

# MATHS

# **BOOKS - RD SHARMA MATHS (ENGLISH)**

# AREA OF PARALLELOGRAMS AND TRIANGLES

#### Others

**1.** In ABC, D is the mid-point of AB, P is any point of BC,  $CQ \mid \mid PD$  meets AB in Q. Show that  $ar(BPQ) = \frac{1}{2}ar(ABC)$ . TO PROVE :  $ar(BPQ) = \frac{1}{2}ar(ABC)$  CONSTRUCTION : Join CD.

**2.** ABCD is a parallelogram, G is the point on AB such that AG = 2 GB, E is a point of DC such that CE = 2DE and F is the point on BC such that BF = 2FC. Prove that:  $ar( \triangle EGB) = \frac{1}{6}ar (ABCD)$ 

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**3.** The side AB of a parallelogram ABCD is produced to any point  $P \cdot A$  line through A parallel to CP meets CB produced in Q and the parallelogram PBQR completed. Show that  $ar(llgmABCD) = ar(llgmBPRQ) \cdot \text{CONSTRUCTION} : \text{Join } AC$  and PQ. TO PROVE : ar(llgmABCD) = ar(llgmBPRQ)

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**4.** In a  $\triangle ABC$ , If L and M are points on AB and AC respectively such that  $LM \mid BC$ . Prove that:  $ar (\triangle LOB) = ar (\triangle MOC)$ 

5. D is the mid-point of side BC of  $\triangle ABC$  and E is the mid-point of BD. If O is the mid-point of AE , prove that  $ar( \triangle BOE) = \frac{1}{8}ar( \triangle ABC).$ 

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**6.** In Fig. 9.30, D and E are two points on BC such that BD = DE = EC. Showt^a r(A B D)=a r(A D E)=a r(A E C)`. Can you now answer the question that you have left in the Introduction of this chapter, whether the field of Budha has been actually divided into three parts of equal area ?

7. A villager Itwari has a plot of land of the shape of a quadrilateral. The Gram Panchayat of the village decided to take over some portion of plot from one of the corners to construct a health centre. Itwari agrees to the above proposal with the condition that he should be given equal amount of land in lieu of his land adjoining his plot so as to form a triangular plot. Explain how his proposal will be implemented.

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8. In parallelogram ABCD, AB = 10cm. The altitudes corresponding to the sides AB and AD are respectively 7cm and 8cm. Find AD.

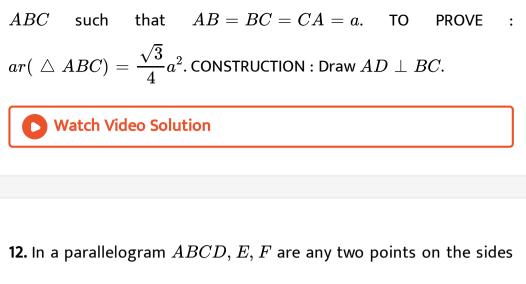
**9.** D, E, F are the mid points of side AB, BC, AC prove that BDEF is a parallelogram whose area is half that of  $\Delta$  ABC

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**10.** If the medians of a  $\triangle ABC$  intersect at G, show that  $ar(\triangle AGB) = ar(\triangle AGC) = ar(\triangle BGC) = \frac{1}{3}ar(\triangle ABC).$ GIVEN :  $\triangle ABC$  such that its medians AD, BE and CF intersect at G. TO PROVE :  $ar(\triangle AGB) = ar(\triangle BGC) = ar(\triangle AGC) = \frac{1}{3}ar(\triangle ABC)$ 

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**11.** Prove that the area of an equilateral triangle is equal to  $\frac{\sqrt{3}}{4}a^2$ , where *a* is the side of the triangle. GIVEN : An equilateral triangle



AB and BC respectively. Show that  $ar(\ riangle \ ADF) = ar(\ riangle \ DCE).$ 

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**13.** The diagonals of a parallelogram ABCD intersect at O. A line through O meets AB in X and CD in Y. Show that  $ar(AXYD) = \frac{1}{2}(AR^{gm}ABCD)$ 

**14.** Show that the segment joining the mid-points of a pair of opposite sides of a parallelogram, divides it into two equal parallelograms. GIVEN : A parallelogram ABCD, E and F are the mid-points of opposite sides AB and CD respectively. TO PROVE :  $ar( \mid \mid^{gm} AEFD) = ar( \mid \mid^{gm} EBCF)$  CONSTRCUTION : Join EF.

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15. Diagonals AC and BD of a trapezium ABCD with  $AB \mid \ | \ CD$ intersect each other at O. Prove that ar  $( \ \triangle \ AOD) = ar( \ \triangle \ BOC).$ 

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**16.** In Figure, ABCD is a quadrilateral and  $BE \mid |AC$  and also BE meets DC produced at E. Show that area of  $\triangle ADE$  is equal to the area of the quadrilateral ABCD.

17. If a triangle and a parallelogram are on the same base and between the same parallels lines, then the area of the triangle is equal to half that of the parallelogram. GIVEN : A  $\triangle ABC$  and  $| |^{gm} BCDE$  on the same base BC and between the same parallels BC and AD. TO PROVE : ar( $\triangle ABC$ )=1/2 ar ( $| |^{gm} BCDE$ ) CONSTRUCTION : Draw AL  $\perp$  BC and DM  $\perp$  BC, produced at M.

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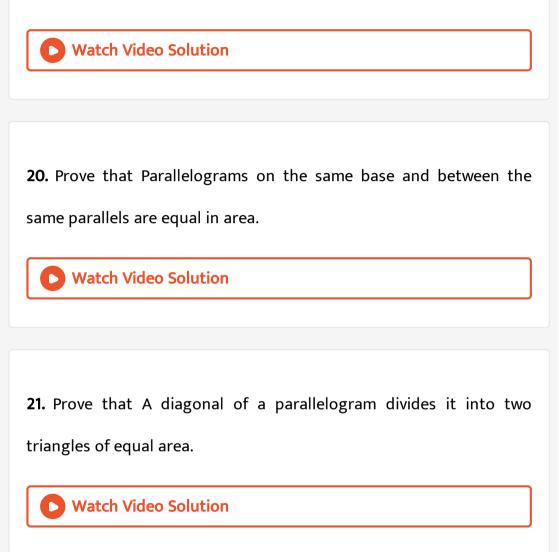
**18.** In Figure, ABCDE is a pentagon. A line through B parallel to AC

meets DC produced at F. Show that: (i)  $ar( \bigtriangleup ACB) = ar( \bigtriangleup ACF)$  (ii) ar(quadrilateral

AEDF) = ar(ABCDE)

19. Prove that The area of a parallelogram is the product of its base

and the corresponding altitude.



