ ABD*
(ii)							*Δ ABC=Δ ABD*
(iii)							*Δ ABC=Δ ABD*

Conclusion: Triangles standing on the same base and between the same parallels are equal in area.

Theoretical proof:



Given: *Δ ABC and Δ BCD are on the same base AB and between the same parallels AB and DC.*

To prove: *Area of Δ ABC = Area of Δ ABD.*

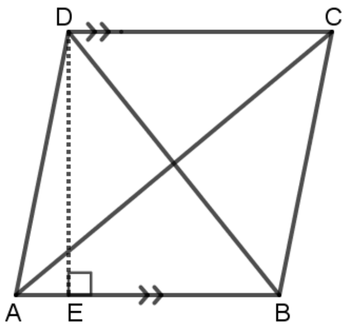
Construction: AE // BC is drawn. AE meets DC at E.

Proof:

S.N.	*Statements*	*S.N.*	*Reasons*
1.	*ABCE is a parallelogram.*	*1.*	*Being AB // EC and AE // BC.*
2.	$\Delta ABC = \frac{1}{2} \square ABCE$	*2.*	*Diagonal of a parallelogram bisect the parallelogram.*
3.	$\Delta ABD = \frac{1}{2} \square ABCE$	*3.*	*Being triangle and parallelogram on the same base and between the same parallels.*
4.	$\Delta ABC = \Delta ABD$	*4.*	*From statements (2) and (3).*

Hence, proved.

Alternatively:



Given: $\Delta\, ABC$ and $\Delta\, ABD$ are on the same base AB and between the same parallels AB and DC.

To prove: Area of $\Delta\, ABC$ = Area of $\Delta\, ABD$.

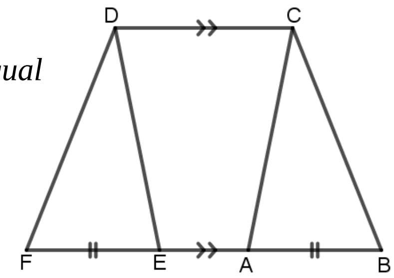
Construction: $DE \perp AB$ is drawn. DE is the height of both Δ^s ABC and ABD.

Proof:

S.N.	Statements	S.N.	Reasons
1.	$Area\ of\ \Delta\ ABC = \frac{1}{2}\ AB \times DE$	1.	$Area\ of\ \Delta\ is\ \frac{1}{2}\ (base \times height)$
2.	$Area\ of\ \Delta\ ABD = \frac{1}{2}\ AB \times DE$	2.	$Area\ of\ \Delta\ is\ \frac{1}{2}\ (base \times height)$
3.	$Area\ of\ \Delta\ ABC = Area\ of\ \Delta\ ABD$	3.	$From\ statements (1) and\ (2)$

Hence, proved.

Corollary:

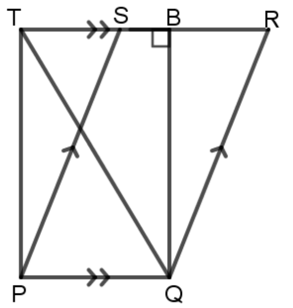


Triangles on the equal base and between the same parallels equal in area. In the figure alongside, FE = AB and FB // DC.

So, area of Δ FED = area of Δ ABC.

Examples with solution:

Example 1: $If\ PQ = 5\ cm\ and\ BQ = 8\ cm,\ then\ find\ the\ area\ of$ $\Delta\ PQT\ and\ \square\ PQRS.$



$Solution:$

$Here, base(b) = PQ = 5\ cm$

$Height(h) = BQ = 8\ cm$

$$Area\ of\ \square\ PQRS = base \times height$$
$$= 5\ cm \times 8\ cm$$
$$= 40\ cm^2$$

$\therefore The\ area\ of\ \square\ PQRS\ is\ 40\ cm^2.$

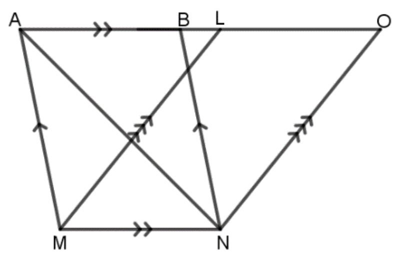
$$And\ area\ of\ \Delta\ PQT = \frac{1}{2}\ base \times height$$
$$= \frac{1}{2}(5\ cm \times 8\ cm)$$
$$= \frac{40\ cm^2}{2}$$
$$= 20\ cm^2$$

$\therefore The\ area\ of\ \Delta\ PQT\ is\ 20\ cm^2.$

Alternatively,

$And\ area\ of\ \Delta\ PQT = \frac{1}{2}\ area\ of\ \square\ PQRS......$

Example 2: *In the figure alongside, the area of ▱LMNO is* $44\ cm^2$*. Find the area of* Δ *ABN.*



