MATHS

NCERT - NCERT MATHEMATICS(HINGLISH)

AREAS OF PARALLELOGRAMS AND TRIANGLES

Exercise 9 3

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

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2. In a triangle ABC, E is the mid-point of median AD. Show that $ar\ (BED) = \frac{1}{4} ar\ (ABC)$

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3. In Fig.9.23, E is any point on median AD of a ΔABC. Show that $ar\ (ABE) = ar\ (ACE)$.

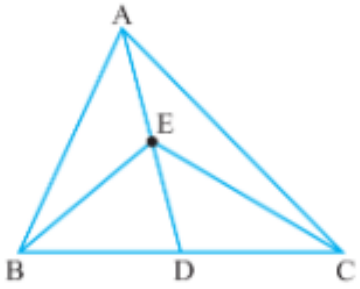

Fig. 9.23

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4. D and E are points on sides AB and AC respectively of ΔABCsuch that$ar\ (DBC)\ =\ ar\ (EBC)$. Prove that $DE\ |\ |\ BC$.

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5. In Fig. 9.25, diagonals AC and BD of quadrilateral ABCD intersect at O such that $OB\ =\ OD$. If $AB\ =\ CD$, then show that:(i) $ar\ (DOC)\ =\ ar\ (AOB)$(ii)

$ar\ (DCB)\ =\ ar\ (ACB)$(iii) `D A\ ||\ C

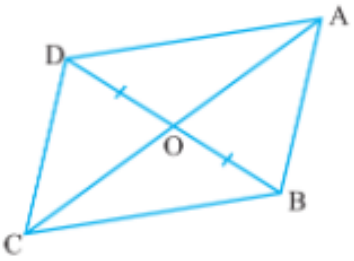

Fig. 9.25

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6. D, E and F are respectively the mid-points of the sides BC, CA and AB of aΔABC.Show that (i) BDEF is a parallelogram. (ii) $ar\ (DEF) = \frac{1}{4} ar\ (ABC)$(iii) $ar\ (BDEF) = \frac{1}{2} ar\ (ABC)$

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7. In Fig. 9.24, ABC and ABD are two triangles on the same base AB. If line- segment CD is bisected by AB at O, show that $ar(\triangle ABC) = ar(\triangle ABD)$

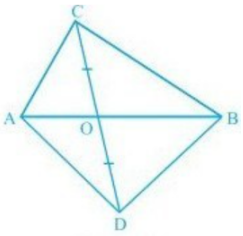

Fig. 9.24

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8. 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. Show that $ar\,(ABCD) = ar\,(PBQR)$.

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9. XY is a line parallel to side BC of a triangle ABC. If $BE \parallel AC$ and $CF \parallel AB$ meet XY at E and F respectively, show that $ar\,(ABE) = ar\,(ACF)$

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10. Diagonals AC and BD of a trapezium $ABCD$ with $AB \parallel DC$ intersect each other at O. Prove

that $ar\ (AOD) = ar\ (BOC)$.

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11. In Figure, $ABCDE$ is a pentagon. A line through B parallel to AC meets DC produced at F.

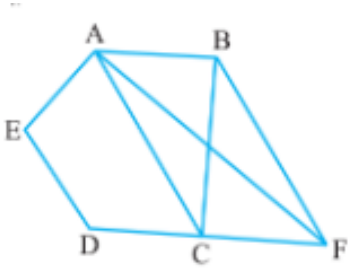

Fig. 9.27

Show that: $ar\ (ACB) = ar\ (ACF)$

$ar\ (AEDF) = ar\ (ABCDE)$

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12. A villager Itwaari has a plot of land of the shape of a quadrilateral. The Gram Panchayatof the village decided to take over some portion of his plot from one of the corners toconstruct a Health Centre. Itwaari agrees to the above proposal with the conditionthat he should be given equal amount of land in lieu of his land adjoining his plot soas to form a triangular plot. Explain how this proposal will be implemented.

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

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14. In Fig.9.28, $AP \mid\mid BQ \mid\mid CR$. Prove that $ar\,(AQC) = ar\,(PBR)$.

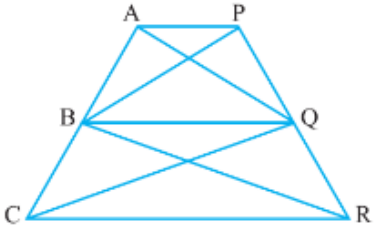

Fig. 9.28

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15. 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.

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16. In Fig.9.29, $ar\,(BDP) = ar\,(ARC)$ and $ar\,(BDP) = ar\,(ARC)$. Show that both the quadrilaterals ABCD and DCPR are trapeziums.

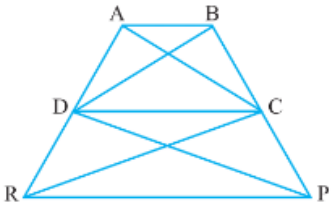

Fig. 9.29

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Solved Examples

1. In Fig. 9.22, ABCD is a quadrilateral and $BE \mid\mid AC$and also BE meets DC produced at E. Show that area of $\Delta ADE$is equal to the area of the quadrilateral ABCD.