**22.** If each diagonal of a quadrilateral separates it into two triangles of equal area then show that the quadrilateral is a parallelogram. GIVEN : A quadrilateral ABCD such that its diagonals AC and BDare such that ar(ABD) = ar(CDB) and ar(ABC) = ar(ACD). TO PROVE: Quadrilateral ABCD is a parallelogram.



**23.** The area of a triangle is half the product of any of its sides and the corresponding altitude. GIVEN : A ABC in which AL is the altitude to the side BC. TO PROVE :  $ar(ABC) = \frac{1}{2}(BC \cdot AL)$ CONSTRUCTION : Through C and A draw CDBA and ADBCrespectively, intersecting each other at D.

24. Triangles ABC and DBC are on the same base BC with A, D on opposite side of line BC, such that  $ar(\perp ABC) = ar(DBC)$ . Show that BC bisects AD.

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**25.** If the diagonals AC, BD of a quadrilateral ABCD, intersect at O, and sequrate the quadrilateral into four triangles of equal area, show that quadrilateral ABCD is a parallelogram. GIVEN : A quadrilateral ABCD such that its diagonals AC and BD intersect into that separate it four parts at O and such ar(AOB) = ar(BOC) = ar(COD) = ar(AOD) TO PROVE : Quadrilateral ABCD is a parallelogram.

**26.** If P is any point in the interior of a parallelogram ABCD, then prove that area of the triangle APB is less than half the are of parallelogram.

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**27.** The diagonals of quadrilateral ABCD, AC and BD intersect in *O*. Prove that if BO = OD, the triangles ABC and ADC are equal in area. GIVEN : A quadrilateral ABCD in which its diagonals ACand BD intersect at *O* such that BO = OD. TO PROVE : ar(ABC) = ar(ADC)

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**28.** XY is a line parallel to side BC of triangle ABC. BEllAC and CF II ABmeetXY  $\in$  E and Frespectively. Showt^a r( A B E)=a r( A C

F)dot`

**29.** In Figure, ABCD is a trapezium in which ABDC and DC = 40cm and AB = 60cm. If X and Y are, respectively, the midpoints of AD and BC, prove that :  $XY = 50cm \ DCYX$  is a trapezium  $ar\left(trap\dot{D}CYX\right) = \frac{9}{11}ar\left(trapX\dot{Y}BA$ 

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**30.** Show that the diagonals of a parallelogram divide it into four triangles of equal area. GIVEN : A parallelogram ABCD. The diagonals AC and BD intersect at O. TO PROVE : ar(OAB) = ar(OBC) = ar(OCD) = ar(AOD)

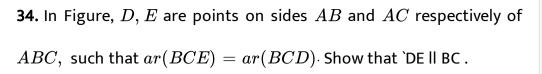
**31.** Show that the area of a rhombus is half the product of the lengths of its diagonals. GIVEN : A rhombus ABCD whose diagonals AC and BD intersect at O. TO PROVE :  $ar(rhombusABCD) = \frac{1}{2}(AC \cdot BD)$ 

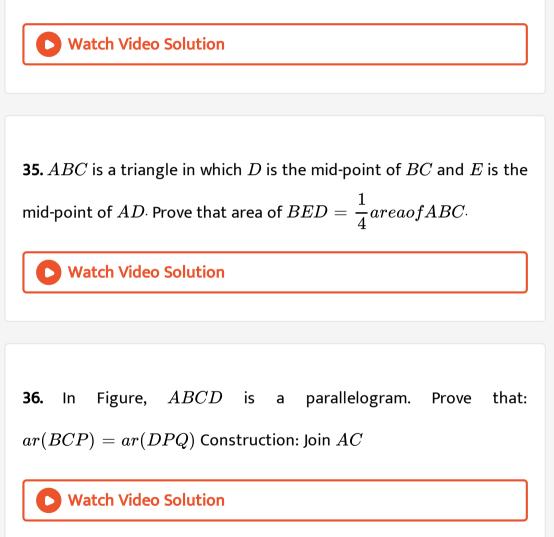
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**32.** ABCD is a parallelogram whose diagonals AC and BD intersect at  $O \cdot A$  Line through O intersects AB at P and DC at  $Q \cdot$  Prove that  $ar(POA) = ar(QOC) \cdot$ 

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**33.** A point D is taken on the side BC of a ABC such that BD = 2dC. Prove that ar(ABD) = 2ar(ADC).





**37.** ABCD is a parallelogram X and Y are the mid-points of BC and CD respectively. Prove that  $ar(AXY) = \frac{3}{8}ar(\uparrow(gm)ABCD)$ 

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**38.** The area of a trapezium is half the product of its height and the sum of parallel sides. GIVEN : A trapezium ABCD in which  $AB \mid |CD; AB = a, DC = b$  and AL = CM = h, where  $AL \perp DC$  and  $CM \perp AB$ . TO PROVE :  $ar(trap. ABCD) = \frac{1}{2}h(a + b)$  construction : Join AC

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**39.** Parallelogram ABCD and rectangle ABEF have the same base AB and also have equal areas. Show that the perimeter of the parallelogram is greater than that of the rectangle.

**40.** O is any point on the diagonal BD of the parallelogram ABCD.

Prove that  $ar( \bigtriangleup OAB) = ar( \bigtriangleup OBC)$ 

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**41.** Prove that the area of a rhombus is equal to half the rectangle contained by its diagonals. Given: A rhombus ABCD such that its diagonals AC and BD intersect at O. To Prove:  $ar (rhombus ABCD) = \frac{1}{2}$  (area of the rectangle contained by its diagonals  $= \frac{1}{2}(AC \times BD)$ 

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**42.** A quadrilateral ABCD is such that diagonal BD divides its area in two equal parts. Prove that BD bisects AC. GIVEN : A quadrilateral

ABCD in which diagonal BD bisects it. i.e.  $ar( \triangle ABD) = ar( \triangle BDC)$  CONSTRUCTION : Join AC Suppose AC and BD intersect at O. Draw  $AM \perp BD$  and  $CN \perp BD$ . TO PROVE : AO = OC.

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43. Prove that two triangles having the same base and equal areas lie

between the same parallels.

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**44.** Show that a median of a triangle divides it into two triangles of equal area. GIVEN : A  $\triangle ABC$  in which AD is the median. TO PROVE :  $ar( \triangle ABD) = ar( \triangle ADC)$  CONSTRUCTION : Draw  $AL \perp BC$ 

**45.** ABCD is a trapezium with  $AB \mid DC$ . A line parallel to AC intersects AB at X and BC at Y. Prove that  $ar( \triangle ADX) = ar( \triangle ACY).$ 



46. Diagonals AC and BD of a quadrilateral ABCD intersect at Oin such a way that  $ar( \triangle AOD) = ar( \triangle BOC)$ . Prove that ABCD is a trapezium.