Solution:

$Here, area\ of\ \square\ LMNO = 44\ cm^2.$

$Now, area\ of\ \square\ ABNM = area\ of\ \square\ LMNO.$ *[Since, ▱LMNO and ▱ABNM are on the same base MN and between the same parallels MN // AO.]*

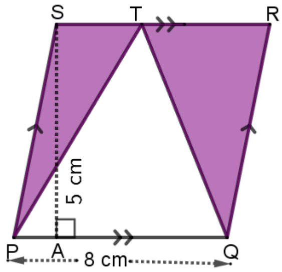
$$= 44\ cm^2$$

$So, area\ of\ \Delta\ ABN = \frac{1}{2}\square\ ABNM$ *[Since, diagonal AN bisects the ▱ABNM.]*

$$= \frac{1}{2} \times 44\ cm^2$$
$$= 22\ cm^2$$

$\therefore Area\ of\ \Delta\ ABN\ is\ 22\ cm^2.$

Example 3: *If $PQ = 8\ cm$ and $AS = 5\ cm$, then find the area of shaded region.*



Solution:

Here, in $\square\ PQRS$:

$Base(b) = 8\ cm$

$Height(h) = 5\ cm$

$Area\ of\ \square\ PQRS = base \times height$

$= 8\ cm \times 5\ cm$

$= 40\ cm^2$

$Area\ of\ \Delta\ PQT = \frac{1}{2} base \times height$

$= \frac{1}{2}(8\ cm \times 5\ cm)$

$= 20\ cm^2$

We know that,

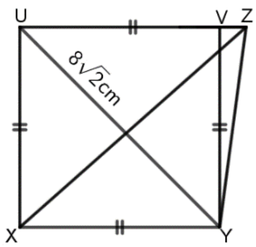
$Area\ of\ shaded\ region = Area\ of\ \square\ PQRS - Area\ of\ \Delta\ PQT$

$= 40\ cm^2 - 20\ cm^2$

$= 20\ cm^2$

$\therefore$ *The area of shaded region is* $20\ cm^2$.

Example 4: *In the figure alongside, $XYVU$ is a square with it's diagonals $UY = 8\sqrt{2}\ cm$ where UV is produced to Z and Z is joined with Y. Find the areas of the square $XYVU$ and $\Delta\ XYZ$.*



Solution:

Here, diagonal of a given square $(d) = UY = 8\sqrt{2}\ cm$

i) $Area\ of\ a\ square\ XYVU = \frac{1}{2}\ d^2$

$= \frac{1}{2}\ \left(8\sqrt{2}\ cm\right)^2$

$= 64\ cm^2$

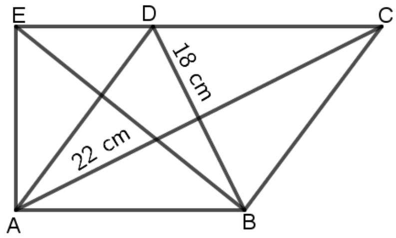
ii) $Area\ of\ \Delta\ XYZ = \frac{1}{2}\ Area\ of\ the\ square\ XYVU$ *[Since, triangle and square (Parallelogram) on the same base and between the same parallels]*

$= \frac{1}{2}\ (64\ cm^2)$

$= 32\ cm^2$

$\therefore$ *The area of the* $\Delta\ XYZ$ *is* $32\ cm^2$.

$\boldsymbol{Example\ 5}$: $In\ the\ figure\ ABCD\ is\ a\ rhombus\ where\ diagonals\ AC = 22\ cm\ and\ BD = 18\ cm.$ $Find\ the\ area\ of\ \Delta\ ABE.$



$Solution$:

$Here, In\ a\ rhombus\ ABCD$:

$One\ diagonal(d_1) = 22\ cm$

$Another\ diagonal(d_2) = 18\ cm$

$$Area\ of\ the\ rhombus = \frac{1}{2}\ (d_1 \times d_2)$$

$$= \frac{1}{2}\ (22\ cm \times 18\ cm)$$

$$= 198\ cm^2$$

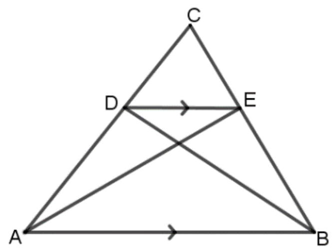
$Area\ of\ \Delta\ ABE = \frac{1}{2}\ area\ of\ the\ rhombus\ ABCD.$ *[Since, triangle and rhombus (parallelogram) are on the same base and between the same parallel lines]*

$$= \frac{1}{2}\ (198\ cm^2)$$

$$= 99\ cm^2$$

$\therefore The\ area\ of\ \Delta\ ABE = 99\ cm^2.$

$\boldsymbol{Example\ 6}$: If AB // DE, then prove that Δ ACE = Δ BDC.