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2. If a triangle and a parallelogram are on the same base and between thesame parallels, then prove that

the area of the triangle is equal to half the area of the parallelogram.

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3. Show that a median of a triangle divides it into two triangles of equal areas.

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4. 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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Exercise 9 2

1. $ABCD$ is a parallelogram, $AE \perp DC$and $CF \perp AD$. If $AB = 16\,cm$, $AE = 8\,cm$ and $CF = 10\,cm$, find AD.

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

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3. P and Q are any two points lying on the sides DC and AD respectively of a parallelogramABCD. Show that $ar\ (APB) = ar\ (BQC)$.

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4. In Fig. 9.16, P is a point in the interior of a parallelogram ABCD. Show that(i) $ar(APB) + ar(PCD) = \frac{1}{2}ar(ABCD)$(ii) $ar(APD) + ar(PBC) = ar(APB) + ar(PCD)$

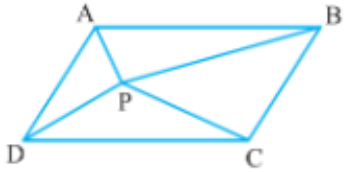

Fig. 9.16

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5. In Fig. 9.17, $PQRS$ and $ABRS$ are parallelograms and X is any point on side BR. Show that (i) $ar(PQRS) = ar(ABRS)$(ii)

$ar(AXS) = \frac{1}{2}ar(PQRS)$

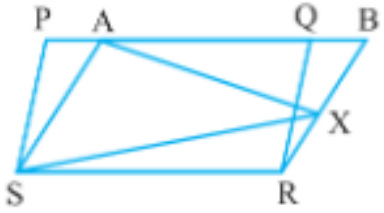

Fig. 9.17

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6. A farmer was having a field in the form of a parallelogram PQRS. She took any point Aon RS and joined it to points P and Q. In how many parts the fields is divided? Whatare the shapes of these parts? The farmer wants to sow wheat and pulses in

equalportions of the field separately. How should she do it?

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Exercise 9 4

1. ABC is a right triangle right angled at A. BCED, ACFG and ABMN aresquares on the sides BC, CA and AB respectively. Line segment $AX \perp DE$meets BCat Y. Show that:(i) $\Delta MBC \cong \Delta ABD$(ii) `a r\ (B Y X D)\ =\ 2\

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2. Diagonals AC and BD of a quadrilateral $ABCD$ intersect each other at P. Show that $ar\,(APB) \times ar\,(CPD) = ar\,(APD) \times ar\,(BPC)$.

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3. P and Q are respectively the mid-points of sides AB and BC of a triangle ABC and Ris the mid-point of AP, show that (i) $ar(PRQ) = \frac{1}{2}ar(ARC)$(ii) $ar(RQC) = \frac{3}{8}ar(ABC)$(iii) $ar(PBQ) = ar(ARC)$

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4. In Fig. 9.32, ABCD is a parallelogram and BC is produced to a point Q such that $AD = CQ$. If AQ intersect DC at P, show that $ar\,(BPC) = ar\,(DPQ)$.

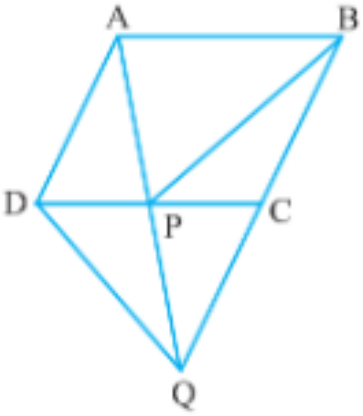

Fig. 9.32

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5. In Figure, $ABC\ and\ BDE$ are two equilateral triangls such that D is the mid-point of $BC\dot{A}E$ intersects BC in F. Prove that: $ar(BDE) = \frac{1}{4}ar\ (\ ABC)$

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6. In Fig. 9.30, D and E are two points on BC such that $BD = DE = EC.$ Show that $ar\ (ABD) = ar\ (ADE) = ar\ (AEC).$ 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 ?

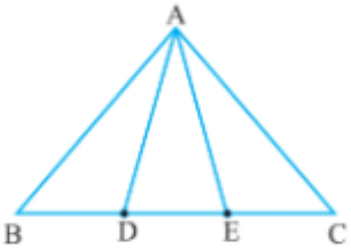

Fig. 9.30

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7. In Fig. 9.31, ABCD, DCFE and ABFE are parallelograms. Show that $ar(ADE) = ar(BCF)$.

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8. Parallelogram ABCD and rectangle ABEF are on the same base AB and have equalareas. Show that the perimeter of the parallelogram is greater than that of the rectangle.

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Exercise 9 1

1. Which of the following figures lie on the same base and between the same parallels.In such a case, write

the common base and the two parallels.

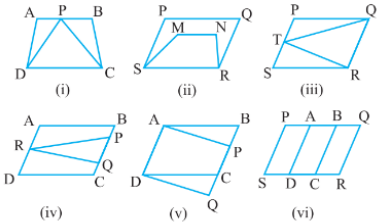

Fig. 9.8

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