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**47.** Let ABCD be a parallelogram of area  $124cm^2$ . If E and F are the mid-points of sides AB and CD respectively, then find the area of parallelogram AEFD.

48. If ABCD is a parallelogram, the prove that ar(ABD) = ar(BCD) = ar(ABC) = ar(ACD)=1/2a r(  $||^{gm}$ A B C D)

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



**50.** Triangles having equal areas and having one side of one of the triangles, equal to one side of the other, have their corresponding altitudes equal.

**51.** In Figure, ABCD is a parallelogram and EFCD is a rectangle.

Also  $AL \perp DC$ . Prove that

(i) ar(ABCD = ar(EFCD)

(ii)  $ar (ABCD) = DC \times AL$ 

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52. If E, F, G and H are respectively the mid-points of the sides of a

parallelogram  $ABCD,\,\,$  show that  $ar(EFGH)=rac{1}{2}ar(ABCD).$ 

53. In Figure, P is a point in the interior of a parallelogram ABCD .

Show that 
$$ar(APB) + ar(PCD) = \frac{1}{2}ar(\hat{\ }(gm)ABCD)$$

aR(APD) + ar(PBC) = ar(APB) + ar(PCD)

54. In Figure, PQRS and ABRS are parallelograms and X is any point on side BR. Show that :  $ar( \mid \mid^{gm} PQRS) = ar( \mid \mid^{gm} ABRS),$  $ar( \bigtriangleup AXS) = \frac{1}{2}ar( \mid \mid^{gm} PQRS)$ 

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**55.** The diagonals of a parallelogram ABCD intersect at a point O. Through O, a time is drawn to intersect AD at P and BC at Q. Show that PQ divides the parallelogram into two parts of equal area.

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**56.** E, F, G, H are respectively, the mid-points of the sides of parallelogram ABCD. Show that the area of EFGH is half the area of the parallelogram, ABCD. GIVEN : A quadrilateral ABCD in which L, F, G, H are respectively the mid-points of the sides AB, BC, CD

and  $DA_{\cdot}$  TO PROVE :  $ar(\ \hat{}\ (gm)EFGH)=rac{1}{2}ar(\ \hat{}\ (gm)ABCD)$ 

CONSTRUCTION : Join H and F

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**57.** The side AB of a parallelogram ABCD is produced to any point P. A line through A and parallel to CP meets CB produced at Q and then parallelogram PBQR is completed as shown in Figure. Show that  $ar(\hat{}(gm)ABCD) = ar^{gm}PBQR$ .

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58. In Figure, BC||XY, BX||CA and AB | | YC Prove that: ar(ABX) = ar(ACY)

**59.** The medians BE and CF of a triangle ABC intersect at G . Prove

that area of  $\triangle GBC$ =area of quadrilateral AGFE.

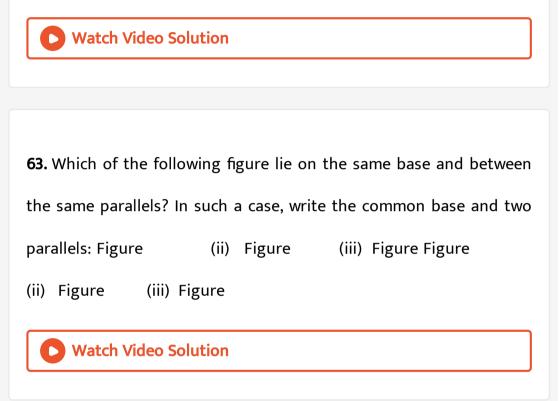


**60.** ABCD is a parallelogram. E is a point on BA such that BE = 2EAand F is a point on DC such that DF=2 FC. Prove that AECF is a parallelogram whose area is one third area of parallelogram ABCD.



**61.** A circular grassy plot of land, 42 m in diameter has a path of 3.5m wide running round it on the outside. Find the cost of gravelling the path at Rs.4 per square metre.

**62.** A point *O* inside a rectangle *ABCD* is joined to the vertices. Prove that the sum of the areas of a pair of opposite triangles so formed is equal to the sum of the areas of other pair of triangles.



**64.** ABCD is a quadrilateral and BD is one of its diagonals as shown in Figure. Show that ABCD is a parallelogram and find its area.

**65.** In parallelogram ABCD, AB = 10cm. The altitudes corresponding to the sides AB and AD are respectively 7cm and 8cm. Find AD.

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**66.** Show that the segment joining the mid-points of a pair of opposite sides of a parallelogram, divides it into two equal parallelograms.

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**67.** The diagonals of a parallelogram ABCD intersect at O. A line through O meets AB in X and CD in Y. Show that  $ar (quadrilateralAXYD) = \frac{1}{2}ar(parallelogram \ ABCD)$ 

68. Prove that of all parallelograms of which the sides are given, the

parallelogram which is rectangle has the greatest area.

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**69.** In Figure, ABCD is a parallelogram and EFCD is a rectangle.

Also  $AL \perp DC$ . Prove that

(i) ar(ABCD = ar(EFCD)

(ii)  $ar (ABCD) = DC \times AL$ 

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**70.** If E, F, G and H are respectively the mid-points of the sides of a parallelogram ABCD, Show that  $ar(EFGH) = \frac{1}{2}ar (ABCD)$ 

71. p AND q are any two points lying on the sides DC and ADrespectively of a parallelogram ABCD. Show that ar(APB) = ar (BQC).

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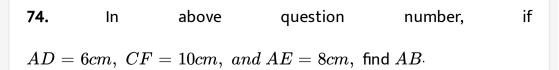
72. In Figure, P is a point in the interior of a parallelogram ABCD.

Show that  $ar(APB) + ar(PCD) = \frac{1}{2}ar(||^{gm}ABCD)$ ar(APD) + ar(PBC) = ar(APB) + ar(PCD)

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**73.** In Figure, ABCD is a parallelogram,  $AE \perp DC$  and  $\mathbb{C}F \perp AD$ .

If AB = 16CM, AE = 8cm and CF = 10cm, find AD





**75.** Let ABCD be a parallelogram of area  $124 \text{ } cm^2$ . If E and F are the mid-points of sides AB and CD respectively, then find the area of parallelogram AEFD

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**76.** If 
$$ABCD$$
 is a parallelogram, then prove that  
 $ar(\triangle ABD) = ar(\triangle BCD) = ar(\triangle ABC) = ar(\triangle ACD)$   
 $= \frac{1}{2} ar (parallelogramABCD)$ 

77. Show that a median of a triangle divides it into two triangles of

equal area.