Solution:

Given: AB // DE

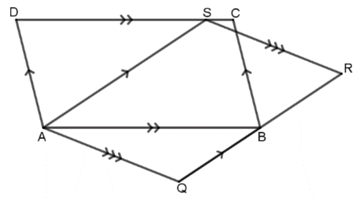
To prove: Δ ACE = Δ BDC

Proof:

S.N.	Statements	S.N.	Reasons
1.	Δ ADE = Δ BDE	1.	Triangles on the same base DE and between the same parallels DE // AB.
2.	Δ ADE+Δ DCE=Δ BDE+Δ DCE	2.	Adding same Δ DCE on the both sides of statement (1)
3.	Δ ACE = Δ BDC	3.	By whole part axiom

Hence, proved

Example 7: *In the given figure, ABCD and AQRS are two parallelograms. Prove that* $\square\, ABCD = \square\, AQRS$.

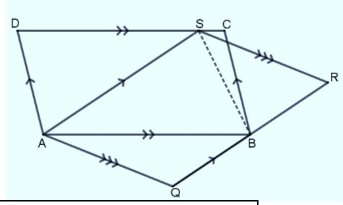


$Solution$:

Given: *ABCD and AQRS are parallelograms.*

To prove: $\square\, ABCD = \square\, AQRS$.

Construction: Join S and B.

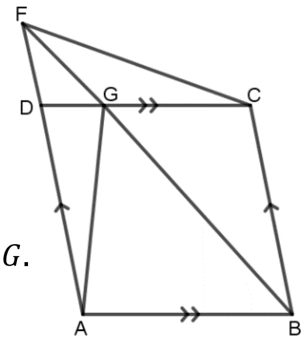


Proof:

S.N.	Statements	S.N.	Reasons
1.	$\Delta\, ABS = \frac{1}{2}\square\, ABCD$	1.	*Being Δ and $\square$ on the same base AB and between the same parallels AB and DC.*
2.	$\Delta\, ABS = \frac{1}{2}\square\, AQRS$	2.	*Being Δ and $\square$ on the same base AS and between the same parallels AS and QR.*
3.	$\square\, ABCD = \square\, AQRS$	3.	*From statements (1) and (2)*

Hence, proved.

Example 8: *In the figure alongside, ABCD is a parallelogram where G is a point on BG. If BG and AD are produced to meet at F, then prove that* $\Delta\, AFG = \Delta\, DFC$.



$Solution$:

$Given$: $ABCD$ *is a parallelogram in which* G *is a point on* BG.

BG *and* AD *are produced to meet at* F.

$To\ prove$: $\Delta\, AFG = \Delta\, DFC$

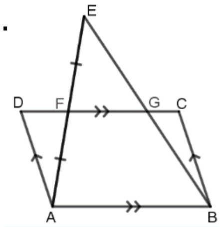
Proof:

S.N.	Statements	S.N.	Reasons
1.	$\Delta\, ABG = \frac{1}{2}\square\, ABCD$	1.	*Being $\Delta$and $\square$ standing on the same base and between the same parallels.*
2.	$\Delta\, ABG = \Delta\, ADG + \Delta\, BCG$	2.	*From statement (1)*
3.	$\Delta\, BCF = \frac{1}{2}\square\, ABCD$	3.	*Same as reason(1)*
4..	$\Delta\, ABG = \Delta\, BCF$	4.	*From statements (1) and (2)*
5.	$\Delta\, BCF = \Delta\, ADG + \Delta\, BCG$	5.	*From statements (2) and (4)*
6.	$\Delta\, BCF - \Delta\, BCG = \Delta\, ADG + \Delta\, BCG - \Delta\, BCG$	6.	*Subtracting Δ BCG from both sides of St. (5)*
7.	$\Delta\, FCG = \Delta\, ADG$	7.	*By whole part axiom*
8.	$\Delta\, FCG + \Delta\, FDG = \Delta\, ADG + \Delta\, FDG$	8.	*Adding Δ FDG on both sides of St.(7)*
9.	$\Delta\, AFG = \Delta\, DFC$	9.	*By whole part axiom.*

Hence, proved.

Example 9: *In the figure alongside, ABCD is a parallelogram and* $AF = FE$.

Prove that area of $\Delta\, EFG = \frac{1}{4}$ *area of* $\square\, ABCD$.

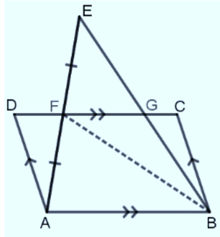


Solution:

Given: $ABCD$ *is a parallelogram and* $AF = FE$.

To prove: *Area of* $\Delta\, EFG = \frac{1}{4}$ *area of* $\square\, ABCD$.

Construction: *Join B and F*.

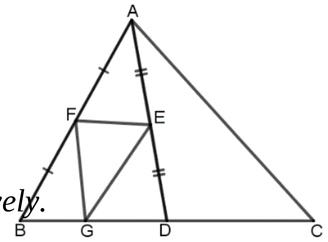


Proof:

S.N.	Statements	S.N.	Reasons
1.	G is the mid-point of BE.	1.	By using mid-point theorem in $\Delta\, ABE$.
2.	$\Delta\, EFG = \frac{1}{2}\,\Delta\, BEF$ i.e. $2\,\Delta\, EFG = \Delta\, BEF$	2.	FG is the median of the Δ BEF.
3.	$\Delta\, BEF = \Delta\, ABF$	3.	FB is the median of the $\Delta\, ABE$
4.	$\Delta\, ABF = \frac{1}{2}\,\square\, ABCD$	4.	Δ ABF and ▱ABCD are on the same base and between the same parallels AB // DC.
5.	$2\,\Delta\, EFG = \frac{1}{2}\,\square\, ABCD$ i.e. $\Delta\, EFG = \frac{1}{4}\,\square\, ABCD$	5.	From statements (2), (3) and (4)

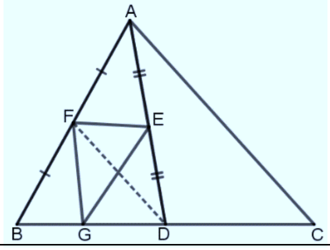
Hence, proved.

Example 10: *In the given figure, D is the mid-point of side BC of Δ ABC, E is the mid-point of AD, F is mid-point of AB and G is any point of BD. Prove that: Δ ABC=8 Δ EFG.*



Solution: D, E and F are the mid-points of BC, AD and AB respectively.

i.e. BD=DC, AE=ED and AF=FB. G is any point of BD.



To prove: Δ ABC=8 Δ EFG.

Construction: Join F and D.

Proof:

S.N.	Statements	S.N.	Reasons
1.	EF // DB	1.	In Δ ABD, E and F are the mid points of the sides AD and AB respectively.
2.	$\Delta\, ABD = \frac{1}{2}\, \Delta\, ABC$	2.	The median AD bisects the Δ ABC.
3.	$\Delta\, AFD = \frac{1}{2}\, \Delta\, ABD$	3.	The median FD bisects the Δ ABD.
4.	$\Delta\, EFD = \frac{1}{2}\, \Delta\, AFD$	4.	The median EF bisects the Δ AFD.
5.	$\Delta\, EFD = \Delta\, EFG$	5.	Δ EFD and Δ EFG are on the same base EF and between the same parallels EF and DB.
6.	$\Delta\, EFD = \frac{1}{2} \times\, \Delta\, AFD$ $\Delta EFD = \frac{1}{2} \times \frac{1}{2}\, \Delta\, ABD$	6.	From statements (3) and (4).
7.	$\Delta EFD = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}\, \Delta\, ABC$	7.	From statements (6) and (2).
8.	$\Delta EFG = \frac{1}{8}\, \Delta\, ABC\ i.e. \Delta\, ABC = 8\, \Delta\, EFG$	8.	From statements (7) and (5).

Hence, proved.

❖ ***Multiple Choice Questions:***

1) *If the length of a side of a equilateral triangle is 3 cm then how much is the area of the triangle ?*
   a) $3.8\ cm^2$
   b) $3.9\ cm^2$
   c) $3.89\ cm^2$
   d) $3.98\ cm^2$
2) *If the area of equilateral triangle ABC is* $16\sqrt{3}\ cm^2$ *then how long is the side of the triangle ABC ?*
   a) $8.01\ cm$

   b) *8.001 cm*

   c) $8.1\ cm$

   d) $8\ cm$

3) *If the altitude of a triangle is 5 cm and base is* $4\sqrt{2}$ *cm then how much is the area of the triangle ?*