78. AD is one of the medians of a  $ABC \cdot X$  is any point on AD . Show that ar(ABX) = ar(ACX)

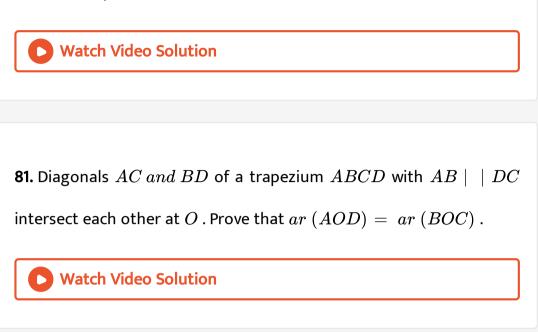
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**79.** In a ABC, E is the mid-point of median AD. Show that  $ar\left(BED\right)=rac{1}{4}ar\left(ABC
ight)$ 



**80.** In Figure, ABCD is a quadrilateral and  $BE \mid AC$  and also BE meets DC produced at E. Show that area of ADE is equal to the





82. In Figure, ABCDE is a pentagon. A line through B parallel to

AC meets DC produced at F. Show that:

(i) ar(ACB) = ar(ACF)

(ii) ar(AEDF) = ar(ABCDE)



**83.** Show that the diagonals of a parallelogram divide it into four triangles of equal area.

**84.** The diagonals of quadrilateral ABCD, AC and BD intersect in O. Prove that if BO = OD, the triangles ABC and ADC are equal in area.

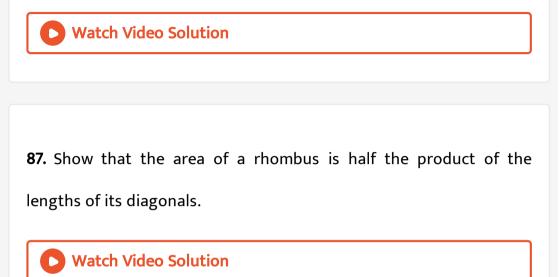
in arca.



**85.** If the diagonals AC, BD of a quadrilateral ABCD, intersect at O, and separate the quadrilateral into four triangles of equal area, show that quadrilateral ABCD is a parallelogram.

86. If each diagonals of a quadrilateral separates it into two triangles

of equal area then show that the quadrilateral is a parallelogram.



**88.** The side AB of a parallelogram ABCD is produced to any point P. A line through A and parallel to CP meets CB produced at Q and then parallelogram PBQR is completed as shown in Figure. Show that  $ar( \mid \mid^{gm} ABCD) = ar( \mid \mid^{gm} PBQR)$ 



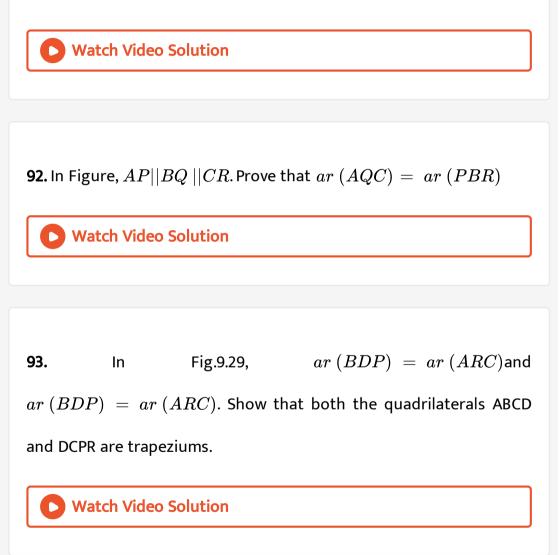
**89.** A villager Itwari has a plot of land of the shape of a quadrilateral. The Gram Panchayat of the village decided to take over some portion of plot from one of the corners to construct a Health centre. Itwari agrees to the above proposal with the condition that he should be given equal amount of land in lieu of his land adjoining his plot so as to form a triangular plot. Explain how his proposal will be implemented.

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**90.** ABCD is a trapezium with  $AB \mid DC$ . A line parallel to ACintersects AB at X and BC at Y. Prove that ar(ADX) = ar(ACY).



**91.** Diagonals AC and BD of a quadrilateral ABCD intersect at O in such a way that ar(AOD) = ar(BOC). Prove that ABCD is a trapezium.



94. Diagonals AC and BD of a quadrilateral ABCD intersect at Oin such a way that ar(AOD) = ar(BOC). Prove that ABCD is a trapezium.

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95. In Figure, diagonals AC and BD of quadrilateral ABCD intersect at

O such that OB=OD. If AB=CD, then show that:

(i) ar riangle (DOC)=ar riangle (AOB)

(ii) ar riangle (DCB)=ar riangle (ACB)

(iii) DA || CB



**96.** A point O inside a rectangle ABCD is joined to the vertices. Prove that the sum of the areas of a pair of opposite triangles so formed is equal to the sum of the other pair of triangles. Given: A rectangle ABCD and O is a point inside it. OA, OB, OC and OD

have been joined. To Prove: ar(AOD) + ar(BOC) = ar(AOB) + ar(COD)

**97.** Show that the area of a rhombus is half the product of the lengths of its diagonals. GIVEN : A rhombus ABCD whose diagonals AC and BD intersect at O. TO PROVE :  $ar(rhombusABCD) = \frac{1}{2}(ACxBD)$ 

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**98.** ABCD is a parallelogram and O is any point in its interior. Prove

that:

(i) 
$$ar (AOB) + ar (COD) = \frac{1}{2} ar (ABCD)$$
  
(ii)  $ar (AOB) + ar (COD) = ar (BOC) + ar (AOD)$ 



**99.** A quadrilateral ABCD is such that diagonal BD divides its area in two equal parts. Prove that BD bisects AC GIVEN : A quadrilateral ABCD in which diagonal BD bisects it. i.e.  $ar( \triangle ABD) = ar( \triangle BDC)$  CONSTRUCTION : Join AC Suppose AC and BD intersect at O. Draw  $AL \perp BD$ . TO PROVE : AO = OC

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**100.** Parallelogram ABCD and rectangle ABEF have the same base AB and also have equal areas. Show that the perimeter of the parallelogram is greater than that of the rectangle. GIVEN :  $A \mid \mid^{gm} ABCD$  and a rectangle ABEF with the same base AB and equal areas. TO PROVE : Perimeter of  $\mid \mid^{gm} ABCD$  > Perimeter of rectangle ABF i.e. AB + BC + CD + AD > AB + BE + EF + AF **101.** O is any point on the diagonal BD of the parallelogram ABCD.