   a) $20\sqrt{2}\ cm^2$

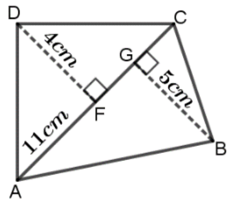
   b) $10\sqrt{2}\ cm^2$

   c) $5\sqrt{2}\ cm^2$

   d) $40\sqrt{2}\ cm^2$

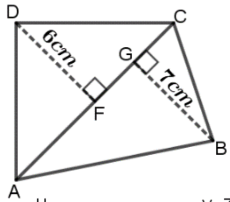
4) *Area of a parallelogram is 48* cm^2. *If base of the parallelogram is 6 cm then how much is the height of the parallelogram ?*
   a) *16 cm*
   b) *4 cm*
   c) *6 cm*
   d) *8 cm*
5) *If there are 3 cm and* $4\sqrt{2}$ *cm lengthy diagonals in a rhombus then how much is the area of the rhombus ?*
   a) $12\sqrt{2}\ cm^2$
   b) $6\sqrt{2}\ cm^2$
   c) $24\sqrt{2}\ cm^2$
   d) $3\sqrt{2}\ cm^2$
6) *There are 3 m and 4 m lengthy parallel lines in a trapezium. If distance between the parallel lines is 2 m then how much is the area of the trapezium ?*
   a) $8\ m^2$
   b) $6\ m^2$
   c) $14\ m^2$
   d) $7\ m^2$
7) *Area of a trapezium is* $18\ cm^2$. *If there are 3 cm and 6 cm lengthy parallel lines in the trapezium then how much is the distance between the parallel lines ?*
   a) *3 cm*
   b) *6 cm*
   c) *4 cm*
   d) *2 cm*

8) *How much is the area of the quadrilateral given alongside ?*



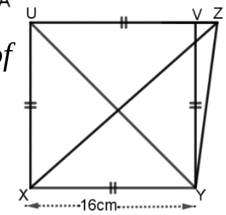
a) $44\ cm^2$
b) $55\ cm^2$
c) $27.5\ cm^2$
d) $49.5\ cm^2$

9) *If area of the quadrilateral ABCD is* $52\ cm^2$, $FD = 6\ cm$ *and* $BD = 7\ cm$ *then how long is the diagonal AC ?*



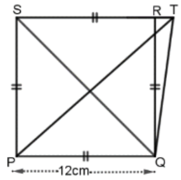
a) $4\ cm$
b) $8\ cm$
c) $6\ cm$
d) $9\ cm$

10) *In the given figure alongside,* $XY = 16\ cm$. *How much is the area of the triangle XYZ ?*



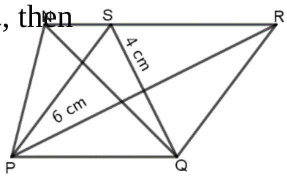
a) $256\ cm^2$
b) $64\ cm^2$
c) $32\ cm^2$
d) $128\ cm^2$

11) *In the given figure alongside,* $PQ = 12\ cm$. *How much is the area of the triangle SQR ?*



a) $144\ cm^2$
b) $72\ cm^2$
c) $36\ cm^2$
d) $18\ cm^2$

12) If diagonals of a rhombus PQRS are PR= $6\ cm$ and SQ= $4\ cm$, then how much is the area of the rhombus PQRS ?



a) $24\ cm^2$
b) $48\ cm^2$
c) $12\ cm^2$
d) $18\ cm^2$

13) *What is the relation between ▱ABCD and ▱ABEF if they are standing on the same base and between the same parallel lines?*

a) *Area of* ▱ABCD $= \frac{1}{2}$ *Area of* ▱ABEF
b) *Area of* ▱ABCD = *Area of* ▱ABEF
c) *Area of* ▱ABEF $= \frac{1}{2}$ *Area of* ▱ABCD
d) *Area of* ▱ABCD = 2 *times area of* ▱ABEF

14) *What is the relation between ▱ABCD and* ΔABE *if they are standing on the same base and between the same parallel lines?*

a) *Area of* ▱ABCD $= \frac{1}{2}$ *Area of* $\Delta\ ABE$
b) *Area of* ▱ABCD = *Area of* ΔABE
c) *Two times area of* ▱ABCD = *Area of* ΔABE
d) *Area of* ▱ABCD = 2 *times area of* ΔABE

15) *What is the relation between* $\Delta\ MNO$ *and* $\Delta\ MNP$ *if they are standing on the same base and between the same parallel lines?*

a) *Area of* $\Delta\ MNO = \frac{1}{2}$ *Area of* $\Delta\ MNP$
b) *Area of* $\Delta\ MNP = 2$ *times area of* $\Delta\ MNO$
c) *Area of* $\Delta\ MNO$ = *Area of* $\Delta\ MNP$
d) *Area of* $\Delta\ MNO = 2$ *times area of* $\Delta\ MNP$

16) *Area of* ▱*RSTU is* $54\ cm^2$. *If* ▱*RSTU and* Δ *RSM are standing on the same base and lying between the same parallel lines, how much is the area of* Δ *RSM?*

a) $54\ cm^2$
b) $108\ cm^2$
c) $27\ cm^2$
d) $13.5\ cm^2$

17) *Area of* ▱*RSTU is* $84\ cm^2$ *and length of base is* 7 *cm. If* ▱*RSTU and* Δ *RSM are standing on the same base and lying between the same parallel lines, how much is the height of the* Δ *RSM ?*

e) $6\ cm$
f) $24\ cm$
g) $7\ cm$
h) $12 cm$

18) *Area of* Δ *LMN is* $44\ cm^2$ *and base of that* Δ *is* 11 *cm. If* ▱*LMNT and* Δ *LMN are standing on the same base and lying between the same parallel lines, how much is the height of the* ▱*LMNT ?*

i) $8\ cm$
j) $22\ cm$
k) $4\ cm$
l) $16\ cm$

19) *Area and base of* ▱*PQRS are* $90\ cm^2$ *and* $10\ cm$ *respectively. If* ▱*PQCD and* ▱*PQRS are standing on the same base and lying between the same parallel lines, how much is the height of* ▱*PQCD ?*

a) $10\ cm$

b) $4.5\ cm$

c) $18\ cm$

d) $9\ cm$

20) *Area of* ▱*LMNO is* $64\sqrt{2}\ cm^2$. *If* ▱*LMNO and* Δ *LMR are standing on the same base and lying between the same parallel lines where base is 8 cm, how much is the height of* Δ *LMR?*

a) $8\sqrt{2} cm$

b) $2\sqrt{2}\ cm$

c) $4\sqrt{2}\ cm$

d) $16\sqrt{2}\ cm$

21) *Area of* Δ *PQR is* $4\sqrt{7}\ \ cm^2$. *If* Δ *PQR and* Δ *PQS are standing on the same base and lying between the same parallel lines, how much is the area of* Δ *PQS ?*

a) $2\sqrt{7}\ cm^2$

b) $4\sqrt{7}\ cm^2$

c) $\sqrt{7}\ cm^2$

d) $8\sqrt{7}\ cm^2$

22) *Area and base of* Δ *PQR are* $24\ cm^2$ *and* $4\ cm$ *respectively. If* Δ *PQR and* Δ *PQS are standing on the same base and lying between the same parallel lines, how much is the height of* Δ *PQS ?*

a) $4\ cm$

b) $3\ cm$

c) $6\ cm$

d) $2\ cm$

23) *Area of a parallelogram is ABCD is* $22\ cm^2$. *If the parallelogram ABCD and a square CDMN are standing on the same base and between the same parallels, then how much is the area of the square CDMN?*

a) $11\ cm^2$

b) $44\ cm^2$

c) $22\ cm^2$

d) $5.5\ cm^2$

24) *Area of a rhombus is PQRS is* $29\ m^2$. *If the rhombus PQRS and a a parallelogram RSCD are standing on the same base and between the same parallel lines, then how much is the area of the parallelogram ?*

a) $58\ m^2$

b) $14.5\ m^2$

c) $7.25\ m^2$

d) $29\ m^2$

25) *Area of a parallelogram is LMNT is* $32\sqrt{3}\ cm^2$. *If the parallelogram LMNT and a rectangle RSTN are standing on the same base and between the same parallel lines, then how much is the area of the rectangle ?*

a) $16\sqrt{3}\ cm^2$

b) $32\sqrt{3}\ cm^2$

c) $8\sqrt{3}\ cm^2$

d) $64\sqrt{3}\ \ cm^2$

26) *Area of a rhombus ABCD is* $70\ cm^2$. *If the rhombus ABCD and a square ABMN are standing on the same base and between the same parallel lines, then how much is the area of the square ABMN ?*

a) $35\ cm^2$

b) $140\ cm^2$

c) $70\ cm^2$

d) $17.5\ cm^2$

27) *Area of a rhombus ABCD is* $35\sqrt{5}\ cm^2$. *If the rhombus ABCD and a triangle CDM are standing on the same base and between the same parallel lines, then how much is the area of the triangle ?*

a) $35\sqrt{5}\ cm^2$

b) $70\sqrt{5}\ cm^2$

c) $\frac{35\sqrt{5}}{4}\ cm^2$

d) $\frac{35\sqrt{5}}{2}\ cm^2$

28) *Area of a square ABCD is* $43\sqrt{3}\ cm^2$. *If the square ABCD and a triangle ABE are standing on the same base and between the same parallel lines, then how much is the area of the triangle ?*

$a)\ 43\sqrt{3}\ cm^2$

$b)\ \frac{43\sqrt{3}}{2}\ cm^2$

$c)\ 86\sqrt{3}\ cm^2$

$d)\ \frac{43\sqrt{3}}{4}\ cm^2$

29) *Area of a rectangle LMNO is* $25\sqrt{2}\ cm^2$. *If the rectangle LMNO and a triangle NOG are standing on the same base and between the same parallel lines, then how much is the area of the triangle ?*