Prove that ar( riangle OAB) = ar( riangle OBC)

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102. Triangles ABC and DBC are on the same base BC with A, D on opposite side of line BC, such that  $ar( \triangle ABC) = ar( \triangle DBC)$ . Show that BC bisects AD.

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103. D and E are points on sides AB and AC respectively of  $\Delta ABC$ 

such that ar(DBC) = ar(EBC). Prove that  $DE \mid BC$ .



**104.** If the medians of a  $\triangle ABC$  intersect at G, show that  $ar(\triangle AGB) = ar(\triangle AGC) = ar(\triangle BGC) = \frac{1}{3}ar(\triangle ABC).$ GIVEN :  $\triangle ABC$  such that its medians AD, BE and CF intersect at G TO PROVE :  $ar(\triangle AGB) = ar(\triangle BGC) = ar(\triangle CGA) = \frac{1}{3}ar(\triangle ABC).$ Watch Video Solution

**105.** D, E and F are respectively the mid-points of the sides BC, CA and AB of  $a\Delta ABC$ . Show that (i) BDEF is a parallelogram.

(ii)  $ar (DEF) = rac{1}{4}ar (ABC)$ (iii)  $ar (BDEF) = rac{1}{2}ar (ABC)$ 

**106.** BD is one of the diagonals of a quadrilateral ABCD. AM and CN are the perpendiculars from A and C, respectively, on BD. Show that ar (quad. ABCD)= $\frac{1}{2}BD(AM + CN)$ 

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**107.** ABCD is a quadrilateral. A line through D, parallel to AC, meets BC produced in P as shown in figure. Prove that  $ar( \triangle ABP)$ =a r (Quad.ABCD).

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**108.** If the median of a  $\triangle$ ABC intersect at G. show that ar ( $\triangle$ AGC) = ar

 $(\triangle AGB) = ar (\triangle BGC) = 1/3 ar (\triangle ABC)$ 

**109.** XY is a line parallel to side BC of triangle ABC. If BEIIACand CFIIAB meet XY at E and F respectively. Show that ar(ABE) = ar(ACF).



**110.** E, F, G, H are respectively, the mid-points of the sides AB, BC, CD and DA of parallelogram ABCD. Show that the quadrilateral EFGH is a parallelogram and that its area is half the area of the parallelogram, ABCD. GIVEN : A quadrilateral ABCD in which L, F, G, H are respectively the mid-points of the sides AB, BC, CD and DA. TO PROVE : (i) Quadrilateral EFGH is a parallelogram  $ar( \mid \mid^{gm} EFGH) = \frac{1}{2}ar( \mid \mid^{gm} ABCD)$  CONSTRUCTION : Join AC and HF

111. XY is a line parallel to side BC of  $\triangle ABC$ .  $BE \mid |AC$  and  $CF \mid |AB$  meet XY in E and F respectively. Show that ar(ABE) = ar(ACF).

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**112.** E, F, G, H are respectively, the mid-points of the sides AB, BC, CD and DA of parallelogram ABCD. Show that the quadrilateral EFGH is a parallelogram and that its area is half the area of the parallelogram, ABCD.

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**113.** The side AB of a parallelogram ABCD is produced to any point P. A line through A parallel to CP meets CB produced in Q and the parallelogram PBQR completed. Show that

 $ar(\ \hat{}\ (gm)ABCD) = ar(\ \hat{}\ (gm)BPRQ) \cdot \text{ CONSTRUCTION }: ext{ Join}$ AC and PQ. TO PROVE :  $ar(\ \hat{}\ (gm)ABCD) = ar(\ \hat{}\ (gm)BPRQ)$ 

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114. Any point D is taken in the base BC of a triangle ABC and ADis produced to E, making DE equal to AD. Show that  $ar ( \triangle BCE) = ar( \triangle ABC)$ 

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115. In ABC, D is the mid-point of AB, P is any point of BCCQPDmeets AB in Q. Show that  $ar(BPQ) = \frac{1}{2}ar(ABC)$ .

116. In a parallelogram ABCD, E, F are any two points on the sides AB and BC respectively. Show that ar( riangle ADF) = ar( riangle DCE).

117. In Figure, ABCD is a trapezium in which  $AB \mid DC$ . DC is produced to E such that CE = AB, prove that  $ar( \triangle ABD) = ar( \triangle BCE)$ . Construction: Draw DM on BAproduced and  $BN \perp DC$ 

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**118.** Prove that the area of an equilateral triangle is equal to  $\frac{\sqrt{3}}{4}a^2$ ,

where a is the side of the triangle.



**119.** In Figure, BC||XY, BX||CA and AB | | YC. Prove that: ar(ABX) = ar(ACY).



120. In Figure, ABCD is a parallelogram. Prove that: ar(BCP) = ar(DPQ) CONSTRUCTION : Join AC.

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**121.** ABC is a triangle in which D is the mid-point of BC and E is the mid-point of AD. Prove that area of  $\triangle BED = \frac{1}{4}area \ of \ \triangle ABC$ . GIVEN : A  $\triangle ABC$ , D is the mid-point of BC and E is the mid-point of the median AD. TO PROVE :  $ar(\ \triangle BED) = \frac{1}{4}ar(\ \triangle ABC)$ .

**122.** ABCD is a parallelogram X and Y are the mid-points of BCand CD respectively. Prove that  $ar(AXY) = \frac{3}{8}ar(\ (gm)ABCD)$ GIVEN : A parallelogram ABCD in which X and Y are the mid-points of BC and CD respectively. TO PROVE :  $ar(AXY) = \frac{3}{8}ar(\ (gm)abcd)$  CONSTRUCTION : Join BD.

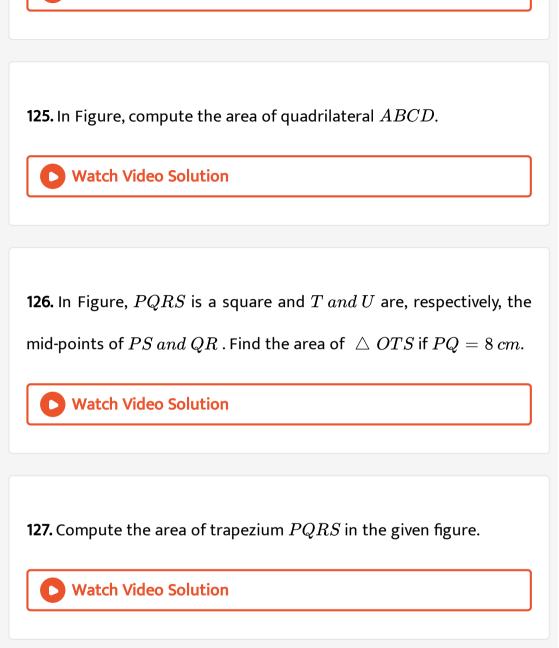
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**123.** The diagonals of a parallelogram ABCD intersect at a point O. Through O, a line is drawn to intersect AD at P and BC at Q. Show that PQ divides the parallelogram into two parts of equal area.