$a)\ 25\sqrt{2}\ cm^2$

$b)\ 50\sqrt{2}\ cm^2$

$c)\ \frac{25\sqrt{2}}{2}\ cm^2$

$d)\ \frac{25\sqrt{3}}{4}\ cm^2$

30) *Area of a* Δ *XYZ is* $102\ cm^2$ $and\ altitude\ of\ that\ is$ $12\ cm$. *If the* Δ *XYZ and rectangle WXYZ are standing on the same base and between the same parallel lines, then how much is the length of the rectangle ?*

a) 12 cm
b) 17 cm
c) 6 cm
d) 8.5 cm

31) *Area of a* Δ *ABC is* $84\ cm^2$ $and\ height\ of\ that\ is$ $14\ cm$. *If the* Δ *ABC and rhombus MBCN are standing on the same base and between the same parallel lines, then how much is the base of the rhombus ?*

a) 6 cm
b) 14 cm
c) 7 cm
d) 12 cm

32) *Area of a* Δ *XYZ is* $72\ cm^2$ $and\ altitude\ of\ that\ is$ $12\ cm$. *If the* Δ *XYZ and square WXYZ are standing on the same base and between the same parallel lines, then how much is the length of the square ?*

a) 12 cm
b) 6 cm
c) 24 cm
d) 18 cm

33) *What is the relation between ▱ABCD and ▱PQRS if they are standing on the equal base and between the same parallel lines?*

a) Area of ▱ABCD $= \frac{1}{2}$ *Area of ▱PQRS*
b) Area of ▱ABCD = Area of ▱PQRS
c) Area of ▱ABEF $= \frac{1}{2}$ *Area of ▱PQRS*
d) Area of ▱ABCD = 2 *times area of ▱PQRS*

34) *What is the relation between ▱MNOP and* ΔABE *if they are standing on the same base and between the same parallel lines?*

a) Area of ▱MNOP $= \frac{1}{2}$ *Area of* Δ *ABE*

b) Area of ▱MNOP $=$ *Area of* ΔABE

c) *Two times area of* ▱MNOP $=$ *Area of* ΔABE

d) *Area of* ▱MNOP $= 2$ *times area of* ΔABE

35) *What is the relation between* $\Delta\ ABC$ *and* $\Delta\ PQR$ *if they are standing on the equal base and between the same parallel lines?*

a) *Area of* $\Delta\ ABC = \frac{1}{2}$ *Area of* $\Delta\ PQR$

b) *Area of* $\Delta\ ABC = 2$ *times area of* $\Delta\ PQR$

c) *Area of* $\Delta\ ABC =$ *Area of* $\Delta\ PQR$

d) *Area of* $\Delta\ PQR = 2$ *times area of* $\Delta\ ABC$

36) *Area of* ▱LMNO is $64\ cm^2$. *If* ▱LMNO *and* $\Delta\ PQR$ *are standing on the equal base and lying between the same parallel lines, how much is the area of* $\Delta\ PQR$?

m) $64\ cm^2$

n) $128\ cm^2$

o) $32\ cm^2$

p) $16\ cm^2$

37) *Area of* ▱PQRS is $100\ cm^2$. *If* ▱ABCD *and* ▱PQRS *are standing on the equal base and lying between the same parallel lines, how much is the area of* ▱ABCD?

$a)\ 50\ cm^2$

$b)\ 200\ cm^2$

$c)\ 25\ cm^2$

e) $100\ cm^2$

38) *Area of* $\Delta\ PQR$ *is* $8\sqrt{11}\ \ cm^2$. *If* $\Delta\ PQR$ *and* $\Delta\ LMN$ *are standing on the equal base and lying between the same parallel lines, how much is the area of* $\Delta\ LMN$?

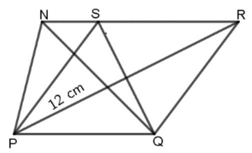
$a)\ 4\sqrt{11}\ cm^2$

$b)\ 8\sqrt{11}\ cm^2$

$c)\ 2\sqrt{11}\ cm^2$

$d)\ 16\sqrt{11}\ cm^2$

39) *If the area of a rhombus PQRS is* $42\ cm^2$ *and PR*$=12\ cm$*, then how Much is the length of SQ ?*



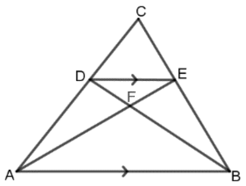
a) 5 *cm*

b) *8 cm*

c) *6 cm*

d) *7 cm*

40) What is the relation between $\Delta\ ADF$ and $\Delta\ BEF$?



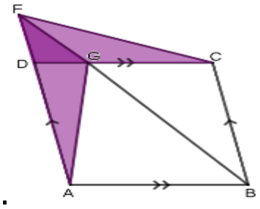
a) $\Delta\ ADF = \frac{1}{2}\Delta\ BEF$

b) $\Delta\ BEF = \frac{1}{2}\Delta\ ADF$

c) $\Delta\ ADF = \Delta\ BEF$

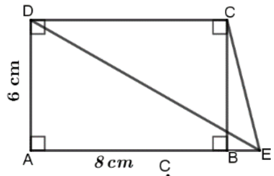
d) $\Delta\ ADF = 2\ \Delta\ BEF$

41) What is the relation between $\Delta\, AFG$ and $\Delta\, DFC$?