**124.** The medians BE and CF of a triangle ABC intersect at G.

Prove that area of  $riangle GBC = area \ of \ quadrilateral \ AFGE.$ 



128.

Figure,

 $\angle AOB = 90^{\circ}, \ AC = BC, \ OA = 12 \ cm \ and \ OC = 6. \ 5cm.$  Find

the area of riangle AOB.

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**129.** In Figure, ABCD is a trapezium in which AB = 7cm, AD = BC = 5cm, DC = X cm, and distance between AB and DC is 4cm. Find the value of X and area of trapezium ABCD

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**130.** In Figure, OCDE is a rectangle inscribed in a quadrant of a circle of radius 10cm. If  $OE = 2\sqrt{5}cm$ , find the area of the rectangle.

131. In figure, ABCD is a trapezium in which  $AB \mid |CD$  . Prove that:  $ar( \bigtriangleup AOD) = ar( \bigtriangleup BOC).$ 



132. In Figure, ABCD, ABFE and CDEF are parallelograms. Prove that  $ar( \bigtriangleup ADE) = ar( \bigtriangleup BCF)$ 

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**133.** Diagonals AC and BD of a quadrilateral ABCD intersect each at P. Show that:  $ar( \triangle APB) \times ar( \triangle CPD) = ar( \triangle APD) \times ar( \triangle PBC)$ 

**134.** In Figure, ABC and ABD are two triangles on the base AB. If line segment CD is bisected by AB at O, show that  $ar ( \triangle ABC) = ar ( \triangle ABD)$ 

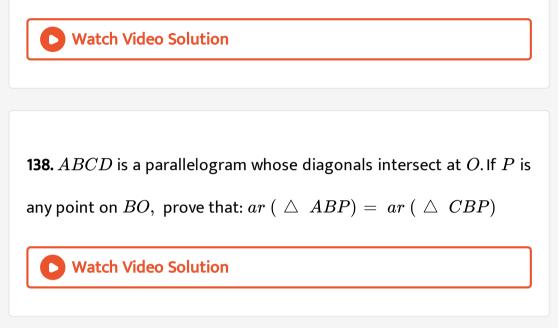
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**135.** If P is any point in the interior of a parallelogram ABCD, then prove that area of the triangle APB is less than half the area of parallelogram.



**136.** If AD is a median of a triangle ABC, then prove that triangles ADB and ADC are equal in area. If G is the mid-point of median AD, prove that  $ar ( \triangle BGC) = 2ar ( \triangle AGC)$ .

137. A point D is taken on the side BC of a ABC such that BD = 2DC. Prove that ar(ABD) = 2 ar(ADC)



**139.** ABCD is a parallelogram in which BC is produced to E such that CE = BC. AE intersects CD at F. Prove that ar(ADF) = ar(ECF). If the area of  $DFB = 3 cm^2$ , find the area of ABCD.

**140.** ABCD is a parallelogram whose diagonals AC and BDintersect at O. A line through O intersects AB at P and DC at Q. Prove that ar (  $\triangle POA$ ) = ar (  $\triangle QOC$ ).



**141.** ABCD is a parallelogram. E is a point on BA such that BE = 2 EA and F is a point on DC such that DF = 2 FC. Prove that AECF is a parallelogram whose area is one third of the area of parallelogram ABCD.

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**142.** In  $\triangle ABC$ , P and Q are respectively the mid-points of AB and BC and R is the mid-point of AP. Prove that:  $ar(\triangle PBQ) = ar(\triangle ARC)$  **143.** In  $\triangle ABC$ ,  $P \ and Q$  are respectively the mid-points of  $AB \ and BC$  and R is the mid-point of AP. Prove that:  $ar (\triangle PRQ) = \frac{1}{2}ar (\triangle ARC).$ 

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**144.** In  $\triangle ABC$ , P and Q are respectively the mid-points of AB and BC and R is the mid-point of AP. Prove that:  $ar(\triangle RQC) = \frac{3}{8} ar(\triangle ABC).$ 

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**145.** ABCD is a parallelogram, G is the point on AB such that AG = 2 GB, E is a point of DC such that CE = 2DE and F is the point of BC such that BF = 2FC. Prove that: ar (ADEG) = ar (GBCE) **146.** ABCD is a parallelogram, G is the point on AB such that AG = 2 GB, E is a point of DC such that CE = 2DE and F is the point on BC such that BF = 2FC. Prove that:  $ar( \triangle EGB) = \frac{1}{6}ar (ABCD)$ 

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147. ABCD is a parallelogram, G is the point on AB such that AG = 2 GB, E is a point of DC such that CE = 2DE and F is the point of BC such that BF = 2FC. Prove that:  $ar ( \triangle EFC) = \frac{1}{2} ar ( \triangle EBF)$ 

148. In figure, ABCD is a parallelogram, AE perpendicular to DC and CF

perpendicular to AD. If AB = 16cm, AE = 8cm and CF = 10cm, Find AD.

**149.** In Figure, CD ||AE and CY||BA. (i) Name a triangle equal in area of  $\triangle CBX$  (ii) Prove that  $ar (\triangle ZDE) = ar (\triangle CZA)$ (iii) Prove that  $ar (BCZY) = ar (\triangle EDZ)$ .

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**150.** In figure, PSDA is a parallelogram in which PQ = QR = RS and AP ||BQ||CR | |DS. Prove that  $ar ( \triangle PQE) = ar ( \triangle CFD).$ 

**151.** In Figure, ABCD is a trapezium in which ABDC and DC = 40cm and AB = 60cm. If X and Y are, respectively, the midpoints of AD and BC, prove that :  $XY = 50cm \ DCYX$  is a trapezium  $ar\left(trap\dot{D}CYX\right) = \frac{9}{11}ar\left(trapX\dot{Y}BA$ 

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**152.** In Figure, ABCD is a trapezium in which  $AB \mid DC$  and DC = 40cm and AB = 60cm. If X and Y are, respectively, the midpoints of AD and BC, prove that :

(i) 
$$XY = 50cm$$

(ii)  $ar(trapDCYX) = \frac{9}{11}ar(trap(XYBA)).$ 



**153.** In Figure, ABCD is a trapezium in which  $AB \mid DC$  and DC=40cm and AB=60 cm. If X and Y are, respectively, the mid-points

of 
$$AD \text{ and } BC$$
, prove that:  
 $ar\left(trap\dot{D}CYX\right) = \frac{9}{11} ar\left(trapX\dot{Y}BA\right)$   
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**154.** In Figure, ABC and BDE are two equilateral triangls such that D is the mid-point of BC. If AE intersects BC in F, Prove that:  $ar(BDE) = \frac{1}{4}ar(ABC).$ 

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**155.** In Figure, ABC and BDE are two equilateral triangls such that D is the mid-point of BCAE intersects BC in F. Prove that:  $ar(BDE) = \frac{1}{2}ar(BAE)$ 

**156.** In Figure, ABC and BDE are two equilateral triangles such that D is the mid-point of BCAE intersects BC in F. Prove that: ar(BFE) = ar(AFD)

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**157.** *ABC* is a triangle in which *D* is the mid-point of *BC* and *E* is the mid-point of *AD*. Prove that area of  $BED=\frac{1}{4}$  area of ABC.

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**158.** In figure, ABC and BDE are two equilateral triangles such that D is the mid-point of BC. If AE intersects BC in F. Prove that:  $ar( \triangle BFE) = 2ar( \triangle FED).$ 

**159.** *D* is the mid-point of side *BC* of *ABC* and *E* is the mid-point of *BD*. If *O* is the mid-point of *AE*, prove that  $ar(BOE) = \frac{1}{8}ar(ABC)$ 

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**160.** In Figure, X and Y are the mid-points of AC and AB respectively,  $QP \mid BC and CYQ and BXP$  are straight lines. Prove that ar (ABP) = ar (ACQ).

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**161.** In Figure ABCD and AEFD are two parallelograms. Prove that:

PE = FQ

**162.** In Figure, ABCD and AEFD are two parallelograms? Prove that: ar(APE): ar(PFA) = ar(QFD) : ar(PFD)

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 163. In Figure, 
$$ABCD$$
 is a parallelogram.  $O$  is any point on  $AC$ .

  $PQ ||AB and LM||AD$ .
 Prove that

  $ar(parallelogramDLOP) = ar(parallellogramBMOQ)$ 

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**164.** In a 
$$\triangle ABC$$
, If  $L$  and  $M$  are points on  $AB$  and  $AC$   
respectively such that  $LM \mid BC$ . Prove that:  
 $ar ( \triangle LCM) = ar ( \triangle LBM)$ 

**165.** In a ABC, If L and M are points on AB and AC respectively such that  $LM \mid BC$ . Prove that: ar(LBC) = ar(MBC)



**166.** In a ABC, If L and M are points on AB and AC respectively

such that  $LM \mid |BC$ . Prove that: ar(ABM) = ar(ACL).

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**167.** In a ABC, If L and M are points on AB and AC respectively

such that  $LM \mid BC$ . Prove that: ar(LOB) = ar(MOC).



**168.** In Figure D and E are two points on BC such that BD = DE = EC. Show that

$$ar(\ ABD) = \ ar \ (\ ADE) = ar \ (\ AEC) \cdot$$



**169.** In Figure, ABC is a right triangle right angled at A, BCED, ACFG and AMN are square on the sides BC, CA and AB respectively. Line segment  $AX \perp DE$  meets BCat Y. Show that:  $MBC \cong ABD$ 

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**170.** In Figure, ABC is a right triangle right angled at A, BCED, ACFG and AMN are square on the sides BC, CA and AB respectively. Line segment  $AX \perp DE$  meets BC at Y. Show that: ar (BYXD) = 2 ar (MBC)



171. In Figure, ABC is a right triangle right angled at A, BCED, ACFG and ABMN are squares on the sides BC, CA and AB respectively. Line segment  $AX \perp DE$  meets BCat Y. Show that: ar (BYXD) = ar (ABMN).

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**172.** In figure, ABC is a right triangle right angled at A. BCED, ACFG and ABMN are square on the sides BC, CA and AB respectively. Line segment  $AX \perp DE$  meets BCat Y. Show that:  $\triangle FCB \cong \triangle ACE$ 

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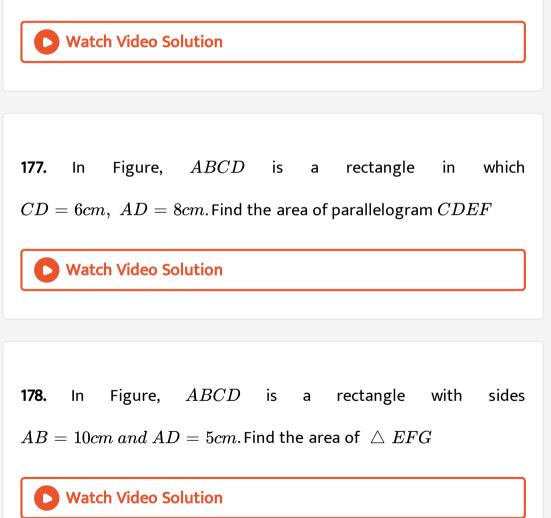
**173.** In figure, ABC is a right triangle right angled at A. BCED, ACFG and ABMN are square on the sides  $BC, \ CA \ and \ AB$  respectively. Line segment  $AX \perp DE$  meets BC at Y. Show that:  $ar \ (CYXE) = 2ar( \ \bigtriangleup \ FCB).$ 

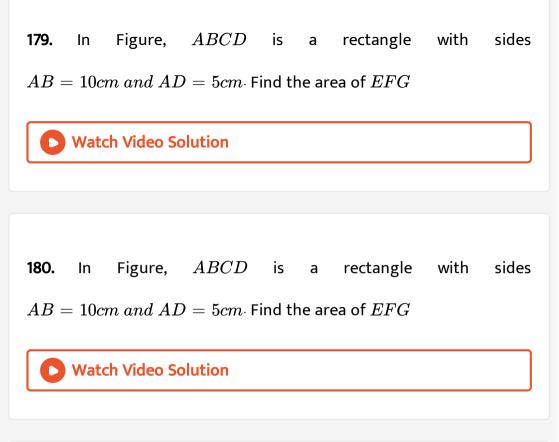
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**174.** In figure, ABC is a right triangle right angled at A. BCED, ACFG and ABMN are square on the sides BC, CA and AB respectively. Line segment  $AX \perp DE$  meets BCat Y. Show that: ar(CYXE) = ar(ACFG).