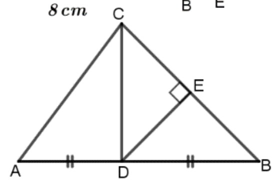
a) $\Delta\, AFG = \frac{1}{2}\Delta\, BFC$
b) $2\Delta\, AFG = \Delta\, BFC$
c) $\Delta\, AFG = 2\Delta\, BFC$
d) $\Delta\, AFG = \Delta\, BFC$

42) In the given figure, ABCD is a rectangle. Find the area of $\Delta\, DCE$.



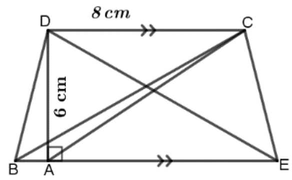
a) $12\ cm^2$
b) $24\ cm^2$
c) $48\ cm^2$
d) $36\ cm^2$

43) $In\ the\ given\ figure, DE \perp BC$ and D is mid point of AB. If $BC = 18\ cm$ and $DE = 14\ cm$, find the area of $\Delta\, ABC$.



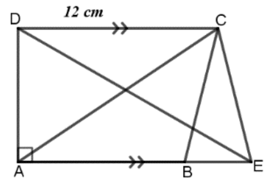
$a)\ 126\ cm^2$
$b)\ 63\ cm^2$
$c)\ 252\ cm^2$
$d)\ 378\ cm^2$

44) In the figure alongside, if $BE \parallel DC, DA \perp BE, AD = 6\ cm\ and$ $DC = 8\ cm, then\ find\ the\ area\ of\ \Delta\, DCE.$



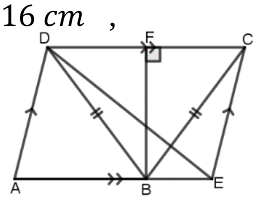
$a)\ 48\ cm^2$
$b)\ 24\ cm^2$
$c)\ 12\ cm^2$
$d)\ 96\ cm^2$

45) If area of $\Delta\, DCE$ is 48 cm^2 and DC= 12 cm, how much is the length of the side AD ?



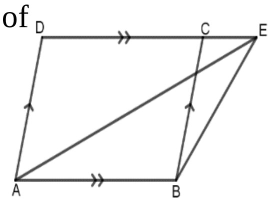
a) 4 cm
b) 6 cm
c) 8 cm
d) 12 cm

46) In the given figure, $BD = BC, BF \perp DC, DB = 10\ cm$ and $AE = 16\ cm$, find the area of parallelogram ADCE.



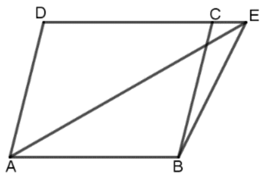
a) $48\ cm^2$
b) $24\ cm^2$
c) $64\ cm^2$
d) $96\ cm^2$

47) In the given figure, ABCD is a parallelogram. If the area of trapezium ABED= $75\ cm^2$ and the area of $\Delta\, BCE = 10\ cm^2$, find the area of $\Delta\, ABE$.



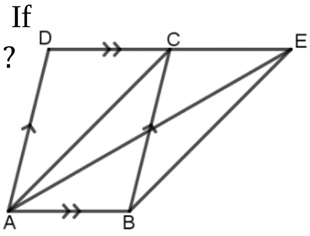
a) $65\ cm^2$
b) $55\ cm^2$
c) $23.5\ cm,^2$
d) $32.5\ cm^2$

48) In the given figure, ABCD is a rhombus. If the area of trapezium ABED= $65\ cm^2$ and the area of $\Delta\, BCE = 8\ cm^2$, find the area of $\Delta\, ABE$.



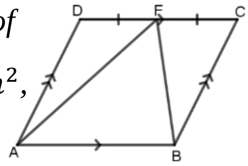
a) $28.5\ cm^2$
b) $57\ cm^2$
c) $27.5\ cm^2$
d) $56.5\ cm^2$

49) In the figure alongside, ABCD and ABEC are parallelograms. If area of $\Delta\, ACE$ is $31\ cm^2$, how much is the area of the $\Delta\, ADC$?



a) $15.5\ cm^2$
b) $62\ cm^2$
c) $31\ cm^2$
d) $31.5\ cm^2$

50) In the given figure, ABCD is a parallelogram and F is the mid-point of the line segment DC. If the area of the parallelogram ABCD is $48\ cm^2$, *find the area of quadrilateral ABCF.*



a) $24\ cm^2$
b) $12\ cm^2$
c) $48\ cm^2$
d) $36\ cm^2$