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**175.** In Figure, ABC is a right triangle right angled at A, BCED, ACFG and ABMN are square on the sides BC, CA and AB respectively. Line segment  $AX \perp DE$  meets BCat Y. Show that: ar(CYXE) = ar(ACFG) **176.** In fig, ABC and BDE are two equilateral triangles such that D is the mid-point of BC. If AE intersects BC at F, show that: (i) ar(BDE)= 1/4 ar(ABC) (ii) ar(BDE)= 1/2 ar(BAE)





181. PQRS is a rectangle inscribed in a quadrant of a circle of radius

 $13cm\cdot A$  is any point on  $PQ\cdot$  If  $PS=5cm, ext{ then find }ar \ (RAS)$ 

**182.** In square ABCD, P and Q are mid-point of AB and CD respectively. If AB = 8cm and PQ and BD intersect at O, then find area of OPB

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**183.** ABC is a triangle in which D is the mid-point of BC, E and F are mid-points of DC and AE respectively. If area of ABC is  $16 \ cm^2$ , find the area of DEF

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**184.** PQRS is a trapezium having PS and QR as parallel sides. A is any point on PQ and B is a point on SR such that  $AB \mid |QR|$ . If area of  $\triangle PBQ$  is  $17 \ cm^2$ , find the area of  $\triangle ASR$ 



**185.** ABCD is a parallelogram. P is the mid-point of ABBD and CPintersect at Q such that CQ:QP = 3:1. If  $ar (PBQ) = 10 \ cm^2$ , find the area of parallelogram ABCD

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186. P is any point on base BC of ABC and D is the mid-point of BCDE is drawn parallel to PA to meet AC at E. If  $ar~(ABC) = 12cm^2$ , then find area of EPC

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**187.** Two parallelograms are on equal bases and between the same parallels.

The ratio of their areas is



**188.** A triangle and a parallelogram are on the same base and between the same parallels. The ratio of the areas of triangle and parallelogram is

(a)1:1

(b) 1:2

(c) 2:1

(d) 1:3

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**189.** Let ABC be a triangle of area 24sq. units and PQR be the triangle formed by the mid-points of sides of ABC. Then the area of

PQR is 12 sq. units (b) 6 sq. units 4 sq. units (d) 3 sq. units



190. The median of a triangle divides it into two (a)congruenttriangle (b) isosceles triangles (c)right triangles (d)triangles of equal areas

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**191.** In a ABC, D, E, F are the mi-points of sides BC, CA and AB respectively. If  $ar(ABC) = 16cm^2$ , then ar (trapezium FBCE) =  $4 \ cm^2$  (b)  $8 \ cm^2$  (c)  $12cm^2$  (d)  $10cm^2$ 

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**192.** ABCD is a parallelogram. P is any point on CD. If  $ar (DPA) = 15 \ cm^2$  and  $ar (APC) = 20 \ cm^2$ , then ar (APB) =(a)  $15 \ cm^2$  (b)  $20 \ cm^2$  (c)  $35 \ cm^2$  (d)  $30 \ cm^2$  **193.** The area of the figure formed by joining the mid-points of the adjacent sides of a rhombus with diagonals  $16cm \ and \ 12cm$  is  $28 \ cm^2$  (b)  $48 \ cm^2$  (c)  $96 \ cm^2$  (d)  $24 \ cm^2$ 



**194.** A, B, C, D are mid-points of sides of a parallelogram PQRS. If  $ar (PQRS) = 36CM^2$ , then  $ar(ABCD) = 24 \ cm^2$  (b)  $18 \ cm^2$ (c)  $30 \ cm^2$  (d)  $36 \ cm^2$ 

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**195.** The figure obtained by joining the mid-points of the adjacent sides of a rectangle of sides  $8cm \ and \ 6cm$  is. a) rhombus of area  $24 \ cm^2$  (b) a rectangle of area  $24cm^2$  a square of area  $26 \ cm^2$  (d) a trapezium of area  $14 \ cm^2$ 

**196.** The mid points of the sides of a triangle ABC along with any of the vertices as the fourth point make a parallelogram of area equal to: ar (ABC) (b)  $\frac{1}{2}ar (ABC) \frac{1}{3}ar (ABC)$  (d)  $\frac{1}{4}ar (ABC)$ 

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**197.** If AD is median of ABC and P is a point on AC such that ar(ADP): ar(ABD) = 2:3, then ar(PDC): ar(ABC) is 1:5 (b) 1:5 (c) 1:6 (d) 3:5

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**198.** Medians of ABC intersect at G . If  $ar (ABC) = 27 \ cm^2$ , then

 $ar\left(BGC
ight) =$ 

(i)  $6 \ cm^2$ 

(b)  $9 \ cm^2$ 

(c)  $12 \ cm^2$ 

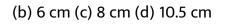
(d)  $18 cm^2$ 

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**199.** In a *ABC* if *D* and *E* are mid-points of *BC* and *AD* respectively such that  $ar (AEC) = 4 cm^2$ , then ar (BEC) =(b)  $4 cm^2$ (b)  $6 cm^2$ (c)  $8 cm^2$ (d)  $12cm^2$ 

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**200.** In Figure, ABCD is a parallelogram. If  $AB = 12 \ cm, \ AE = 7.5 \ cm, \ CF = 15 \ cm, \ then \ AD =$  (a) 3 cm





201. In Figure, PQRS is a parallelogram. If X and Y are mid-points of PQ and SR respectively and diagonal SQ is joined. The ratio arXQRY: ar (QSR) =
(a) 1:4
(b) 2:1

(c) 1:2

(d) 1:1

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**202.** In Figure, ABCD and FECG are parallelograms equal in area. If  $ar (AQE) = 12cm^2$ , then arFGBQ =(a)  $12 cm^2$  (b)  $20 \ cm^2$ 

(c)  $24 \ cm^2$ 

(d)  $36 \ cm^2$ 



**203.** Diagonal AC and BD of trapezium ABCD, in which  $AB \mid DC$ , intersect each other at O. The triangle which is equal in area of AOD is AOB (b) BOC (c) DOC (d) ADC

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**204.** ABCD is a trapezium in which  $AB \mid |DC$ . If  $ar(ABD) = 24 \ cm^2 and \ AB = 8 \ cm$ , then height of ABC is 3 cm (b) 4 cm (c) 6 cm (d) 8 cm

**205.** ABCD is a trapezium with parallel sides AB = a and DC = b. If E and F are mid-points of non-parallel sides AD and BC respectively, then the ratio of areas of quadrilaterals ABFE and EFCD is: a : b (b) (a + 3b) : (3a + b) (3a + b) : (a + 3b)(d) (3a + b) : (3a + b)

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**206.** ABCD is a rectangle with O as any point in its interior. If  $ar (AOD) = 3 \ cm^2 and \ ar (BOC) = 6 \ cm^2$ , then area of rectangle ABCD is:  $9cm^2$  (b)  $12 \ cm^2$  (c)  $15cm^2$  (d)  $18 \ cm^2$